Does Decomposition of GDP Growth Matter for the Poor? Empirical Evidence from Pakistan

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Abstract
This paper examines how the economic growth of different sectors affects poverty in Pakistan uses the time series data over the period 1973-2010. The ARDL co-integration approach has been applied to investigate the impact of sectoral growth on aggregate as well as disaggregated poverty in the long run and short run. The results indicate that industrial growth reduces total, rural and urban poverty significantly while the performance of services sector affects the composition of poverty insignificantly. The agricultural sector growth has a negative impact on aggregate poverty while it has an insignificant impact on disaggregated poverty.
Keywords: Sectoral Growth, Rural Poverty, Urban Poverty, Co-integration.
JEL Codes: O41, P46,

I. Introduction

Growth analysis has developed into an important and well-established field in economics. Such analysis is customarily carried out on a highly aggregate level. The degree of aggregation to apply and the concepts to use depend on the problems which one wants to examine, and there is certainly a need both for aggregate and disaggregate analyses. Over recent decades, most of the developing economies of Asia achieved reductions in absolute poverty incidence, but these reductions varied greatly in size. Differences in the rate of aggregate economic growth explain part, but not all of these differences. It is almost universally accepted that economic growth is a necessary condition that brings about an increase in income, which, in turn, pushes people out of poverty. However, it has also been agreed that growth is a necessary but not the sufficient condition for poverty reduction, and many have attempted to explain why so is. Osmani (2002), for example, argues that there is no invariant relationship between the rate of growth and the rate of poverty reduction. In other words, the faster growth is not always accompanied by a faster rate of poverty reduction. One factor that could be important is the sectoral composition of growth.

Different sectors in the economy have different impact on poverty reduction. Some sectors are more poverty reducing than others. So, not only the aggregate growth, but also the sectoral composition of growth matters for poverty alleviation. The main objective of this study is to investigate the impact of sectoral (agriculture, industry and services) growth on aggregate and disaggregate (rural and urban) poverty in Pakistan. The rest of the paper is organized as follows: section II describes relevant literature review on sectoral growth and poverty reduction.

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Theoretical framework has been presented in section III. Methodology, model and data description are presented in section IV. The empirical evidence has been provided in section V. The section VI concludes.

II. Literature Review

In developing countries, the relationship between poverty and economic growth has become a widely debated issue in current development literature and thinking (Thorbecke and Jung, 1996; Lipton and Ravallion, 1993). In the Millennium Development Goals by United Nations (2000), the key attention has been given to poverty reduction issue. It has also been decided to reduce poverty by half till the year 2015. This goal may be achieved through economic growth because it may be considered that economic growth is the best tool for poverty reduction. As Dollar and Kraay (2002) have pointed out that growth is good for the poor and that the income of the poorest 20 per cent rises proportionately with average national income. Fields (1989), The World Bank (1990), Squire (1993), Asian Development Bank (1994) and Ravallion and Chen (1997), Dorward, *et al* (2004), Balisacan and Fuwa (2004), Tambunan (2005), Tsai and Huang (2007), among others, sustain this point of view that economic growth is associated with poverty reduction outcome.

Although the relationship between poverty and economic growth is clear, however, the rate of poverty reduction due to economic growth varies across countries and over time. Over current decades, most Asian Developing Economies achieved cutbacks in absolute poverty incidence, but these cutbacks differ greatly in size. Aggregate economic growth partially explains the reduction in poverty in the said developing economies. It is almost unanimously accepted that economic growth is an indispensable condition that brings about an upsurge in income, which, in turn, drives people out of poverty. Though, it has also been accepted that growth is a pre-requisite for poverty alleviation but the only growth is not sufficient and many have endeavored to explain why so is. Osmani (2002), for example, claims that rate of growth has no firm relation with rate of poverty reduction. Stating differently, faster growth is not always supplemented by a faster rate of poverty reduction. One factor that could be imperative is the sectoral composition of growth. Lipton and Ravallion (1993), in their study on 'Poverty and Policy', lay substantial emphasis in the sectoral composition of output growth as an important contributing factor of poverty alleviation. Many studies such as Warr and Wang (1999), Mellor (1999), Timmer (1997), Ravallion and Datt (1996), Hasan and Quibria (2004) and Suiyahadi et al (2006), among others, come to the conclusion that a specific sector of each country has been mostly effective in poverty reducing. In Indian perspective, Ravallion and Datt (1996; 2002) indicate the significance of the geographic and sectoral composition of economic growth in reducing poverty. They conclude in their study that rural economic growth has been more favorable in poverty reduction than urban growth and the services sector growth has significant effects in reducing poverty rather than agricultural or industrial sector growth. Cross-country evidence has also empirically supported that the growth processes which were more labor-intensive brought significant declines in poverty, as discussed by Loayza and Raddatz (2006). Ravallion and Chen (2007), using time series data, concluded that the sectoral composition of economic growth mattered to inequality and poverty in China, irrespective of the overall rate of growth.

It has generally been accepted in the literature that although growth may be good for poverty reduction, but all economic growth is not equally good. Some patterns of growth may be more favorable in poverty reducing than others. For example, Thurlow and Wobst (2006) use a micro-simulation and apply a general equilibrium model to investigate the impact of sectoral composition growth on poverty reduction in Zambia. The effects of growth in agriculture,

manufacturing and mining are analyzed. Growth in agriculture has been found more poverty reducing than the growth in manufacturing or mining. They conclude from the study that some patterns of growth may be more favorable in poverty reducing than others. Similarly, Christiaensen *et al* (2006) point out that poverty reduction outcome may be different across sectors because the poor may enjoy the benefits of growth, more, if the growth occurs where the poor reside. Their findings also confirm that growth in the agricultural sector is, on average, more poverty reducing than the growth occurring outside agriculture. The importance of sectoral composition of economic growth in poverty reduction is also evident from the study by Ferreira *et al* (2009), among others, who examine the determinants of poverty dynamics in Brazil during the period 1984-2004. They focus on the pattern of growth (sectoral composition), initial conditions at the state level and the role of policy changes in poverty reduction. They find services sector to be more poverty reducing than the agriculture or the manufacturing sector. The growing impact of agriculture as well as the services sector in reducing poverty did not vary among states while the growth impact of industry in reducing poverty significantly varied among different states. The states with the initial higher level of health facilities and political participation had higher elasticities. The present study contributes to the existing literature on the relationship between economic growth and poverty reduction in Pakistan by rigorously quantifying the contribution of sectoral growth to poverty alleviation. The study focuses on the impacts of sectoral growth on poverty in a country specific context for Pakistan. The study analyses not only the impacts of sectoral economic growth of total poverty, but also on its rural and urban composition in Pakistan.

Attempts have been made to discuss the growth- poverty relationship and the agricultural growth and poverty nexus in the context of Pakistan. Although the growth - poverty relationship has been analysed in Pakistan by Ahmad and Ludlow (1989), Malik (1992), Gazdar (1998), Ali and Tahir (1999), Ali and Rehman (2015), Ali (2015), Ali and Bibi (2017), Sajid and Ali (2018), Audi and Ali (2017) and Bhatti, H. Arshad (2001), among others, there is, however, no serious study that examines the impact of sectoral economic growth on the reduction of poverty in Pakistan. There arises the need to analyse not only the impact of aggregate economic growth on poverty, but also the impact of the sectoral composition of economic growth on poverty. This study will make it possible to observe the effects of growth in particular sectors on poverty in Pakistan.

III. Theoretical Framework

The present section provides some theoretical considerations about total, rural and urban poverty headcounts. The correlation between sectoral economic growth and poverty (total, rural and urban) has been discussed in the sub-section of the present section.

III.I. Total, rural and urban poverty

First of all, the relationship between total, rural and urban poverty is discussed and then, it is analyzed that how economic growth affects it. The total population is considered as the composition of rural and urban components. N, N_r and N_u is used to denote total, rural and urban population respectively, where $N = N_r + N_u$. The share of rural population in the total population is denoted by $\beta_r = {}^{N_r}/_{N}$, while the share of urban population is denoted by $\beta_u = {}^{N_u}/_{N}$ and

$\beta_r + \beta_u = {}^{N_r}/_{N} + {}^{N_u}/_{N}$.

$$\beta_r + \beta_u = {}^{(N_r + N_u)}/_{N} = {}^{N}/_{N} = 1$$

So, $\beta_r + \beta_u = 1$. The total number of populations in poverty is given by $N_{p=} N_{rp} + N_{up}$whereN_{rp} and N_{up} denote the people falling into poverty in rural areas and urban areas respectively.

Total poverty is denoted by:

$$P = {}^{N_p}/_{N} = (N_{rp} + N_{up})/N$$
$$= {}^{N_{rp}}/_{N} + {}^{N_{up}}/_{N}$$
$$= \left[{}^{N_{rp}}/_{N}\right] \times \left[{}^{N_r}/_{N_r}\right] + \left[{}^{N_{up}}/_{N}\right] \times \left[{}^{N_u}/_{N_u}\right]$$
$$= \left[{}^{N_{rp}}/_{N_r}\right] \times \left[{}^{N_r}/_{N}\right] + \left[{}^{N_{up}}/_{N_u}\right] \times \left[{}^{N_u}/_{N}\right]$$

Since,${}^{N_r}/_{N} = \beta_r$, is the share of rural population in total population and ${}^{N_u}/_{N} = \beta_u$, is the share of urban population in total population and N_{rp} is the number of people in poverty in rural areas and may be denoted as $P_r$and similarly, $N_{up}$is the number of people in poverty in urban areas and may be denoted as P_u. So, aggregate poverty incidence is

$P = \beta_r P_r + \beta_u P_u$ 1

Where β_r>0 and β_u>0

Taking a total differential of the equation (1), the changes in aggregate poverty incidence are obtained:

$dP = \beta_r dP_r + \beta_u dP_u$ (2)

From (2), we obtain two decompositions in the change in poverty incidence:

(i) The change in rural poverty, weighted by the share of population in rural areas.

(ii) The change in urban poverty, weighted by the share of population in urban areas.

III.II. Poverty and Sectoral Growth

Although economic growth is considered as a key to reduce poverty, all growth processes do not reduce poverty equally (World Bank 2000). Some sectors or regions may be more poverty reducing than others (Ravallion and Datt, 1996, 2002).

To test the impacts of sectoral economic growth on poverty reduction, the study investigates it as follows:

The real GDP growth rate is shown as $Y = Y_a + Y_i + Y_s$, Where Y is the growth rate of GDP and Y_a, Y_i and Y_s Are the growth rates of GDP in agricultural, industrial and services sectors respectively. The study decomposes the overall rate of economic growth into its sectoral components as follows:

$y = y_a + y_i + y_s$

$P = a^1 + в^1 y$ (3)

Putting the value of y in the above equation and by estimating the equation,

$P = a^1 + в_a^1 y_a + в_i^1 y_i + в_s^1 y_s$ (4)

And testing whether $в_a^1 = в_i^1 = в_s^1$, so, it can be tested directly whether the sectoral composition of economic growth matters for the reduction of poverty. Therefore, if $в_a^1 = в_i^1 = в_s^1$, As described in equation (4), above, there is no need to decompose the aggregate economic growth in its different sectors. However, if $в_a^1 \neq в_i^1 \neq в_s^1$ Then, there is justification to decompose aggregate economic growth in its different sectors and to test which sector may affect poverty more than others. Estimating the parameters of the equation (4) is enough to support the decomposition.

We estimate the system

$p = a^1 + [в_a^1 y_a + в_i^1 y_i + в_s^1 y_s]$ (5)

$\beta_r P_r = a^2 + [B_a^2 y_a + B_i^2 y_i + B_s^2 y_s]$ (6)

$\beta_u P_u = a^3 + [B_a^3 y_a + B_i^3 y_i + B_s^3 y_s]$ (7)

And so, the parameters will be estimated by using identities.

$$B_a^1 = B_a^2 + B_a^3, and, B_a^3 = B_a^1 - B_a^2$$
$$B_i^1 = B_i^2 + B_i^3, and, B_i^3 = B_i^1 - B_i^2$$
$$B_s^1 = B_s^2 + B_s^3, and, B_s^3 = B_s^1 - B_s^2$$

IV. Econometric methodology and data sources.

In the previous section, the theoretical discussion about the sectoral growth and poverty models has been carried out in detail. The present section expresses the empirical issues related to the estimation of poverty and sectoral growth models. In the econometric application of these models, Augmented Dickey-Fuller (ADF) test are applied to ensure that the concerned variables in the equations are co-integrated. The practical importance of these tests is to determine that the variables are stationary. If all of them are integrated of degree one i.e. I (1), then it can be concluded that their combination is stationary i.e. I (0). In such a case, there is co-integration among the concerned variables in the model and there exists the possibility for estimating the error correction model. However, if there is no integration of degree one among all the concerned variables rather, they contain a mixed order of integration, i.e. I (0) or I (1), there is the possibility of co-integration among the variables used in the model estimation of error correction model is possible.

IV.I. Autoregressive Distributed Lag (ARDL) Approach to Co-integration

ARDL estimation approach was developed by Peseran and Shin (1995a) and Peseran *et al* (1996a). The relationship among concerned variables is examined in this estimation procedure. The present study employs this procedure. It should be noted that if any variable included has integration of order two i.e. I (2), the procedure will be crashed. So, it is compulsory that none of the variables included in the model should be integrated of order two for employing this procedure. The appropriate critical values have been tabulated by Peseran *et al.* (1996a) for (*k*) numbers of regressors and whether the ARDL model includes an intercept and/or trend. Two sets of critical values have been provided by them. One set assumes that all the concerned variables are I (0). A band is provided for each application which covers all the possible classifications of the variables into I (0) and I (1), or even integration exits fractionally. There is no need to know that whether the integration among the concerned variables is of type I (0), I (1), or fractionally integrated, if the computed value of F-statistics is falling outside this band. However, if the computed value of F-statistics is falling within this band, there exist inconclusive results of the inference and will depend on whether the concerned variables are I (0) or I (1). The coefficients of long run relation are estimated in the second stage. Inferences are made about their values by applying ARDL. If the investigator is satisfied that the long run relation among the concerned variables is not spurious, it is suitable to proceed to this stage.

IV.II. Co-integration and Error Correction Mechanism (ECM) using ARDL

The long run coefficients and the models of error correction are estimated in the second phase of ARDL after making sure that F-statistics of joint significance are outside the critical values given by Peseran (1996a). Above specified model has been estimated for finding the coefficients of long-run and associated ECM. ARDL (*p, q1, q2*) for different sub-sectors of economic growth and poverty (total, rural and urban) models because this is the generalized form of these models which have the following form:

$$\Delta y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta y_{t-i} + \sum_{i=1}^{q_1} \alpha_2 \Delta x_{t-i} + \sum_{i=1}^{q_2} \alpha_3 \Delta control_{t-i} + \varepsilon_t \ldots 8$$

Where, y represents poverty headcount (total, rural and urban), x denotes growth rate of agriculture, industry and services sectors in different models because the above specified equation is the generalized form of different models used in the study. Selection of the order of ARDL (*p, q1, q2*) has been made on the basis of Schwartz Bayesian Criterion (SBC). The next step presents the short-run dynamic parameters which have been obtained by estimating an error correction model associated with long-run estimates. The generalized form of the model has been specified as follows:

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta y_{t-i} + \sum_{j=1}^{q} \alpha_j \Delta x_{t-j} + \sum_{k=1}^{q} \alpha_k \Delta CONTROL_{t-k} + \varepsilon ET_{t-1} + \mu_t \quad (9)$$

Where αi, αj, αk and αo are short-run coefficients while ε is speed of adjustment of the model's convergence to equilibrium. The study tests the impact of sectoral growth on poverty alleviation in Pakistan during the period 1973 to 2010 due to unavailability of data for poverty for the rest of the year. The data sources for the study are "Handbook of Statistics on Pakistan Economy" by State Bank of Pakistan (2010) "Pakistan Economic Survey: Various Issues" by Govt of Pakistan, Center for research on Poverty Reduction & Income Distribution (2005), CRPRID and Annual Report of Social Policy and Development Centre (2005).

V. Empirical Results

To test whether a unit root process is followed by a time series is a critical issue. In order to discover that a unit root exists, there are many tests which are developed by the econometricians. However, the most popular tests are developed by Dickey and Fuller to test the unit root.

Table 1

Variables	At level		At Difference	
	T-Statistics [Lags]	Prob	T-Statistics [Lags]	Prob
HC	-2.7636 [1]	0.0736	-4.0650 [0]	0.0032
RHC	-1.2390 [9]	0.6429	-7.6827 [7]	0.0000
UHC	-3.1667 [0]	0.0302	-3.0684 [0]	0.0381
GDPG	-4.5564 [0]	0.0008	-9.2588 [0]	0.0000
AGRG	-7.7518 [0]	0.0000	-6.7595 [2]	0.0000
INDG	-4.2775 [0]	0.0017	-5.5293 [4]	0.0001
SERG	-4.2465 [0]	0.0019	-7.4696 [0]	0.0000

Since, all the variables used in the study have not the integration order of zero or one or have a mixed order of integration; it is a pre-requisite to compute F-statistics and, so, Autoregressive Distributed Lag (ARDL) approach to co-integration has been used in the study. Table 2 represents the results of bound test. In the first column of the table, equation with the dependent variable first in the order followed by the independent variables has been shown. For estimation purposes, there are three equations. Total, rural and urban poverty headcount is the dependent variables while a set of independent variables is taken to explore the effects of sectoral growth in total, rural and urban poverty. To find the existence of a long run relationship, every equation has been tested. In the second column, the results of F-statistics have been presented. The critical value of upper bound has been shown in the third column for conclusion. Pesaran *et al.* (1999) have tabularized the appropriate critical values for different number of independent variables and whether the regressors hold an intercept/ time trend. It is shown in the table that F values of all the equations are outside the upper band which indicates that the long run relationship exists among the concerned variables. For estimation purposes, there are three

equations in the table and results of bounds test show that the long run relationship exists among the concerned variables.

Table 2: Results of Bounds Test for Co-integration (HC)

Equation	F-Statistics	Critical Value	Conclusion
HC/AGRG,INDG,SERG, INF, TR, UE	10.2610	4.2661 (95%) 3.6083 (90%)	Co-integration
RHC/AGRG, INDG, SERG, INF, TR, UE	12.0433	4.2661 (95%) 3.6083 (90%)	Co-integration
UHC/AGRG, INDG, SERG, INF, TR, UE	27.0412	4.2661 (95%) 3.6083 (90%)	Co-integration

Efforts have been made to explore the relationship between growth and poverty. This is the macroeconomic approach to growth, but the aspect of the relationship between sectoral growth and poverty is often neglected in the literature. The study fills this gap by disaggregating growth into its sectoral components and discusses the results obtained from the sectoral growth and poverty model. In the present section, the long run results related to sectoral growth and poverty have been presented in table 3. The results indicate that there is negative and significant relation between agricultural growth and poverty headcount, but in case of rural headcount and urban headcount the relationship is negative but insignificant. Industrial growth has negative and significant impact on the total, rural and urban headcount. The results of the impact of services, growth on poverty show that there is a negative but insignificant correlation. Inflation has a positive and significant impact on total headcount and positive, but insignificant in case of rural and urban headcount. Trade openness is negative and significantly correlated with total, rural and urban poverty headcount. The rate of unemployment is positively and significantly related to poverty headcounts.

Table: 3 Long-run Estimates of Sectoral Growth and Poverty

Explanatory Variables	Model I (0, 1, 0, 1, 0, 0, 1) Dependent Variable: HC	Model II (0, 1, 0, 1, 0, 0, 1) Dependent Variable: RHC	Model III (0,1, 0, 1, 0, 0, 1) Dependent Variable: UHC
Constant	51.7959* (6.0053)	53.5721* (4.8772)	24.5877* (4.6216)
Agricultural Growth	-0.5844*** (-1.7335)	-0.4538 (-1.0726)	-0.3743 (-1.4364)
Industrial Growth	-1.8252* (-2.6039)	-2.2204** (-2.3990)	-1.3644* (-2.5928)
Services Growth	-0.7180 (-0.9273)	-1.0938 (-1.0668)	-0.7186 (-1.1414)
Rate of Inflation	0.6275** (2.0295)	0.4727 (1.1997)	0.2988 (1.2251)
Trade Openness	-1.0006* (-3.0515)	-0.8695** (-2.1954)	-0.4579*** (-1.9279)
Rate of Unemployment	2.9057* (2.5160)	3.1233** (2.1548)	3.8014* (3.3498)

Note: *, **, *** show significance level at 1%, 5% and 10% respectively

The short run estimates have been presented in table 4. The results show that agricultural growth has negative and significant impact on total headcount and negative, but insignificant

impact on rural headcount as well as urban headcount. Industrial growth and services growth have negative, but insignificant relation to total, rural and urban headcount as shown in the model one, two and three of table 4. Rate of inflation has a positive relation to total, rural and urban headcounts but the relationship is significant only in case of total headcount. Trade openness and rate of unemployment have positive and significant correlation with total, rural and urban headcount. The values of error term show that the model of total headcount has 14 per cent speed of adjustment towards equilibrium while models, rural headcount and urban headcount have 12 per and 9 percent speed of convergence towards equilibrium respectively.

Table: 4 Short-run Estimates of Sectoral Growth and Poverty

Explanatory Variables	Model I (1,0,1,0,0,1,0) Dependent Variable: HC	Model II (1, 0, 1, 0, 0, 1, 0) Dependent Variable: RHC	Model III (1, 0, 1, 0, 0, 1, 0) Dependent Variable: UHC
Δ Agricultural Growth	-0.0866*** (-1.7694)	-0.0569 (-1.0738)	-0.0337 (-1.4358)
Δ Industrial Growth	-0.0300 (-0.4338)	-0.1012 (-1.3506)	-0.0514 (-1.5539)
Δ Services Growth	-0.1064 (-0.9793)	-0.1372 (-1.1647)	-0.0647 (-1.2327)
Δ Rate of Inflation	0.0930** (1.9384)	0.0593 (1.1455)	0.0269 (1.1670)
Δ Trade Openness	0.1784* (4.9807)	0.2049* (5.2837)	0.0901* (5.2845)
Δ Rate of Unemployment	0.4308* (2.9579)	0.3919* (2.4875)	0.3422* (4.8673)
Error correction term (ecm)	-0.1482* (-4.9967)	-0.1255* (-4.1817)	-0.0900* (-5.2790)
R-squared	0.8633	0.8359	0.8996
Adjusted R-squared	0.8177	0.7812	0.8661
F-statistics	24.3632	19.6508	34.5625
DW-statistics	1.4123	1.4183	1.5401

Note: *, **, *** show significance level at 1%, 5% and 10% respectively

Sectoral composition of economic growth may affect the overall rate of poverty independent of the rate of overall growth. For example, some sectors may be more poverty reducing than the other sectors. The sectoral composition of growth is very important for poverty reduction. Poverty reduction is mostly the result of growth within sectors rather than the migration of labor from the low-income sector to the high-income sector. Generally, the poor live in rural areas and if the growth happens in the rural sector, it would be more pro-poor. If the growth bypasses the sectors or areas where the poor reside, it would be less successful in reducing poverty. If the growth uses the most abundant factor the poor usually own (the unskilled labor), the poverty can be reduced significantly. Thus, the structure of growth to much extant, determines the pace of poverty reduction.

VI. Conclusions

The study decomposes GDP growth into three major sub-sectors and estimates the impact of these sectors in total, rural and urban poverty. The results show that agricultural growth has negative and significant effect on total poverty in the long run; however, it has negative, but insignificant impact on rural and urban poverty in the long run. Industrial growth has negative

and significant impact on the total, rural and urban poverty in the long run. The services growth has been negative, but insignificantly correlated with total, rural and urban poverty. The short run estimates show that agricultural growth has negative and significant impact on total poverty, but insignificant impact on rural poverty as well as urban poverty. Industrial growth and services growth have negative, but an insignificant relation to total, rural and urban poverty. Thus, it can be concluded from the results that although the growth of all three sectors has poverty reducing impact, however the agriculture and industrial sectors are more pro-poor in case of Pakistan. For policy implications, it is recommended that growth of agricultural sector should be improved for rural poverty. For urban poverty, the growth of industrial sector must be enhanced. Finally, the services sector has the potential to reduce overall poverty in Pakistan.

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