Determinants of population growth: empirical evidence from Pakistan (1960-2017)

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DETERMINANTS OF POPULATION GROWTH: EMPIRICAL EVIDENCE FROM PAKISTAN (1960–2017)

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Abstract

The importance of population studies in Pakistan has been recognized since very ancient times. While population growth issues rarely grab the headlines in the media, it is imperative to note that Pakistan continues to be a victim of population growth. Employing the Ordinary Least Squares (OLS) estimation criterion, the study seeks to uncover the determinants of population growth in Pakistan over the period 1960 – 2017. Diagnostic tests were carried out in order to verify the statistical appropriateness of the estimated model. Amongst other findings, the study revealed that a 1% increase in contraceptive prevalence rate will lead to approximately 3.53% decrease in population growth in Pakistan. The study, whose policy recommendations are four – fold, strongly; encourages the government to put measures as to reduce population growth in Pakistan.

Key Words: Contraceptive, Infant Mortality Rate, Life Expectancy, Pakistan, Population Growth, Total Fertility Rate

I. INTRODUCTION

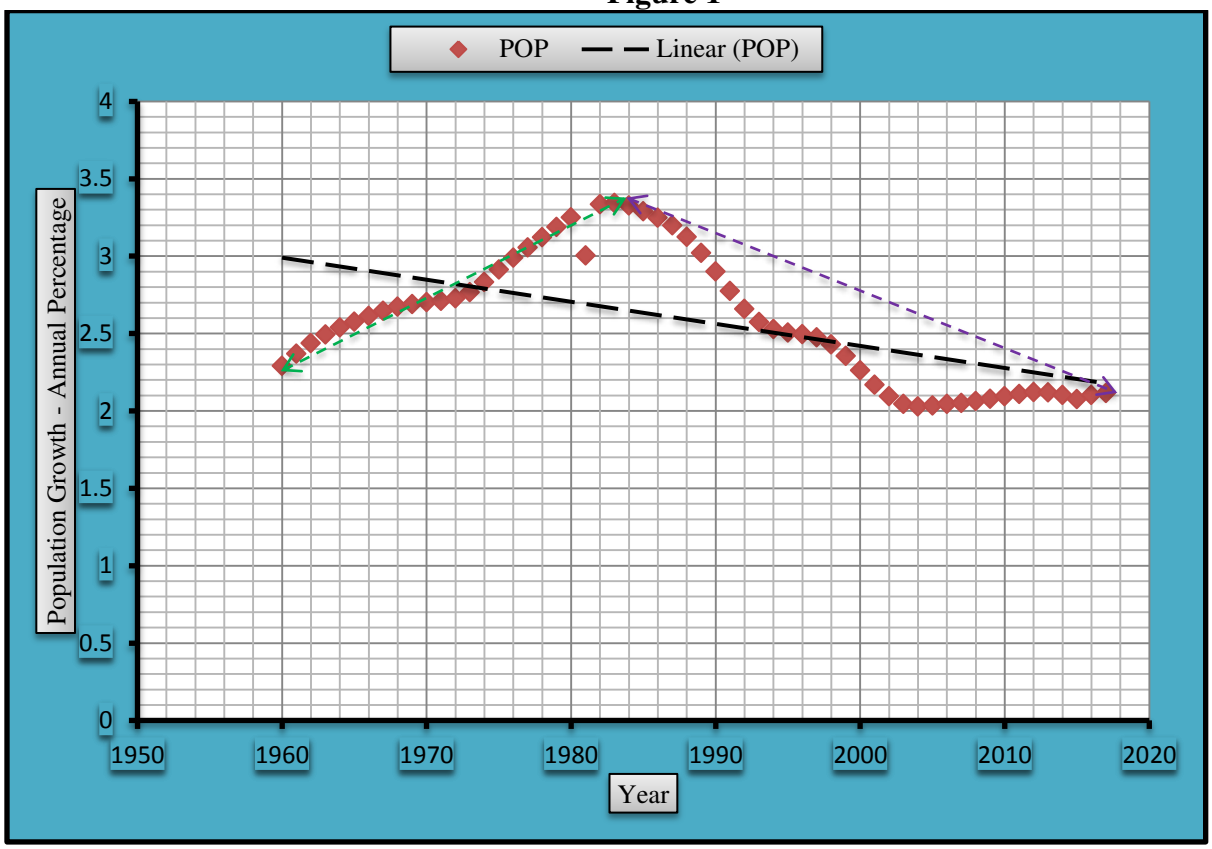
"My biggest worry is population growth, and if it continues at the current rate, we will be standing shoulder to shoulder in 2600. Something has to happen, and I don't want it to be a disaster" – ***Prof Stephen Hawking, 2016 (Cambridge University)***

In Pakistan it is not generally recognized that a large and rapidly growing population is a serious problem. The majority of people do not rank population control as one of the most serious issues facing the country. Editorials, letters to the editors, and news stories devote considerable space to political and economic problems ranging from health issues, unemployment and jobs, corruption, energy shortages, food, water and housing shortages, transportation deficiencies and civil unrest (Siddiqui, 1998). In Pakistan, population issues rarely make the headlines and yet one of the biggest challenges in the world today is the rapid population growth.

Since its founding, as already noted by Siddiqui (1998), Pakistan has exhibited a continuously high rate of population growth. Pakistan, with a population of approximately 203 million people, currently stands 6th amongst the most populous countries in the world. Rapid population growth puts excessive pressure on all the resources and impedes economic growth and development. Pakistan, according to Huda (2014); is a low income country with limited resources for public services. Unplanned population growth as already noted by Huda (2014); results in severe shortage of resources, increase food insecurities and threaten healthcare system of Pakistan. The cessation of rapid population growth cannot be over – looked if Pakistan is to continue its journey of development. Since 1965, Pakistan has had a population policy in one form or another. However, statistics in tables 1 – 3 and figures 1 – 5; clearly indicate that the population policy in Pakistan has not been very successful, hence the need to conduct an empirical inquiry into the population growth phenomenon in Pakistan.

Population growth trends in Pakistan (1960 – 2017)

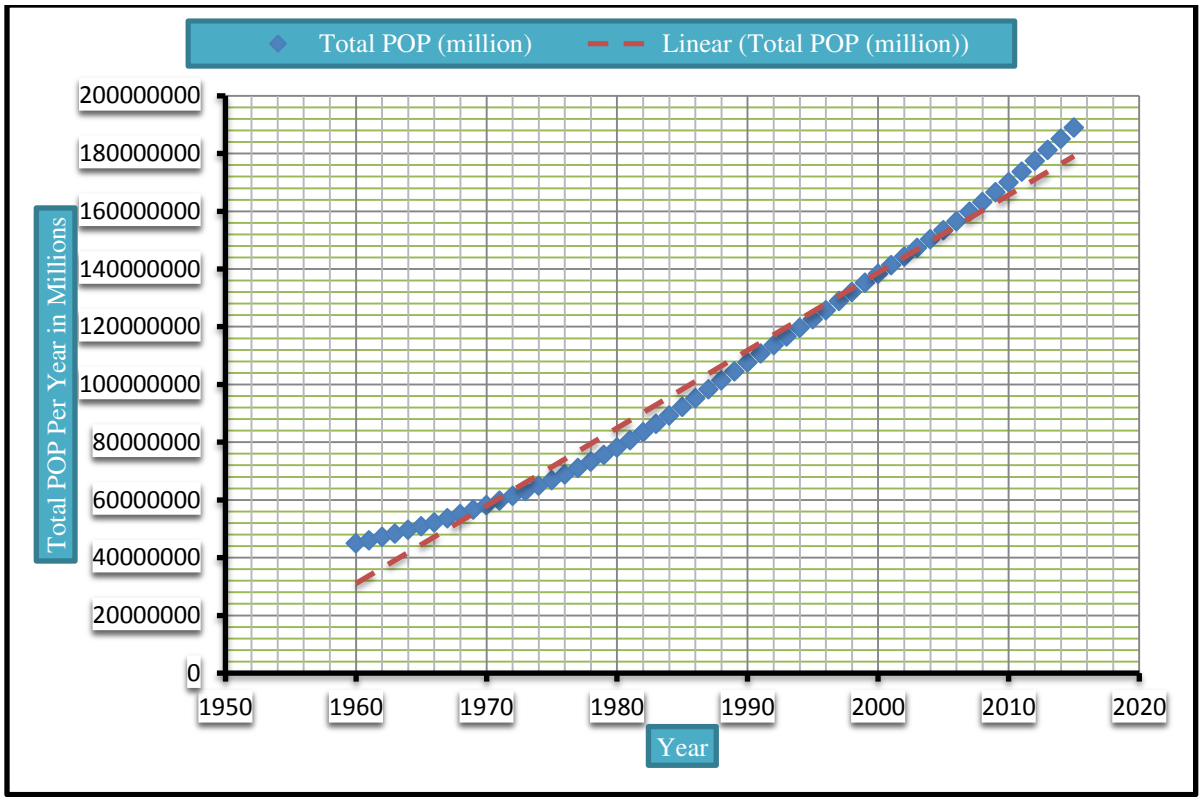
Figure 1



Source of Data: World Bank (2018)

The trend in population growth in Pakistan over the period 1960 – 2017 is shown in figure 1 above. The figure shows that the population growth increased at a generally increasing rate over the period 1960 – 1982 as indicated by the green double arrow, with a maximum of approximately 3.3% growth in 1982. This analysis concurs with figure 2 below which shows that over the same period, total population in Pakistan increased by 38 515 712 people; which is a great increase by both Asian and world standards. Figure 1 above, indicates that since 1982, population growth in Pakistan is increasing at a decreasing rate as shown by both the dotted black trend line and the purple double arrow. Population growth in Pakistan is currently around 2% per annum. Figure 2 below, shows that in 2015, total population in Pakistan was pegged around 188 million people. The trend line figure 2 below generally indicates that total population in Pakistan is increasing and is likely to go up even worse in the years to come. Therefore it is imperative for policy makers to take action now, because excessively high population may be a threat to economic development as already heighted by Malthus (1978).

Figure 2. Total Population trends in Pakistan (1960 – 2015)

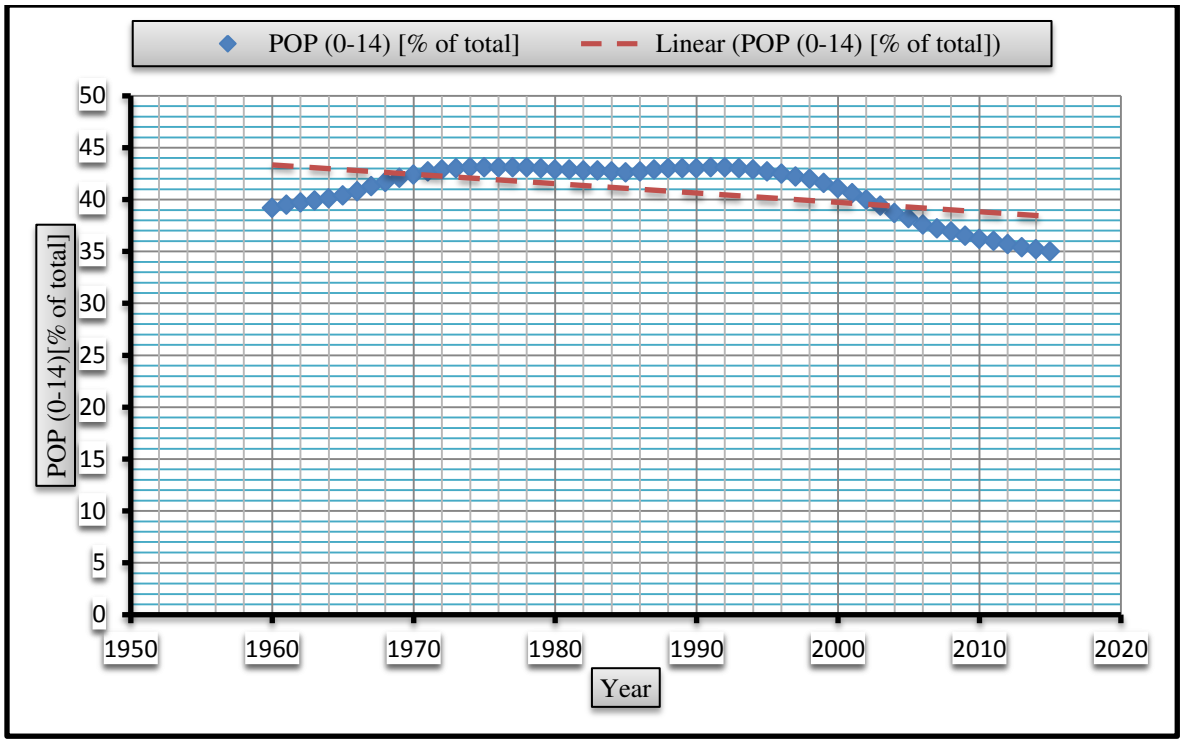


Source of Data: World Bank (2018)

Age Composition of the Population of Pakistan

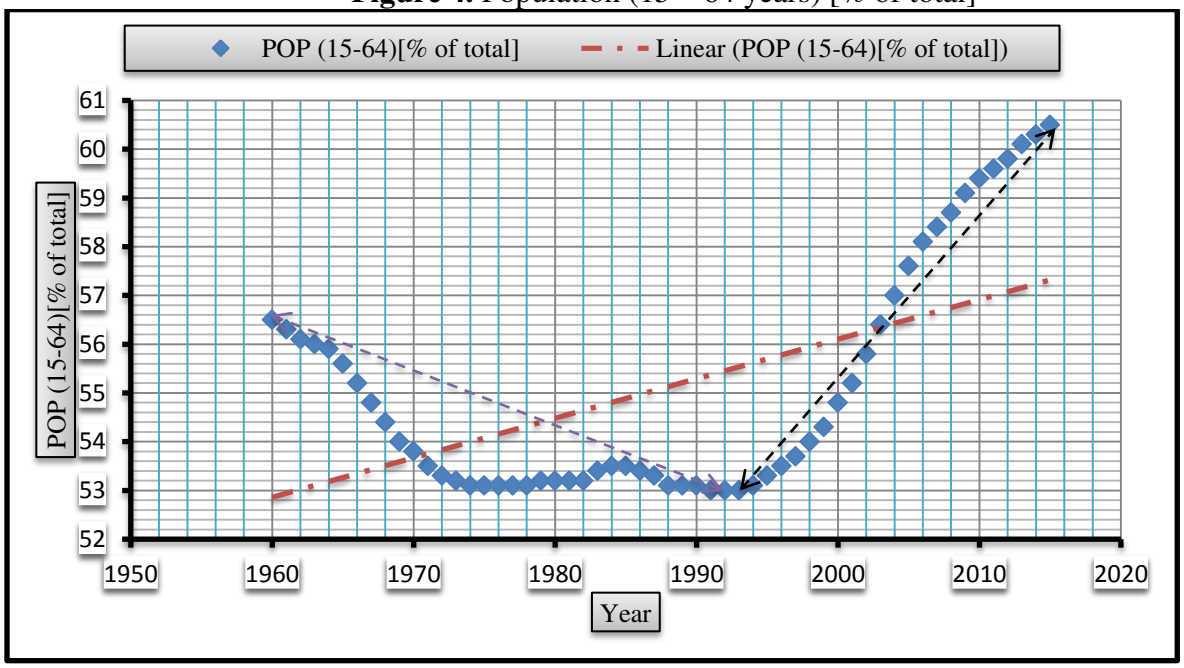
Figures 3, 4 and 5 below seek to analyze the age composition of the population of Pakistan over the period 1960 – 2015. As clearly shown by figure 4, most people in Pakistan fall within the range 15 – 64 years old. This means that in Pakistan young people take the lion's share in terms of total population. This apparently explains the reason why there is high unemployment in Pakistan. Most young people are not employed in Pakistan precisely due to over – supply of labour. The government of Pakistan now has the burden of creating more and more jobs. A closer look at figure 4 shows that the young population of Pakistan is generally increasing as indicated by an upward trend line. People within the age 15 – 64 years have increased since 1992, from 53% up to 60.5% of total population in 2015. Figure 3 indicates that children (0 – 14) years range between 35% - 43.1% of total population. This roughly tells us something about fertility rates in Pakistan – that they are still very high despite the government's efforts to reduce fertility rates in Pakistan. This argument concurs with table 3 below which indicates that in Pakistan, total fertility rate was approximately 3.7% in 2016, surpassing total fertility rates of other Asian countries such as India (2.3%), China (1.6%), Bangladesh (2.3%), Philippines (2.8%), Japan (1.5%), South Korea (1.2%) and Thailand (1.2%) amongst others. A closer look at figure 5 shows that for the 2 decades between 1960 – 1980, adult population (65 & above) generally declined from 4.3% in 1960 to approximately 3.8% in 1980. Since then, the adult population has increased up to approximately 4.5% of total population in 2015. This could have been necessitated by slight improvements in the health service delivery in Pakistan.

Figure 3. Population (0 – 14 years) [% of total]: 1960 – 2015



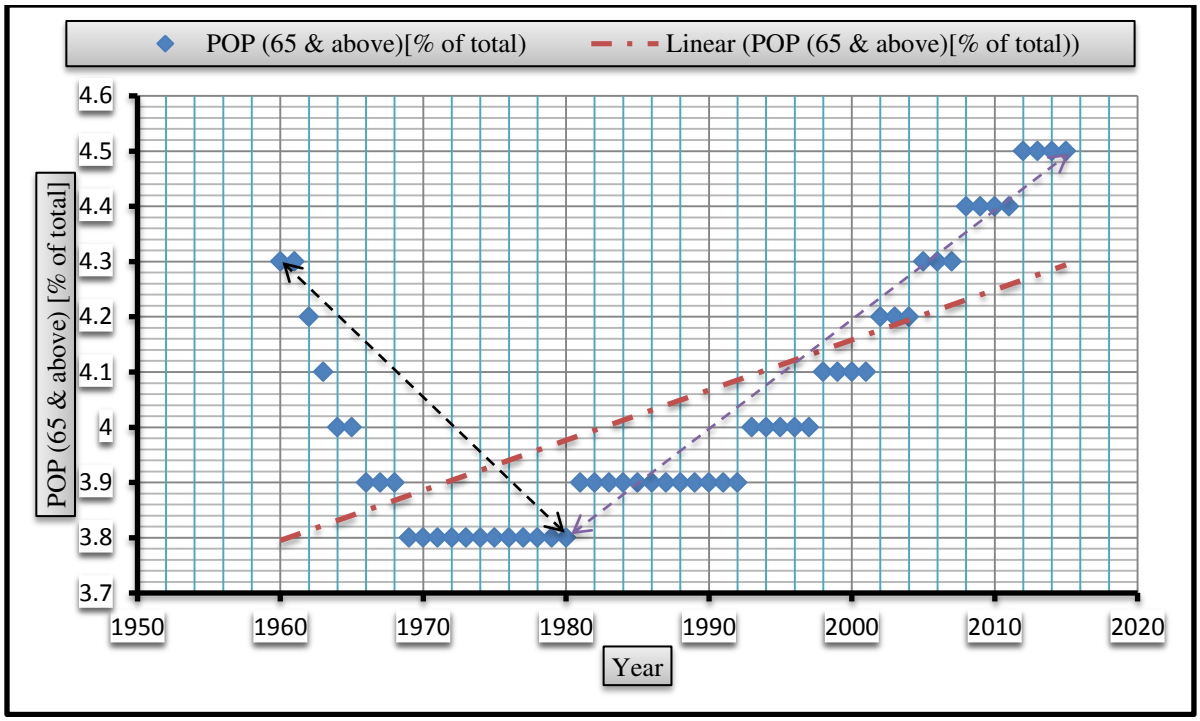
Source of Data: World Bank (2018)

Figure 4. Population (15 – 64 years) [% of total]



Source of Data: World Bank (2018)

Figure 5. Population (65 & above years) [% of total]



Source of Data: World Bank (2018)

Population Growth Dynamics in Pakistan

Table 1. Top 13 Largest Countries in the world [195, 1996 & *projected* 2050]

	1950			**1996**			**2050**	
Rank	Country	Population (Million)	Rank	Country	Population (Million)	Rank	Country	Population (Million)
1	China	555	1	China	1.232	1	India	1.533
2	India	358	2	India	945	2	China	1.517
3	USA	158	3	USA	269	***3***	***Pakistan***	***357***
4	Russian Federation	102	4	Indonesia	200	4	USA	348
5	Japan	84	5	Brazil	161	5	Nigeria	339
6	Indonesia	80	6	Russian Federation	148	6	Indonesia	318
7	Germany	68	***7***	***Pakistan***	***140***	7	Brazil	243
8	Brazil	54	8	Japan	125	8	Bangladesh	218
9	UK	51	9	Bangladesh	120	9	Ethiopia	213
10	Italy	47	10	Nigeria	115	10	Iran	170
11	France	42	11	Mexico	93	11	Zaire	165
12	Bangladesh	42	12	Germany	82	12	Mexico	154
13	***Pakistan***	***40***	13	Viet Nam	75	13	Philippines	131

Source of Data: United Nations, Population Division (1998)

In 1950 & 1996, as shown in table 1 above, China was the most populous country with estimated total populations of 555 million and 1.232 million respectively. Table 2 below also shows that China is still maintaining the 1st position in terms population. Further inference from tables 1 above & 2 below; indicate that since 1950; China has been standing out as the most populous country in the world. However, by 2050, China's population is expected to have increased at a significantly decreasing rate and thus China is expected to grab the 2nd position in 2050. As shown in table 1 above, in 1950, Pakistan was the 13th most populous country in the world with a total population of approximately 40

million. As we can see, by 1996, population in Pakistan had increased by 100 million; that is, from 40 million to 140 million. This implies that over the period 1950 – 1996, population in Pakistan increased at an astonishing average rate of approximately 2.2 million per annum. Projections by the United Nations, Population Division (1998), indicate that by 2050, Pakistan would the 3rd most populous country in the world; with an estimated population growth of 357 million. This is clear indication that something must be done now in order to control population growth in Pakistan, just like what is happening in other Asian and non – Asian countries (e.g China, USA, Japan and India amongst others) where population is spiraling. In Pakistan, spiraling population is likely to be a problem precisely due to the fact that Pakistan has relatively less natural resource endowments, especially if we are to compare her with African countries where abundant natural resources are currently lying idle.

Table 2. Top 10 Most Populous Countries in the world for the year 2016

Rank	Country	Population (millions)
1	China	1.378
2	India	1.329
3	USA	324
4	Indonesia	259
5	Brazil	206
6	***Pakistan***	***203***
7	Nigeria	187
8	Bangladesh	163
9	Russia	144
10	Mexico	129

Source of Data: Population Reference Bureau (2016)

Latest data, as shown in table 2 above, indicate that Pakistan is in the 6th position in terms of total population when compared to the other countries in the rest of the whole world. Her total population is estimated to be around 203 million people. Given the fact that Pakistan has got a young population, as shown in figure 4 above and table 3 below, it becomes crystal clear why there is persistent high unemployment and poverty in Pakistan.

Demographic Indicators – Pakistan & a few other Asian Countries

Where pop means population, B/1000 is Birth per thousand, D/1000 is Deaths per thousand, IMR is infant mortality rate, TFR is total fertility rate, GNI is gross national income, A/M means all contraceptive methods used and M/M implies modern contraceptive methods used.

Table 3

Country	Pop – mid – 2016	Pop – mid – 2030	B/1000 pop	D/1000 pop	IMR	TFR	Life exp @ birth		% of pop below 15 years	% of pop above 65 years	GNI per capita	Use of Contraceptive	
							M	F				A/M	M/M
Pakistan	***203.4***	***265.6***	***30***	***7***	***67***	***3.7***	***66***	***67***	***36***	***4***	***5350***	***35***	***26***
India	1328.9	1530	22	7	40	2.3	67	70	29	6	6020	54	47
China	1378	1 411.2	12	7	11	1.6	75	78	17	10	14160	85	84
Bangladesh	162.9	186.5	20	5	38	2.3	71	73	33	6	3550	62	54
Philippines	102.6	124	23	7	22	2.8	65	72	32	5	8900	55	38
Japan	125.3	116.7	8	10	1.9	1.5	80	87	13	27	38870	54	44
S. Korea	50.8	52.2	9	5	3	1.2	79	86	14	14	34700	80	70
Thailand	65.3	66.8	12	8	10	1.6	72	79	19	11	15210	79	77

Source of Data: Population Reference Bureau (2016)

As shown in table 3 above, population in Pakistan is around 203 million people and is projected to increase to 265.6 million people by 2030. These figures are much higher if we are to compare Pakistan with other Asian countries such as Bangladesh, Philippines, Japan, South Korea and Thailand amongst others. Pakistan, as shown in table 3, has the highest births per thousand, which is

estimated to be around 30. This is currently the highest birth – rate in Asia. Pakistan also has the highest infant mortality rate of approximately 67%. This could be attributed to relatively poor health service delivery in Pakistan as compared to other Asian countries such as Japan and China. Pakistan also has the highest fertility rate, which is estimated to be around 3.7%. Now, the reasons as to WHY, are actually an empirical issue; however, it is generally suspected that high fertility in Pakistan is attributed to a number of factors ranging from economic, political up to social & cultural factors. High fertility rates can also be explained by the limited use of contraceptives (both traditional & modern methods) as shown in the table above; where Pakistan has the lowest number of people who use contraceptives. Pakistan's GNI per capita, which is approximately US$ 5350; is relatively low as compared to other Asian countries such as China (US$ 14 160), India (US$ 6 020) and Thailand (US$ 15 210) amongst others.

Relevance of the study

One of the major challenges facing Pakistan is the mounting boom in the country's population (Anwar, 2009). The United Nations (1998) population report projects that in 2050, Pakistan will be the 3rd most populous country in the world with an expected 357 million people. Ahmad & Ahmad (2016) argue that the population of Pakistan, nowadays; increases by 1 million every 3 months. If this argument by Ahmad & Ahmad (2016) is true, then no development plan can bear Pakistan's population growth rate. For a country like Pakistan, where there are relatively less natural resource endowments; high population growth is not only a burden on the country's limited economic assets but also increase dependency ratios of young people and consequently limit production growth in the economy. In fact, Afzal (2009) noted that population pressures in Pakistan are threatening arable land, forests and water resources. Rosen & Conley (1995) warned that, in the near future; limited renewable freshwater supplies may be the biggest obstacle to increasing Pakistan's food supply. There is therefore, need to conduct a recent empirical examination of the determinants of population growth in Pakistan. The study is envisaged to assist policy makers in not only understanding population growth dynamics in Pakistan but also with adopting more strategic population policies in Pakistan.

Organization of the study

The study comprises of eight sections and these are introduction, literature review, materials & methods, results presentation, interpretation & discussion, recommendations and conclusion; in their chronological order.

II. LITERATURE REVIEW

Theoretical Literature Review

The Malthusian population trap is a famous theory of the link between population growth and economic development. This theory states that human population grows geometrically while the means of subsistence grows arithmetically being subject to the law of diminishing returns. The popularity of the Malthusian population trap has convinced a plethora of development economists and policy makers that rapid population growth is a threat to economic development. This is mainly attributed to the proposition that rapid population growth results in tightening jobs markets, generating underemployment and discouraging labor force mobility across sectors. Therefore, the Malthusian population trap argues that rapid population growth is a real problem to any economy (Nyoni & Bonga, 2017). Malthus identified moral restraint (delay of marriage) and vice (measures of birth control) as important factors that determine population growth. New Malthusians such as William Faunce (1981) strongly support the Malthusian population theory and believe that the only solution to population growth is birth control through family planning.

Empirical Literature Review

Anwar (2009) empirically examined causes and prevention of population explosion in the rural areas

of Peshawar (Pakistan), and identified causes of population explosion as economic, religious, governmental, psychological and infrastructure related ones. Similarly, Kamal & Pervaiz (2011) investigated factors affecting the family size in Pakistan and concluded that women's age, husband's education, women currently not working, lack of consensus between husband and wife on number of children, son preference, high fertility intention, contraceptive knowledge, contraceptive use, and child mortality are responsible for big family size (more than two children). Huda (2014) reviewed the determinants of population growth in Pakistan and concluded that there are several factors which contribute to population growth in Pakistan and these include high fertility rates, inadequate family planning practices, illiteracy, lack of political will, inefficient bureaucracy, cultural as well as religious background. In a similar Asian study, Wei *et al* (2015) analyzed population growth models and factors affecting the Chinese population and concluded that two factors, the degree of urbanization and the sex ration, have significant influences on population growth in China. In Africa, Ademoh (2017) analyzed population growth and life expectancy in Nigeria and found out that life expectancy will increase if the population growth rate decrease and the vice – versa. In another most recent Asian study, Singh *et al* (2017) studied the determinants of population growth in Rajasthan (India) and concluded that there are many demographic and socio – economic factors responsible for population growth and these include mortality rate, crude birth rate, and crude death rate amongst other factors.

III. MATERIALS & METHODS

Econometric Model (*Brief* Discussion & Specification)

The research employed an Ordinary Least Squares (OLS) estimation criterion. Our model is synonymous to one of the functional specifications by Singh *et al* (2017) in their Step – Wise Regression Model. However, this study does not adopt the step – wise estimation criterion used by Singh *et al* (2017) due to the following reasons:

a) Step – wise regression is suitable when the researcher wants to select the best model, the so – called, parsimonious model; from a pool of *suspected* possible variables. Miller (2002) notes that step – wise regression methods may not identify sets of variables that fit well, even when such sets exists
b) The present study is strictly guided by relevant theoretical underpinnings and therefore it was not necessary to include a *large* pool of explanatory variables.

Above all, Harrell (2001) summarized the essential problems of the Step – Wise regression methods as follows:

a) R^2 values are biased high
b) F and $\varkappa^2$ test statistics do not have the claimed distribution
c) The standard errors of the parameters are too small
d) Consequently, the confidence intervals around the parameter estimates are too narrow
e) P – values are too low, due to multiple comparisons, and are difficult to correct
f) Parameter estimates are biased high in absolute value
g) Collinearity problems are exacerbated

The choice of the OLS approach in this study is hinged on the Gauss–Markov Theorem (GMT) of a Classical Linear Regression Model (CLRM), which states that in a linear regression model in which the errors have expectation zero and are uncorrelated and have equal variances; the Best Linear Unbiased Estimator (BLUE) of the coefficients is given by the OLS estimator. The implication is that when the GMT assumptions of a CLRM are satisfied, the OLS model produces consistent, efficient and unbiased estimates of the parameters. We also carry out various diagnostic tests in order to check

whether our model conforms to the underlying OLS assumptions.

Our model is stated in linear form as below:

$$logPOP_t = ¢ + Ø logLEB_t + ϕ logCPR_t + \mu logU_t + ϱ logTFR_t + \delta logIMR + \lambda logPCIG_t + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots [i]$$

Where,

POP is population growth measured in percentages, LEB is life expectancy at birth measured in years, CPR is the contraceptive prevalence rate (*any method*) measured in percentages, U is unemployment measured in percentages, TFR is the total fertility rate measured in percentages, IMR is the infant mortality rate measured in percentages, and PCIG is economic growth proxied by per capita income growth in percentages. All the variables have **natural logarithms** (*affectionately known as natural logs*) in order to put them on the same wave length for meaningful econometric analysis. Natural logs make the effective relationship non – linear, at the same time; preserving the linear model. Log transformation, according to Gujarati & Sangeetha (2007); is necessary to reduce the problem of heteroskedasticity because it compresses the scale in which the variables are measured, thereby reducing a tenfold difference between two values to a twofold difference. Natural logs also minimize the variability between the minimum & maximum values of the variables and are also a convenient way of transforming a highly skewed variable into one that is more approximately normal. ¢ is the model constant, (Ø, ϕ, μ, ϱ, δ & ƛ) are the estimation parameters, ε_t is the white noise error term and *t* represents the time dimension.

Data Sources

Population growth functions for developing countries are usually difficult to estimate due to lack of adequate data on most demographic indicators. Pakistan is a developing country that is also facing similar problems of inadequacy of data. Spanning from 1960 – 2017, data employed in this study was gathered from more than one source; that is, the World Bank (online data – base), Pakistan Demographic & Health Survey (various issues, Government of Pakistan) and the Economic Surveys ([various issues] – Ministry of Finance, Government of Pakistan). These sources of data have been chosen on the basis that they are highly celebrated for credibility and integrity at both national and international levels.

Diagnostic Tests

Unit Root Test (Stationarity Test)

The study used the most preferred Augmented Dickey – Fuller (ADF) test to check for stationarity of the study variables. A variable is stationary if the ADF statistic is less than the critical value. To avoid spurious regressions in in time series models, it is mandatory for us to work with stationary data. In the event that some of the variables (let's say, one or two), have been found to be non – stationary, as is the case with a myriad of time – series data; *differencing* may be required. However, in most instances; the researcher ought to consider dynamic econometric approaches such as Vector Autoregressive (VAR), Autoregressive Distributed Lag (ARDL) and Error Correction Model (ECM). Below is a table showing the results of the ADF tests:

Table 4

Variables	ADF Statistics	Critical Values	Conclusions
logPOP	-3.557805**		Stationary
logLEB	-4.376624*	@ 1% – -3.63653	Stationary
logCPR	-4.107630*	@ 5% – -2.9499	Stationary
logU	-4.73269*	@10% – -2.6133	Stationary
logTFR	-3.505821**		Stationary
logIMR	-3.7994805		Stationary
logPCIG	-4.123767*		Stationary

NB: * & ** denote 1% & 5% significance levels respectively

Multicollinearity Test (Correlation Matrix)

Table 5

	logLEB	logCPR	logU	logTFR	logIMR	logPCIG
logLEB	1.000000					
logCPR	-0.985070	1.000000				
logU	-0.977647	-0.721640	1.000000			
logTFR	-0.577342	0.685223	-0.724533	1.000000		
logIMR	0.563284	0.0705530	0.600532	-0.377436	1.000000	
logPCIG	0.058264	-0.054327	0.085452	-0.091370	-0.089216	1.000000

H_0: there is perfect multicollinearity

H_1: there is no perfect multicollinearity

Decision: We reject the null hypothesis since all values are not greater than 0.8; and conclude that there is no perfect multicollinearity.

ARCH LM Test

Table 6

F – Statistic:	**0.144811**	**Probability:**	**0.705983**
Obs R* - squared:	0.152917	Probability:	0.695764

H_0: there is autocorrelation

H_1: there is no autocorrelation

Decision: We reject the null hypothesis, since the p – value, 0.705983 is insignificant and; conclude that there is no autocorrelation

White Test

Table 7

F – Statistic:	**1.488704**	**Probability:**	**0.198887**
Obs R* - squared:	15.73789	Probability:	0.203538

H_0: there is heteroskedasticity

H_1: there is no heteroskedasticity

Decision: We reject the null hypothesis since the p – value, 0.198887; is insignificant and; conclude that there is no heteroskedasticity.

Misspecification Test (R^2 test)

H_0: the model is not correctly specified

H_1: the is correctly specified

Decision: We reject the null hypothesis since R^2 is greater than 60% and conclude that the model has been correctly specified. The model R – squared is 0.975708.

Testing for the significance of the whole model (F – statistic test)

H_0: the model is not significant

H_1: the model is significant

Decision: We reject the null hypothesis since the F – statistic 194.1319, has a probability of 0.000000; implying that there is apparently no way this model can be rejected.

IV. RESULTS PRESENTATION, INTERPRETATION & DISCUSSION

Descriptive Statistics

The following table shows descriptive statistics of the variables included in the model. Analysis of the table below basically indicates two important issues: (a) the large gap between the maximum and minimum of the logged variable MR, reveals a possibility of existence of outliers in this variable. However the rest of the variables have relatively smaller standard deviations, indicating the non – existence of outliers. (b) The generally accepted rule of thumb for normally distributed data is that skewness should be equal to zero and kurtosis should be equal to three. Analysis of the table below indicates that all the variables are nearly normally distributed.

Table 8

	logPOP	logLEB	logIMR	logCPR	logU	logTFR	logPCIG
Mean	2.536811	61.94444	93.33611	9.559972	5.005556	5.049083	-2.280066
Median	2.4518	62	92.35	9.1825	5	4.97	2.197050
Maximum	3.3441	66	122.1	12.1825	7.8	6.535	6.692
Minimum	2.0278	57	65.8	7.41	2.6	3.61	-8.289
Std. Dev	0.483557	2.756234	17.41405	1.6685011	1.41978	1.0698	1.381886
Skewness	0.505855	-0.157319	0.097585	0.38225	0.09187	0.098372	-0.747033
Kurtosis	1.699351	1.892152	1.719217	1.722555	2.233319	1.415303	3.402846
Jarque – Bera	4.072867	1.989486	2.517746	3.32449	0.932341	3.8824961	1.642318
Probability	0.130493	0.369819	2.518831	0.189713	0.6274	0.147714	0.365162
Observations	58	58	58	58	58	58	58

Results

Table 9

Variable	Coefficient	Std. Error	t – Statistic	Probability
C	8.572623	3.757244	-2.281625	0.8300
logLEB	-0.112722	0.04799	2.348879	0.0658***
logIMR	-0.014828	0.012453	-4.190653	0.03917**
logCPR	**-3.533343**	**0.082752**	**5.23665**	**0.0000***
logU	0.000582	0.0206667	-0.366859	0.0964
logTFR	1.9793	0.124274	2.247456	0.0024*
logPCIG	0.801665	1.052582	1.718239	0.0363**

NB: *, ** & *** means significant at 1%, 5% & 10% levels of significance

By substituting coefficients (*expressed to 3 decimal places*) the **estimated model** becomes:

Table 10

logPOP$_t$ = 8.573 - 0.113logLEB$_t$ – 0.015logIMR$_t$ – 3.533logCPR$_t$ + 0.001logU$_t$ + 1.979logTFR$_t$ + 0.802logPCIG$_t$ + ε$_t$ …. [ii]			
R – squared:	0.975 708	F – Statistic:	194. 131 9
Adjusted R – squared:	0.970 682	Prob (F – Statistic):	0.000 000
Durbin Watson:	1.932453		

Interpretation & Discussion of Regression Results

Life Expectancy at Birth (logLEB): The coefficient of life expectancy at birth has a negative sign and is statistically significant at 10% level of significance. This means that a 1% increase in life expectancy will lead to an approximately 0.11% decrease in population growth in Pakistan. The results are synonymous to Ademoh (2017). Table 3 above, shows that life expectancy in Pakistan is currently around 66 years for males and 67 years for females. This is relatively lower than other Asian countries such as Japan, China and South Korea.

Infant Mortality Rate (logIMR): The coefficient of infant mortality has a negative sign and is statistically significant at 5% level of significance. This implies that a 1% increase in infant mortality reduces population growth in Pakistan by approximately 0.01%. Infant mortality is an essential indicator of the health situation in any country. Table 3 above shows that infant mortality is still very high in Pakistan. This is a clear indication that there is need to improve public health facilities in Pakistan.

Contraceptive Prevalence Rate (logCPR): The coefficient of contraceptive prevalence rate has a negative sign and is statistically significant at 1% level of significance. This means that a 1% increase in contraceptive prevalence rate will lead to approximately 3.53% decrease in population growth in Pakistan. While confirming both the Malthusian population trap and the New Malthusian population growth ideology, our results are also in line with previous studies such as Kamal & Pervaiz (2011) and Huda (2014). According to Cleland *et al* (2006), prevalence of contraceptives in developing countries is 60%. This is the reason why there is high population growth in developing countries – contraceptive prevalence is very low. Bongaarts *et al* (2013) note that there are several reasons of non – compliance with contraceptives including availability of family planning (FP) services, low level of knowledge, cost related to contraceptives, side effects of contraceptives, social and cultural issues. A myriad of FP methods are used in Pakistan, including both traditional and modern methods. According to Ali *et al* (2014) the demand for contraceptive is 55%, while prevalence of contraceptive usage is 35%; this further confirms the fact that in Pakistan, contraceptive demand and usage is still very low.

Unemployment (logU): The coefficient of unemployment has a positive sign and is statistically significant at 10% level of significance. The implication is that a 1% increase in unemployment in Pakistan will lead to approximately 0.001% increase in population growth. Unemployment in Pakistan is very high and table 11 below indicates that unemployment is likely to increase in developing countries (*such as Pakistan*), to approximately 1.806 million people by the year 2050.

Table 11. World Labor – Force, 1995, with projection to 2050

Region	Year		***Additional jobs required (1995 – 2050)***	***% change in labour – force (1995 – 2050)***
	1995	2050		
	(in millions)			
World	2.735	4.455	1.720	76
Most Developed Countries	598	513	-(84)	-(17)
Developing Countries	***2.127***	***3.928***	***1.806***	***85***
Least Developed Countries	258	866	607	235

Source of Data: United Nations (1999)

Now, there is a strong connection between unemployment and poverty. Most unemployed people are inevitably poor people. According to Huda (2014), 21.04% of people are living below the poverty datum line in Pakistan. Just like in other developing countries, fertility rates in Pakistan are quite higher amongst unemployed poor women. Employed and wealthy women tend to have more control over decisions related to their own reproductive health issues.

Total Fertility Rate (logTFR): Total fertility rate (TFR) refers to the number of children that would be born to a woman if she were to live to the end of her child – bearing years. The coefficient of total fertility rate has a positive sign and statistically significant at 1% level of significance. This implies that a 1% increase in fertility rate will lead to approximately 1.98% increase in population growth in Pakistan. Our results are similar the findings by Anwar (2009), Kamal & Pervaiz (2011) and Huda (2014). In Pakistan, where almost everyone is a Muslim, males and females are bound to marry and fulfill their sexual and proactive needs within marriage. Even today, it is rare to encounter divorce in

Muslim countries, despite the fact that it may be allowed by religious prescription. In Pakistani society, remarriage of widows and divorces is greatly encouraged. Although the legal age for marriage for females is 16 years, most girls in Pakistan are married off below the age of 16 due to both religious and cultural beliefs of parents. These are some of the most important issues that cause high total fertility rates in Pakistan. TFR is responsible for high population growth in Pakistan. TFR constitutes of wanted and unwanted fertility. Unwanted fertility refers to the condition where by women bear children more than they desired. Unwanted pregnancies in Pakistan are approximately 43.2%; of which 15.3% end up with abortion, 22% unintended births and 5.9% miscarriage. Wanted fertility refers to the number of births excluding unwanted birth. Currently, the hypothesized size of ideal family for women and men are around 4.3 and 4.1. This indicates the fact that both males and females prefer a large family. It is imperative to note that both wanted and unwanted pregnancies are quite higher in rural and uneducated families in Pakistan.

Economic Growth (logPCIG): The coefficient of economic growth has a positive sign and is statistically significant at 5% level of significance. This means that a 1% increase in economic growth in Pakistan, will lead to approximately 0.8% increase in population growth. These findings are acceptable because higher income per capita implies that large families can survive and continue to bear more and more children whom they afford to take care of. However, a lot still needs to be done in order to improve the performance of the Pakistani economy.

RECOMMENDATIONS

The following policy prescriptions are recommended:

i. Given the pivotal role played by religion in Pakistan, religious leadership in the country should be on the fore – front of any fertility reduction programme.
ii. There is need to come up with Public Awareness Programmes (PAPs) in order to promote increased demand for family planning and encourage a smaller family – size norm.
iii. The government of Pakistan should engage the donor community in order to get financial support for providing adequate family planning and reproductive health services.
iv. In order to complement and reinforce the above endeavors [i – iii], the introduction of legislature on the size of the family should be issued by the government of Pakistan, just like what is happening in other highly populous Asian countries such as China and India.

CONCLUSION

The main objective of this study was to analyze the determinants of population growth in Pakistan. Literature review indicated that there are a plethora of factors that affect population growth in Pakistan and these include crude birth rate, crude death rate, religion, husband and wife's education, total fertility rate, total infant mortality rate, contraceptive knowledge, culture and women's age amongst others. However, our estimated model reveals that the determinants of population growth in Pakistan over the period 1960 – 2017 are life expectancy at birth, economic growth, contraceptive prevalence rate, unemployment, infant mortality rate and total fertility rate. A highly significant and negative coefficient of contraceptive prevalence rate points to the fact that family planning (FP) services are key in reducing population growth in Pakistan.

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