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Keywords : *foreign aid, growth rate, foreign direct investment, labor force, stationarity, cointegration, causality.*

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A Time Series Analysis of Foreign Aid and Income Inequality in Pakistan

Sharafat Ali [α] & Najid Ahmad [σ]

Abstract - Pakistan economy is one those economies that has received a huge amount of foreign aid. Foreign aid has been considered to help capital-deficient economies to fulfill the desired levels of finances to generate growth, increase employment and income, and furthermore, it helps to alleviate poverty levels in the recipient economies. Present study focuses on the analysis of impact of foreign aid on income inequality in Pakistan. Since time series data is used for the analysis so the ADF and Phillip-Perron unit root test are applied to find out each of the time series to be stationary at its first difference. Johansen contegration test and vector error correction models are employed to examine the long run and short run impacts of growth, foreign aid, foreign direct investment, and labor force participation rate on income inequality, respectively. The cointegration test results confirm negative impact of economic growth on income inequality whereas foreign aid, foreign direct investment and labor force participation rate are concluded to have inequality increasing impacts. The results are statistically significant. Vector error correction model results showed long run causality as the coefficient of error correction term has the negative and significant coefficient. The Engle-Granger causality test showed bidirectional causality between aid and growth. The study also draws some conclusions and policy recommendations.

Keywords : foreign aid, growth rate, foreign direct investment, labor force, stationarity, cointegration, causality.

I. Introduction

One of the strands of economic literature considers foreign capital inflows as necessary and sufficient conditions for the economic growth of the developing economies. According to the proponents of foreign aid the inflows of external finance is necessary and sufficient condition for the development of the underdeveloped economies. Argument is that foreign aid not only complements domestic resources but also supplements domestic savings to fulfill saving-investment gap and additional resources become available to achieve targets of growth. Foreign aid helps the developing economies to accelerate the takeoff into the self-sustained growth by encouraging the domestic investment and process of industrial development (Rostow, 1960); Waterson, 1965).

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Foreign aid helps to reduce the foreign exchange gap. Foreign aid provides access to the modern technology and managerial skills. It also provides access to the foreign markets (Chenery and Strout, 1966; Papanek, 1973; Gupta, 1975; Levy, 1988; Thirlwall, 1999). Chenery and Strout (1966) provided a most explicit and well-set model for sustainable development with the help of external financial resources. According to this model, the target of growth can be achieved by filling the dual-gaps by foreign aid. The authors are of the opinion that foreign aid is utilized one to one as investment in the economy. The capital starved country like Pakistan, on its way to growth path, passes through three stages. In first stage, due to the primeval nature of the economy, there may be constrictions on the absorptive capacity to take up desired investment rate for the warranted rate of growth as put forward by the Harro-Domar model of economic growth. The inflows of external aid may help to triumph over the constraint due to absorptive capacity capability. In the second stage, external aid may help to supplement diminutive domestic savings by fulfilling the saving-investment gap that is required for desired growth levels in the economy. In this stage imports may be more that exports due the imported capital goods and machinery, raw material and inputs needed for the economy's production. This increases the trade-gap is the third stage of development. External aid helps to fill this trade-gap. As the economy steps up the ladder of growth, the income inequality would help increasing domestic saving rates to fulfill the domestic saving gap. The growth of the economy leads to imports substitution of consumer goods to be produced locally and exports are increased. Furthermore imports substitution of capital goods imports also start declining and exports, now, grow rapidly in anticipation of the closure of the trade-gap of the economy (Burki, 1998).

The increased investment is a prerequisite for the achievement of economic growth. Mosley (1980) finds a positive impact of aid on economic growth for UK aided countries and negative impact of aid on the growth for French and Scandinavian aided economies. The author also concludes that aid plays no role to improve the growth in Bangladesh, India, Korea, Malawi and Kenya. Hatemi-J and Irandoust (2005), investigating the relationship between foreign aid and economic growth for a panel of developing countries like Botswana, Ethiopia, India, Kenya, Sri Lanka and

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Tanzania, found that aid has a positive and significant on economic activity for each of the country included in the sample. The results of the study imply that inflows of foreign capital, by supplementing domestic savings, have a favorable impact on real income.

One of the strands about the relationship between foreign aid and economic growth is that external capital has negative effects on the growth of the aid recipient economies. Foreign aid is consumed and it substitutes rather than complementing the domestic resources. Foreign aid makes possible the import of inappropriate technology. It may distort the income distribution, and encourage inefficient and corrupt governments in aid recipient developing nations (Griffin and Enos, 1970; Weisskoff, 1972; Boone, 1994; Easterly, 1999). According to some authors the effectiveness of external aid on the growth of the aid receiving country depends on the policy environment. The policy environment may include economic policies adopted by the recipient countries, state interventions in economic activities, business cycles, and stability in inflows of foreign aid into the economy. According to Levy (1984) the negative impact of foreign aid on growth may be due to government intervention, business cycle and instability in aid flows in the aid recipient nations. Burnside and Dollar (2000) concludes that effectiveness of aid on economic growth depends on the soundness of the economic policies pursued by and aid recipient economy. Foreign aid contributes to the growth of private consumption and aid effectiveness on growth may be enhanced by policy reforms (Gounder, 2001; Lloyd *et al.*, 2001; Mavrotas, 2002). But Hansen and Tarp (2001) conclude that aid inflows increase economic growth through capital accumulation and aid effectiveness does not depend on policy environment. Javed and Qayyum (2011) are of the view that inflows of external financial resources have not contributed in the economic development and in the improvement in the living standard of the people in Pakistan. According to the authors external aid, in the absence of good macroeconomic policy, has positive insignificant effect in the long run. External aid showed negative impact on growth in the short run. But with the inclusion of policy index in the model, the external aid has positive and significant impact on economic growth in Pakistan. Javed and Qayyum (2011) suggest sound economic management policy in terms of low levels of inflation, trade openness and low levels of budget deficit to be crucial for the aid effectiveness in the economy.

Singh (1985) taking into consideration the government regulatory actions concludes that state intervention in the economy has negative impacts on growth in the economy. Lensink and Morrissey (2000), examining the effects of aid uncertainty on economic growth, concludes the effect of foreign aid on growth as a function of levels of aid and stability of inflows of aid in the country. According to Pallage and Robe (2001), foreign aid is a major source of income in the majority of aid receiving economies but the authors are of the view that inflows of aid are very volatile and overwhelmingly pro-cyclical. This implies that even if aid fosters growth, the serious problems would nevertheless stem from the fact that patterns of aid disbursement intensify volatility of disposable income of developing countries which affects economic growth negatively.

The studies about the relationship between foreign aid and economic growth have produced inconsistent and elusive results. Empirical studies with respect to Pakistan economy have also concluded mixed results. According to Chishti and Hasan (1992), foreign aid, in the form of grants, has modest effect on public investment but loans show no significant effects on public investment. Net capital inflows, disbursement of grants and foreign loans increase growth in Pakistan (Shabbir and Mahmood, 1992). Some of the empirical studies suggest that foreign has no impact in growth in Pakistan (Ali, 1993). Hussain (1999) is of the view that external aid has positive effect on economic growth in the presence of correct macroeconomic policy environment. Ishfaq and Ahmed (2005) concludes that due to the diversion of aid funds to non-productive activities and inefficient resource allocation in public sector foreign aid not contributed to growth rate of GDP in Pakistan economy.

Alvi and Senbeta (2011) examine the effects of foreign aid on poverty using dynamic panel estimation techniques. According to the authors this technique enables to control for time-invariant country-specific effects of aid and its endogeneity. The study suggested, even after controlling for average income, a significant poverty reducing impact of aid. Foreign aid is associated with a reduction in poverty as measured by the poverty rate, poverty gap index and squared poverty gap index. Alvi and Senbeta also conclude that composition of aid matters as multilateral aid and grants have more poverty reducing effect than that of bilateral aid and loans.

Some of the studies on effectiveness of aid on development conclude that aid may affect some aspects of human development such as education and health. Dreher *et al.* (2006) using panel data and a dynamic panel estimator, using the primary school enrollment rate as the measure of education outcome, examined the impacts of aid to education in less developed countries find that aid has statistically significant positive effects on primary school enrollment rates. Moreover the authors find no robust effect of institutional quality in effectiveness of aid in the sample. Mechaelova and Weber (2006) used same technique to examine the effects of aid on education. The study concludes a small positive and significant effect of aid on primary school enrollment, graduation rates and completion rates. The authors are of the view that

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policies and institutions in aid recipient nations play enormous role for the effectiveness of aid on education.

Mishra and Newhouse (2007) focus on the effectiveness of aid on health outcomes. The authors use panel data to investigate effectiveness of aid different measures of health outcomes. The study concludes that total aid per capita and per capita health aid reduce infant mortality rates significantly but aid has no significant impact on life expectancy. Aggregate aid improves Human Development Index (HDI) and reduces infant mortality rates in less developed nations, Gomanee *et al.* (2005). Gomanee and others are also of the opinion that aggregate aid improves human welfare and reduces infant mortality rate and effectiveness of aid on health and human welfare is higher at lowest levels of income. Aid increases government's expenditure on social spending and increases the absolute income elasticity of poverty and infant mortality reduction in aid recipient economies, Verschoor and Kalwij (2006). Gyimah-Brempong and Asiedu (2008) investigate the impacts of foreign aid on outcomes of primary education and the health sector by using the panel data from a large sample of developing countries. The study concludes that aid has significant and positive effects on primary school completion rates and infant mortality rates. The authors also observe evidence of regional differences in the effectiveness of aid on outcomes of education and health sectors. But this study finds no significant correlation of aggregate aid and outcomes in primary education or health. Gyimah-Brempong and Asiedu support the arguments of Dreher *et al.* (2006) that donors should target their aid for the achievement of Millennium Development Goals (MDGs) in African economies. Gyimah-Brempong and Asiedu (2008) further argue that welfare of the people through aid may be increased if aid is targeted to the primary education and health sectors.

II. The Data Sources, Mehtodology and Statistical Results

This study is an attempt to explore the impact of foreign aid on income inequality in Pakistan. The analysis also includes GDP growth rate, foreign direct investment, and labor force participation rate as explanatory variable in the analysis to test the effects of these variables on income inequality in Pakistan.

$$I = (G, A, F, L) \quad (1)$$

Here I is the income inequality measured by the Gini coefficient, G is the GDP growth rate, A is the official development assistance as percentage of GDP, F is foreign direct investment as percentage of GDP, and L is the labor force participation rate.

In the present study, we have used time series data of all the variables included in the analysis for the period of 1972-2007. The data of the Gini coefficient, real GDP growth rate and labor force participation rate have been taken from the Economic Survey of Pakistan (Various Issues) issued by Ministry of Finance, Government of Pakistan. The data for the official development assistance as percentage of GDP and foreign direct investment is as percentage of GDP have been taken from the World Development Indicators (WDI) (2012) of the World Bank.

The study applies unit root test, Johansen's Cointegration approach and Error Correction Model for the analysis. Since the time series data is used for the analysis, most of the time series are found to be non-stationary. A time series is supposed to be non-stationary if it's mean, variance and autocorrelation is time variant. A non-stationary time series may produce spurious regression, that is, t-ratios and adjusted R-Squared become overestimated in the regression models with the non-stationary time series, Philips (1986). If the time series are stationary at the same level then there may be meaningful association among these variables. In the cointegration analysis, firstly, each of the time series are examined for the presence of unit root and secondly, cointegration test is used to investigate the long run or equilibrium relationship between the variables.

a) The Unit Root Tests for Stationarity

Dickey-Fuller test is used to check the stationarity of the time series when error terms are uncorrelated but when error term become correlated then Augmented Dickey-Fuller (ADF) unit root test is used, Dickey and Fuller (1979). This study employs ADF test on each time series on level and first difference without intercept and trend, with intercept but no trend. The ADF test is specified as:

$$y_t = \rho_1 + \gamma_t t + \gamma y_{t-1} + \sum_{i=1}^{p} \Phi \Delta y_{t-1} + u_t \quad (2)$$

In equation (2), y_t is the level of time series, t is the time trend, and u_t is the white noise error term. The ADF tests the null hypothesis that $\gamma = 0$ against the alternative hypothesis that $\gamma < 0$. In each case, our null hypothesis is that $\Phi = 0$ against the alternative hypothesis of $\Phi < 0$. If the null hypothesis is rejected it is concluded that time series is stationary. If all the time series are stationary at their first difference then they are cointegrated, that is, there exists a long run relationship among the variables, Granger (1986).

It has become a customary to check whether the time series are stationary. We have applied ADF and Phillips-Perron unit root tests, with no intercept and trend, and with intercept and no trend at levels on each of the time series and with no intercept and no trend at the 1st difference of each time series. The results of the ADF test and Phillips-Perron test are reported in the Table 1 and Table 2 respectively.

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Table 1 : ADF Unit Root Test Results

Variable	Level		1st Difference
	No Drift & No Trend	No Drift & No Trend	No Drift & No Trend
LI	-0.7133[0.4000]	-3.0816[0.3702]	-8.1445[0.0000]*
LG	0.2517[0.7528]	-5.8799[0.0000]*	-6.3323[0.0000]*
LA	-1.5009[0.1229]	-2.3842[0.1533]	-6.5162[0.0000]*
LF	-1.4157[0.1434]	-1.0663[0.7180]	-7.3761[0.0000]*
LL	0.6046[0.8423]	-0.7009[0.8336]	-5.7325[0.0000]*

Note: The values in [ ] are MacKinnon (1996) one-sided p-values
*indicate significance at 0.01 level

The ADF and Phillis-Perron unit root tests fail to confirm the stationarity of Gini coefficient, development assistance, foreign direct investment and labor force participation rate both at 1 percent and 5 percent significance level in their level with no drift. The ADF and Phillips-Perron tests confirm the stationarity of each of the time series at their first difference both at 0.01 and 0.05 levels of significance. Both of the unit root tests confirm that all of the time series variables included in the study are stationary, without drift and trend, at their 1st difference at chosen level of significance of 1 percent and 5 percent respectively. Since all of the time series are integrated of the same order so they are considered to be show common trend. After finding all the variables to be stationary at their first difference, Johansen's cointegration test is applied to test whether there is a long run equilibrium association among the variables.

Table 2 : Phillips-Perron Unit Test Results

Variable	Level		1st Difference
	No Drift & No Trend	Drift & No Trend	No Drift & No Trend
LI	-1.0626[0.2545]	-3.047[0.0402]**	-8.6475[0.000]*
LG	-0.6930[0.4094]	-5.8077[0.0000]*	-18.7242[0.0000]*
LA	-1.5170[0.1194]	-2.3842[0.1533]	-10.8207[0.0000]*
LF	-1.3291[0.1667]	-0.8775[0.7835]	-7.3761[0.0000]*
LL	0.6046[0.8423]	-0.7370[0.8241]	-5.7325[0.0000]*

Note: The Values in [ ] Mac Kinnon (1996) one-sided p-values
*(**) indicate significance at 0.01 and 0.05 level.

b) Johansen Cointegration Test

We have used Johansen's cointegration test because Johansen's cointegration test can be applied when three and more than three variables in the model. Engle and Granger (1987) procedure is applied on two variable model. Johansen (1988) developed Vector Autoregressive (VAR) model to ascertain the long run relationship between the variables. Johansen and Juselius (1990) further extended the VAR model. Maximum Likelihood testing procedure on the number of cointegrating vectors has been developed by Johansen (1988) and Johansen and Juselius (1990). The starting point of Johansen's cointegration procedure is VAR of order p as follows

$$Y_t = A_1 Y_{t-1} + \cdots + A_p Y_{p-1} + \varphi + e_t \qquad t = 1, \ldots, T \qquad (3)$$

In equation Y_t is p×1 vector of I(1) time series, the A's are parameters to be estimated, e_t are error terms and φ is the vector of constants. Johansen cointegration method uses an error correction specification to discriminate between stationarity by linear combination and by differencing as:

$$\Delta Y_t = B_1 \Delta Y_{t-1} + \cdots + B_{k-1} \Delta Y_{t-k+1} + \Pi Y_{t-k} + \varphi + e_t \quad (4)$$

The rank of Π suggests the number of cointegrating vectors. The rank of Π shows the number of the linear combinations of Y_t to be stationary. If *a* and *b*, in this case, are both $p \times r$ matrices then rank of Π can be featured as ab' and $0 <$ rank $(\Pi) = r < P$. the Johansen cointegration estimates two test statistics; the Trace statistic and Max-eigenvalue statistic, to explore number of cointegrating vectors.

The time series integrated of the same order are cointegrated, that is, there exists a long run or equilibrium relationship between the time series. We have used Johansen's cointegration technique on the assumption of no deterministic trend in the data. The Table 3 and the Table 4 show the results of Johansen's cointegration test. In the Johansen's cointegration test, first of all, we selected the lag length for cointegration based on the Akaike and Shwarz Information Criteria by using vector autoregressive test. Akaike information

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criterion confirms that the appropriate lag length is 3. The Johansen cointegration method estimated two unrestricted cointegration rank statistics; the Trace statistic and the Max-Eigenvalue statistic. The trace statistic indicated 3 cointegrated vectors at 5 percent level of significance but the Max-eigenvalue statistic confirm 4 cointegrating vectors at 5 percent significance level.

Table 3 : Unrestricted Cointegration Rank Test (Trace)

Null Hypothesis	Eigenvalue	Trace Statistic	5 % Critical Value	p-value*
None **	0.8718	165.9900	69.8189	0.0000
At most 1 **	0.8584	100.2572	47.8561	0.0000
At most 2 **	0.5016	37.7165	29.7971	0.0050
At most 3	0.3792	15.4356	15.4947	0.0510
At most 4	0.0056	0.1802	3.8415	0.6712

* Mackinnon-Haug-Michelis (1999) p-values
** denotes the rejection of the hypothesis at the 0.05 level
Note: Trace test indicate 3 cointegrating equations at 0.05 level.

Table 4 : Unrestricted Cointegration Rank Test (Max-Eigenvalue)

Null Hypothesis	Eigenvalue	Max. Statistic	5 % Critical Value	p-value*
None **	0.8718	65.7328	33.8769	0.0000
At most 1 **	0.8584	62.5407	27.5843	0.0000
At most 2 **	0.5016	22.2810	21.1316	0.0343
At most 3 **	0.3792	15.2554	14.2646	0.0348
At most 4	0.0056	0.1802	3.8415	0.6712

* Mackinnon-Haug-Michelis (1999) p-values
** denotes the rejection of the hypothesis at the 0.05 level
Note: Trace test indicate 3 cointegrating equations at 0.05 level.

The Johansen cointegration test results suggest that income inequality, GDP growth rate, official assistance, foreign direct investment and labor force participation move together in the long run. This implies that the variables are cointegrated. We have normalized the cointegrating vectors with respect to Gini coefficient (LI) for better elucidation. The normalized cointgrating vector is given in Table 4.

Table 4 : Normalized Cointegrating Coefficients

LI_t	LG_t	LA_t	LF_t	LL_t
1.0000	0.2535	-0.0844	-0.1197	-3.1793

We can write the above cointegrating vector in equation as:

$$LI_t = -0.2535LG_t + 0.0844LA_t + 0.1197LF_t + 3.1793LL_t$$
$$t\text{-}value = (-7.0858)\ \ (3.1571)\qquad (7.1093)\qquad (-8.0151) \tag{5}$$

All of the variables used in the analysis are in logged forms, so the estimated coefficients can be interpreted as respective elasticities. In the Johansen's cointegrating equation, dependant and independent variables all are on the same side of the equation, Johnston and Dinardo (1997) so the estimated elasiticities in the Table 4 appear with the reversed signs in the equation (5). Johansen's cointegration model concludes that GDP growth reduces the income inequality in Pakistan over long run period. The GDP growth elasticity of Gini coefficient is -0.2535 and it is significant at 1% level of significance. The results of the study are consistent with the economic theory that the relationship between growth and income inequality can run both ways. The pioneer study about the relationship between growth and income inequality was presented by Kuznets (1955). According to Kuznets (1955) income inequality increases in early stages of growth and at higher levels of growth it starts declining. This inverted U-shaped relationship between growth and income inequality is known as Kuznets hypothesis. The focus of the researchers, in recent years, has been on the analysis of the impacts of income inequality on economic growth of an economy. Some of these studies

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[Persson and Tabellini (1994); Alesina and Perotti (1996); Mo (2000); Panizza (2002) Banerjee and Duflo (2003)] are found to conclude negative impacts of inequality on growth.

The income inequality decreasing impact of growth implies that increase in the real GDP growth would help to reduce the income inequality in Pakistan. The increased growth resulting in employment growth and increase in the average productivity would help the economy to get lower levels of income inequality. Attainment of the higher GDP growth may cause an increase in the employment level as opinionated by the Okun's law in economic theory. The increased growth of the economy resulting in the increasing the productivity more in the low-wage sector than that in high-wage sector would be helpful in declining the income inequality. Increased growth would also increase the aggregate income level and thus the consumption and saving of the economy. Consumption would, directly increase the aggregate demand and would stimulate growth. The increased saving would help to increase investment levels by increasing the productive capacity (capital stock) of the economy in the long run.

Official development assistance increases income inequality in Pakistan as it has the positive sign and it is statistically significant at 0.01 level. The elasticity is 0.0844 showing that one percent increase in official development assistance causes an increase of 8.44 percent in the Gini coefficient of Pakistan. The foreign aid though can be beneficial for the development of the recipient country but reliance on aid makes the pendency of the economy on external sources, increases ways to corruption and also affects economic administration badly. The income inequality increasing impact of external aid may be due to the fact that aid flows might have been used less productively. The leakage of the aid flows into the non-industrious expenditures may have caused negative impacts on growth, (Ishfaq and Ahmad, 2005; Javid and Qayyum, 2011), thereby caused increase in income inequality. Furthermore unpredictable aid flows and unfavorable policies may have resulted in increase the inequality in Pakistan. Pakistan economy received more aid during the military regimes than that in the democratic times. The aid inflows in Pakistan have been observed to be adjusted to the financial and tactical interests of donors rather than requirements of the Pakistan economy, (Javid and Qayyum, 2011). The easy accessibility of aid caused distraction of foreign aid in non-industrious deeds, wastefulness of aided money in civic sector resulted in inefficient allocation of resources. The tax system of an economy not only helps to generate revenue for the government but also it can be a tool for the equal distribution of income. Without a hitch availability of external aid and foreign borrowing kept the government away from tough policy options like substantial taxation of consumption and income due to the elite class of rulers in Pakistan.

Foreign direct investment and labor force participation rate also suggest income inequality increasing impact in long run. The foreign direct investment and labor force elasiticities of income inequality are 0.9997 and 3.1793, respectively. These elasiticities are also significant at 1% level of significant. The inflows of FDI are considered to fulfill the resource gap between desired funds and domestic accessible resources. These inflows also make possible the transfer of managerial skills and new technology in the host country. This transfer of knowledge, skills and modern technical skills improve the productivity of the labor in the host economies, (Todaro and Smith, 2005).

The effects of FDI on income inequality depend on sectoral distribution and on the implemented economic policies in the economy, (Te Velde, 2003). The inflows of the FDI into the skill-intensive sectors expand the relative position of the skilled-labor and thereby result in increased wage inequality. Foreign firms are characterized with the modern technology, more productive methods of production, and more innovative business. Foreign firms grant access to firm-specific training and general education to the labor force and make the skilled-labor productive resulting in an increase in the wage differential between unskilled and skilled labor.

Moreover, the inflows of FDI from the industrialized economies may have negative impacts on growth of the developing economies. If the recipient economy pursues the superfluous protection policies to be a magnet for FDI inflows it may result in reduction of competition and growth in host countries. The substantial reverse flows of profit funds from the host economy may reduce growth of the economy in the long run. Sheikh *et al.* (2011) found FDI to have negative and significant impact on growth of the Pakistan economy. The reverse flows of profit funds and extraction of labor and financial resources from the host economy distort and hinder the growth trajectory of the economy and herby cause an increase in the income inequality.

Labor force participation rate is concluded to have income inequality increasing impact in Pakistan in the long run. Pakistan is one of the developing countries that are characterized with highest population growth rates. The higher population growth, over the decades caused supply pressures in the Pakistan economy. Pakistan being an underdeveloped and capital deficient economy failed to obtain required levels of investment in social sectors such as education and health resulting in the poor quality of labor. Poor quality of labor, consequently, capitulate low incomes and thus lower levels of welfare at household level.

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c) Granger Causality Test Based on Vector Error Correction Mechanism (VECM)

The presence of cointegrating vectors implies that the relationship between the variables can be expressed as Vector Error Correction Mechanism (VECM), (Engle and Granger, 1987). The presence of cointegrating vectors does not confirm the direction of causality. Since income inequality, GDP growth rate, official aid, foreign direct investment, and labor force participation are cointegrated. The VECM modeling is at service to find out the direction of causality. The VECM arrangements regarding the determinants of income inequality is given as follows:

$$\Delta LI_{1t} = \Phi_{10} + \sum_{i=1}^{p} \Phi_{11,i}\, \Delta LG_{1,t-1} + \sum_{i=1}^{p} \Phi_{12,i}\, \Delta LA_{2,t-1} + \sum_{i=1}^{p} \Phi_{13,i}\, \Delta LF_{3,t-1} + \sum_{i=1}^{p} \Phi_{14,i}\, \Delta LL_{4,t-1} + \omega_1 E_{t-1} + \upsilon_{1t} \quad (6)$$

$$\Delta LG_{2,t} = \Phi_{20} + \sum_{i=1}^{p} \Phi_{21,i}\, \Delta LI_{1,t-1} + \sum_{i=1}^{p} \Phi_{22,i}\, \Delta LA_{2,t-1} + \sum_{i=1}^{p} \Phi_{23,i}\, \Delta LF_{3,t-1} + \sum_{i=1}^{p} \Phi_{34,i}\, \Delta LL_{4,t-1} + \omega_2 E_{t-1} + \upsilon_{2t} \quad (7)$$

$$\Delta LA_{3t} = \Phi_{30} + \sum_{i=1}^{p} \Phi_{31,i}\, \Delta LG_{1,t-1} + \sum_{i=1}^{p} \Phi_{32,i}\, \Delta LI_{2,t-1} + \sum_{i=1}^{p} \Phi_{23,i}\, \Delta LF_{3,t-1} + \sum_{i=1}^{p} \Phi_{34,i}\, \Delta LL_{4,t-1} + \omega_3 E_{t-1} + \upsilon_{3t} \quad (8)$$

$$\Delta LF_{4t} = \Phi_{40} + \sum_{i=1}^{p} \Phi_{41,i}\, \Delta LG_{1,t-1} + \sum_{i=1}^{p} \Phi_{42,i}\, \Delta LA_{2,t-1} + \sum_{i=1}^{p} \Phi_{43,i}\, \Delta LI_{3,t-1} + \sum_{i=1}^{p} \Phi_{44,i}\, \Delta LL_{4,t-1} + \omega_4 E_{t-1} + \upsilon_{4t} \quad (9)$$

$$\Delta LL_{5t} = \Phi_{50} + \sum_{i=1}^{p} \Phi_{51,i}\, \Delta LG_{1,t-1} + \sum_{i=1}^{p} \Phi_{52,i}\, \Delta LA_{2,t-1} + \sum_{i=1}^{p} \Phi_{53,i}\, \Delta LF_{3,t-1} + \sum_{i=1}^{p} \Phi_{44,i}\, \Delta LI_{4,t-1} + \omega_5 E_{t-1} + \upsilon_{5t} \quad (10)$$

The terms E's in the equation (6)-(10) refers to the error correction terms. In our analysis, we estimated equation (6) to investigate the causation from explanatory variables to income inequality. The equation (7)-(10) are also estimated to test the causality among other variables in the model. The VECM equations (6)-(10) provide additional conduit for Granger causality to be explained that standard Granger causality test overlooks completely. The VECM approach makes us possible to differentiate between long run and short run causality. The statistical significance of the coefficient of the lagged Es (ω values) is identified by *t*-value. If the coefficient of the error term is negative and significant then there exists long run causality among the variables. The VECM model identifies even a weak causality by applying a joint F-value or a Wald (χ^2) test to the coefficients of the each of the equation in VECM. Significance of the Wald statistic confirms the short run Granger causality. The short run causality means dependant variable acts in response to short run disturbance to stochastic setting. The significance of joint F-value or Wald statistic refers to the robust Granger causality. Prior to the causality test diagnostic tests such as Jarque-Bera test, Breusch-Godfrey Serial Correlation LM Test and heteroskedasticity (ARCH) test are applied on the equation (6)-(10) to check any departure from the standard assumptions. After the confirmation for the standard assumptions to be hold, we applied Granger causality test based on the VECM. The summary results of the Granger causality tests based on the VECM from the equations (6)-(10) are reported in the Table 5.

Table 5 : Multivariate Granger Causality Tests Based On Block Exogeniety Wald Tests (Summary)

	Independent Variable					$\sum\chi^2$ (12df)	E(-1)
	ΔLI_t	ΔLG_t	ΔLA_t	ΔLF_t	ΔLL_t		
1	2	3	4	5	6	7	8
Dep. Variable	χ^2(3df)					[p-value]	(t-value)
ΔLI_t	-	12.9584* [0.0047]	3.6843 [0.2976]	15.2599* [0.0016]	65.8256* [0.0000]	105.5307* [0.0000]	-0.5464** (-3.0016)
ΔLG_t	41.2341* [0.0000]	-	23.3428* [0.0000]	15.8403* [0.0012]	48.0403* [0.0000]	80.3846* [0.0000]	6.0320* (3.2951)
ΔLA_t	9.3715** [0.0247]	9.7138** [0.0212]	-	1.4414 [0.6959]	1.3732 [0.7118]	27.9834* [0.0056]	1.3216 (0.5833)
ΔLF_t	4.0175 [0.2596]	6.0535 [0.1090]	7.6920*** [0.0528]	-	6.0280 [0.1103]	26.0939** [0.0104]	10.140* (3.2326)
ΔLL_t	1.9762 [0.5774]	7.3497*** [0.0616]	3.3455 [0.3414]	5.9042 [0.1035]	-	18.4216 [0.1035]	0.2600 (1.8518)

Note: The values in [ ] and ( ) are p-values and t-values respectively.
*indicates significance at 0.01 level
** indicates significance at 0.05 level
***indicates significance at 0.10 level

The error correction term appearing in the LI equation has the right sign and it is statistically significant at 5 percent level of significance. So it implies that there is a long run causality running from official aid

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to income inequality in Pakistan. The columns 2-5 of the Table 5 show the χ^2 values for individual variable and joint significance of the variable. The joint χ^2 for LI equation shows that there exists short run causality. The individual χ^2 statistics is also significant but not for official aid. The error correction term for GDP growth equation is significant at 0.01 level but it has positive sign. But, for this equation, joint χ^2 statistics is significant showing the presence of short run causality running from income inequality to real GDP growth. All of the individual chi-squared values are also significant at 1.0 percent level of significant.

III. Conclusion

External aid is supposed to help the capital deficient economies by assisting the growth of the economy and therefore reducing the poverty and income inequality in the economy. Pakistan is one of the economies that have received a huge amount of official aid. Present analysis explores the impact of aid on income inequality in Pakistan for the period 1972-2007. The results of the study confirm the income inequality increasing impact of official aid in Pakistan in the long run. It is evident that the financial resources received in terms of foreign aid have not been used for development rather these funds may have been sidetracked to unproductive activities. So the aid inflows could not add to the growth of Pakistan economy, employment generation and therefore increased the income inequality in the economy.

The results imply that there is need to trim down the reliance of the economy on external aid and debt. A healthy environment of the investment would help to improve growth of the economy. Broadening the tax base would help to improve the availability of financial resources domestically. The policies are desired that ensure and encourage the more stable sources of foreign financial funds. The attraction of foreign direct investment and expansion of export oriented manufacturing may be much more reliable and stable source of financial resources. Increase in FDI inflows and export of the economy would stimulate growth of the economy. Increased growth would help in alleviating poverty and reducing income inequality. "Trade, not Aid' policy would be helpful.

Pakistan economy has been characterized with the feature of macroeconomic instability. Inconsistency in domestic policies and unfavorable global economic environment has adversely affected the growth of the economy. Aid by the donor agencies and institutions may be helpful if the aid flows are directed to prop up structural change and provide a footing for long run inclusive growth. Lessening the of role of the state in agricultural marketing, procurement of wheat, encouragement of market-based enticements would be supportive in increasing crop-yields leading to the food subsidy rationalization.

Sectoral reforms, investment in energy sector, financial, infrastructure, manufacturing sectors of the economy would not only enhance efficiency and usefulness but also facilitate private sector investment for future growth. Increase in growth would not be sufficient. Growth should be inclusive and inequality lessening. Job creating and livelihood promoting growth creating employment opportunities for both of the rural and urban low-income households would be desirable. The use of aided money to expand investment, fortify vocational and technical education and training would help to pass on skills to the labor force. Since small scale and medium enterprises are the major job provider so the utilization of the external finance to institute and make possible the business climate for small scale and medium enterprises in Pakistan would be helpful in providing the broadened horizons of livelihood and would reduce the menace of economic and social exclusion of the poor and deprived.

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