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Economic Growth and Inflow of Remittances: Do They Combat Poverty in an Emerging Economy?

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Abstract Poverty is such a social problem which itself begets so many socio-economic evils in a country. It never lets the government of a country to sit easy and focus on some other issues. Almost all countries who are running through this lurch; at there, governments, policy advisors and researchers are always busy in formulating strategies to combat poverty. Therefore; feeling the significance of the topic, this study is designed to empirically test the impact of economic growth, workers remittances, rural population and literacy rate on poverty in Pakistan. The empirical findings of the study reveal that economic growth; workers' remittances and rural population significantly deteriorate poverty. Moreover; it has found that there exists bidirectional causality between economic growth and poverty and between workers' remittances and poverty in Pakistan.

Keywords Pakistan · Poverty · Economic growth · Remittances

1 Introduction

The debate on poverty reduction is very important for development economists as well as economic policy makers in developing world. Economically; poverty starts with the assumptions, that the well-being of families is primarily and positively related to their

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ability to consume goods and services. It reveals that more consumption leads to greater welfare. This suggests that a family is poor if its consumption possibilities are low according to some established standard. Poverty will be measured by two ways according to the definition of Social Security Administration (SSA), absolute poverty and relative poverty. Absolute poverty indicates that progress towards raising the income of all citizens to minimum level, while relative approach measures the degree to which inequality in the income distribution has changed. Relative poverty is related to all over the world, while absolute poverty is mostly related to South Asia and Sub-Saharan Africa. In contrast to the income measures of poverty, human poverty is most important in current issues of Pakistan.

Human poverty is related with the deficiencies of education, health, level of employment and worker remittances. Fluctuation in economic activities causes change in prices of goods and services. Change in prices not only influences the level of real income, those who are on full time work but it also badly affects those who are already unemployed or underemployed. Likewise, the rate of growth in the economy influences the level of employment. For instance, if an economy is growing too slowly then it is really hard to provide the jobs for those who are entering into the labor force. Consequently, the number of people unemployed in the economy will significantly increase and some of those who are on full time work will also be employed only part time or substantially below of their working capacity. Long period of time with high rates of unemployment and short-run reductions in the level of employment will have direct effect on the frequencies of poverty. Some people are very poor and they find it difficult to climb above the poverty level because of discrimination in employment practices. However, to overcome from it education has become a mean of necessary step for reaching higher levels of occupations and income. In general, those individuals who have lower levels of educational qualifications are more likely to be unemployed and may even work for only fewer hours per year and indeed receive lower level of income. The main cause of poverty in under developed countries is that, low levels of literacy due to heavy dropout rates and the system of education is also not well connected with the job opportunities. Further, if people are not well educated then they try to adopt more labor intensify occupation by using old techniques of production and out dated equipment. In such situation, productive of labor remain low and overall production level will be far below which eventually increases poverty in developing countries. A number of studies in the literature document that educated parents are the most important factors for influencing their children educational attainment (Duncan et al. 1994; Haveman and Wolfe 1995; Smith et al. 1997; Nagin and Tremblay 2001; Davis-Kean 2005; Dearing et al. 2001). Further, previous studies argue that the school dropout is higher among the poor families' children. Sabir and Tahir (2012) recommend that Pakistan may reduce poverty in the long run by changes in macroeconomic variables (GDP growth, population growth, minor and major crops). Roemer and Gugerty (1997) established the correlation between poverty and economic growth. They document that economic growth is the significant factor for reducing the poverty. Their analysis explained that those countries grow quickly, that leads to greater poverty alleviation.

In Pakistan poverty rapidly increased in the 1990's due to lack of effective government policies towards population growth and economy under performed during this era. It is widely argued in the economic literature that higher population growth rates create lot of problems because in developing countries population is growing much faster than the resources growth. As a result of this, most of the developing countries are facing several unpleasant economic issues such as; poverty, unemployment and inflation. In 2014, Pakistan is ranked 62 in the list of 229 countries for having a young population of 33 % of total population. Although the

belief is widely held that poor families have more children. This higher birth rate is largely due to the lack of information and resources to carry out effective family planning. The statistics show that poverty in rural areas is much higher than the urban areas of Pakistan. In 1990–1991, the urban poverty was slightly higher than the country average poverty. However, over the time period the urban poverty has significantly decreased from 26.6 % in 1990–1991 to 13.1 % in 2005–2006. On the other hand, rural poverty has marginal increased from 25.2 % in 1990–1991 to 27.0 % in 2004–2005.

Many researchers have been contributing from time to time in order to enrich the literature on the impact of economic growth on poverty. The studies conducted by Fosu (2009), Chani et al. (2011), Cheema and Sial (2012), and Tahir et al. (2014) have found negative but robust impact of economic growth on poverty. This shows that as a country encourages production activities then the demand for employment increases, which further enhances the earnings of the working class, and hence poverty reduces due to increase in income resources of the people. Moreover; we could also find number of studies which test the impact of remittance inflows on poverty. For instance; the studies like Gupta et al. (2007), Kalim and Shahbaz (2009), Goff (2010), Banga and Sahu (2010), Javid et al. (2012), and Chaudry and Imran (2013) explored that remittance inflows are more helpful to alleviate poverty in a country. These studies have given us the thought to test the impact of economic growth and remittance inflows on poverty for a case of Pakistan. This study also considers rural population and literacy rate as control variables. In order to fulfill our research objective; we apply ARDL bounds testing approach and VECM by covering the period from 1978 to 2011.

The rest of the study is organized as follows: Part-2 deals with literature review of earlier studies. Part-3 provides the methodology of the study and Part-4 includes the estimation and analysis of the models while Part-5 provides concluding remarks with policy recommendation and also the contributions to the existing literature.

2 Literature Review

2.1 The Impact of Economic Growth on Poverty

In order to understand the relationship between economic growth and poverty; we will go through the studies which have been conducted by various researchers. We start from the study conducted by Galor and Tsiddon (1996) who document that economic growth has a positive impact on jobs creation and has a negative impact on wage differentials among the skilled and unskilled labor. This therefore decreases poverty and income level disparities in the country. Roemer and Gugerty (1997) established the relationship between economic growth and poverty reduction. They reported that economic growth is one of the best ways for poverty reduction. Another study by Ali and Tahir (1999) examined the relationship between growth, poverty and income inequality. They applied the ordinary least squares (OLS) and Cochran-orcutt iterative approaches. Their results confirmed that rural poor enjoy the fruits of higher economic growth as compared with urban poor individuals. Bigsten and Levin (2000) scrutinized the relationship between economic growth, income distribution and poverty. Their results indicated the negative relationship between economic growth and poverty.

Similarly, Fosu (2009) investigated the impact of economic growth on poverty reduction for the 86 countries of the world. Using Random Effect model on the data series from

1977 to 2004; the study concluded that economic growth had negative and significant impact on poverty in the selected countries. Anwar (2010) explored the impact of economic growth, income inequality on poverty by applying poverty decomposition approach in case of Pakistan. The empirical evidence exposed that growth components contributed to poverty reduction and redistribution components benefited only urban areas but it left adverse effects on the poor in rural areas. Kar et al. (2011) found unidirectional causality running from economic growth to the poverty in Turkey. The similar findings were disclosed in the studies of Odhiambo (2009) and Pradhan (2010). Furthermore, Chani et al. (2011) employed ARDL bounds testing approach on the data series from 1972 to 2008 and found that economic growth had negative and significant impact on poverty in the long run and short run in Pakistan. Another study conducted by Cheema and Sial (2012), in which they explored the impact of economic growth on poverty for Pakistan. By applying two way fixed and random effect models on the data series from 1992 to 2007, the study concluded that economic growth had significant and negative impact on poverty in Pakistan.

Afterwards, Tahir et al. (2014) conducted a study to examine the impact of economic growth on poverty in Pakistan. They considered simple OLS technique for the data set ranges from 1980 to 2012 in order to test their research objective. They found that economic growth was significantly decreasing poverty in Pakistan. Kalim and Hassan (2014) investigated the effects of public defense spending on poverty for Pakistan. They considered disaggregated GDP like industrial and service sector value additions as control variable in the study. Using ARDL bounds testing approach on the annual data from 1976 to 2012, this study confirmed long run relationship between poverty and its determinants in Pakistan. Moreover, this study also found that public defense spending; service sector value addition and industrial value addition had negative and significant impact on poverty in Pakistan. Another study by Rehman and Shahbaz (2014) who explored the dynamic relationship among financial development, economic growth and poverty, after using ARDL approach this study confirmed evidence of long run relationship among the considered variables. Abosedra et al. (2015) document that an increase in economic growth can significantly reduce poverty levels in Egypt. The authors establish the link between economic growth and poverty through the financial sector development. Likewise, Zhuang et al. (2009) argue that financial sector development leads to economic growth which eventually reduces poverty.

2.2 The Impact of Remittance Inflows on Poverty

There are number studies which have examined the impact of remittances on poverty. For instance, Gupta et al. (2007) examined the impact of inflow of remittances on poverty in the selected 76 countries of the world. Using Three Stage Least Square and Panel OLS; the study found that inflow of remittances had negative and significant impact on poverty into these selected countries. Afterwards, we see the study of Kalim and Shahbaz (2009) who also explored the effects of remittances on poverty in Pakistan. They applied Fully Modified Ordinary Least Square method for the data series from 1973 to 2006 to examine empirical results. They concluded that remittances had negative but significant impact on poverty in Pakistan. Besides this; the impact of remittances and economic growth on poverty was also tested by Goff (2010). After using unbalanced panel data set on 65 developing countries for the period of 1980–2005, this study found that both remittances and economic growth had negative and significant impact on poverty into these economies.

Similarly, Banga and Sahu (2010) also examined the impact of remittances on poverty for the selected 77 countries of the world. After employing Three Stage Least Square model on the data series from 1980 to 2008; the study concluded that inflows of remittance had negative and significant impact on head count ratio (proxy for poverty) in the considered countries. Another study by Javid et al. (2012) investigated the impact of remittance inflows on poverty in Pakistan. After employing ARDL bounds testing approach, the empirical results suggested that inflows in the form of remittance were significantly decreasing poverty in Pakistan. In another study, Chaudry and Imran (2013) found the similar results for Pakistan.

2.3 The Impact of Population Growth on Poverty

Some studies also explored the impact of population growth on poverty. For example, Mallick and Ghani (2005) found population growth as an important determinant of poverty which was significantly affecting poverty in Pakistan. Similarly, the study of Sabir and Tahir (2012) examined the impact of population growth on poverty after considering GDP growth, income, major and minor crops and inflation as control variables. Using multiple regression technique; this study disclosed that population growth was significantly increasing poverty whereas, GDP growth was significantly decreasing poverty in Pakistan. After this, Zaman et al. (2011) also explored the impact of population growth on poverty in Pakistan. They concluded that population growth and air pollution had significant effect on poverty.

2.4 The Impact of Literacy on Poverty

The relationship between literacy rate and poverty level was explored by Njong (2010) who investigated the impact of education on poverty in Cameroon and he found that education had negative impact on poverty in Cameroon. Afterwards, Stephen (2011) explored the impact of literacy rate on poverty for Nigeria and the findings of the study concluded that literacy rate was not significantly alleviating poverty in Nigeria. In another study, Janjua and Kamal (2011) investigated the relationship between education, income and poverty for the selected 40 developing countries of the world. Using Random Effect model on the data series from 1999 to 2007, they concluded that income growth had positive but insignificant while education had significant but negative impact on poverty in the selected countries. While, Afzal et al. (2012) also investigated the relationship between education, poverty and economic growth for Pakistan and after applying Toda-Yamamoto Augmented Granger Causality (TYAGC) test. The results suggested that higher education and economic growth could significantly reduce poverty in Pakistan.

3 Nature of Data and Methodology

3.1 Data

The data on the selected variables such as; real GDP per capita; remittances as share of GDP, and rural population have been obtained from world development indicator (CD-ROM 2013), World Bank. The population series is used to convert remittances variable into per capita. However; the dataset on the variables like rural population as share of total

population and literacy rate is taken from the various issues and volumes of Economic Survey of Pakistan. The data on poverty[1] is borrowed from Jamal (2006) and from the various issues and volumes of Economic Survey of Pakistan. The study covers the period of 1978–2011.[2]

3.2 Model of the Study

The log linear model is used to investigate the impact of remittances, economic growth on poverty reduction in case of Pakistan. The general regression equation is specified as follows:

$$LPOV_t = \beta_{1C} + \beta_2 LGDPPC_t + \beta_3 LREM_t + \beta_4 LRUR_t + \beta_5 LEDU_t + \mu_t \quad (1)$$

where, *LPOVt* Log [(Total Number of Poor People)/(Total Population)] as proxy for Poverty, *LGDPPCt* Log [(Real GDP)/(Total Population)] as proxy for Economic Growth, *LREMt* Log [(Remittances)/(Real GDP)], *LRURt* Log [(Rural Population)/(Total Population)], *LEDUt* Log [Literacy Rate] as Proxy for Education.

The rationale behind using log-linear model is that it improves the efficiency and consistency of the estimated results and it is validated by the researchers conducted by Ehrlich (1977), Layson (1983), Bowers and Pierce (1975), Cameron (1994) and Ehrlich (1996).

3.3 Empirical Methodology

The procedure for estimating empirical models is classified into four segments: the first segment investigates the random walk problem by using Ng and Perron (2001) unit root test; the second segment examines the long run relationship among the selected variables of the study by applying ARDL bounds testing[3] (Pesaran et al. 2001) approach, the third segment explores long run and short run coefficients for the study by following ARDL approach and finally, Granger causality test is applied based on Vector Error Correction Method (VECM) framework to explore the short run and long run causal relationship among the variables. These models are described as follows:

3.3.1 Estimating Random Walk Problem

In this segment; random walk problem is going to be tested by considering Eqs. (2–4) and these equations are developed by NG and Peroon (2001).

$$\overline{MZ_a} = (T^{-1} y_T^d - \hat{\lambda}^2) \left[2T^{-2} \sum_{t=1}^{T} y_{t-1}^d \right]^{-1} \quad (2)$$

[1] The data from 1978 to 2003 is obtained from the study conducted by Jamal (2006) and from the year 2004–2011 is obtained from for the various issues and volumes of Economic Survey of Pakistan.

[2] The primary reason to select this time period is that we were not able find out the data on literacy rate before 1978.

[3] Results for ARDL Bounds Testing Approach are obtained by using Demo Version of Mircofit 5.2 developed by Pesaran et al. (2001).

$$\overline{MSB} = \left[\frac{T^{-2}\sum_{t=1}^{T} y_{t-1}^{d}}{\hat{\lambda}^{2}}\right]^{1/2} \tag{3}$$

$$\overline{MZ_t} = \overline{MZ_a} \quad x\overline{MSB} \tag{4}$$

The GLS de-trending method used by Ng and Perron (2001) is primarily developed by Elliot et al. (1996). Modernized Phillip-Perron tests of Perron and Ng (1996) perform more consistently and efficiently when these tests follow GLS de-trending method. The consistency and efficiency of the results for random walk problem cannot be obtained by applying conventional tests for unit root like Phillips and Perron (1988) and Augmented Dickey and Fuller (1981). The modern version of Phillips-Perron (1988) test is Ng and Perron (2001) test. Also, the modern version is free from the problem of distortions in the size of the disturbance term which has large and negative MA or AR roots.

3.3.2 ARDL for Cointegration

In the second segment; the relationship among poverty, per capita gross domestic product, remittances as share of GDP, rural population as share of total population and literacy rate as proxy for education will be computed by considering ARDL bounds testing (Pesaran et al. 2001) approach. It is suggested that ARDL bounds testing approach is more efficient for the data series which contain mixed order of integration. Besides this; one could confirm long run relationship among the variables of the study in case when the estimated value of F-statistics turn outs to be larger as compared to the upper critical bound. The equations from (5 to 9) will serve to examine the long run relationship among the variables of the study and these equations are given as below:

$$\begin{aligned}\Delta LPOV_t = {} & \alpha_{C_{11}} + \alpha_{11} LPOV_{t-1} + \alpha_{12} LGDPPC_{t-1} + \alpha_{13} LREM_{t-1} + \alpha_{14} LRUR_{t-1} \\ & + \alpha_{15} LEDU_{t-1} + \beta_{11} \sum_{i=1}^{p} \Delta LPOV_{t-i} + \beta_{12} \sum_{i=0}^{p} \Delta LGDPPC_{t-i} \\ & + \beta_{13} \sum_{i=0}^{p} \Delta LREM_{t-i} \beta_{14} \sum_{i=0}^{p} \Delta LRUR_{t-i} + \beta_{15} \sum_{i=0}^{p} \Delta LEDU_{t-i} + \eta_{11}\end{aligned} \tag{5}$$

$$\begin{aligned}\Delta LGDPPC_t = {} & \alpha_{C_{21}} + \alpha_{21} LPOV_{t-1} + \alpha_{22} LGDPPC_{t-1} + \alpha_{23} LREM_{t-1} + \alpha_{24} LRUR_{t-1} \\ & + \alpha_{25} LEDU_{t-1} + \beta_{21} \sum_{i=0}^{p} \Delta LPOV_{t-i} + \beta_{22} \sum_{i=1}^{p} \Delta LGDPPC_{t-i} \\ & + \beta_{23} \sum_{i=0}^{p} \Delta LREM_{t-i} + \beta_{24} \sum_{i=0}^{p} \Delta LRUR_{t-i} + \beta_{25} \sum_{i=0}^{p} \Delta LEDU_{t-i} + \eta_{21}\end{aligned} \tag{6}$$

$$\begin{aligned}\Delta LREM_t = {} & \alpha_{C_{31}} + \alpha_{31} LPOV_{t-1} + \alpha_{32} LGDPPC_{t-1} + \alpha_{33} LREM_{t-1} + \alpha_{34} LRUR_{t-1} \\ & + \alpha_{35} LEDU_{t-1} + \beta_{31} \sum_{i=0}^{p} \Delta LPOV_{t-i} + \beta_{32} \sum_{i=0}^{p} \Delta LGDPPC_{t-i} \\ & + \beta_{33} \sum_{i=1}^{p} \Delta LREM_{t-i} + \beta_{34} \sum_{i=0}^{p} \Delta LRUR_{t-i} + \beta_{35} \sum_{i=0}^{p} \Delta LEDU_{t-i} + \eta_{31}\end{aligned} \tag{7}$$

$$\begin{aligned}\Delta LRUR_t = {} & \alpha_{C_{41}} + \alpha_{41} LPOV_{t-1} + \alpha_{42} LGDPPC_{t-1} + \alpha_{43} LREM_{t-1} + \alpha_{44} LRUR_{t-1} \\ & + \alpha_{45} LEDU_{t-1} + \beta_{41} \sum_{i=0}^{p} \Delta LPOV_{t-i} + \beta_{42} \sum_{i=0}^{p} \Delta LGDPPC_{t-i} \\ & + \beta_{43} \sum_{i=0}^{p} \Delta LREM_{t-i} + \beta_{44} \sum_{i=1}^{p} \Delta LRUR_{t-i} + \beta_{45} \sum_{i=0}^{p} \Delta LEDU_{t-i} + \eta_{41}\end{aligned} \tag{8}$$

$$\begin{aligned}\Delta LEDU_t = {} & \alpha_{C_{51}} + \alpha_{51} LPOV_{t-1} + \alpha_{52} LGDPPC_{t-1} + \alpha_{53} LREM_{t-1} + \alpha_{54} LRUR_{t-1} \\ & + \alpha_{55} LEDU_{t-1} + \beta_{51} \sum_{i=0}^{p} \Delta LPOV_{t-i} + \beta_{52} \sum_{i=0}^{p} \Delta LGDPPC_{t-i} \\ & + \beta_{53} \sum_{i=0}^{p} \Delta LREM_{t-i} + \beta_{54} \sum_{i=0}^{p} \Delta LRUR_{t-i} + \beta_{55} \sum_{i=1}^{p} \Delta LEDU_{t-i} + \eta_{51}\end{aligned} \tag{9}$$

Error correction representation of the selected ARDL model is found by introducing first period lagged error term in the long run equation of ARDL model. The negative and significant sign of the lag term in the first period of the stochastic term signifies movement towards long term stable equilibrium point. The movement will be away from long run stable equilibrium point in case positive and insignificant sign of the first period lag term of the stochastic term. The equations from (10–14) are developed to capture the short run dynamics and movement towards long term stable equilibrium point:

$$\begin{aligned}\Delta LPOV_t = {} & \beta_{C_{11}} + \beta_{11} \sum_{i=1}^{p} \Delta LPOV_{t-i} + \beta_{12} \sum_{i=0}^{p} \Delta LGDPPC_{t-i} + \beta_{13} \sum_{i=0}^{p} \Delta LREM_{t-i} \\ & + \beta_{14} \sum_{i=0}^{p} \Delta LRUR_{t-i} + \beta_{15} \sum_{i=0}^{p} \Delta LEDU_{t-i} + \gamma_{11} ECM_{t-1} + \varepsilon_{11}\end{aligned} \tag{10}$$

$$\begin{aligned}\Delta LGDPPC_t = {} & \beta_{C_{21}} + \beta_{21} \sum_{i=0}^{p} \Delta LPOV_{t-i} + \beta_{22} \sum_{i=1}^{p} \Delta LGDPPC_{t-i} + \beta_{23} \sum_{i=0}^{p} \Delta LREM_{t-i} \\ & + \beta_{24} \sum_{i=0}^{p} \Delta LRUR_{t-i} + \beta_{25} \sum_{i=0}^{p} \Delta LEDU_{t-i} + \gamma_{21} ECM_{t-1} + \varepsilon_{21}\end{aligned} \tag{11}$$

$$\begin{aligned}\Delta LREM_t = {} & \beta_{C_{31}} + \beta_{31} \sum_{i=0}^{p} \Delta LPOV_{t-i} + \beta_{32} \sum_{i=0}^{p} \Delta LGDPPC_{t-i} + \beta_{33} \sum_{i=1}^{p} \Delta LREM_{t-i} \\ & + \beta_{34} \sum_{i=0}^{p} \Delta LRUR_{t-i} + \beta_{35} \sum_{i=0}^{p} \Delta LEDU_{t-i} + \gamma_{31} ECM_{t-1} + \varepsilon_{31}\end{aligned} \tag{12}$$

$$\begin{aligned}\Delta LRUR_t = {} & \beta_{C_{41}} + \beta_{41} \sum_{i=0}^{p} \Delta LPOV_{t-i} + \beta_{42} \sum_{i=0}^{p} \Delta LGDPPC_{t-i} + \beta_{43} \sum_{i=0}^{p} \Delta LREM_{t-i} \\ & + \beta_{44} \sum_{i=1}^{p} \Delta LRUR_{t-i} + \beta_{45} \sum_{i=0}^{p} \Delta LEDU_{t-i} + \gamma_{41} ECM_{t-1} + \varepsilon_{41}\end{aligned} \tag{13}$$

$$\Delta LEDU_t = \beta_{C_{51}} + \beta_{51}\sum_{i=0}^{p}\Delta LPOV_{t-i} + \beta_{52}\sum_{i=0}^{p}\Delta LGDPPC_{t-i} + \beta_{53}\sum_{i=0}^{p}\Delta LREM_{t-i} + \beta_{54}\sum_{i=0}^{p}\Delta LRUR_{t-i} + \beta_{55}\sum_{i=1}^{p}\Delta LEDU_{t-i} + \gamma_{51}ECM_{t-1} + \varepsilon_{51} \quad (14)$$

4 Results and Discussion

Table 1 presents the descriptive statistics on the selected variables of the study. Findings from Jarque–Bera test suggest that the null hypothesis of normal distribution cannot be rejected for all the variables of the study. This therefore indicates that the selected variables of the study follow normal distribution properties.

The problem of random walk in dataset is tested by applying unit root test developed by Ng and Perron (2001). The results are shown in the Table 2. We find mixed order of integration such as I (0) and I (1). Poverty is stationary at level while economic growth, foreign remittances, rural population and education are integrated at I (1). The mixed order of integration advocates us to apply the Auto Regressive Distributed Lag (ARDL) model to examine the cointegration relationship among the selected variables.

The ARDL bounds testing results are reported in Table 3. We find that our computed value is greater than upper critical bound at 10 % level of significance when economic growth, foreign remittances, rural population and education are used as independent variables. This validates that there is a cointegration relationship between the variables for the period of 1978–2011.

The empirical findings in Table 4 demonstrate that economic growth has negative impact on poverty. This shows that a 1 % increase in economic growth contributes to poverty reduction by 2.76 %, all else is same. As economic growth enhances; it substantially increases productivity activities in the country, as a result of it demand for the inputs and employment level will increase. The increase in demand for the inputs and employment will tend raise the earnings of the working class. The increased earnings will raise the purchasing power of the people, and thus poverty is deteriorating in Pakistan.

Table 1 Descriptive statistics

Variables	$LPOV_t$	$LGDPPC_t$	$LREM_t$	$LRUR_t$	$LEDU_t$
Mean	3.180045	10.11066	−0.644348	4.230145	3.659487
Median	3.138517	10.13878	−0.524048	4.231115	3.663443
Maximum	3.514526	10.45667	0.133599	4.294752	4.060443
Minimum	3.005683	9.705914	−1.677974	4.165086	3.202746
SD	0.139079	0.213135	0.510372	0.037863	0.288435
Skewness	0.815541	−0.146901	−0.484427	−0.037984	−0.076290
Kurtosis	2.589436	2.238886	2.132003	1.873936	1.569854
Jarque–Bera	4.007733	0.942952	2.397136	1.804538	2.930515
Probability	0.134813	0.624080	0.301626	0.405648	0.231019
Sum	108.1215	343.7623	−21.90783	143.8249	124.4226
Sum Sq. Dev.	0.638314	1.499081	8.595823	0.047309	2.745425

Std standard, *Sq.* square, and *Dev.* deviation

Table 2 Unit root test

Ng–Perron test statistics									
Dependent variable	I (0)				Dependent variable	I (1)			
	MZ_a	MZ_t	MSB	MPT		MZ_a	MZ_t	MSB	MPT
$LPOV_t$	−11.0315	−2.3134	0.2097	2.3567	$\Delta LPOV_t$	−13.3238	−2.5289	0.18981	2.0367
$LGDPPC_t$	0.2125	0.1119	0.5266	21.1818	$\Delta LGDPPC_t$	−10.0408	−2.2376	0.2229	2.4518
$LREM_t$	−5.0029	−1.4991	0.2997	5.0898	$\Delta LREM_t$	−7.3412	−1.9159	0.2610	3.3375
$LRUR_t$	2.1357	5.4371	2.5458	512.086	$\Delta LRUR_t$	−6.0298	−1.7280	0.2866	4.0892
$LEDU_t$	0.9257	0.8497	0.9179	58.6763	$\Delta LEDU_t$	−10.3362	−2.1823	0.2111	2.7172

Asymptotic critical values				
Level of significance (%)	MZ_a	MZ_t	MSB	MPT
1	−13.8000	−2.58000	0.17400	1.78000
5	−8.10000	−1.98000	0.23300	3.17000
10	−5.70000	−1.62000	0.27500	4.45000

Table 3 ARDL bounds testing approach

Significance level (%)	Estimated models		$POV_t = f(GDPPC_t, REM_t, RUR_t, EDU_t)$	
	Optimal lags		(1,1,1,1,0)	
	F—statistics		4.5109*	
	W—statistics		22.5547*	
	Critical bounds for F—statistics		Critical bounds for W—statistics	
	Lower critical bound	Upper critical bound	Lower critical bound	Upper critical bound
5	3.2178	4.6443	16.0888	23.2217
10	2.6867	3.8991	13.4337	19.4955
Diagnostic tests				
R^2	0.92753	Serial correlation		0.2303 [0.631]
Adjusted—R^2	0. 90338	Functional form		1.3507 [0.245]
F—statistics	38.3984***	Normality		1.5206 [0.468]
DW—statistic	2.0301	Heteroscedasticity		0.4084 [0.523]

*, ** and *** demonstrate significance level at 10; 5 and 1 % respectively. The values in parenthesis indicate the probability values

Foreign remittances are inversely linked with poverty and it is statistically significant at 10 % level. Other things remain same; a 1 % increase in foreign remittances will alleviate poverty by 0.10 %. As inflow of the workers' remittances increase, it elevates the availability of the funds in the recipient country, which could further be utilized to raise the purchasing capacity of the people in order to curtail poverty. The relationship between rural population and poverty is negative and it is significant at 1 %. As in our case, it has witnessed that due to increase in the inflow of workers' remittances, poverty comes down. Moreover; in case of Pakistan, rural population is increasing over time, and we are surprised that it is significantly reducing poverty. One possible justification could be that people in the villages do not send their children to schools for getting education; rather they demand their children to go for work which increases their income and consumption and eventually their poverty. Furthermore; as people get more educated, their demand in the job market increases, so, employment increases, due to this they earn more money in order meet their basic needs. Hence poverty shrinks in the country. The impact of education on poverty is negative but statistically insignificant.

The short run results are also reported in Table 4. We find that a 1 % increase in economic growth; workers' remittances, and rural population as share of total population decline poverty by 1.23, 0.15, and 63.32 % respectively. The impact of education on poverty remains insignificant. The negative and significant coefficient of the lagged error term demonstrates that deviation in short run model converges towards long run by 76.29 % every year. This will take almost 2 years to reach equilibrium point following poverty function in Pakistan.

4.1 VECM Granger Causality Analysis

The estimated results shown in Table 5 demonstrate the direction of causality between the variables of the study for short term and into long term. We begin with the long term

Table 4 Long term and short term dynamics

Estimated long term coefficients using the ARDL approach				
Dependant variable: $LPOV_t$				
Variable	Coefficient	SE	t-Statistic	Prob. value
$LGDPPC_t$	−2.7608	0.41503	−6.6521	0.000
$LREM_t$	−0.10013	0.052763	1.8977	0.070
$LRUR_t$	−16.2235	4.7978	−3.3815	0.002
$LEDU_t$	−0.32228	0.53271	−0.60497	0.551
C	100.5448	24.6683	4.0759	0.000
Error correction representation for the selected ARDL model				
Dependant variable: $\Delta LPOV_t$				
Variable	Coefficient	SE	t-Statistic	Prob. value
$\Delta LGDPPC_t$	−1.2313	0.57253	−2.1507	0.041
$\Delta LREM_t$	−0.14641	0.038995	−3.7547	0.001
$\Delta LRUR_t$	−63.3285	25.9914	−2.4365	0.022
$\Delta LEDU_t$	−0.24587	0.39272	−0.62607	0.537
ecm_{t-1}	−0.76292	0.18607	−4.1003	0.000
R^2	0.66594	Mean dependent variable		−0.011223
Adjusted R^2	0.55458	S.D. dependent variable		0.05955
S.E. of regression	0.03974	Akaike information criterion		55.8672
Sum squared residual	0.03790	Schwarz Bayesian criterion		49.1323
Log likelihood	64.8672	Durbin–Watson stat		2.0301
F-statistic	9.5685	Prob. value (F-statistic)		0.000

Table 5 VECM granger causality analysis

Dependant variable	Direction of causality					
	Short run causality					Long run
	$\Delta LPOV_t$	$\Delta LGDPPC_t$	$\Delta LREM_t$	$\Delta LRUR_t$	$\Delta LEDU_t$	ECM_{t-1}
$\Delta LPOV_t$	–	5.3758* (0.0130)	12.8047* (0.0002)	0.6967 (0.5094)	8.0523* (0.0025)	−1.1178* [−6.1057]
$\Delta LGDPPC_t$	3.3818** (0.0533)	–	5.0829** (0.0158)	0.0213 (0.9789)	0.4624 (0.6360)	−0.7956* [−3.2133]
$\Delta LREM_t$	8.8746* (0.0016)	1.1250 (0.3434)	–	5.4878** (0.0121)	2.4603 (0.1097)	−1.7646* [−3.6764]
$\Delta LRUR_t$	1.1298 (0.3419)	0.2337 (0.7936)	3.4411** (0.0510)	–	0.3169 (0.7318)	−0.0681*** [−1.9940]
$\Delta LEDU_t$	0.4576 (0.6389)	0.8173 (0.4552)	1.7470 (0.1987)	0.3444 (0.7125)	–	−1.3875** [−2.6981]

*, ** and *** show significance at 1, 5 and 10 % levels respectively

causality results which state that the estimated coefficient of the first period lagged term of error term [ECM_{t-1}] is negative and significant for the all the equations. This indicates the presence of bi-directional causality between poverty and economic growth; poverty and worker's remittances, poverty and rural population, and poverty and education in the long run in Pakistan. Moreover; if an economy is hit with any macroeconomic shock, then the destabilizing effects will be corrected to put an economy towards stable long run equilibrium and the speed of adjustment will be almost 177 % for worker's remittances, almost 139 % for education, almost 112 % for poverty and the speed of adjustment will be almost 1 % for rural population.

Besides long term causality results; we now explain short term causality results. The empirical results of Table 5 have exposed that there exists bi-directional causality between economic growth and poverty; between inflow of worker's remittances and poverty, and between rural population and inflow of worker's remittances in the short run. Additionally; there also exists unidirectional causality between poverty and rural population and it moves from rural population to poverty in the short run.

5 Conclusion and Policy Implications

This paper investigates the impact of economic growth; workers' remittances, rural population, and education on poverty in case of Pakistan for the period of 1978–2011. We have applied Ng and Perron (2001) unit root test to test stationary properties of the variables. The ARDL bounds testing approach to cointegration is applied to examine the long run relationship among the variables. We have used VECM Granger causality test to examine the direction of causal relationship among the variables. Our findings confirm the presence of long run relationship among the variables. Moreover, economic growth declines poverty. Foreign workers' remittances contribute to poverty reduction. Rural population also lowers poverty level. The causality analysis reveals the bidirectional causality between economic growth and poverty. The feedback effect exists between foreign workers' remittances and poverty. The relationship between rural population and foreign workers' remittances is also bidirectional.

Based on the findings of this study, we dram the following important policy implications: The empirical result of this study has exposed that inflow of worker's remittances is significant macroeconomic factor which combat poverty in Pakistan. Therefore; if the labor force in Pakistan is provided with education; training and skills and then the surplus labor force can be exported to other countries. It will not only broaden the base of worker's remittances but also widens the base of foreign exchange earnings. More inflow of worker's remittances and high foreign exchange earnings will promote productivity activities in the country; so, employment opportunities and overall employment level will increase, and hence their purchasing power will also increase. Therefore; the increase in the purchasing power of the people will reduce number of vulnerable from the country and hence poverty declines in the country. Therefore; this study suggests that policies must be aimed at improving the skills of the workforce by providing them training and education and then export the surplus workforce. Government could set up a system through which people living abroad send their money through legal channel at low cost. So, the exported workforce could be helpful in curtailing the cancer of poverty from Pakistan.

Furthermore; the estimated results reveal that economic growth and rural population are also important factors which significantly combat poverty in Pakistan. In order to enhance

growth activities; government may improve the structure of agriculture, industrial, and services sectors by providing them with basic infrastructure, cheap raw material, research and development, and updated technology, all these sectors will be helpful in promoting growth activities in the country. The increase in growth activities will improve economic growth and therefore, poverty will deteriorate in the country. Moreover; around 67 % of total population is still living in rural parts of the country and this population is associated with cropping in agriculture sector. Rural population is an important source of promoting returns to agriculture sector through the cultivation. Therefore; government must introduce public skills development programs for rural population. These programs must provide knowledge to rural population about agriculture inputs (both mechanical and biological) and their use; about the quality of the land, and the latest methods of cultivation. Due to this; overall boost will be emerged in the cropping sector, which will increase the earnings of the rural population and hence their living standard. Therefore; poverty will decline in the country.

Finally, our study makes an important contribution to the body of knowledge and to the existing literature on the issue of poverty. Particularly, our study addresses very important issues in the literature. For instance, Pakistan is one of the fastest developing economies in the world; however it has been suffering due to internal and external political conflicts which have led to increase the poverty levels in the country. Therefore, in this study we aimed at understanding the role of economic growth and foreign remittances inflow on reducing poverty in Pakistan along with rural population and education. Our findings reveal that economic growth, remittances inflow and rural population are playing an important role for shrinking poverty levels in Pakistan. Therefore, our study offers significant knowledge on the issue of poverty in Pakistan and the factors that are helping to reduce it significantly.

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