Assessing the Poverty Bias of Growth in Agriculture Sector: Evidence from Pakistan

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Abstract-The aim of this study is to examine the potential impact of agriculture growth on the poors in Pakistan during 1964-2006. This research is extended within the phenomena of Poverty Bias of Growth (PBG) as proposed by McCulloch and Baulch (2000) in the literature. The cumulative outcome of four decades (43 years) is anti-poor. The results of impulse response analysis, indicate that one standard error shock to agricultural growth have negative impact on rural poverty, while one shock in income inequality causes rural poverty to fall up to next 10 years. At last, one error shock to poverty causes agriculture income to deteriorate in the next 10 years.

Index Terms - Rural Household Income, Poverty, Income Inequality, Poverty Bias of Growth, Impulse Response function, Agriculture, Pakistan.

I. INTRODUCTION

Pakistan has a developing mixed economy based largely on agriculture, light industries, and services. Pakistan's agriculture has practiced rapid growth since the 1960s. The average yearly growth of about 4% over the last four decades has surpassed the population growth rate of about 2.8 %. This rate of growth in agriculture has been continued by the technological progress embodied in the high-yielding varieties of grains and cotton with sustaining public investment in irrigation, agricultural research and physical infrastructure. Agriculture is approximately one-fourth of the GDP having employed 46 percent of manpower. Wheat, Sugarcane and Cotton are prominent crops of Pakistan's economy. Manufacturing takes one-fifth of the GDP having one-eighth of the man-power. In textile, the leading export is cotton textile. 0.4 Percent of the GDP is shared by government controlled mining. Coal, iron, ore, petroleum and natural gases are extracted relatively. The widely mined

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products are chromate, gypsum and lime stone (World Bank Report, 2006).

The periods of high and low agricultural growth have generally overlapped with periods of strong and deprived performance of the national economy. A relative agricultural stagnation in the 1950s and 1970s constrained overall economic growth in the economy. In the 1960s, a remarkable performance of agriculture, pushed by the introduction of the new seed-water-fertilizer technology, assists the economy in attaining its highest growth rates. Likewise, in the 1980s and 1990s, even though considerable decline in the sector's contribution to GDP, it had a substantial influence on overall economic growth. The link between agriculture and the overall economy is brought home even more stridently during years of abnormal weather or natural calamities. The damage suffered by agriculture during these periods never fails to have a significantly unfavorable effect on the overall growth of GDP (Economic Survey of Pakistan 2008).

The growth rate of the economy of Pakistan has been 7.5 percent during the years 2003-07. The growth rate decreased up to 7.0 percent during the years 2006-07. According to the poverty reduction strategy paper (PRSP-11), the major causes of Poverty in Pakistan, has been less production in agriculture, restricted access to land, hike in unemployment and non-standard prices of commodities (PRSP, 2003). The latest estimate of inflation - adjusted poverty Line is Rs.944.47 per adult equivalent per month up from Rs.878.64 in 2004-05. The magnitude of poverty differs substantially depending on the definition used. The most normally used measure of poverty is the headcount ratio. It is also known as the incidence of poverty and gives the proportion of the total population falling below the poverty line. The poverty line is derived in Pakistan on the basis of income which can provide daily intake of 2250 calories per person (2450 calories per adult equivalent in rural areas and 2150 in urban areas). According to the caloric-based poverty (headcount ratio), the occurrence of rural poverty declined sharply from 49.1 percent in 1969-70 to 18.32 percent in 1987-88. Though, poverty has increased significantly in the 1990s— rising from 18.32 percent in 1987-88 to 23.91 percent in 1992-93 and further to 39.3 percent in 2001-02. The current estimates suggest that poverty has declined sharply 11.19 percentage points in 2004-05 and more reduce to 1.1 percent in 2005-06 (PSLM Survey, 2005-06).

A variety of summary measures are used to describe and quantify inequality. The Gini coefficient is by far the most accepted statistical indicator of inequality. The Gini coefficient varies from zero (complete equality) to 1 (complete inequality), the more uneven the income

distribution, the higher the Gini coefficient. Approximately, rural income distribution has worsened over the last three and a half decades. However, decade-wise investigation suggests that income distribution improved in the 1960s—the Gini coefficient declined from 35.0 percent in 1963-64 to 29.5 percent in 1970-71; but deteriorated in the 1970s. Income distribution improved in the 1980s but deteriorated sharply in the 1990s. The Gini coefficient increased from 32.0 percent in 1986-87 to 42 percent in 2005-06 (Economic Survey of Pakistan, 2005-06).

The affiliation between growth, inequality, and poverty has been a debatable point. On the one hand, growth is reflect on central or the superlative course to reduce poverty (World Bank Report 1990) with the prerequisite that access to education, health, and social services are accessible to all by means of other policies. On the other hand, there is a comprehension that growth, inequality, and poverty relations are non-linear, complex, and path dependent in their dynamics. An imperative point made in this context by Kuznets (1955) was the empirical finding of an inverted U shape relationship between growth and inequality which suggested that the inequality would increase with growth in the beginning, but will decline at higher levels of growth as the benefits of growth trickle down to lower income strata.

Kuznet's inverted U has been confronted and seems to have disappeared [Deininger & Squire (1996) and Kanbur (2002)]. For instance, Deininger & Squire (1996) challenged a comprehensive test on Kuznet hypothesis, rejecting earlier conformity and provided that there was no evidence of an inverted U curve for individual countries. The pro-poor growth argument has its roots in the pro-distribution arguments given by Chenery & Ahluwalia - 1970s. In 1990, pro-poor growth was re-coined as 'broad-based growth' in the World Development Report, however, this term since had not gained noteworthy momentum. A number of studies have attempted to redefine and evaluate a pro-poor growth, including Kakwani and Pernia (2000); McCulloch, et al. (2000); Ravallion & Chen (2002) and Son (2004), with yet no significant discoveries.

Son (2006) suggests a technique to review the pro-poorness of government fiscal policies, in view of introducing marginal reforms. The research proposes pro-poor index for assessing government expenditure and tax policies. The proposed methodology was adopted in Thailand is 1998 Socio-Economic Survey. Son & Kakwani – 2006, measured the impact of price change on poverty, by taking entire class of additive separable poverty measures. This impact was captured as price elasticity of poverty, expressing a new price index for the poor (PIP). Son & Kakwani – 2007, examined global estimates of pro-poor growth. The objective was to present a cross-country analysis of pro-poor growth in 80 countries through 237 growth spells, during the period of 1984-2001. This research authenticates the association between growth patterns and economic identified as significant determinants of growth and inequality.

Shirazi (1995) employed the Logit model to find out the probability of locating a poor household with some other variables. He finds that educational level of the head of

household increases, the probability of that household being poor decreases. These effects are said to hold for equally urban and rural areas. Iqbal, et al (2002) concluded that firm size and farmer's education were the major factors in the adoption of recommended wheat varieties. Saboor (2004) examines the rural poverty, agriculture growth and income inequality in Pakistan. The author of this research has adopted poverty equivalent growth rate on rural areas of Pakistan during 1991 to 2002. Jamal (2006) examines the alliance between poverty, growth and inequality in the context of Pakistan. The results point out a positive correlation between per capita GDP and income inequality. Zaman and Ahmad (2008) examines the poverty – growth nexus in Pakistan during 1985-2006. They conclude that agriculture growth is anti-poor during the said period.

The above discussion confirms a strong linkage between rural poverty, agriculture growth and rural income inequality in the special context of Pakistan. In this paper an analysis has been carried out to find a relationship between growth and poverty reduction, by applying the approach developed by McCulloch and Baulch (2000). This paper does not include all dimensions and factors of the poverty-growth nexus but limited to the following variables:

1) *Poverty:* Rural poverty is used as a dependent variable for the study. The headcount ratio (RHCR) used as a proxy for rural poverty, where it is defined as the proportion of people living below a certain income threshold or the number of households unable to afford certain basic goods and services.

2) *Economic Growth:* The independent variables used in this study to test their relationship are constructed as follows: Economic Growth is one of the explanatory variables in that model. Traditionally growth has been measured in terms of per-capita income. This statistic is not obtained from HIES data but calculated from the estimates of GNP and population. For consistency of analysis and validity of statistical procedure we required a more direct measure of growth based on the same sample survey from which other measures of poverty and inequality are derived. So we have settled for rural average household income (RAHHI) as an indicator of rural growth.

3) *Income Inequality:* The next variable is income inequality (RGINI) which is a numerical measure of how disproportionately one variable is associated with another. GINI is a good index of income inequality which meets major criterion of transfer sensitivity. The experience of developing countries in the 1990s does not reveal any sign of a systematic trade off between measures of absolute poverty and relative inequality. Indeed, falling inequality tends to come with falling poverty incidence. And rising inequality appears more likely to be putting a brake on poverty reduction than to be facilitating it[1].

This current study aims to determine the correlation between agriculture growth, rural poverty and income

1 Ravallion, Martin (2005). "A Poverty-Inequality Trade off", World Bank Policy Research Working Paper 3579, April 2005. Available to www-wds.worldbank.org

inequality in the social context of Pakistan's agriculture sector. Time Series breakdown on poverty measures from Household Income and Expenditure Surveys / Pakistan Integrated Household Survey is done, by selecting data from 1964 – 2006. The study focuses on the impact of poverty upon agriculture growth in Pakistan, through analyzing the data. The objective of this paper is to determine whether growth was pro-poor or not in so far as the reduction in growth is greater than that which would have happened were growth distributionally neutral. Poverty Bias of Growth (PBG) is calculated on this data set, as proposed by McCulloch and Baulch (2000) in the literature.

This paper is organized in four sections. Section 2 provides data source and methodological framework. The empirical results are presented in Section 3, while the final section concludes the study.

II. DATA SOURCE & METHODOLOGICAL FRAMEWORK

Base-line for poverty is obtained from Economic Survey of Pakistan – 2008, where 2,450 Calories are mentioned as cut-off point for rural Pakistan. For rural income inequality, micro-data is taken from Federal Bureau of Statistics – Pakistan. Anwar – 2006 and Economic Survey of Pakistan - 2008 has estimated inequality parameters. Same parameter estimate is taken as indication in this study. Data is analyzed by Poverty Bias of Growth (PBG) in rural Pakistan.

A. Poverty Bias of Growth (PBG)2:

McCulloch and Baulch (2000) intend a measure of pro-poor growth called the poverty bias of growth (PBG). This measure pays an exacting focus on reducing inequality. The PBG is obtained from the negative of the inequality component attained from the symmetric poverty decomposition methodology, which was suggested by Kakwani (2000) i.e,

$$\Delta P = \Delta P\mu + \Delta P\Psi \qquad (1)$$

Where

$\Delta P\mu$ is the change in poverty when the distribution of inequality does not change. $\Delta P\Psi$ is the change in poverty when inequality changes in the absence of growth. It can be either negative or positive depending on whether growth is accompanied by improving or worsening inequality.

McCulloch and Baulch (2000) propose a simple and instinctive measure of the poverty bias of growth (PBG) between two periods can be calculated as:

PBG = Poverty reduction with distributional neutral growth – Poverty reduction which actually occurred.

PBG = $\Delta P\mu - \Delta P$ (2)

PBG = - $\Delta P\Psi$

If the PBG is positive, this indicates a pro-poor bias of growth. If it is negative, growth has an anti-poor bias.

B. Generalized Impulse Response Function:

Impulse response is a common tool for investigating the interrelationships among the variables in dynamic models. This tool is valuable in co-integrated systems. In such system, it is assumed that although the individual variables are non-stationary, there are linear combinations of them which are stationary. These linear combinations are often interpreted as long-run equilibrium relations. An impulse function measures the time profile of the effect of a shock on the behavior of a series. Generalized impulse response function may be applied to both linear and non-linear model which provides a natural method of dealing with the problems of shock and compositional dependence of impulse responses for multiple linear and non-linear time series.

III. RESULTS AND DISCUSSIONS

To calculate poverty bias of growth (PBG), two sets of household survey are required, which are conducted at two different points of time. By using PBG on these data sets that period is regarded as poverty biased of growth or anti-poor bias. In this study two decades data is used, from 1964 – 2006..

Table 1 demonstrate that agriculture sector secured substantial reductions in poverty during 1967-70; 1972-79; 1984-87, 1996-97 and 2005-06 with the poverty headcount falling by 0.63; 21.91; 3.19; 1.9 and 6.15 percent respectively. Decomposing the transform in poverty into growth and inequality mechanism shows that most of the change in poverty in agriculture resulted from growth in the mean income expenditure. There are eighteen years that explains eight phases which are regarded as pro-poor biased of growth in agriculture sector. First phase is from 1969-70; second is 1972-79; third is 1984-85; fourth is 1986-87; fifth is 1993-94; sixth is 1996-97; seventh is 2002-05; and eight is from 2005-06. Periods specified above are pro-poor while remaining is pro-rich or anti-poor. Cumulative effect of four decades is anti-bias of growth. Thus, in agriculture sector, the anti-poor bias of growth has drastically truncated the poverty reduction which growth has brought (graphical representation of this is shown in Figure 1).

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2 This methodology has been adopted from McCulloch, N., and B. Baulch. 2000. "Tracking Pro-poor Growth". ID21 Insights No. 31, Institute of Development Studies, Sussex. Further it is for the knowledge of all concerned that except methodology, which is adopted, every thing else in this article is original and solely owned by this author.

TABLE 1:   POVERTY BIAS OF GROWTH (PBG)

Years	$\Delta P\mu$	ΔP	$PBG = \Delta P\mu - \Delta P$	Decision
1964-67	0.161	7.93	-7.769	Anti-poor bias of growth
1967-69	-2.076	0.32	-2.396	Anti-poor bias of growth
1969-70	-0.330	-0.63	0.300	Pro-poor bias of growth
1970-71	0.744	1.39	-0.646	Anti-poor bias of growth
1971-72	0.343	3.25	-2.907	Anti-poor bias of growth
1972-79	-0.389	-21.91	21.521	Pro-poor bias of growth
1984-85	-0.949	-3.61	2.661	Pro-poor bias of growth
1985-86	-3.633	-3.36	-0.273	Anti-poor bias of growth
1986-87	-2.021	-2.6	0.579	Pro-poor bias of growth
1987-88	-2.775	0.10	-2.875	Anti-poor bias of growth
1990-91	0.459	5.22	-4.761	Anti-poor bias of growth
1992-93	0.293	3.95	-3.657	Anti-poor bias of growth
1993-94	0.579	0.47	0.109	Pro-poor bias of growth
1996-97	-0.323	-1.90	1.577	Pro-poor bias of growth
1997-99	1.933	8.72	-6.787	Anti-poor bias of growth
1999-02	0.672	4.60	-3.928	Anti-poor bias of growth
2002-05	-0.715	-11.19	10.475	Pro-poor bias of growth
2005-06	-0.036	-1.11	1.074	Pro-poor bias of growth
1964-06	-11.159	-10.36	-0.799	Anti-poor bias of growth

Source: Calculated by the authors. PBG = Poverty Bias of Growth

Figure 1: Poverty Bias of Growth (1964-2006)
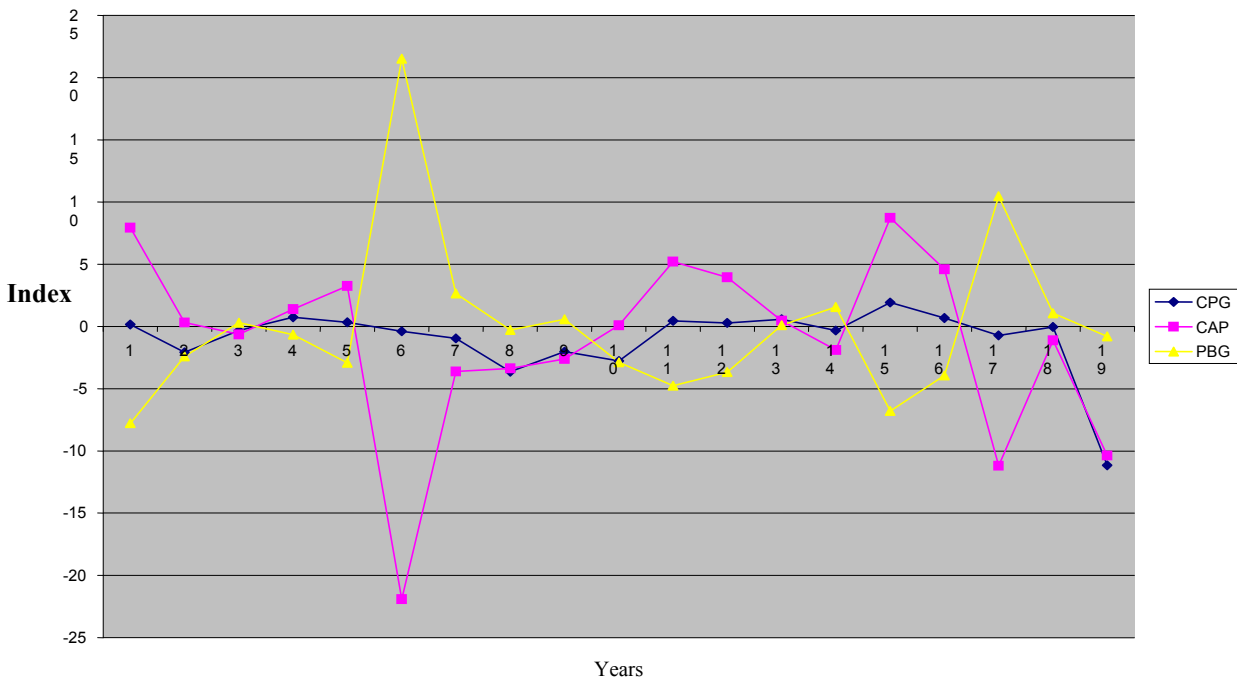
Where CPG stands for change in poverty with respect to agriculture growth when income inequality does not change, CAP stand for actual poverty reduction and PBG represent for poverty biased for growth. Figure 1 depicts that out of 19 phases which equals to almost four three years, eight phases are Pro-poor, while 10 phases are anti-poor. Cumulative effects are pro-rich or in other words it is regarded as anti-poor which mean that over all poverty has increased throughout the specified time period. The generalized version of impulse response analysis is applied in this study to test the causality between agriculture growth, rural poverty and income inequality. Impulse response shock to rural poverty is presented in Figure 2. It reveals that 17.0 percent increase in poverty (RHCR) may reduce the agriculture growth by 1.1 percentage point in the very beginning of the horizon. If this process persists, in 2016, there would be 8 percent fall in potential of agriculture growth to a 0.5 percent increase in poverty. The negative impact of rise in poverty on income inequality is also visible.

Impulse response shock to agriculture growth (RAHHI) is shown in Table 4. Future horizon demonstrates that 22.0 percent increase in agriculture growth leads to 1.4 percent decrease in rural poverty while 16.2 percent increase in income inequality. As the time horizon passes, income

inequality is increased in response to increase in agricultural growth.

Figure 2:   Impulse Response Function for Rural Poverty
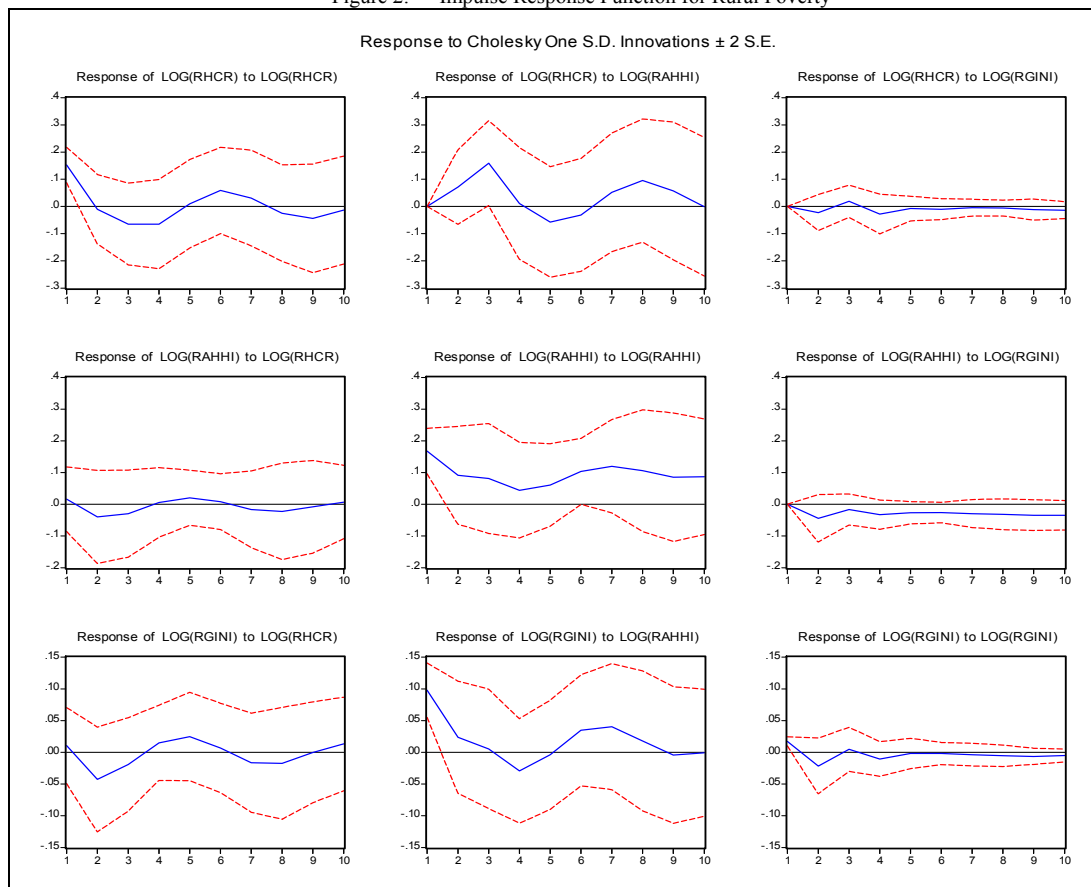
IV.   CONCLUSION & RECOMMENDATION

This paper has demonstrated simple procedure of the poverty Bias of Growth (PBG) that can be intended by deducting the change in poverty reduced by the real pattern of growth from that which would have been formed by distributional neutral growth and normalizing the result. The result reveals that, during last four decades (43 years), eight phases are regarded as pro-poor bias of growth while remaining is the anti-biased of growth in agriculture sector. Cumulative effect of eighteen phases is anti-bias of growth.

The results of impulse response analysis, point out that one standard error shock to agricultural growth has negative impact on rural poverty in the following 10-year period. Likewise, one standard error shock in income inequality causes rural poverty to fall up to next 10 years. Lastly, the impulse response of poverty indicates that one error shock to poverty causes agriculture income to deteriorate in the next 10 years. The findings suggest that the Government should focus on poverty bias of growth (PBG) rather than the actual growth rate. In order to improve PBG, the poverty alleviation strategy must be in tandem with rational income distribution.

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