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Impact of Demographic and Health Factors on GDP Growth of South Asian Countries

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ABSTRACT
The changing aspects of world economic transformation has been attention-grabbing especially for last 10-20 years as this time duration has seen swift progress and development in economic, demographic and health factors. Among the developing countries, there has been a dramatic increase in South Asia's GDP. GDP of South Asia has grown by 7% on average in the last decade. This GDP growth is further expected to grow by 8% by 2019 (World Bank).Particularly, significant increase in the GDP growth of the countries like India, Srilanka, Bangladesh and Pakistan is observed. This achievement in economic growth must be backed by the characteristics of the country's nationals. Among such characteristics, one of the determinants of GDP growth is country's demographic factors and the health of the nationals. Demographic factors play its role in the economic growth by molding the characteristics of the people in a country and therefore percentage of labor force participation. There has not been significant contribution in the literature on the impact of these demographic factors on South Asian GDP. This study has validated new indication supporting the impression that disparity in demographic features is a significant determinant of growth in the country's economic growth. Using a panel dataset from 2002 to 2011 at the country-level in the South Asia, this study is conducted to analyze by incorporating factors related to demographic and health into a function of economic growth, this study has depicted that demographic changeover has played a significant role in South Asia's development. It was statistically found that health expenditure and mortality has a significant positive association with the GDP growth. It is important to note that potential growth of South Asian economies is largely dependent on its skill formation capacity of its population, particularly working age population. Therefore, Government of a country should play a major role to strengthen its health sector which can contribute more effectively towards economic growth and development.
Keywords: GDP growth, life expectancy, mortality, fertility, health expenditure, South Asia

INTRODUCTION

There has been significant transition in the demographic features of South Asia over the last few years. Such transition refers to lower percentages of mortality and higher percentages of

fertility. This changeover has been the most in South Asian region as compared to any other region of the world. In this paper, an attempt has been made to depict that the economic growth of south Asia is partly due to changeover in the demographic factors. This changeover is mainly due to the fact that population growth has been significantly high in the recent past in South Asia, which has resulted in increased workforce and the national output. The practical studies show that inhabitant's progress has an only intermediate influence on economic progress.

Industrialization in the Countries of South Asia and therefore changes in the structural output has resulted a major changeover. With people migrating from rural areas to urban areas which resulted in increased workforce not only in the form of male labor workforce but also in the form of female labor workforce. Emergence of females in the national output has resulted in increased workforce. Due to female participation in the labor force has reduced demand for child labor and children spend more years in school. As a result the level of education and therefore literacy rate has increased leading to economic development.

Lower to Higher fertility rate and Higher to lower mortality rate is being described here as a high demographic transition. This high demographic transition has resulted in the growth of labor force and higher population of people between the age group 15-30 years.
Poor health and the outlook of early mortality have trouble millions around the world. Currently, there exit a proposition that improved health leads to economic growth and prosperity. Such as, Commission's report on Macroecomimcs and Health (2001), lead by Jeffrey Sachs, reported health as a major factor of economic prosperity. Likewise, growth of African countries declines by 1.3% per year as a result of Malaria. (Abuja Declaration, 2000). In this study, the famous claim of health with economic growth was also assessed.

Motivation of this Study

This research has two motives. The main motive is to derive a function that predicts the relationship between demographic factors on economic growth. The secondary motive is to apply that function to deduce how much of the South Asian growth can be elucidated by the region's specific demographic changeover.
One aim in this study is to respond to that important issue that how much GDP will be effected by the health improvements and transition of other demographic factors. A mixture of these factors being considered here such as life expectancy, fertility, mortality and health expenditure per capita to predict changes in GDP.

LITERATURE REVIEW

South Asia is the most densely populated region of the world with total population equal to one-fifth of the world's population. Population growth and its impact on economy has been a topic of debate in the region. Population has been the main characteristic of demographic features. There are "population pessimists" who believe that population growth negates the effect of technological progress and capital accumulation which is very necessary for the development of any country (Coaled and Hoover 1958 and Ehrlich 1968). Whereas, population

optimists believe that population growth enables country to make use of economies of scale, increased labor force and more formation of capital. (Boserup 1981, Kuznets 1967, and Simon 1981). In 80's (Bloom and Freeman 1986 and Kelley 1988) concluded that no real positive or negative impact to GDP due to growth in population. This research was supported by panel data and applying regression on a set of countries.

Current contributions by (Barlow 1994, Bloomand Freeman 1988, Branderand Dowrick1 994, Coale 1986, and Kelley and Schmidt 1995) have classified this demographic feature into mortality and fertility rate and evaluate their impacts on GDP growth. These researches have concluded that fertility rate has negative association with growth of economy. Whereas, mortality rate has an insignificant impact on growth rate.

Current literature on the impacts of health on economic performance takes into accounts both, household side and aggregate side economics. As per various microeconomics studies, emergence of new diseases and poor health has caused a significantly negative impact on person's efficiency. Whereas, as per macroeconomic studies, very strong relation has been found in per capita income and health factors such as life expectancy. But there has been a problem in making conclusions from micro and macroeconomic studies. Such as, studies at micro level inferred that increase in life expectancy will leads to larger population and therefore low resources per capita. A new study by, Acemoglu and Johnson (2007), concludes that when the harms of health's endogeneity and lost variables are adjusted, health upgrading in the era after World War II in reality had a reverse effect on income per capita.

HEALTH EFFECT ON GDP

One motive in this study is to examine quantitatively the part that health modification performs in enlightening differences in earnings amid countries which are rich as compared to poor. Therefore, calculating the growth in earnings caused by the change in the health. But, none of the countries of South Asia is classified as rich countries. Therefore, the impact of health on economy is being defined in this study as the growth in GDP of South Asian countries over the years.

Various ways have been classified by economists to measure health impact on economic growth. This proposition is based on the fact that healthier people are expected to work more efficiently and effectively and thereby increasing the national output as an outcome. As per (Bloom and Canning [2000], Kalemli-Ozcan, Ryder, and Weil [2000], impact of improved health on population growth is vague but reduced infant and lowered mortality tends to increased number of times the fertility.

HYPOTHESIS IN STUDY

The amount of growth of national health care expenditures appears to have been significantly related to the growth of the GDP (Fuchs, 2013). According to previous researches it is proved that a long run relationship exists between income per capita, health expenditures, and literacy rate. The results proved a positive and significant relationship between health care expenditure, education and economic growth. Good health is found to be a trivial predictor of a country's economic growth. Past researches by Hansen and King (1996), Blomqvist and Carter

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(1997), McCoskey and Selden (1998), Gerdtham and Löthgren (2000) establish an important relationship between gross domestic product and health care expenditure.

Jewell et al. (2003) studied this relationship with the presence of structural changes including demographic variables . The cause of this joint relationship between GDP and health care expenditure is due to the fact that an increase in health care expenditure in a country elevates the safety, security and welfare of workers, which advances the labor efficiency since a healthy worker can work harder and longer and can think clearly (Bloom and Canning, 2006). Kornfeld, Hartman and Catlin (2010) find a positive and significant relationship between health care expenditure and GDP per capita. Newhouse, (1977) suggests that GDP of a country is the most influential factor on health expenditures which supports Kleiman, (1974). The most of studies reveal the positive impact (Behrman, 1990; Barro and Sala-i Martin, 1995; Bloom and Sachs, (1998), several papers indicate the negative impact on growth (Cullis and West, 1979; Easterly and Rebelo, 1993; Acemoglu and Johnson, 2006). Esteve and Zahonero (2007) examine the long run relationship between per capita national income (GDP) and per capita health expenditure. Previous researches found the consistent long run relationship between both variables. Amiri and Ventelou (2010) studied the relationship between GDP per capita and per capita health care expenditure. Olaniyan, Onisanwa and Oyinlola (2013) established a long run relationship between health care expenditure and gross domestic product (GDP). Lv and Zhu (2014) examine the relationship between per capita GDP and health care expenditure for the 42 countries of Africa over the period of 1995-2005 and established a long run relationship between health expenditure, literacy and income per capita. GDP per capita over the medium-to long-term, is strongly inversely related to mortality rates during in the short term however rapid economic growth is infrequently related with increased mortality rate. Economic growth has been the dominant element in mortality rate decline in the US over the 20th century. Economic slump and successive periods of rapid economic growth are associated with a deceleration in the normally declining curve of mortality against time (Brenner, 1979).

Previous researchers have claimed an inverse relation between the national economic level and mortality rates. The increase in the mortality rate is followed by economic adversity and vice versa. This has been investigated and proved for the United States, and for 1936-1976 for England and Wales. A strong, negative association between changes in per capita GDP and infant mortality was found. The results suggest that over 1 million excess deaths have occurred in the developing world during 1980-2004 in countries experiencing economic contractions of 10 percent or greater. Most recent research suggests that mortality increases when macroeconomic conditions temporarily improve. One cause of higher death rates during good economic times may be that individuals adopt less healthy lifestyles.

The infant mortality rate indicates how many babies die in their first year of life out of 1000 babies born alive; it is considered to be a prominent indicator of the performance of the health care system .The infant mortality rate have a negative relationship with health care

expenditure. Previous studies found that infant mortality rate over 1,000 live birth have a negative relationship with health care expenditure. While GDP per capita, over the medium- to long-term, is strongly inversely related to mortality rates. Economic growth, cumulatively over at least a decade, has been the dominant factor in mortality rate decline in the US over the 20th century. The volatility of rapid economic growth as it departs from its major trend, has a very short-term effect (within a year) to increase mortality—partly owing to adaptation to new technology and the adjustment of the formerly unemployed to new jobs, social status, and organizational structures.

The desirable effects of improved health, increased life expectancy. The instrumented changes in life expectancy have a large effect on population; a 1% increase in life expectancy leads to an increase in population of about 1.5%. Life expectancy has a much smaller effect on total GDP both initially and over a 40-year horizon (Acemoglu & Johnson, 2007). Life expectancy has a much smaller effect on total GDP, however. Consequently, there is no evidence that the large increase in life expectancy raised income per capita

Based on the above discussion and on the motive of research, following hypotheses are developed.
H1: Health Expenditure per capita has a significant impact on South Asia's GDP
H2: Death Rate has a significant impact on South Asia's GDP
H3: Mortality rate has a significant impact on South Asian GDP.
H4: Life expectancy has significant impact on South Asian GDP.

METHODLOGY

Multiple Linear Regression is being applied on a panel data of 10 years (2002 -2011) of all SAARC countries taking into account all explanatory variables.

RESULTS

Panel data regression has been applied on E Views as shown in Table-1. Results from panel regression are showing life expectancy, Health expenditures and Fertility as significant variables. Value of R square was found as low consistent with the previous research.

TABLE 1

Dependent Variable: GDP
Method: Panel Least Squares
Date: 12/28/14 Time: 14:35
Sample: 2002 2011
Periods included: 10
Cross-sections included: 7
Total panel (unbalanced) observations: 58

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIFEEXPE	-0.200139	0.082805	-2.416999	0.0191
HEALTHEX	0.034323	0.011756	2.919510	0.0051
LN_FERTI	-5.347309	2.066118	-2.588094	0.0124
C	23.84723	7.534386	3.165119	0.0025

R-squared	0.233758	Mean dependent var	5.867241
Adjusted R-squared	0.191189	S.D. dependent var	2.226979
S.E. of regression	2.002809	Akaike info criterion	4.293451
Sum squared resid	216.6072	Schwarz criterion	4.435550
Log likelihood	-120.5101	Hannan-Quinn criter.	4.348801
F-statistic	5.491278	Durbin-Watson stat	1.495036
Prob(F-statistic)	0.002290		

Figure 1

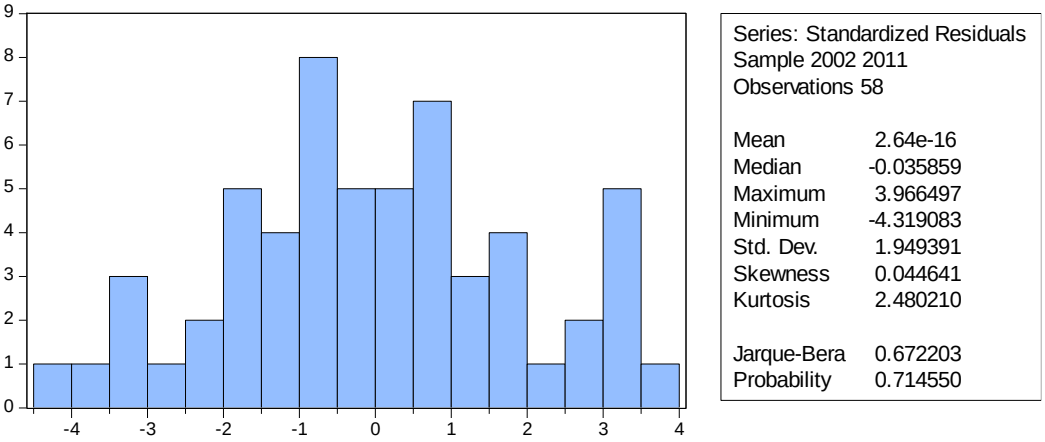

Figure 1 showing the data as normal with value of Jarque-Bera as greater than 0.05.

TABLE 2

Variance Inflation Factors
Date: 12/28/14 Time: 14:43
Sample: 1 69
Included observations: 58

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
LIFEEXPE	0.006857	449.4258	3.598274
HEALTHEX	0.000138	3.988724	1.103752
LN_FERTI	4.268845	77.77221	3.566558
C	56.76698	820.8139	NA

Our tests of multicolinearity depicts that no multicolinearity exists as the VIF value is less than 5.

TABLE 3

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.213336	Prob. F(3,54)	0.0971
Obs*R-squared	6.350930	Prob. Chi-Square(3)	0.0957
Scaled explained SS	4.074385	Prob. Chi-Square(3)	0.2535

Table 3 shows the behavior of our residuals as homoscedastic. It was concluded based on BP Godfrey test by acceptance of its hypothesis.

TABLE 4

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.346244	Prob. F(2,52)	0.2691
Obs*R-squared	2.855315	Prob. Chi-Square(2)	0.2399

From Table-4, LM test was applied in which it is concluded that no autocorrelation exist found in our model.

TABLE 5

Dependent Variable: GDP
Method: Panel Least Squares
Date: 12/28/14 Time: 14:35
Sample: 2002 2011
Periods included: 10
Cross-sections included: 7
Total panel (unbalanced) observations: 58

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIFEEXPE	0.317420	0.361627	0.877754	0.3844
HEALTHEX	-0.003358	0.026326	-0.127542	0.8990
LN_FERTI	2.847278	5.590180	0.509336	0.6129
C	-18.41281	29.07763	-0.633229	0.5296

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.378423	Mean dependent var	5.867241
Adjusted R-squared	0.261878	S.D. dependent var	2.226979
S.E. of regression	1.913288	Akaike info criterion	4.291109
Sum squared resid	175.7121	Schwarz criterion	4.646357
Log likelihood	-114.4421	Hannan-Quinn criter.	4.429485
F-statistic	3.246997	Durbin-Watson stat	1.911051
Prob(F-statistic)	0.003722		

Table-5 showing the regression results of fixed effect model. Though R-square is better in this case as compared to pooled regression but all the predictors here are found as insignificant and importantly, F-statistic value is very less.

F-test is further applied to check validity of fixed effect results. F-test in Table-6 is also aligning with the Table-5 results that show the weak impact of fixed effect model.

TABLE-6

Redundant Fixed Effect Tests
Equation: Untitled
Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	1.861912	(6,48)	0.1070
Cross-section Chi-square	12.135834	6	0.0590

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TABLE 7

Dependent Variable: GDP
Method: Panel EGLS (Cross-section random effects)
Date: 12/28/14 Time: 14:36
Sample: 2002 2011
Periods included: 10
Cross-sections included: 7
Total panel (unbalanced) observations: 58
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LIFEEXPE	-0.174515	0.093878	-1.858943	0.0685
HEALTHEX	0.030266	0.012886	2.348736	0.0225
LN_FERTI	-4.681031	2.321158	-2.016679	0.0487
C	21.55872	8.561344	2.518147	0.0148

Effects Specification		
	S.D.	Rho
Cross-section random	0.453675	0.0532
Idiosyncratic random	1.913288	0.9468

Weighted Statistics

R-squared	0.154300	Mean dependent var	4.800058
Adjusted R-squared	0.107317	S.D. dependent var	2.096075
S.E. of regression	1.962668	Sum squared resid	208.0116
F-statistic	3.284141	Durbin-Watson stat	1.554798
Prob(F-statistic)	0.027588		

Unweighted Statistics

R-squared	0.230351	Mean dependent var	5.867241
Sum squared resid	217.5703	Durbin-Watson stat	1.486490

Table-7 and Table-8 depicts the impact of Random effect model. Table-7 showing nearly all our predictors as significant variable but the value of F-statistic is found as very low. Though, Hausman test in Table-8 validate the reliability of Random effect Model in comparison to the fixed effect model.

TABLE 8

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	5.933685	3	0.1149

TABLE 9

Lagrange multiplier (LM) test for panel data
Date: 05/20/16 Time: 13:05
Sample: 2002 2011
Total panel observations: 68
Probability in ()

Null (no rand. effect) Alternative	Cross-section One-sided	Period One-sided	Both
Breusch-Pagan	2.597989	0.241084	2.839073
	(0.1070)	(0.6234)	(0.0920)
Honda	-1.611828	0.491003	-0.792543
	(0.9465)	(0.3117)	(0.7860)
King-Wu	-1.611828	0.491003	-0.937979
	(0.9465)	(0.3117)	(0.8259)
GHM	--	--	0.241084
	--	--	(0.5333)

From table-9, Lagrange Multiplier (LM) test for panel data has been applied to finalize the validity of Random effect model versus that of pooled regression model. Results accept the null hypothesis that Pooled regression model is better.
So our final model will be based on pooled regression model be most effective in actually predicting the GDP. From Table-1 our final model will be,

GDP = 23.84723 - 0.2 Life Expectancy + 0.03 Health Expenditure – 5.347 Ln Fertility Rate
Whereas, death rate is considered as an insignificant variable in actually predicting the GDP. Also, Life expectancy, Health expenditures and Fertility has 23% impact in the changes in GDP.

TABLE 10

Pairwise Granger Causality Tests

Date: 05/16/16 Time: 14:57

Sample: 2002 2011

Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
LEXP does not Granger Cause GDP	61	2.91432	0.0931
GDP does not Granger Cause LEXP		0.01142	0.9153
HEXP does not Granger Cause GDP	61	2.53575	0.1167
GDP does not Granger Cause HEXP		0.44073	0.5094
DR does not Granger Cause GDP	61	4.90313	0.0308
GDP does not Granger Cause DR		2.07437	0.1552
FR does not Granger Cause GDP	61	1.64355	0.2049
GDP does not Granger Cause FR		0.05534	0.8148

In the end, granger causality to check the impact of GDP on our predictors, fertility rate, death rate, health expenditure and life expectancy. Results from Table-10 revealed that no causality was found on our predictors due to GDP except the death rate.

CONCLUSION, LIMITATIONS AND FUTURE IMPLICATIONS

The findings established in this research are revisionist, and thus the means and data applied will probably be scrutinized by others. Forthcoming work will no doubt improve and revise our work. Using a panel dataset from 2002 to 2011 at the country-level in the South Asia findings from this study provides the empirical evidence of significant effect on the economic growth from the three key following areas. First, there is the positive effect of the fertility rate on GDP. Our study also implies a positive relation between fertility rate and economic growth but there could be future repercussions as well as their will be additional pressure on limited resources available with these underdeveloped nations. From these outcomes, the governments should keep an eye on the changing demographic structure and should devise their policies accordingly. Governments should also review the population polices of developed countries and should learn and apply those policies wherever it is applicable in order to boost economic growth.

Second, the life expectancy presents a substantial boost to the growth of economies of South Asia. It implies that GDP is positively correlated with life expectancy. Health conditions in South Asia have improved in the last few decades resulted in healthier people as compared to 70s which ultimately resulted in higher life expectancy. So, Governments should upgrade the healthcare standards e.g starter of vaccines, programs of drugs or constructive behavior variations like the decrease in smoking or having alcohol rates. In the last century, the normal

life expectancy in the United States jumped by additional 30 years as the percentage of transferrable ailments dropped.

Third, our new variable health expenditure also proxy a positive association of South Asia's GDP. Our work also portrays a positive association between health expenditures and the growth rate, so health expenditures in the societies also need to be reviewed regularly. Further, health insurance data can be viewed in this regard. Governments can also support companies providing medical and life insurance which will force people to spend more amount on health expenditure. Moreover, this step will promote a healthy lifestyle within the nations.

Unlike the previous researches, in which researches have predicted the mortality rate by using GDP growth rate. We, on the contrary have verified the impact of mortality on GDP. As our domain was to investigate the impact on GDP due to demographic and health factors. Granger causality was also verified to remove any ambiguity in this regard. It has been statistically found that mortality do not have any significant relation with the economic growth. Therefore, as per the previous research, growth in population as per the 'population optimist' as a result of higher fertility do play part in the economic development. Higher percentage of labor force has resulted higher output and therefore higher output.

Future research in this domain can be improved by adding more demographic and health variables in the model studied above. Moreover, the same study could be applied in the data of any country or region which can help the policy makers in forecasting the GDP growth/decline and other macroeconomic variables.

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