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Changing Demographics and Economic Growth: A Case Study of Pakistan

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Abstract

The objective of this study is to determine the relationship between various demographic variables and economic growth of Pakistan for the period of 1980-2012. Time series econometric technique has been used for the analysis. Johansen's co-integration test showed presence of long run relationship between different demographic variables. After establishing the presence of error correction term in the model, variance decomposition test has been used to identify the individual shocks between the variables. The study concludes that the demographic transition has very important role in the economic growth of Pakistan.

Keywords: *Pakistan**,** Demographic trends, Human capital formation, Economic growth***.**

1. Introduction

The goals of economic growth and development can never be accomplished without Human Capital Development. It matters a lot to know that the population which comprises of people of different age and gender would be productive for the economy or not? If the populaces are healthy, skilled, efficient, and productive, the economy will flourish.

Change in demographic situation can affect the economic situation of the country. It begins with the changes in health status because health is the key to success for any economy. Society with better health condition is more likely to have better human capital formation, which induces the skills and

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abilities of labour force and nation as a whole. In this way, the labour will be more productive and efficient. Increase in life expectancy, decline infant mortality and fertility are few of the indicators of health facilities in the country. Drop in the infant mortality rate at one hand indicates the better maternity and health facilities also affect the fertility behaviours.

Decline in fertility will bring positive changes by improving the worth of human capital and ultimately controls population growth. If the economy has the capacity to absorb the labour force, the skilled and healthy labour force will have positive effect on the economy. Challenging unemployment problem is one major problem of all developing countries. Changes in family size, better employment opportunities, and improved working capacity of labour and increasing participation of females in labour force will instantly affect the living standards and foster the economic development of the country.

According to Notestein (1945), most of the countries, irrespective of their development stage observe significant demographic transitions. One of the most important demographic changes is the change in population growth rate. According to Bloom and Williamson (1998), demographic transaction starts with mortality decline and escalating birth-rates, simultaneously contributing to a surge in population growth after a certain period. This lowering mortality rate sets off a steady and prolonged drop in fertility rate.

A number of economists have tried to determine the relationship between different demographic variables to understand the transition process. Rostow (1990) indicated that negative relation between birth and death rates per capita GNP in seventy-six countries while Van (1996) studied the fertility behaviour from the point of view of economic investigation. Neoclassical economists indicate the casual relationship among fertility, mortality, and economic growth. However, new theories of population growth insist about the independent behaviour of mortality and fertility rate, (Sah 1991; Cigno, 1998).

Becker (1973) supported the argument about endogenous nature of fertility in relation to the economic system as he identified a number of socioeconomic factors affecting the fertility and economic growth relationship. Recent globalisation process has significantly affected the demographic indicators. The technological advancement in different sectors has increased life expectancy and reduced the mortality rate. A number of studies can be found on population dynamics and life expectancy (Nazli, 1986), Hashmi(1997), Afzal (2009)].

Neoclassical economist also assumes that the labour force growth is directly related to population growth rate. Bloom et al.(2009) pointed out that the age distribution of the population has direct relationship with economic growth. If the economy possesses high rate of working age population as compared to dependent population group, it may lead to increase in labour supply and help in escalating the growth process.

Demographic vicissitude has immense significance for growth and development of any society because it offers an influential and analytical instrument by which the potential development can be estimated. Also the Demographic transition provides vital insight about the challenges for future.

The aim of this paper is to determine the long run relationship between different demographic variables and economic growth in Pakistan from 1980 to 2012.

1.1 Brief History of Demographic Trends in Pakistan

Pakistan has a population of approximately 193 million and ranked as sixth most populated nation of the world and second among the Islamic countries with ever-growing population. Previous few years witnessed a stable annual population growth rate of 1.8%during the period 2005-2009 and in the year 2010, it was estimated at 1.59%.

During 1980, Pakistan experienced a very high fertility rate of 6.5%. In 1990, the total fertility rate began to decline and reached below six for the first time in Pakistan. In 2009, total fertility rate was 3.6 which reduced to 3.28 in 2010**.** Infant Mortality was 62 deaths/1000 live births in *2009but it increased significantly to*65.32 deaths.1000 birth took -place in year 2010.

In Pakistan, Family Planning Program was initiated in 1960 but there is no notable role in declining the population growth rate and the main reasons are low awareness about the contraceptive methods, access to safe birth control methods and also the demands for son rather than daughter. During the year 2010, the contraceptive prevalence was around 48%, which is still low.

The major reasons for infant and child mortality rate are lack of health facilities and lack of immunisation. Other reasons of infant and maternal mortality rates are the frequent pregnancies and births. The infant mortality rate in Pakistan is high in comparison to other South Asian countries. The under 5-mortality rate is decreased to 99 per 1,000 live births as compared to 1990's which was 276 per 1000 live births.

Pakistan is on 6^{th} number in ranking of high maternal mortality rates that accounts for 300-400 deaths per 100,000 births. The economic growth in Pakistan has experienced a fluctuation because of many reasons, the major are the current depreciation, huge debt burden, political instability and corruption. Pakistan experienced a relatively better GDP growth rate during the first half of 80's. However, during the late 80's, a declining trend in GDP growth rate was observed which remained with some fluctuation till the end of 90’s.

After year 2000 until 2007, the economic experienced a significant increase as the GDP Growth Rate increased rapidly but the change of government in

2008 brought changes in fortune for the economy as it witnessed the sudden and rapid decline in the GDP growth rate during the period 2008-2010.

2. Literature Review

Schultz and Pall (1985) by using the time series data of Sweden from 1860-1910 showed that reduction in child mortality reduces the fertility rate in Sweden up to 25%.Yamada (1985) showed "new-born mortality and fertility behaviour action association. He determined that a drop in infant death rate is actually as a result of rise in per capita real earnings that brings about a subsequent decline in fertility. Nazli (1986) also had done a similar study in Pakistan. Rostow (1990) performed the analysis for seventy-six countries by using cross- section data and to determine that "birth and death have negative relation with per capita GNP".

Kelley and Schmidt (1994) used panel data of 89 countries for three growth periods (1960-1970, 1970-1980, and 1980-1990) to indicate that the population growth rate does not have significant impact on per capita output growth. Kelley and Schmidt (1995) used panel data of 89 countries for three-development stages starting from 1960 to 1990 which expresses "that the population escalation has no impact on economic growth".

Hondroyiannis and Papapetrou (1999) while analysing the US economy for the period (1960-95) monitored the affiliation among wages, fertility choice, interest rate and output. They found that "there is no long run relationship among these variables and the wages, real interest rates and output are associated with the variation in fertility choice".

Climent and Meneu (2003) examined the economy of Spain from 1960-2000. They explored the interaction between "demographic and economic variables". The outcome showed that "total fertility rate cause changes in GDP, and IMOR does total affect the fertility behaviour".

Alam et al.(2003) found that the fertility decline in Pakistan during the period 1965-1998 in the long run is due to the interaction with anticipated family planning and considerable socio-economic structural adjustment.

Hondroyiannis and Papapetrou (2004) using the relationship between fertility choice behaviour and infant mortality rate in Greece during the period 1960-1998 revealed that decline in Infant Mortality has caused a drop in fertility rates in the long run. Moreover, neutrality and fertility were also decreased by an increment in real wages.

Zakria et al. (2013) used two parametric models to determine the age specific fertility behaviour in Pakistan. They found significant decline in the fertility behaviour over the period of time. Many other researchers e.g. Nasir et al. (2010), Nasir et al. (2009) Islam and Ali (2004) have done similar works in determining the age specific fertility in Pakistan.

Choudhry and Elhorst (2010) studied the effects of demographic transaction on economic growth in a cross-country analysis of India, China and Pakistan to determine the positive effect of population growth and negative effect on dependency ration in all countries.

Iqbal et al. (2015) while studying the impact of demographic transition on economic growth of Pakistan from the period 1974-2011 identified that the demographic transition positively affects economics growth in the long run while the effect is negative in short run.

3. Methodology

3.1 Data

Data utilised in this particular analysis have been obtained from the World Development Indicators (WDI) and statistical Bureau of Pakistan, for the period from 1980 to 2012). The variables used in this analysis include “GDP growth rate, total fertility rate, life expectancy, population growth rate, and infant mortality rate”.

Where:

Ln = Natural Logarithm

Y = annual growth rate Gross Domestic Product

IMOR = infant mortality rate

PG = Population Growth rate

LEXP = Life Expectancy

TFR = total fertility rate

µi = Error Term

3.2 Estimation Technique

A number of studies have used endogenous growth model to determine the relationship between population dynamics and economic growth. However, in this study, the unrestricted VAR model has been used to determine the behaviour of different demographic indicators and economic growth.

In a time series analysis, VAR model is used when we are not certain about the exogeneity of variables .It also helps in determining the predictive behaviours of different indicators; therefore, we have to treat each variable symmetrically. Two variables VAR model with K= 2 are considered:

$$y_t = b_{10} - b_{12}z_t + c_{11}y_{t-1} + c_{12}z_{t-1} + \varepsilon_{yt} \quad \text{........(1)}$$

$$z_t = b_{20} - b_{21}y_t + c_{21}y_{t-1} + c_{22}z_{t-1} + \varepsilon_{zt} \quad \text{.......... (2)}$$

With $\varepsilon_{it} \sim i.i.d(0, \sigma_\varepsilon^2)$ and $\text{cov}(\varepsilon_y, \varepsilon_z) = 0$

We can rewrite the above eq (1) & (2) in matrix form as:

$$\begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix}\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} b_{10} \\ b_{20} \end{bmatrix} + \begin{bmatrix} c_{11} & c_{12} \\ c_{21} & c_{22} \end{bmatrix}\begin{bmatrix} y_{t-1} \\ z_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{yt} \\ \varepsilon_{zt} \end{bmatrix}$$

More simply:

$$\boxed{BX_t = \Gamma_0 + \Gamma_1 X_{t-1} + \varepsilon_t} \ldots\ldots\ldots\ldots (3)$$

The above model is the structural or primitive form of the VAR model .

To obtain standard form of VAR, we need to multiply the both sides of equation (4) by B-1:

$$B^{-1}BX_t = B^{-1}\Gamma_0 + B^{-1}\Gamma_1 X_{t-1} + B^{-1}\varepsilon_t \ldots\ldots\ldots (4)$$

Thus we obtain the standard form of VAR:

$$\boxed{X_t = A_0 + A_1 X_{t-1} + \varepsilon_t} \ldots\ldots (5)$$

We can rewrite the equation (6) as:

$$Y_t = A_1 Y_{t-1} \_ \ldots\ldots + A_p Y_{t-p} + Bx_t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots (6)$$

3.3 Unit Root Test

The prerequisite in time series analysis is to determine the order of integration between all variables. Augmented Dickey-Fuller (ADF) test and Phillips –Perrontest of unity root are used to test the unit root amongst all series. AFD takes the following general form:

$$\Delta Y = \psi + Y_{t-1} + \beta_{t-1} + \sum \beta_j Y_{t-1} + \varepsilon_t \ldots\ldots (2)$$

$$\Delta Y_t = \psi + \nu Y_{t-1} + \beta_t + \sum \beta_j \Delta Y_{t-j} + \varepsilon_t \ldots\ldots (3)$$

While the general form of Phillips –Perron test is as:

$$Z_\rho = n(\widehat{\rho}_n - 1) - \frac{1}{2}\frac{n^2\widehat{\sigma}^2}{s_n^2}\left(\widehat{\lambda}_n^2 - \widehat{\gamma}_{0,n}\right)$$

3.4 Johansen Co-Integration Test

The presence of long run relationship in the model is called co-integration. The Johansen co-integration procedure has been used for investigation. The general form of Johansen's method is based on vector auto regression (VAR) of order P given by:

$Y_t = \alpha + \Delta_1 y_{t-1} + \Delta p\ y_{t-p} + \varepsilon_t$

$$y_t = \alpha + \Delta_1 Y_{t-1} + \Delta p Y_{t-p} + \varepsilon_t$$

Here Y_t is an nx1 vector of variables which are integrated of order commonly denoted by (1) and $\varepsilon_t$is an nx1 vector of variations.

3.5 Error Correction Model

Once the co-integrating vectors have been determined in a model, one can proceed to carry out VECM analysis.

$$\Delta X_t = \alpha_x + \sum \beta_{x,i} \Delta Y_{t-1} + \varphi_X ECT_{,t-1}\ \varepsilon_{x,}t \ \ldots\ldots\ldots (3)$$

$$\Delta Y_t = \alpha_x + \sum \beta_{x,i} \Delta X_{t-1} + \sum \vartheta_{x,i} \Delta X_{t-1} + \varphi_X ECT_{,t-1}\ \varepsilon_{x,}t \ \ldots\ldots\ldots 4)$$

Here $\varphi_x$and φ_y measure the error correction mechanism which are the parameters of the term ECT, that compel X_t and Y_t to move back to their long run equilibrium relationship.

3.6 Variance Decomposition model

Variance Decomposition modelling explains exactly how substantially a fluctuation in a variable is caused by its own shock and how much effect shocks have on different variables. In the short run, most of the deviation is due to its own shock. However, as the influence of lagged variables starts increasing, the ratio of the effect of other shocks grows over time. To compute the n-period predicted error of A in order to find that of say B, the general form of Variance Decomposition model is

$$x_{t+n} - Ex_{t+n} = \Phi_0 \varepsilon_{t+n} + \Phi_1 \varepsilon_{t+n-1} + \Phi_2 \varepsilon_{t+n-2} + \ldots + \Phi_{n-1} \varepsilon_{t+1} = \sum_{i=0}^{n-1} \varepsilon_{t+n-i} \ \ldots (7)$$

Equation (7) indicates the variation in X over an N period on time cause by its own variation and by exogenous shocks.

4. Results and Discussion

The ADF and PP test are performed at levels and first difference. The results of unit root tests in Table-1shownon-stationary trend for all the variables when tested at various levels. However, all the variables become stationery at first difference. Hence it confirms all the series in I (1).

Table-1: Unit Root Test

	ADF Level		ADF First Difference		PP Level		PP First Difference	
	Constant	Constant and Trend	Constant	Constant and Trend	Constant	Constant and Trend	Constant	Constant and Trend
LNY	0.81	-5.09	-1.39	-7.92*	-2.30	-5.4*	-2.09	-4.00*
LNIMOP	-1.29	-4.25	-2.29	-4.49*	-0.44	4.59*	-1.39	4.53*
LNLEXP	-1.23	-4.92*	-0.46	-5.91*	-1.42	-6.01*	-2.96	-5.90*
LNPG	-0.43	-5.24	-1.87	-5.36*	-0.81	-5.48*	-2.24	5.38*
LNTFR	-0.89	-3.12	1.45	-5.58*	-0.78	-5.84*	-2.59	-6.06*

Note: * indicates level of significant 5%,

The results of co-integration test determining the long run relationship are given in Table-2. Both trace test and maximum eigenvalue indicates four co-integrating equations at 5% level of significance, confirming the long run equilibrium relationship in the model.

Table 2. Johansen Co-Integration Test (A)

Trace-Statistics

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.951012	282.1309	175.1715	0.0000

At most 1 *	0.881218	200.6938	139.2753	0.0000
At most 2 *	0.832721	143.1713	107.3466	0.0000
At most 3 *	0.777681	94.89284	79.34145	0.0021
At most 4	0.645366	54.29450	55.24578	0.0605
Trace test indicates 4 cointegratingeqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Table 3. Johansen Co-Integration Test (B)

Maximum Eigen Value

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.951012	81.43704	55.72819	0.0000
At most 1 *	0.881218	57.52259	49.58633	0.0062
At most 2 *	0.832721	48.27842	43.41977	0.0138
At most 3 *	0.777681	40.59834	37.16359	0.0194
At most 4	0.645366	27.99003	30.81507	0.1066
Max-eigenvalue test indicates 4 cointegratingeqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

After determining the existence of long run relationship in the model, the next step is to test the short run error correction term in the model. Table-3 indicates the result of error correction model. The GDP growth rate, Gross fixed capital formation and labour force participation rate indicate correct negative signs and are significant for study. In addition, IMOR, LEXP and PG also indicate negative signs; however, they are insignificant.

Table 4. Vector Error Correction Model

Error Correction:	D(LNGDPGR)	D(LNIMOR)	D(LNLEXP)	D(LNPG)	D(LNTFR)
CointEq1	-0.180471	-0.443082	-0.108607	-0.031359	-0.181934
	(1.29984)	(1.09759)	(0.17089)	(0.04053)	(0.04623)
	[-3.93698]	[-0.75369]	[-0.63553]	[-0.7737]	[-3.93502]
D(LNGDPGR(-1))	0.318057	-0.197315	0.348687	0.043512	0.084051
	(0.27623)	(1.01114)	(0.15743)	(0.03734)	(0.04259)
	[1.15144]	[-0.19514]	[2.21482]	[1.16539]	[1.97335]
D(LNGFCF(-1))	1.26E-05	4.90E-06	3.55E-06	1.68E-06	3.40E-06
	(1.2E-05)	(4.2E-05)	(6.6E-06)	(1.6E-06)	(1.8E-06)
	[1.08761]	[0.11568]	[0.53863]	[1.07045]	[1.90354]
D(LNLFPR(-1))	-1.924785	-0.998932	-0.068154	-0.046374	-0.210697
	(0.77044)	(2.82023)	(0.43911)	(0.10414)	(0.11880)
	[-2.49831]	[-0.35420]	[-0.15521]	[-0.4453]	[-1.77356]
D(LNIMOR(-1))	0.095365	0.053264	0.075503	0.000730	0.013129
	(0.06975)	(0.25532)	(0.03975)	(0.00943)	(0.01076)
	[1.36725]	[0.20861]	[1.89928]	[0.07743]	[1.22075]
D(LNLEXP(-1))	0.421962	-0.726921	-0.060099	0.026129	0.006094
	(0.35009)	(1.28152)	(0.19953)	(0.04732)	(0.05398)
	[1.20531]	[-0.56723]	[-0.30120]	[0.55216]	[0.11289]
D(LNPG(-1))	1.494398	4.762083	0.280111	-0.027593	0.424555
	(1.84076)	(6.73823)	(1.04913)	(0.24881)	(0.28384)
	[0.81184]	[0.70673]	[0.26699]	[-0.1109]	[1.49575]
D(LNTFR(-1))	-1.860871	1.051959	-1.793868	-0.198129	-0.267564
	(1.42619)	(5.22068)	(0.81285)	(0.19277)	(0.21991)
	[-1.30478]	[0.20150]	[-2.20688]	[-1.0277]	[-1.21667]
C	-0.574989	-0.432732	0.046743	-0.150055	-0.210788

	(0.57563)	(2.10713)	(0.32808)	(0.07781)	(0.08876)
	[-0.99889]	[-0.20537]	[0.14248]	[-1.9285]	[-2.37480]

Note: Stander error in ( ) and t-values in [ ]

Table-4 reports variance decomposition of variables for the period of 1-5 years. Variance decomposition model explains individual shocks in the model. In the first period, the real GDP (100%) is fully explained by its own innovation that indicates its exogenous nature. However, next 4 periods indicate fluctuation and by the 5th year, its own innovation has been reduced to 56%, while TFR (6%), GFCF (26%), LFPR (5%) and LEXP (5%) are other variables which significantly explain the variation in the long run. Decomposition of GFCF indicates 94% effect of its own innovation and GDP (6%) in the first period. In the last period, 73% of the innovation is explained by GFCF and 19% by LFPR. During the first period, infant mortality rate is explained 72% by its own innovation and 24% by GDP.

Innovation in life expectancy for the first period is explained 94% by itself, and at the 5th period, it is reduced to (54%) innovation by itself while IMOR (20%), GFCF (5%), GDP (8%), TFR (7%) explain the variation in long run. In the first period, the Innovation in LFPR is explained (98%) by LFPR itself. During the last period (71%), innovations explained by LFPR itself, while GDP (10%) and GFCF (9%) explain the innovation in the last period.

Decomposition of population growth rate indicates that during early time period, 93% innovation is explained by population growth that decreases with the passage of time to 91%. Decomposition of TFR indicates that during the first period (43%) was caused by itself while LFPR (23%) and LFPR (19%) affect the variations. During the 5thperiod, only (18%) variation is explained by itself while LFPR (42%), GDP (13%), LEXP (14%) and GFCF (8%) affected the variations in the long run.

Table 5. Variance Decomposition Model

Period	S.E.	LNGDPGR	LNGFCF	LNLFPR	LNIMOR	LNLEXP	LNPG	LNTFR
1	1.63	100.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.000
2	2.26	67.08882	8.98689	0.37778	2.17237	7.37289	0.820	13.18
3	2.95	62.20606	17.2904	4.04536	1.46245	5.37012	1.539	8.085
4	3.31	58.61509	23.1413	4.94207	1.38335	4.25661	1.226	6.434
5	3.62	56.06197	25.9276	4.70985	1.69535	4.40160	1.590	5.613
Variance Decomposition of LNGFCF								
Period	S.E.	LNGDPGR	LNGFCF	LNLFPR	LNIMOR	LNLEXP	LNPG	LNTFR
1	36447.6	5.51730	94.482	0.00000	0.00000	0.00000	0.00	0.000
2	67816.0	1.79219	89.758	6.05310	0.00815	0.56928	0.00	1.817
3	96461.4	1.00338	80.041	14.4094	0.28043	0.30214	0.00	3.960
4	120296.	1.13821	74.460	18.7052	1.54307	0.30338	0.00	3.841
5	139470.	1.22186	73.141	19.3707	2.38658	0.24855	0.01	3.614
Variance Decomposition of LNLFPR								
Period	S.E.	LNGDPGR	LNGFCF	LNLFPR	LNIMOR	LNLEXP	LNPG	LNTFR
1	0.59905	0.57345	1.5884	97.8381	0.00000	0.00000	0.00	0.000
2	0.88077	6.83351	5.0612	77.4885	2.72516	4.00651	3.87	0.005
3	1.07859	7.54709	7.6705	74.6201	3.53112	2.76205	3.53	0.335
4	1.29641	9.09291	8.3200	72.871	3.59049	2.53231	3.04	0.549
5	1.46861	9.69941	8.6365	71.4216	4.15092	2.44838	3.05	0.592
Variance Decomposition of LNIMOR								
Period	S.E.	LNGDPGR	LNGFCF	LNLFPR	LNIMOR	LNLEXP	LNPG	LNTFR
1	5.98081	24.17668	3.62103	0.58555	71.6167	0.00000	0.00	0.000
2	9.09813	30.56790	4.36936	0.41841	63.7397	0.25408	0.65	0.000
3	11.1199	33.16416	4.51885	0.28020	60.6999	0.48336	0.73	0.118
4	12.8123	34.57059	4.35759	0.25152	59.2625	0.51548	0.86	0.172

5	14.3255	35.31236	4.19380	0.20473	58.7540	0.48882	0.88	0.158
Variance Decomposition of LNLEXP								
Period	S.E.	LNGDPGR	LNGFCF	LNLFPR	LNIMOR	LNLEXP	LNPG	LNTFR
1	0.93120	0.318768	2.23908	0.61563	2.67175	94.1547	0.00	0.000
2	1.39049	8.569981	1.85424	2.34759	15.3184	65.3355	0.42	6.150
3	1.72107	7.814335	3.67471	2.79845	17.9035	59.4263	0.39	7.987
4	1.95515	8.669664	5.01577	3.62215	18.9566	55.8622	0.41	7.456
5	2.21278	7.938567	5.45509	5.46618	19.8211	53.8367	0.47	7.009
Variance Decomposition of LNPG								
Period	S.E.	LNGDPGR	LNGFCF	LNLFPR	LNIMOR	LNLEXP	LNPG	LNTFR
1	0.220	1.133420	3.25770	0.30144	0.83516	1.25489	93.2	0.000
2	0.304	1.072505	1.72269	0.65679	0.96684	0.80204	92.4	2.332
3	0.366	1.497391	1.21724	0.46622	1.00252	0.78406	91.2	3.772
4	0.421	1.835471	0.96887	0.35617	0.82041	1.01711	90.9	4.008
5	0.468	1.937254	0.81007	0.34245	0.73904	0.99500	91.0	4.133
Variance Decomposition of LNTFR:								
Period	S.E.	LNGDPGR	LNGFCF	LNLFPR	LNIMOR	LNLEXP	LNPG	LNTFR
1	0.251	8.484007	1.39807	19.2532	0.11767	23.6510	3.73	43.36
2	0.394	17.06785	4.14004	30.4494	0.61175	26.3830	2.53	18.81
3	0.525	11.89653	6.65824	46.2836	1.74094	15.8922	2.55	14.97
4	0.603	11.85735	8.06273	43.2183	3.53895	13.5421	2.07	17.70
5	0.670	12.52368	8.34612	41.8297	3.19903	14.2428	2.21	17.6
Cholesky Ordering: LNGDPGR LNGFCF LNLFPR LNIMOR LNLEXP LNPG LNTFR								

Granger causality with in error correction framework is used to determine the direction of relationship between different demographic variables and economic growth. Table-5 shows the results of granger causality. The result indicates unidirectional causality runs from LFPR to GDP. The results shows unidirectional causality running from TFR to LEXP, GDP to LEXP and

IMOR to LEXP while bidirectional causality exist between TFR and GDP. The result also indicates bidirectional causality running from GFCF to TFR, LFPR to TFR and PG to TFR.

Table 6. Causality Based on Error Correction Framework

Dep.	Independent						
	LNY	LNGFCF	LNLFPR	LNIMOR	LNLEXP	LNPG	LNTFR
LNY	-----	1.18290	6.2415*	1.86937	1.452766	2.6590*	2.7024*
LNGFCF	5.6154*	-----	0.01267	0.09784	0.113183	0.546083	0.356252
LNLFPR	0.20669	0.08814	-----	1.36478	1.035760	0.932599	0.105849
LNIMOR	0.03808	0.01338	0.12545	------	0.321756	0.499461	0.040602
LNLEXP	4.90542	0.29011	0.02409	3.6072*	-----	0.071285	4.87036*
LNPG	1.35814	1.14585	0.19830	0.00599	0.304883	-----	1.056314
LNTFR	3.8941*	3.6234*	3.1455*	1.4902	0.012744	2.23727*	-----

5. Conclusion

The objective of this paper was to determine the nature of relationship between demographic variables and economic growth of Pakistan from 1980 to 2012). The result of co-integration indicates the presences of long run relationship between the variables and error correction model indicates the expected negative signs for a number of variables. Variance decomposition model is used to explain the exogenous and indigenous shocks. Granger causality with in error correction framework is used to determine the direction of relationship between different variables.

The analysis indicates the total fertility rate which contributes significantly to economic growth of Pakistan. Total fertility and GDP contribute to increase the life expectancy. While in the GDP growth, Labour force participation rate, population growth and gross fixed capital formation affect the fertility behaviour in Pakistan.

It indicates that health related issues are the main concern for Pakistan. Even though Population growth is contributing to economic growth, it can be improved by provision of quality of health and education facilities. To gain advantage from the demographic changes accruing over time, it is required to focus on improving the health facilities and issues like infant and maternal mortality. Infant mortality is found to be completely exogenous which means it does not affect fertility rate in Pakistan.

Demographic changes have an effect on the overall society. To develop any policy measure, it is important to understand the mechanism of demographic transition in context to society of Pakistan.

The on-going process of demographic transition has very important practical implications. Changes in family structure, the status of women and children, participation of woman labour in the economic development, fertility and mortality trends, and health and education indicators offer a great description of demographic changes; all such factors are very useful in explaining the speed of convergence of Pakistan’s economy. Based on our results, this study recommends that with special focus on women of Pakistan, education and health should be given the top priority because health and education have the major role to play in human capital accumulation and economic developments of the country. Finally, this study can be extended by including the finance and trade related variable in order to explain the impact of demographic transition on capital flow for development process of the economy.

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