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Population and Poverty Alleviation in Pakistan: An Aggregated and Disaggregated Analysis*

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Abstract

A high Population growth rate is always considered a big problem in developing countries. The present study aims to simultaneously work on population and poverty in Pakistan over the period 1975 to 2015 by using the ARDL technique. The main results of the poverty model demonstrate that there is a positive association between poverty headcount ratio, population, taxes, GDP, and unemployment while an increase in trade openness, foreign direct investment, and literacy rate would decrease the poverty level. On the other hand, findings on the determinants of population explore that the effect of an increase in the inflation rate and literacy rate is negative on the population growth rate while the unemployment rate, remittances, foreign direct investment, and taxes indicate a positive relationship with the population growth rate. Findings of population dynamics and poverty encapsulate that a high birth rate increases poverty while a high fertility rate and death rates reduce the poverty in Pakistan. The study has suggested that poverty alleviation programs may target such areas which are deprived of social economic and educational betterment along with health facilities provision. The budget for the education and health sectors of Pakistan may be increased with special importance given to the rural areas.

Key Words: Birth Rate, Fertility Rate, Life Expectancy, Labor Force Participation Rate, Poverty headcount
JEL Code: R23, I32

1. Introduction

The whole world is getting populated despite numerous efforts made by various organizations. Demographers have defined population growth as a change in population size, depending on the interplay of the processes of the population (mortality, migration, and fertility) and that might be measured in both absolute as well as relative terms. In another sense, the human population is bearing to the numerical alteration in size or any given region of place between two periods and family planning constrain people from becoming a machine of reproduction. The growth of the population is a demanding challenge that inserts pressure on development and growth, thereby impeding the maintenance of a feasible society (Akinleye and Alade, 2008). The consequences of population growth manifest largely on deforestation, climate change, desertification, pollution, species extinction, and elimination of natural climate on one hand, and housing pressure, unemployment, congestion of transport traffic, security of infrastructure as well as strain on amenities (Iwejingi, 2011). Most of the time it has been believed that a fall in population growth rate would bring crucial advantages towards better life quality but that is possible only if we understood properly the way it works (Azure et al., 2016). Large birth rates stimulate the demand for resource allocation to the socio-economic as well as the welfare sectors specifically, housing, food, clothing, health, and education. The fast-growing population raises the question of the labor force, issues of poverty and unemployment, and living standards. This situation raises the ratio of dependency and productive employment which exceeds the existing jobs hence influencing the development level adversely (Todaro and Smith, 2009). For the developing world, the fast-growing rate of population is a big challenge to provide amenities and resources. The world population was 7.2 billion in 2013, almost double the population that was in 1960. The calculated world population might be 9.4 billion by 2050. The rapid growth of the population started after the revolution in the industrial sector in Europe, followed by the fall in death rates in Africa and Asia. More than sixty percent of the world population are living in Asia, and 4 out of 6 most populated countries of the world are in Asia. This locality has a growth rate of 1.3% than the growth of the world population of 1.1%.

A major issue associated with a high population growth rate is poverty. Poverty is an obscenity that personnel to divine wants and needs and attacks individuals to be greedy agents of the economy. The inefficiency of human beings to get the opportunities as well as choices, that harm their self-esteem is known as poverty. It indicates that people are helpless to perform their dynamic act in a nation; as well as the destitution from the sources between the people. A position in which the people are deprived of welfare is known as poverty, which brings many amplitudes. It is composed of the inadequacy of the income as well as an inefficiency to obtain fundamental wants in the shape of goods & services, that are needed for the endurance of any person with the maintenance of his/her self-esteem. Further, when an economy is not able to sustain public prosperity in form of providing basic health, education, food, clean water as well as voice and accountability (VA)

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opportunities, then it faces the issue of poverty (Bukhari et al., 2021). The strong need for a sustainable poverty alleviation campaign in Pakistan demands fresh study to be carried out to describe the relationship between poverty and Population. The relationship between population and poverty alleviation is inconsistent because the underlying parameters and assumptions vary for different countries. Therefore, it may be argued that depending on the social and economic conditions of a country population growth can contribute, deter or even have no effect at all on poverty alleviation. The strong need for sustainable poverty alleviation in Pakistan demands fresh studies to be carried out to describe the relationship between poverty and population. So, in this research, our concern is with the factors influencing poverty and the population in Pakistan. Based on these reasons, it is essential to inquire about the factors that influence poverty and population growth in Pakistan. This study investigates the determinants influencing poverty and population separately. Further, an analysis is also done based on determinants of population-related variables of poverty that is not been investigated before this study in the context of Pakistan. Hence, this research is important to devise poverty and population growth reduction policies by analyzing the factors affecting both these major issues.

2. Review of Literature

Poverty is usually influenced by various factors especially population growth and fertility. So, the review of literature related to poverty, population growth, and fertility can be expressed in Table 1.

Table 1: Summary of Studies on Population and Poverty Alleviation

Reference(s)	Countries	Period of Study	Methodology /Model	Findings
Amin et al. (2007)	51 developing countries	1990-2005	Linear Regression	The relationship between poverty and fertility varies according to the measure of fertility.
Chen et al. (2016)	China	2009-2012	Fixed Effect Method	The population has become a main influencing factor in poverty in most rural areas of China.
Barbier Hochard (2017)	Developing countries	2000 to 2012	Spatial Analysis	The falling poverty will entail targeting rural populations in less favoured lands
Kurnianto et al. (2018)	Maesan	2018	OLS Regression	Population growth, economic growth as well as unemployment, have a significant impact on poverty
Libois and Somville2 (2018)	Nepal	2018	OLS	Reductions in household fertility can reduce poverty
Ali et al. (2018)	Developing countries	2002-2015	Fixed Effect Method	The population has a negative impact on poverty.
Adayi (2018)	Nigeria	1973-2016	ARDL technique	Population growth influences economic growth, poverty, and agricultural output negatively.
Islam and Ghani (2018)	Malaysia	1995-2014	Linear Regression	Population, as well as poverty, have a negative influence on energy consumption in Malaysia.
Nabi et al. (2020)	Developed and Developing Countries	2011	cross-sectional regression and switching regression	It exists a negative association between population growth and poverty
Sarker et al. (2021)	Bangladesh	2012-13	Spatial lag model	Fertility is associated with literacy rate, child labor, poverty level as well as their districts of neighbours.

A review of the literature indicates that population growth has a negative effect on poverty in developing countries. Fertility also affects the level of poverty in various aspects. To the best of our awareness, no studies have been done on the factors i.e. population dynamics with respect to professions, employment and unemployment, age and sex, geography and birth, death and fertility. Therefore, this study is unique in itself as it is going to investigate these factors and their effect on poverty which will help out researchers to further investigate these grounds.

3. Data and Methodology

In this study, we have estimated two main models namely, determinants of poverty and determinants of population growth. These are the aggregated models. In these models, the dependent variables are poverty headcount ratio (PHCR) and population growth (POPG). A disaggregated analysis is also a part of this study that consists of five models named; model 1 is about population dynamics w.r.t profession, model 2 shows population dynamics w.r.t employment and unemployment, model 3 exhibits population dynamics w.r.t age and sex, model 4 explains population dynamics w.r.t geography and model 5 discusses the population dynamics w.r.t birth, death, and fertility. In these models, PHCR is the dependent variable. The general form of these models can be expressed as:

3.1. Aggregated Models

3.1.1. Overall Determinants of Poverty

$$PHCR = \alpha_0 + \alpha_1 TRADE + \alpha_2 POPG + \alpha_3 UR + \alpha_4 REM + \alpha_5 SSE + \alpha_6 TAX + \alpha_7 BDG + \alpha_8 ED + \alpha_9 FDI + \alpha_{10} GDPPC + \alpha_{11} GINI + \varepsilon \quad (1)$$

3.1.2. Overall Determinants of Population Growth

$$POPG = \alpha_0 + \alpha_1 GDPPC + \alpha_2 UR + \alpha_3 REM + \alpha_4 FDI + \alpha_5 SSE + \alpha_6 INF + \alpha_7 PHCR + \alpha_8 GINI + \alpha_9 TAX + \varepsilon \quad (2)$$

3.2. Disaggregated Models

$$PHCR = \alpha_0 + \alpha_1 EmpI + \alpha_2 EmpA + \alpha_3 EmpS + \varepsilon \quad (3)$$

$$PHCR = \beta_0 + \beta_1 UnM + \beta_2 UnF + \beta_3 LFPRM + \beta_4 LFPRF + \varepsilon \quad (4)$$

$$PHCR = \delta_0 + \delta_1 PopM + \delta_2 PopF + \delta_3 DepY + \delta_4 DepO + \varepsilon \quad (5)$$

$$PHCR = \gamma_0 + \gamma_1 PopU + \gamma_2 \mathrm{PopR} + \gamma_3 \mathrm{LCity} + \gamma_4 PD + \varepsilon \quad (6)$$

$$PHCR = \lambda_0 + \lambda_1 \mathrm{LEM} + \lambda_2 \mathrm{LEF} + \lambda_3 \mathrm{IMR} + \lambda_4 DR + \lambda_5 BR + \lambda_6 FR + \varepsilon \quad (7)$$

where, **PHCR**= Poverty Head Count Ratio
BR =Birth rate
DEPO =Age dependency ratio, old (% of working-age population)
DEPY=Age dependency ratio, young (% of working-age population)
DR =Death rate, crude (per 1,000 people)
EMPA=Employment in agriculture (% of total employment)
EMPI=Employment in the industry (% of total employment)
EMPS=Employment in services (% of total employment)
POPF =Population, female (% of total)
FR = Fertility rate, total (births per woman)
IMR=Life expectancy at birth, female (years)
LCITY=Population in the largest city (% of urban population)
LEF=Life expectancy at birth, female (years)
LEM=Life expectancy at birth, male (years)
LFPRF=Labor force participation rate for ages 15-24, female (%)
LFPRM=Labor force participation rate for ages 15-24, male (%)
POPM=Population, male (% of total)
PD=Population density (people per sq. km of land area)
POPR=Rural population (% of total population)
UNF=Unemployment, female (% of the female labor force)
UNM=Unemployment, male (% of male labor force)
POPU=Urban population (% of total)

4. Results and Discussions

4.1. Unit Root Analysis

Table 2 shows the results of the unit root of key variables of overall determinants of poverty and population growth.

Table 2: Unit Root Analysis of Key Variables of Overall Determinants of Poverty and Population Growth

Variables	Intercept	Lag	Intercept and Lag	Lag	None	Lag	Conclusion
PHCR	-2.966	1	-2.852	1	-0.727	1	I (1)
	(0.047)		(0.188)		(0.394)		
POPG	-2.523	3	-1.908	2	-1.724	3	I (1)
	(0.118)		(0.629)		(0.08)		
TRADE	-3.001	0	-2.964	0	-7.710	0	I (0)
	(0.043)		(0.154)		(0.000)		
INF	-9.181	0	-4.331	0	-2.278	0	1(0)
	(0.000)		(0.007)		(0.002)		
UR	-7.795	0	-7.722	0	-7.786	0	I (0)
	(0.000)		(0.000)		(0.000)		
REM	-1.323	0	-1.873	0	-1.978	0	I (1)
	(0.609)		(0.481)		(0.980)		
SSE	-6.012	0	-6.157	0	-3.0`2	1	I (0)
	(0.000)		(0.000)		(0.003)		
TAX	-5.070	0	-5.277	0	-4.942	0	I (0)
	(0.000)		(0.000)		(0.000)		
BDG	-7.685	1	-7.608	1	-10.015	0	I (0)
	(0.000)		(0.000)		(0.000)		
ED	-7.448	0	-7.361	0	-7.368	0	I (0)
	(0.000)		(0.000)		(0.000)		
FDI	-1.393	8	-1.110	9	-1.986	0	I (1)
	(0.121)		(0.152)		(0.232)		
GDPPC	-9.888	0	-9.771	0	-10.005	0	I (0)
	(0.000)		(0.000)		(0.000)		
GINI	-4.583	0	15.0.70	0	-4.525	0	I (0)
	(0.000)		(0.001)		(0.000)		

Unit root analysis of key variables of overall determinants of poverty and population growth shows that TRADE, INF, UR, SSE, TAX, BDG, ED, GDPPC and GINI are stationary at the level and PHCR, POPG, REM and FDI are stationary at 1st difference. Table 3 exhibits unit root test results of population-related variables of poverty

The result of the Augmented Dickey-Fuller test shows that the entire variables are mixed integration order means DR, EMPAGP, EMPIND, FEMPOP, FERTRATE, LARGCITY, LEPRAMALE, UNFEMALE and UNMALE are stationary at the level and other variables stationary at 1st difference. So we use the ARDL test to verify the relationship among variables either a long run or short run. Because when the calculated value of unit root (ADF) is higher than any critical value, then the variable is stationary because the null hypothesis gets rejected. This manifests that some regressors are stationary at I (0) and some are at I (1). So, ARDL is an appropriate technique to use for cointegration.

4.2. Bounds Test Analysis

The sketch of tabulated F-statistics was given by Pesaran et al. (2001) in which they formulated two critical bounds namely, upper bound and lower bound. If the computed F-statistics exceed the upper bound there exists a long-run relationship among the variables. But, if calculated F-statistics is lower than the stated lower bound, it indicates the absence of the long-run association. In this section, we are estimating bond tests for population-related variables of poverty. In this section, we are going to investigate the bounds test for overall determinants of poverty and population and population-related variables of poverty.

Table 3: Unit root Test Results of Population Related Variables of Poverty

Variables	Intercept	Lag	Intercept and Trend	Lag	None	Lag	Conclusion
BR	0.884	6	-4.743	5	-1.074	3	I (1)
	(0.994)		(0.002)		(0.250)		
DEPOLD	-3.082	5	-0.555	6	1.416	6	I (1)
	(0.037)		(0.002)		(0.958)		
DEPTOTAL	-1.473	1	-2.659	1	-1.340	1	I (1)
	(0.536)		(0.257)		(0.163)		
DEPYOUNG	-1.559	1	-2.743	1	-1.348	1	I (1)
	(0.493)		(0.225)		(0.161)		
DR	-6.068	7	0.223	7	-2.902	7	I (0)
	(0.000)		(0.997)		(0.005)		
EMPAGP	-7.354	0	-7.313	0	-7.367	0	I (0)
	(0.000)		(0.000)		(0.000)		
EMPIND	-6.670	0	-6.627	0	-6.758	0	I (0)
	(0.000)		(0.000)		(0.000)		
EMPSER	-0.243	0	-3.099	0	1.288	0	I (1)
	(0.924)		(0.120)		(0.947)		
FEMPOP	-2.950	4	-4.976	9	0.096	4	I (0)
	(0.04)		(0.016)		(0.707)		
FERTRATE	0.687	6	-6.017	4	-3.487	6	I (0)
	(0.990)		(0.001)		(0.001)		
IMR	-0.673	1	-1.910	2	-0.686	1	I (1)
	(0.841)		(0.629)		(0.413)		
LARGECTY	-4.834	1	-4.535	1	-0.656	2	I (0)
	(0.000)		(0.004)		(0.426)		
LEFEMALE	0.712	5	-6.357	3	5.512	5	I (1)
	(0.990)		(0.000)		(1.000)		
LEMALE	-3.869	5	-0.837	5	1.445	4	I (1)
	(0.005)		(0.952)		(0.961)		
LFPRFEMALE	-1.062	0	-3.057	0	-6.083	0	I (1)
	(0.721)		(0.130)		(0.000)		
LFPRMALE	-4.819	0	-5.389	0	-0.598	1	I (0)
	(0.000)		(0.000)		(0.451)		
MALEPOP	2.950	4	-4.076	9	-0.116	4	I (0)
	(0.004)		(0.016)		(0.636)		
PD	2.880	4	-0.052	4	0.961	4	I (1)
	(1.000)		(0.993)		(0.907)		
PHCR	-2.966	1	-2.852	1	-0.727	0	I (1)
	(0.047)		(0.188)		(0.394)		
RURPOP	3.048	2	0.041	2	0.108	2	I (1)
	(1.000)		(0.995)		(0.711)		
UNFEMALE	-6.490	0	-6.404	0	-6.574	0	I (0)
	(0.000)		(0.000)		(0.000)		
UNMALE	-.5.256	0	-5.227	0	-5.289	0	I (0)
	(0.000)		(0.000)		(0.000)		
URBPOP	-0.178	1	-1.758	1	0.667	1	I (1)
	(0.932)		(0.704)		(0.856)		

Table 4 elaborates the F-test for cointegration of overall determinants of poverty and population growth at 5% and 10%. In both models, the values of F-statistics that are 25.07 and 18.57 exceeds the upper bounds values i.e. 3.04, 2.08, 2.77 and 2.8 respectively at 5% and 10% level. It implies that the null hypothesis of no cointegration among the variables is rejected in both models.

Table 4: F-Test for Cointegration of Overall Determinants of Poverty and Population Growth

Models	F-Statistic	5% Critical Value Bounds I(0)	5% Critical Value Bounds I(1)	10% Critical value Bounds I(0)	10% Critical value Bounds I(1)
PHCR / TRADE, POPG.UR, REM, SSE, TAX, BDG, ED,	25.07				
FDI, GDPPC, GINI		1.98	3.04	1.76	2.77
POPG / GDPPC, UR, REM, FDI, SSE, INF,	18.57				
PHCR, GINI, TAX		2.04	2.08	1.8	2.8

Table 5: F-Test for Cointegration of Population Related Variables of Poverty

Models	F-Statistic	5% Critical Value Bounds I(0)	5% Critical Value Bounds I(1)	10% Critical value Bounds I(0)	10% Critical value Bounds I(1)
PHCR / EmpI, EmpA, EmpS	3.5797	2.79	3.67	2.37	3.2
PHCR / UnM, UnF, LFPRM, LFPRF	2.9958	2.56	3.49	2.2	3.09
PHCR / PopM, PopM, DepY, DepO	7.1721	2.56	3.49	2.2	3.09
PHCR / PopU, PopR, LCity, *PD*	11.39	2.56	3.49	2.2	3.09
PHCR / LEM, LEF, IMR, *DR, BR, FR*	24.56	2.27	3.28	1.99	2.94

In Table 5 we have analyzed F-statistics of population poverty-related variables at 5% and 10% consisting of five models. Model 1 represents the value of F-statistics is 3.57 which is higher than the upper bound critical value of 3.2 at the 10% level. It implies that the null hypothesis of no cointegration among the variables is rejected. Model 2 represents the value of the F-statistic is 2.99 which is less than the upper bound critical value of 3.09 at the 5% and 10% levels. It implies that the null hypothesis of no cointegration among the variables is accepted. In model 3, the F-statistic value is 7.17 which is higher than the upper bound critical values of 3.49 and 3.09 and at 5% and 10% levels. It implies that the null hypothesis of no cointegration among the variables is rejected. In model 4, F-statistic is 11.39 which is higher than the upper bound critical values of 3.49 and 3.09 at 5% and 10% levels. It implies that the null hypothesis of no cointegration among the variables is rejected. In the last model, the value of the F-statistic is 24.56 which is higher than the upper bound critical values of 3.28 and 2.94 at 5% and 10% levels. It implies that the null hypothesis of no cointegration among the variables is rejected.

4.3. Long Run Analysis

This section encapsulates the long-run analysis of population and poverty alleviation in Pakistan. The poverty and population estimations have been done through aggregated and disaggregated models. We have estimated two aggregated models namely, overall determinants of poverty and overall determinants of population growth. In these models, the dependent variables are Poverty Headcount Ratio (PHCR) and Population Growth (POPG) respectively. Further, the analysis is composed of the disaggregated model in which we have estimated five models i.e. population dynamics for professions, population dynamics for employment and unemployment, population dynamics with respect to age and sex, population dynamics with respect to geography and population dynamics with respect to birth, death, and fertility. In all these models the dependent variable is PHCR.

In Table 6 first independent variable is TRADE which shows a negative and significant relationship with PHCR. A one percent rise in trade can reduce the poverty of Pakistan by 0.66 percent. There are many reasons for this relationship. For example, when the financial system develops it leads to a greater openness of trade that lowers the poverty level. In another sense, easy access to cheap credit can allow the poor to take benefit more from the openness of trade. Further, the advantageous influence of a rise in openness of trade on the reduction of poverty is higher when the human capital investment is stronger because, through appropriate skills, people might be better able to take benefit from the new opportunities that are offered by trade which

in turn decrease the poverty level. Empirical studies also suggested that trade openness can reduce the level of poverty when the law and order situation improves. It might be due to the fact that when the institutional quality improves it results in a more favourable business environment, open market as well as employment opportunities which in turn decreases the level of poverty. Our findings are in line with (Bhagwati and Srinivasan, 2002; Goff and Singh, 2014).

Table 6: Long-run Results of Overall Determinants of Poverty

Dependent Variable: D(PHCR)				
Selected Model: ARDL (1, 1, 2, 2, 0, 1, 2, 2, 0, 2, 2, 2)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
TRADE	-0.663825	0.344783	-1.925341	0.0831
POPG	0.525147	0.296272	1.772520	0.1067
UR	4.216965	1.072360	3.932415	0.0028
REM	-0.452635	0.315638	-1.434035	0.1821
SSE	-0.882104	0.177422	-4.971777	0.0006
TAX	1.354378	0.575034	2.355300	0.0403
BDG	-2.789778	1.284487	-2.171901	0.0550
ED	0.844401	21.39049	0.039476	0.9693
FDI	-0.970099	0.928320	-1.045005	0.3206
GDPPC	-1.869054	0.593963	-3.146753	0.0104
GINI	0.351186	0.083229	4.219515	0.0002
C	11.94813	25.41208	0.470175	0.6483

The next independent variable is population growth (POPG) which indicates a positive and insignificant association with PHCR. Estimations highlight that a 1 percent increase in POPG can increase the PHCR by 0.52 percent. Although the results are insignificant few reasons are needed to explore here regarding the association between population growth and poverty. There are three fundamental channels by which the population influences poverty. These are growth, distribution as well as conversion channels. The channel of growth assigns to the effect of demographic factors on the growth level of feasible welfare per person, generally measured by the average consumption of mean income, given the income distribution. The channel of distribution indicates the influence that changes the income distribution given the feasible welfare per individual. The channel of conversion shows the alteration in actual capabilities or well-being given the feasible welfare per individual. Rapid population, large families, early first births, and high ratios of child-adult can raise the poverty level due to family burden. Our results are in connection with (Herrin and Pernia, 2000; Eastwood and Lipton, 2001 and Orbeta, 2002).

Another factor that affects the PHCR is the unemployment rate (UR) which explores a positive and significant relationship with PHCR demonstrating that 1 percent increase in UR can raise the poverty of Pakistan by 4.21%. Theoretically, it has proved that poverty and unemployment are the twin issues of an economy, as they act against the development and growth of the economy. Empirically it has also been analyzed that when people are unemployed, the detrimental effect is a decrease in standard of living as well as the inability to meet the daily household needs, which in turn entails poverty. Subsequently, when individuals are employed gainfully and able to earn a fair wage, they can able to fulfil their basic needs as a result can get rid of poverty. Moreover, plenty of social costs are usually linked with unemployment ranging from the physical and psychological health of a person and causing poverty. These findings have collaboration by (Taylor and Saunders, 2002; Mohammad and David, 2019).

Remittances (REM) is another important factor that influences poverty negatively. Our findings are also consistent with theory as well as empirical studies. One percent rise in REM can reduce the poverty of Pakistan by 0.45 percent. The personal remittances received from people living abroad raise the living standard of people which in turn reduces poverty. Additionally, through financial development, the remittances put a direct effect on poverty reduction. Other studies argued that the transfer of remittances raises the purchasing power of the wealthy segment and through transfer from wealthy to poor segment smoothens the level of consumption which provides working capital to the economy and decreases poverty. Our findings are matched with those (Gupta et al.,2004; Devkota, 2014, Adukonu and Abebrese, 2016).

Another variable we have added in this analysis is Secondary School Enrollment (SSE) which indicates a negative and highly significant relationship with PHCR. One percent increase in SSE can reduce the poverty of Pakistan by 0.88 percent. There are many reasons for this association such as the improvement in the quality of education would decrease the reliance of parents on tuition which reduces their costs of education

along with providing the school leavers with high skills of life which in turn can reduce the poverty level. Secondary as well as higher education can boost the individual's earnings which contribute to economic development. The post-elementary education makes an important contribution to the reduction in absolute and relative poverty. All in all, the development of secondary education has a significant role in the development of societies i.e. reduction of poverty, infant mortality, life expectancy and economic development. Our findings are in line with (Wedgwood, 2007 and Tilak, 2011).

Although taxes (TAX) have a significant contribution to revenue collection and economic development they can increase the poverty level as our findings show a positive and significant link with PHCR. One percent rise in TAX can increase poverty by 1.35 percent. Empirical studies argued that the imposition of taxes hurt the poor sector proportionately more as compared to the rich. Therefore, in long run, the imposition of various taxes has a deteriorating influence on poverty. Moreover, the rise in import tariffs can hurt the workers and hence worsen the level of poverty. On other hand, the elimination of tariffs on both agricultural as well as industrial goods decreases the depth, incident, and intensity of poverty which in turn can improve the conditions of poverty. Another reason is that when the import taxes are dropped, producers get benefits from low input prices for their production thereby driving costs down, while consumers get benefits from the variety of goods available as well as the spillover effect of the forward and backwards-sectors linkages. As most of the exports of Pakistan are agricultural products therefore the export taxes on these products can depress the unskilled labor wages and hence undesirable results in the poverty. The results are in connection with (Leith et al., 2003; Dartanto, 2010; Corong, 2008; Bhasin, 2011; Ackah and Ayertey, 2012).

The next independent variable that appears in Table 6. is External Debt (ED). According to our estimations, ED has a positive and insignificant effect on PHCR. One percent rise in ED can raise the poverty level by 0.84 percent. Although the findings are insignificant there are a few reasons for this association i.e. when the financial resources of the public are used for the payment of debts then few resources are left behind for providing basic services, employment opportunities, job creation and skilled staff hiring etc. which in turns increases the poverty. Further, the external outflow of financial resources dispossesses the country from basic services and developmental projects. Over years, Pakistan secured to finance the fiscal deficit by affecting external debt thereby the level of poverty increasing. Our findings are in collaboration with (Saungweme and Mufandaedza, 2013; Akram, 2015). Except for ED, we have taken another factor which influences PHCR is Budget Deficit (BDG). BDG also shows positive and significant relation with PHCR. One percent rise in BDG can increase PHCR by 2.78 percent. The reason is that in the case of the budget deficit, the capital is usually used to finance the budget deficit, defence expenditures as well as interest payments on loans that have been taken to overcome BD which can raise the miseries of the poor (Akram, 2013).

Foreign Direct Investment (FDI) explores a negative and insignificant relationship with PHCR. According to our estimations, one percent rise in FDI results in a 0.97 percent reduction in poverty in Pakistan. It is possible due to the inflow nature of FDI, which generally flows into those areas having labor, market availability and good infrastructure. Therefore, through the availability of a feasible economic environment, the effect of foreign direct investment reduces the level of poverty. FDI also provides the investment capital as well as advanced technology that is so important for economic growth and the resulting economic growth plays a crucial role in the reduction of poverty. FDI also considers a key element for successful economic growth. This might be due to the very root of the economic growth being efficient and rapid transfer as well as the adoption of “best practices” across borders. Foreign direct investment is well suited to influence this and translate it into a “broad-based growth”, not least by advancing the human capital. As growth is a single main factor influencing the reduction of poverty, FDI is essential to obtaining that goal. Findings are in connection with (Hung and Grips, 2005; Klein et al., 2001; Magombeyi and Odhiambo, 2017).

In the elimination of poverty, the main factor is GDP and our results also indicate a negative relation between GDP with PHCR. One percent rise in GDPPC can reduce poverty in Pakistan by 1.86 percent. These findings are consistent with the hypothesis that an economy’s growth decreases the number of people in an economy which indicates that holding the other variables constant, the percentage of the people living below the line of poverty in a province will reduce by 0.016 percent when the GDP of that province rises by 1 percent. This finding can be elaborated by Dollar and Kraay’s (2000) results that the growth tends to raise the poor’s income proportionately to overall growth (Hung and Grips,2005). The last variable GINI coefficient shows a positive and highly significant relationship with PHCR indicating that one percent rise in GINI can increase PHCR by 0.35 percent. It might be that high prospects of growth boost up the existing gap between poor and rich and the deprived part of the economy remains behind the bearing facts of growth.

Table 7 elaborates on the aggregate analysis of population growth (POPG). The first explanatory variable is GDPPC which shows a negative and significant relationship with POPG. One percent rise in GDPPC can

reduce population growth by 0.04 percent. This is because the changes in the size of the population are influenced by the size of people's income as their income increases people prefer to quality of their children's lifestyle to the quantity. So as the GDP of a country increases it tends to reduce its population size. Results are in connection with (Lutz and Qiang, 2002). The next variable is the unemployment rate (UR) which indicates a positive and highly significant relationship with PHCR. One percent rise in UR in Pakistan can raise POPG by 0.13 percent. The reason behind it can be that as unemployment increases people prefer the number of children rather than quality so they think more children will help out them in raising their level of income as child labor. So due to the rise in UR the POPG also increases.

Table 7: Long-run Results of Overall Determinants of Population Growth

Dependent Variable: D(POPG)				
Selected Model: ARDL (1, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1, 1)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
GDPPC	-0.040633	0.020981	-1.936636	0.0719
UR	0.132759	0.025898	5.126181	0.0001
REM	0.097112	0.018410	5.274836	0.0001
FDI	0.115013	0.045772	2.512745	0.0239
SSE	-0.012712	0.002789	-4.558543	0.0004
INF	-0.013186	0.009118	-1.446188	0.1687
PHCR	0.003289	0.008017	0.410280	0.6874
GINI	7.427880	3.150542	2.357651	0.0324
TAX	0.037270	0.022005	1.693729	0.1110
C	6.470896	1.227625	5.271071	0.0001

The next variable that influences the POPG is remittances (REM). It shows a positive and significant association with POPG. One percent increase in REM can raise the POPG by 0.09 percent. Although the frequency is too small this positive relationship may be due to the fact that when people receive remittances from abroad they become less worried regarding income and earnings, in such case they might prefer more children which can raise the population growth in Pakistan. Another variable which affects the POPG is Foreign Direct Investment (FDI). It also indicates positive and significant relation with POPG. One percent increase in FDI may raise the POPG by 0.11 percent. The reason behind this phenomenon may be that when FDI increases people find more opportunities for employment and earnings. When their earnings increase they can prefer more children which lead towards the rise in POPG.

Another variable which influences the POPG is Secondary School Enrolment (SSE). SSE has a negative and significant association with POPG. One percent rise in SSE can reduce POPG by 0.01 percent. The reason for this relation might be that when the education level increases people get more aware about the problems related to population growth. They come to know that if they prefer more children they would not be able to better educate them. In that POPG can reduce due to the rise in SSE. Inflation (INF) is another important factor which affects POPG negatively and insignificantly. One percent rise in INF can decrease the POPG by 0.01 percent. The rationale behind this phenomenon might be that due to the continuous rise in prices the consumption level of people decreases. When people come to know that they would not be able to raise their income and consumption levels, they prefer fewer children so the rise in INF leads to a fall in POPG.

Poverty (PHCR) is another factor which affects the POPG. In our analysis, PHCR indicates positive and insignificant relation with POPG. One percent rise in PHCR can increase POPG by 0.003 percent. The percentage ratio of this relation is quite low and the results are insignificant but the reason behind this relation might be that when poverty increases people think that more children will be helping hands for them to increase their income so they prefer more children that can raise POPG. The last variable is Tax (TAX) which also shows a positive and insignificant relation with POPG. One percent rise in TAX can raise the POPG by 0.03 percent.

Table 8 explains the long-run results of population dynamic and poverty that consists of five models. The first model is population dynamics with respect to the profession in which we have taken employment in three sectors i.e. employment in the industrial sector (EmpI), employment in agriculture (EmpA) and employment in the service sector (EmpS). All coefficients show a negative and significant relationship between employment with PHCR but the magnitude of EmpI is higher than EmpA and EmpS having value 2.37. EmpA shows that one percent rise in employment in agriculture can reduce poverty by 1.59 percent while EmpS can decrease poverty by 0.90 percent. This might be because the credit availability and the

capital markets efficiency improve through employment which in turn reduces poverty. The findings are in line with those (Sadiq and Akhtar,2006; Majeed and Tariq, 2011).

Table 8: Long run Results of Population Dynamics and Poverty

Dependent Variable: D(PHCR)									
Variable	**Model 1**	**Variable**	**Model 2**	**Variable**	**Model 3**	**Variable**	**Model 4**	**Variable**	**Model 5**
EmpI	-2.37	**UnM**	2.16	**PopM**	7.405	**PopU**	1.317	**LEM**	-3.495
	(0.02)		(0.10)		(0.00)		(0.00)		(0.04)
EmpA	-1.59	**UnF**	0.62	**PopF**	5.385	**PopR**	-1.857	**LEF**	-1.133
	(0.03)		(0.01)		(0.05)		(0.00)		(0.00)
EmpS	-0.90	**LFPRM**	-0.014	**DepY**	0.987	**LCITY**	-1.259	**IMR**	-5.304
	(0.04)		(0.00)		(0.07)		(0.01)		(0.08)
C	-145.2	**LFPRF**	-0.070	**DepO**	1.927	**PD**	0.710	**DR**	-1.309
	(0.05)		(0.07)		(0.00)		(0.04)		(0.03)
		C	29.87	**C**	-51.83	**C**	3.316	**BR**	5.878
			(0.00)		(0.00)		(0.41)		(0.02)
								FR	-3.374
									(0.01)
								C	54.55
									(0.06)

The second model is a model of population dynamics with respect to employment and unemployment. It is composed of four variables namely, unemployment Male (UnM), unemployment Female (UnF), Labor Force Participation rate, Male (LFPRM) and Labor Force Participation rate, Female (LFMRF). Unemployment of both genders shows a positive relationship with PHCR while the magnitude of male unemployment is higher and it is insignificant to female unemployment. On the other side, Labor Force Participation rates of both genders show a negative and significant link with PHCR. Estimations show that one percent rise in LFPRM can reduce poverty by 0.01 percent while one percent rise in LFPRF can decrease the poverty level by 0.07 percent in Pakistan. The reason behind this phenomenon might be that when the opportunities for employment rise, the people's income also increases which in turn decreases poverty. Results are in line with (Faridi et al., 2016).

The third model is a model of population dynamics with respect to age and sex. It consists of four explanatory variables which are Population, Male (PopM), Population, Female (PopF), Age Dependency Ratio, Young (DepY) and Age Dependency Ratio, Old (DepO). All variables have positive and significant associations with PHCR. The frequency of populations with respect to sex is high because high population growth of both males and females increases poverty especially if they are unemployed and don't have resources to meet their basic needs. On another side, with respect to age, the DepO is higher than DepY because the population growth of old people raises the poverty level as they are usually unable to work and considers a burden on the economy.

The fourth model indicates the population dynamics with respect to geography. This model is also composed of four variables as Population, Urban (PopU), Population Rural (PopR), Population in the largest city (LCITY) and Population Density (PD). PopU explores a positive and highly significant relationship with PHCR because in urban areas when the population increases people would not be able to find work due to the large population that's why poverty increases, while PopR indicates negative relation with PHCR. It might be due to the fact that the rural population is mostly associated with the agriculture sector so when their population increases they indulge the increasing population to work in fields so their poverty reduces.

The last model is a model of population dynamics with respect to birth, death and fertility in which we have taken Life expectancy at birth, Female (LEF), Life expectancy at birth, Male (LEM), Life expectancy at birth, Female (IMR), Death Ratio (DR), Birth Ratio (BR) and Fertility Ratio (FR) as explanatory variables. All variables except BR show a negative and significant relationship with PHCR. BR has a positive relation with PHCR indicating that one percent rise in BR can increase the poverty of Pakistan by 5.8 percent. The results of the fertility rate demonstrate that a rise in FR can reduce poverty because a high fertility rate reduces poverty because people who have low income consider a large family size as an increased income source, and there will work and will contribute to their family income. These results are supported by the microeconomic household theory of fertility.

4.4. Error Correction Analysis

In this section, we are analyzing the error correction results of population dynamics and poverty. Error correction term (ECT) highlights adjustment speed to improve the level of equilibrium in the dynamic models. The coefficient of error correction explores how speedily or slowly the variables move towards their equilibrium level. It is the rule of thumb that the coefficient term would be significant and negative.

Table 9: Error Correction Results of Overall Determinants of Poverty

Dependent Variable: D(PHCR), Selected Model: ARDL (1, 1, 2, 2, 0, 1, 2, 2, 0, 2, 2, 2)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(TRADE)	-0.112863	0.040260	-2.803370	0.0187
D(POPG)	22.16108	2.182498	10.15400	0.0000
D(POPG (-1))	14.31353	2.555485	5.601100	0.0002
D(UR)	0.955471	0.088738	10.76730	0.0000
D(UR(-1))	-0.584241	0.090068	-6.486660	0.0001
D(SSE)	-0.096180	0.027447	-3.504209	0.0057
D(TAX)	0.207625	0.069721	2.977919	0.0139
D(TAX(-1))	0.166144	0.053847	3.085498	0.0115
D(BDG)	-0.071517	0.042479	-1.683588	0.1232
D(BDG(-1))	-0.466009	0.051864	-8.985155	0.0000
D(FDI)	1.199800	0.162888	7.365814	0.0000
D(FDI(-1))	-1.019885	0.153079	-6.662464	0.0001
D(GDPPC)	0.445007	0.035376	12.57951	0.0000
D(GDPPC(-1))	-0.221883	0.036855	-6.020449	0.0001
D(GINI)	56.90151	8.115084	7.011820	0.0000
D(GINI(-1))	61.81097	9.045288	6.833499	0.0000
CointEq(-1)*	-0.423144	0.015802	-26.77812	0.0000
AdjR^2	19.2354	16.5784	3.2654	0.0245
R^2	23.5874	22.3654	3.2548	0.1235

Table 9 demonstrates the error correction results of overall determinants of poverty. The value of ECT is -0.42 and significant elaborates that from long-run equilibrium towards the short-run shocks the deviation may be corrected in four months approximately.

Table 10: Error Correction Results of Overall Determinants of Population growth

Dependent Variable: D(POPG), Selected Model: ARDL (1, 1, 1, 1, 0, 1, 1, 1, 0, 1, 1, 1)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(GDPPC)	-0.001802	0.001234	-1.460159	0.1649
D(GDPPC(-1))	0.006212	0.001347	4.610449	0.0003
D(UR)	-0.016034	0.002768	-5.791848	0.0000
D(UR(-1))	0.012374	0.003527	3.508594	0.0032
D(REM)	0.004680	0.002628	1.781094	0.0952
D(REM(-1))	-0.013246	0.002726	-4.859501	0.0002
D(SSE)	0.000160	0.001004	0.159868	0.8751
D(SSE(-1))	0.006055	0.001169	5.180263	0.0001
D(INF)	-0.005189	0.000872	-5.947899	0.0000
D(GINI)	0.151346	0.303043	0.499419	0.6247
D(GINI(-1))	1.269280	0.269981	4.701374	0.0003
D(TAX)	0.005765	0.002657	2.169894	0.0465
D(TAX(-1))	0.004606	0.002082	2.212620	0.0429
CointEq(-1)*	-0.284122	0.015397	-18.45305	0.0000
AdjR^2	16.25471	12.2547	4.2561	0.04875
R^2	19.35641	15.2354	4.3652	0.1985

Table 10 highlights the error correction results of overall determinants of population growth. The value of ETM is -0.28 exploring that from long-run equilibrium towards the short-run shocks the deviation can be corrected in approximately three months.

Table 11: Error Correction Results of Population Dynamics and Poverty

Variable	Model 1	Variable	Model 2	Variable	Model 3	Variable	Model 4	Variable	Model 5
	0.494104		0.525859		0.121189		0.421459		1.352656
D(PHCR(-1))	(0.0005)	D(PHCR(-1))	(0.0000)	D(PHCR(-1))	(0.1788)	D(PHCR(-1))	(0.0003)	D(PHCR(-1))	(0.0000)
	0.276731		0.237350		0.212578		0.198814		0.884145
D(EMPAGR)	(0.4377)	D(UNMALE)	(0.5920)	D(PHCR(-2))	(0.0625)	D(PHCR(-2))	(0.0143)	D(PHCR(-2))	(0.0000)
	0.201291		0.046789		-1236.093		-0.384870		0.382850
D(EMPAGR(-1))	(0.5698)	D(UNFEMALE)	(0.5204)	D(MALEPOP)	(0.0000)	D(URBPOP)	(0.9815)	D(PHCR(-3))	(0.0000)
	-1.143522		0.115814		2137.801		-411.1629		-182.3211
D(EMPAGR(-2))	(0.0018)	D(UNFEMALE(-1))	(0.1319)	D(MALEPOP(-1))	(0.0000)	D(URBPOP(-1))	(0.1568)	D(LEMALE)	(0.0005)
	0.091285		-0.307100		-1140.628		-834.4049		643.0204
D(EMPIND)	(0.6928)	CointEq(-1)*	(0.0001)	D(MALEPOP(-2))	(0.0000)	D(URBPOP(-2))	(0.0118)	D(LEMALE(-1))	(0.0000)
	-0.213630				-61.84817		-108.2591		992.7455
D(EMPIND(-1))	(0.3525)			D(FEMALEPOP)	(0.0042)	D(POPR)	(0.2882)	D(LEMALE(-2))	(0.0000)
	-0.422227				-33.55013		12.34403		-266.1425
D(EMPIND(-2))	(0.0632)			D(FEMALEPOP (-1))	(0.3717)	D(POPR (-1))	(0.9859)	D(LEMALE(-3))	(0.0002)
	-0.349994				47.80365		1774.211		540.9920
D(EMPIND(-3))	(0.0459)			D(FEMALEPOP (-2))	(0.0293)	D(POPR (-2))	(0.0190)	D(LEFEMALE)	(0.0000)
	-0.012993				1.360837		71.15371		-434.1489
D(EMPSER)	(0.9856)			D(DEPYOUNG)	(0.2454)	D(POPR (-3))	(0.5884)	D(LEFEMALE(-1))	(0.0000)
	1.218972				3.883879		265.1643		317.3252
D(EMPSER(-1))	(0.1031)			D(DEPYOUNG(-1))	(0.0092)	D(POPR (-4))	(0.0003)	D(LEFEMALE(-2))	(0.0000)
	-1.311163				-1.724596		115.8151		-7.715366
D(EMPSER(-2))	(0.0531)			D(DEPYOUNG(-2))	(0.2389)	D(LARGECITY)	(0.2383)	D(IMR)	(0.0000)
	-0.325306				-6.149455		277.9624		-14.57686
CointEq(-1)*	(0.0001)			D(DEPYOUNG(-3))	(0.0003)	D(LARGECITY(-1))	(0.5710)	D(IMR(-1))	(0.0000)
					13.63672		-1076.890		-11.85383
				D(DEPOLD)	(0.5669)	D(LARGECITY(-2))	(0.0297)	D(IMR(-2))	(0.0000)
					-75.47738		-38.49919		-11.81131
				D(DEPOLD(-1))	(0.0079)	D(LARGECITY(-3))	(0.7381)	D(IMR(-3))	(0.0000)
					-26.80041		-200.0841		888.2268
				D(DEPOLD(-2))	(0.3034)	D(LARGECITY(-4))	(0.0005)	D(DR)	(0.0000)
					72.50798		3.976076		2047.589
				D(DEPOLD(-3))	(0.0010)	D(PD)	(0.5345)	D(DR(-1))	(0.0000)
					-0.751526		-1.831785		1612.346
				CointEq(-1)*	(0.0000)	D(PD(-1))	(0.9274)	D(DR(-2))	(0.0000)
							101.7914		706.9413
						D(PD(-2))	(0.0004)	D(DR(-3))	(0.0000)
							-1.600330		-138.9163
						CointEq(-1)*	(0.0000)	D(BR)	(0.0000)
									-124.1773
								D(BR(-1))	(0.0000)
									-323.7927
								D(BR(-2))	(0.0000)
									-57.59054
								D(FERTRATE)	(0.3961)
									157.9038
								D(FERTRATE(-1))	(0.0239)
									-2.700483
								CointEq(-1)*	(0.0000)

Table 11 consists of five models related to population dynamics and poverty. In model 1 the value of ECM is -0.32 and significant which means that from long-run equilibrium to the short-run shocks the deviation can be corrected in three months. In model 2, the ECM value is -0.30 showing that from long-run equilibrium to the short-run shocks the deviation can be corrected in exactly three months. Model 3, explores the value of ECM -0.75, which means that from long-run equilibrium to short-run shocks the deviation can be corrected in more than half a year. Model 4 has a value of ECM -1.60 so from long-run equilibrium to the short-run shocks the deviation can take one and a half years. The last model has the highest value of ECT among all that is -2.70 which indicates that from long-run equilibrium towards the short-run shocks the deviation may be corrected in more than two and a half years approximately.

5. Conclusions and Policy Implications

This study has focused on population and poverty alleviation in Pakistan over the period 1975-2015 by using the ARDL estimation technique. The analysis has been done through three models namely, overall determinants of poverty, overall determinants of population growth and population dynamics and poverty. Findings from overall determinants of poverty reveal that trade has a negative and significant relationship with poverty. Further, rapid population, large families, early first births and high ratios of child-adult are the basic reasons for raising the poverty level due to family burden. Our results are also in line with the theory that shows that poverty and unemployment are the twin issues of an economy, as they act against the development and growth of the economy. Remittances (REM) is another important factor which influences poverty negatively. One percent rise in REM can reduce the poverty of Pakistan by 0.45 percent. Other factors such as tax, external debt and budget deficit also have a positive relationship with poverty as poverty rises due to the rise in these factors and vice versa. Alternatively, GDP and FDI indicate a positive relationship with poverty.

Long-run results of the determinants of population growth explore that GDPPC has a negative and significant relationship with POPG. One percent rise in GDPPC can reduce the population growth of Pakistan by 0.04 percent. Unemployment, foreign direct investment and remittances are positively linked with POPG. On the other side, inflation and secondary school enrollment influence negatively the population growth rate of Pakistan. Other factors i.e. poverty and taxes have a positive relationship with the population growth rate. As poverty increases, people think that more children will be helping hands for them to increase their income so they prefer more children that can raise POPG.

Additionally, the results of Population Dynamics and Poverty comprised five models. Variables in the model of population dynamics with respect to profession show a negative and significant relationship between employment with poverty. The model of population dynamics with respect to employment and unemployment indicates that unemployment of both males and females shows a positive relationship with poverty while labor force participation rates of both genders show a negative and significant link with poverty. The next model, the model of population dynamics with respect to age and sex demonstrates that all variables included in it have a positive and significant association with poverty. The population dynamics model with respect to geography explores distinct results for all variables. The last model, the models of population dynamics with respect to birth, death and fertility shows all variables except birth rate have a negative relation to poverty. This study has suggested that poverty alleviation programs should target such areas which are deprived of social economic and educational betterment. If the fact is generalized we can say that all sections of society should be given equal importance during the formulation of the policies. Moreover, if the life expectancy of females increases it would significantly enhance the poverty level of the country. The reason for this analysis is that a large portion of females in the country do not participate in recorded economic activities. While the employment and income earning, opportunities are not sufficient even for the male proportion of the population.

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