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Does Trade Liberalization reduce Poverty and Inequality? Empirical Evidence from Pakistan

Imran Sharif Chaudhry
Professor of Economics, Bahauddin Zakariya University Multan, Pakistan
E-mail: imran@bzu.edu.pk

Fatima Imran
Lecturer, Department of Economics, Bahauddin Zakariya University Multan, Pakistan
E-mail: fatimafarooq4yahoo.com

Abstract

This paper attempts to analyze the fact that is trade liberalization reducing poverty and income inequality in Pakistan using empirical evidence from time series data analysis. The issue of trade liberalization and its effects on the developing economies has become the hotly debated subject in recent years in all over the world. This issue has also not been analyzed so extensively in Pakistan may be due to some data constraints or due to some other reasons. Pakistan has endeavored to liberalize its trade regime and integrate its market with the world, especially since late 1980s. Pakistan made significant efforts in liberalizing its trade regime during the 1990s. The maximum tariff rate has declined from 225 percent in 1990-1 to 25 percent; the average tariff rate stands at just 11 percent compared to 65 percent a decade ago. The empirical evidence from time series regression analysis suggests that trade liberalization reduces poverty but does not having statistically significant impact on aggregate poverty and income inequality in Pakistan in short-run. In long run, trade liberalization has some strong effects on poverty and inequality. Nevertheless, other control variables - foreign remittances and gross capital formation - are found statistically significant and become highly elastic in reducing poverty and income inequality respectively during the period in short-run. The results of this study are also consistent with some other studies who concluded that trade liberalization has mixed type of effects on the lives of poor and inequality in developing countries.

Keywords: trade liberalization; economic globalization; poverty; inequality; foreign remittances; Pakistan.

1. Introduction

The term trade liberalization has been growing seriously since 1980s almost in all the developing countries and has become a hotly debated subject in recent years. While inequality and poverty reduction have remained always the prime objectives of policy makers, poverty has gained more significance after including in Millennium Development Goals (MDGs), of which the first and overarching one is to halve world poverty by 2015. Economic globalization is making rapid changes in trade relations,

financial and technology flows, and mobility of labor across the world and consequently has brought reduction in poverty incidence (DFID, 2000; World Bank, 2002a, 2002b).

Since economic globalization provides enormous challenges as well as opportunities,[1] but at the same time there exists a large heterogeneity in the degree of its process over time and across countries and regions. This heterogeneity may cause various types of problems like poverty, income inequality and disparity in the development levels across the regions. Therefore, the impact of trade liberalization on inequality and poverty has become a central concern to academicians, policy makers, and international organizations. A key issue in the contemporary debate on economic development has also become to examine whether trade liberalization does reduce poverty and inequality in developing countries. An enormous number of journal articles, books and conference papers have been produced on this issue with some controversial findings and conclusions based on theoretical and empirical research[2].

A published literature has highlighted the imperative role of trade liberalization in influencing poverty (Dollar and Kraay, 2002; World Bank, 2002b; Dollar, 2005; Hertel and Reimer, 2004). Some influential studies have also empirically investigated the effects of economic globalization on poverty through various channels and routes (McCulloch et al., 2001; Berg and Kruger, 2002; Cline, 2004; Dollar and Kraay, 2004; Winters et al., 2004; Nissanke and Thorbecke, 2006; Ravallion, 2006). Since most of the studies have been undertaken with cross-country analyses and comparisons have left ambiguous implications for the effects of trade liberalization on poverty and inequality within the countries, there is least volume of studies on country cases (Ravallion, 2006). Therefore, the present study attempts to contribute in the literature by analyzing the impact of trade liberalization on poverty and inequality in Pakistan rather than considering cross-country or some regional analysis. Moreover, trade liberalization, poverty and inequality nexus is a vital and relatively less studied issue based on empirical research in Pakistan as compared to some other development issues.

Poverty reduction and equitable distribution of income have always been the declared goal of economic development in Pakistan like other developing countries. The issue of trade liberalization has received a momentous attention in Pakistan especially in 1990s. Like neighboring countries China and India, Pakistan has also attempted to integrate its economy through liberalizing investment and trade regime. Pakistan's growth record has been impressive over a long period until 1980s but investment and saving rates have been remained low (Husain, 2006). Despite taking intensive trade liberalization measures, Pakistan's trade performance has also been very dismal. Growth in exports remained slow, while the degree of openness in terms of trade as percentage of GDP declined after the liberalization especially in 1990s. It may be because of low foreign remittances and foreign direct investment (FDI), which are considered complementary requirements for trade liberalization to be successful for promotion of exports, did not increase

[1] The case of china can be viewed as an example of a country that successfully implemented institutional reforms in all sectors of the economy but still there are some challenges for the future. See for example, Fan (1991), Lin (1992), Hussain et al. (2000), Chow (2002), and Chen and Ravallion (2004b).

[2] See Jenkins (2004), Sumner (2004) and Kiely (2005) for detailed literature review of the studies.

sufficiently. As far as poverty is concerned, it has some diverse trends over the period. Therefore, with the growing concern of economic literature regarding the drives of economic globalization in developing economies, it is relevant to put a question that where Pakistan's economy stands after passing almost three decades of globalization. In particular, how far the measures relating to liberalization have helped or hindered alleviating poverty at the national level.

The standard Heckscher-Ohlin (H-O) trade theory[3] and its extended model, Stolper-Samuelson (SS) theorem are employed to some extent for giving theoretical support in empirical analyses. According to H-O model, trade liberalization will increase the relative price of the abundant factor like unskilled labour in developing countries. This in turn should reduce poverty incidence and income inequality.[4] This simplest explanation of the trade liberalization and poverty nexus rests on the assumption that if the trade liberalization would lead to a comparative advantage in producing goods made with unskilled labour. However, it is equally possible that unskilled abundant countries would not always get gains from trade reforms based on less protection for unskilled workers and because of their immobility across the sectors.[5] Therefore, due to the narrow interpretations and ambiguity found in trade theories, a research question of how trade liberalization affects poverty incidence and inequality in developing countries like Pakistan remains largely an empirical one.

As far as growth models[6] are concerned, endogenous growth theory put forward the better causal explanation of the link between greater openness and growth (Dollar, 2005). It is possible to construct theoretical models in which the poor are by-passed by growth or even become increasingly marginalized (Bhagwati and Srinivasan, 2002). This suggests that, as with the link from trade to growth, similarly from trade to poverty reduction is also primarily an empirical question. Several studies concerning the trade-growth linkage reveal that trade is one of the significant driving engines for long run economic growth (Sachs and Warner, 1995a and 1995b; Frankel and Romer, 1999; Stern, 2001; Dollar and Kraay, 2004). Nevertheless, these studies have been criticized on technical ground (Rodriguez and Rodrik, 2001; Cline, 2004).

[3] Principally this theory is based on only two-factor, two-commodities and two-country model. Markusen and Venables (2007) has made criticism on this model and presented a multi-country and multi-good approach to trade theory.

[4] See for instance, Krueger (1983), and Bhagawati and Srinivasan (2002).

[5] According to the new theories, trade liberalization could reduce the wages of unskilled labour even in a labour-abundant country, thereby increasing poverty. See for instance, Stiglitz (1970), Davis (1996), Feenstra and Hanson (1997), Cunat and Maffezzoli (2001), Kremer and Maskin (2003), Banerjee and Newman (2004), Topalova (2007), Harrison (2007).

[6] Second generation growth models (Romer, 1986, 1989; Lucas, 1988 and 1990; Mankiw et al., 1992; Barro and Sala-i-Martin, 1992 and 1995) provide the better explanation on growth predictions than the first generation models (Solow, 1956). On the part of empirical applications of these models, many poor countries in the third world were become vulnerable by high population growth, low public savings rates, and human capital short falls (Barro, 1991; Durlauf and Johnson, 1992; Durlauf and Quah, 1999).

There is a growing body of literature[7] on the impact of economic globalization on poverty among others. Generally, theoretical explanations and empirical evidences on economic globalization and poverty nexus are mixed and inconclusive. Amongst the empirical studies, majority has undertaken cross-country analyses and has left ambiguous implications for the impact of trade openness on poverty within countries (Ravallion, 2006). Most studies emphasize the role of growth in combating poverty by considering a driver of distributional neutral and increasing its rates leads to proportionate increase in incomes of the poor (Dollar and Kraay, 2002; 2004).

2. Data and Diagnostic Methodology

Since the major objective of the present study is to analyze the impact of trade liberalization on poverty and inequality in Pakistan, a critical problem is observed especially with the data availability on poverty. The data sets on poverty are much sensitive especially in establishing poverty lines that need an extra care. However, it was not possible to construct poverty index over time directly from the national household survey data due to time and financial constraints, an aggregate data sets of poverty are obtained from various sources in order to make consistent time series data based on the same poverty line through interpolation. The data on proxies for trade liberalization and other macroeconomic variables having considered as control variables and determinants of poverty and inequality are made available from World Bank Indicators and from the various issues of Pakistan Economic Survey for the period 1980-2010. It is also worth mentioning here that Pakistan has made numerous policies to liberalize its trade since 1980s and observed volatile macroeconomic progress and rising trends of aggregate poverty incidence and inequality. Therefore, this is the main reason to include data sets from 1980 to 2010 for the present study. A detailed list of variables, definition and sources of the data sets are reported in table 1.

Since the literature states that trade liberalization, poverty and inequality linkages are complex and heterogeneous; however the empirical results can be improved and made conclusive by including some relevant control variables to solve the issue of endogeneity. Therefore, a single-equation approach is developed to investigate the trade liberalization, poverty and inequality nexus in Pakistan. Since there are three indices of poverty; poverty incidence, depth of poverty and severity of poverty, but most widely employed measure is the poverty incidence or poverty head count while income inequality is measured by Gini Coefficient.

[7] There is also enormous literature on globalization and poverty produced in edited books in addition to journal articles. See for instance, Cornia (2005), Kaplinsky (2005), Nissanke and Thorbecke (2007), and Harrison (2007).

Table 1: Description of Variables and sources of data

Variables	Explanation	Data Sources
POVT	Aggregate incidence of poverty (head count index in terms of population in percent)	Malik (1988), Amjad and Kemal (1997), Jamal (2003) and various issues of Pakistan Economic Survey since 2005
GINI	Gini Coefficient as a measure of income inequality	Jamal (2003) and various issues of Pakistan Economic Survey
OPEN	Trade openness, calculated by the ratio of the sum of exports and imports to GDP	World Bank, World Development Indicators (WDI), 2011
REMT	Workers' remittances and compensation of employees received as % of GDP	World Bank, World Development Indicators (WDI), 2011
FDI	Foreign direct investment, net inflows as % of GDP	World Bank, World Development Indicators (WDI), 2011
GCF	Gross capital formation as % of GDP	World Bank, World Development Indicators (WDI), 2011
INF	Consumer price index as a measure of inflation	World Bank, World Development Indicators (WDI), 2011
POP	Total population	World Bank, World Development Indicators (WDI), 2011
AGRI	Agriculture value added as percent of GDP	World Bank, World Development Indicators (WDI), 2011
MANU	Manufacturing value added as percent of GDP	World Bank, World Development Indicators (WDI), 2011
SERV	Services value added as percent of GDP	World Bank, World Development Indicators (WDI), 2011
GDPC	Real GDP per capita in Rupees	World Bank, World Development Indicators (WDI), 2011
HCI	Human Capital Index is estimated by considering all enrolment rates	Pakistan Economic Survey, various issues

According to the literature, there are two measures of trade openness namely trade volumes and tools of trade policy. In this study, trade volume as a measure of trade liberalization, exports plus imports as a percentage of GDP, is considered to capture the direct impact of trade openness on aggregate poverty and inequality rather than tariffs or quotas. Since the agriculture sector contributes significantly to Pakistan economy, agricultural production can play an important role in addressing poverty in Pakistan. Value added in agriculture measures the output of the agricultural sector less the value of intermediate inputs. Agriculture comprises value added from forestry, hunting, and fishing as well as cultivation of crops and livestock production.

The foremost driver in addressing the fall in poverty incidence in 1980s was inflow of foreign remittances to Pakistan. Therefore, workers' remittances and compensation of employees comprise current transfers by migrant workers and wages and salaries earned

by nonresident workers are considered as robust determinant besides the trade openness. Foreign direct investment as percent of GDP is used as a proxy of financial liberalization, which measures the medium and long-term ability of a country to attract investment from abroad. Foreign direct investment is the net inflows of investment and sum of equity capital, reinvestment of earnings, other long-term capital and short-term capital as shown in the balance of payments. While the domestic investment rate also plays an important role in fighting poverty, the gross capital formation as percent of GDP consists of outlays on the additions to the fixed assets of the economy plus net changes in the inventories is introduced to capture the growth effects of investment.

Manufacturing value added as a percent of GDP is employed as a control variable representing industry sector. Similarly services value added as percent of GDP is also taken as explanatory variable along with consumer price index as a measure of inflation which has also some direct effects on absolute poverty. Real GDP per capita is also taken as it affects income inequality. Total population of Pakistan is also employed as it shows the size of the market. Human capital index is also constructed to capture the effect of education on inequality and poverty.

While various research methods have been undertaken for empirical studies on trade liberalization, poverty and income inequality nexus, time series regression analyses - not extensively employed in the literature - is undertaken for the present study. Ravallion (2006) and Jin (1998) employed the same methodology to some extent in their studies.

Since estimations based on time series data require special attention, an application of standard estimation techniques on non-stationary time series data can cause spurious results.[8] This can even lead to wrong policy implications and incorrect forecasting. While using time series data sets in regression analyses requires some care due to the trending, persistent nature of many economic time series. If series become stationer at first difference at least, then regression results without considering differences might be spurious.

A number of unit root test methods can be employed for individual time series data, such as the Dickey-Fuller (DF) test, the Augmented Dickey-Fuller (ADF) test, the Phillips-Perron (PP) test, the Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) test, the Elliot, Rothenberg and Stock (ERS) point optimal test, and the Ng-Perron (NP) test. Some of the tests are specific to a particular time series scenario and the application is limited. For simplicity and practicality, we have employed the popular ADF test for our individual time series data. The ADF test assumes a unit root process in the series (unit root under the null hypothesis).

There are different econometrics techniques and routes of empirical data analysis that can be used to estimate the time series equations. If all variables are stationary (i.e. they are I (0)), then equations can simply be estimated by ordinary least squares (OLS). If all or some variables are I (1) and not co-integrated, some data transformations may be necessary before estimating equations by OLS. However, If some co-integration exists among the variables in equations, then there are a number of approaches of different complexities to estimate the model. Some main approaches are the Engel and Granger (1987) two-step procedure and the Johansen (1991, 1995) maximum likelihood reduced

[8] See for instance, Granger and Newbold (1974) and Wooldridge (2006).

rank procedure. Therefore both methods work well in terms of error correction models (ECM) when all variable are having of I (1) order.

When the variables do not have the same order of integration then generally equations are estimated by taking their respective differences in a dynamic regression model. Nevertheless, this is the least possible way-out but in the same circumstances, econometric theory suggests the solution in a more batter way. In general, there are two types of dynamic models.

i. Distributed lag models that include lagged terms of the dependent and independent (or explanatory variables), and

ii. Autoregressive models that include lagged terms of the dependent variable

Therefore, Autoregressive Distributed Lag (ARDL) Model or Autoregressive Model (AR) should be undertaken under the given circumstances. Ravallion (2006) has also used the Autoregressive Model in analyzing the impact of globalization on poverty in a case study of China.

3. Construction of Econometric Models and Diagnostic Tests

In this study, two separate econometric models are constructed; one for poverty incidence and other for income inequality response to trade liberalization with some relevant control variables. The formal structure of multivariate dynamic econometric models can be described in the linear form after taking the natural log on both sides as follows:

The model (a) describing the impact of trade liberalization on poverty in Pakistan and is reported as:

$$LPOVT_t = \alpha o + \alpha_1 LOPEN_t + \alpha_2 LREMT_t + \alpha_3 INF_t + \alpha_4 LFDI_t + \alpha_5 LPOP_t + \alpha_6 LAGRI_t + \varepsilon_t \quad \text{---------- (a)}$$

Similarly, the dynamic model describing the impact of trade liberalization on income inequality is given as follows:

$$LGINI_t = \beta_o + \beta_1 LOPEN_t + \beta_2 LGDPC_t + \beta_3 LMANU_t + \beta_4 LSERV_t + \beta_5 LGCF_t + \beta_6 LHCI_t + \upsilon_t \quad \text{---------- (b)}$$

Note that all variables in both equations of dynamic models are expressed in natural logarithms except the inflation variable that is measured in rate. For ARDL model, lag of all explanatory variables and dependent variable would be included as explanatory variables while for AR model only the lag of dependent variable would be included. The decision would be made in favour of ARDL model when level of stationary would not be I(2) of any series. Otherwise AR model will be employed. In this study, we have also examined econometric problems considering the Breusch-Godfrey (BG) LM and Engle's ARCH tests for serial correlation, White hetroskedasticity test for hetroskedasticity and the Ramsey RESET test for general misspecification of the estimated models.

4. Results and Discussion

During the last thirty years, developing countries increased their trade shares and reduced their tariffs. Most economists expect openness to trade to be associated with higher growth, and growth is good for the poor. Consequently, we would expect that increasing trade should lead to less poverty. Nevertheless if openness to trade is associated with increasing inequality, then the growth gains from trade could be wiped out for those at

the bottom of the income distribution. In other words, if the gains from trade are highly unequal, then the poor may not share the benefits. Many of the studies in the literature suggest that trade liberalization has been associated with rising inequality, and that the poor do not always share in the gains from trade. At the same time, some of studies were of the view that trade liberalization does not affect poverty and inequality significantly.

4.1 Summary Statistics

The results of summary statistics of selected variables of Model-I (Table 2) state that the average poverty has remained around 24 percent in Pakistan during 1980-2010 with maximum of 35 percent while minimum poverty level is around 17 percent. The standard deviation for poverty is around 3.80. Similarly, the average value of the trade liberalization is 34.28 with having 3 value of standard deviation. The average inflation rate remained 9 percent during 1980-2010. For shape of the distribution of variables, skewness (Symmetry) and kurtosis (peakedness or tallness) are also estimated. The trade openness, inflation rate and agriculture value added are negatively skewed while all other variables are positively skewed. The poverty incidence and foreign direct investment are having leptokurtic (long tailed) distribution as are having more than 3. While all other variables in the table 2 are having platykurtic (Short tailed) distribution as are having less than 3. The Jarque-Bera (JB) test for normality of the distribution suggests that residuals are not normally distributed for foreign direct investment variable as it rejects the null hypothesis of normality of the distribution. While the residuals of all other variables; poverty incidence, trade openness, foreign remittances, inflation rate, population and agriculture value added are normally distributed as accepting the null hypothesis of the normality of the distribution.

Table 2 Summary Statistics of Selected Variables of Model-I, 1980-2010

Variables/ Statistical Tools	POVT	OPEN	REMT	INF	FDI	POP	AGRI
Mean	24.44	34.28	4.79	8.55	1.01	124.33	25.56
Median	23.20	34.90	4.29	8.10	0.68	123.87	25.98
Maximum	34.60	38.91	10.25	14.10	3.90	177.00	31.56
Minimum	17.30	26.97	1.45	3.10	0.10	81.36	20.33
Std. Dev.	3.80	3.00	2.35	2.98	0.95	27.09	3.04
Skewness	0.76	-0.53	0.57	-0.17	1.87	0.16	-0.06
Kurtosis	3.57	2.87	2.42	2.07	5.72	2.05	2.38
Jarque-Bera	3.44	1.46	2.14	1.28	27.57	1.31	0.51
Probability	0.18	0.48	0.34	0.53	0.00	0.52	0.77
Observations	31.00	31.00	31.00	31.00	31.00	31.00	31.00

Source: Authors' calculations using E-Views software

Similarly, the summary statistics of selected variables of model-II, 1980-2010 is depicted in table 3, where determinants of income inequality including trade liberalization are given with descriptive statistics. The average value of Gini coefficient is 38.37 with 43 maximum value and 34 minimum value. The standard deviation is 2.44. Overall there is very small amount of volatility or variation in all variables except GDP per capita income

as shown by the values of standard deviation. The income inequality (Gini Coefficient), trade openness and human capital index are negatively skewed while all other variables in the model-II are positively skewed. The result of Kurtosis suggests that except manufacturing value added variable all other variables are having short tail and are also called Platykurtic as having less than 3 value. The results of Jarque-Bera suggest that all variables are having normal distribution except manufacturing value added variable.

Table 3: Summary Statistics of Selected Variables of Model-II, 1980-2010

Variables/ Statistical Tools	GINI	OPEN	GDPC	MANU	SERV	GCF	HCI
Mean	38.37	34.28	25993.27	16.54	50.16	18.76	0.13
Median	38.64	34.90	26635.49	16.28	49.79	18.77	0.13
Maximum	42.57	38.91	34672.22	19.66	55.12	22.52	0.16
Minimum	33.73	26.97	17086.05	14.68	45.56	15.56	0.09
Std. Dev.	2.44	3.00	4930.87	1.21	2.23	1.60	0.02
Skewness	-0.21	-0.53	0.01	1.03	0.14	0.57	-0.42
Kurtosis	2.10	2.87	2.22	3.59	2.82	3.49	1.79
Jarque-Bera	1.27	1.46	0.79	5.96	0.14	1.99	2.80
Probability	0.53	0.48	0.68	0.05	0.93	0.37	0.25
Observations	31.00	31.00	31.00	31.00	31.00	31.00	31.00

Source: Author's estimations using E-Views software

4.2 Correlation Analysis

Since the main use of correlation analysis is to determine the degree of association found in the regression analysis. Therefore, the correlation analysis implies no causality or dependence of the variables but refers simply to the type and degree of association between two variables. The results of correlation matrix of the variables of model-I are reported in table 4 and state that there is 43 percent negative association between poverty incidence and trade openness. It is also observed that inflation has very small association with other variables. The population of Pakistan is strongly associated with agriculture sector and foreign direct investment.

Table 4: Correlation Matrix of the Variables of Model-I, 1980-2010

Variables	POVT	OPEN	REMT	INF	FDI	POP	AGRI
POVT	1.00						
OPEN	-0.43	1.00					
REMT	-0.25	0.01	1.00				
INF	-0.26	0.36	0.08	1.00			
FDI	-0.18	-0.02	-0.32	0.17	1.00		
POP	0.08	-0.33	-0.56	-0.01	0.68	1.00	
AGRI	0.18	0.18	0.48	0.07	-0.78	-0.91	1.00

Source: Author's estimations using E-Views software

Similarly, the correlation estimates of the variables of model-II are reported in table 5. The results state that there is weak and negative association between trade liberalization and income inequality, and between income inequality and gross capital formation. On the other hand, income inequality is strongly positively associated with GDP per capita income and human capital formation. The GDP per capita income is also positively correlated with manufacturing sector, services sector and human capital formation.

Table 5 Correlation Matrixes of the Variables of Model-II, 1980-2010

Variables	GINI	OPEN	GDPC	MANU	SERV	GCF	HCI
GINI	1.00						
OPEN	-0.14	1.00					
GDPC	0.76	-0.23	1.00				
MANU	0.36	0.16	0.57	1.00			
SERV	0.61	-0.32	0.90	0.43	1.00		
GCF	-0.08	0.36	0.22	0.72	0.12	1.00	
HCI	0.88	-0.24	0.93	0.46	0.75	0.07	1.00

Source: Author's estimations using E-Views software

4.3 Stationarity of Variables and Unit-Root Tests

We have employed the Augmented Dickey-Fuller test to estimate the unit root on all time series variables of both models. This test has been employed at level as well as at 1st difference with intercept and with trend and intercept. Lagged order is selected on the basis of Akaik Information Criteria (AIC) for all variables. The results are reported in tables 6 and 7 respectively for both models

Table 6: Results of Augmented Dickey-Fuller (ADF) Test of Model-I with Intercept, and Trend & Intercept

Variables	ADF Test with Intercept			ADF Test with Trend and Intercept		
	Level	1st Difference	Conclusion	Level	1st Difference	Conclusion
LPOVT	-1.69	-3.39	**I(2)**	-1.77	-3.30	**I(2)**
LOPEN	-3.25	-7.07	**I(1)**	-3.46	-6.96	**I(1)**
LREMT	-1.63	-4.76	**I(1)**	-1.07	-4.88	**I(1)**
INF	-1.42	-4.83	**I(1)**	-1.18	-5.11	**I(1)**
LFDI	-1.63	-4.84	**I(1)**	-2.54	-4.75	**I(1)**
LPOP	-0.76	-5.30	**I(1)**	-0.76	-5.30	**I(1)**
LAGRI	-0.99	-4.52	**I(1)**	-1.93	-4.45	**I(1)**

Source: Author's estimations using E-Views software

Table 7: Results of Augmented Dickey-Fuller (ADF) Test of Model-II with Intercept, and Trend & Intercept

Variables	ADF Test with Intercept			ADF Test with Trend and Intercept		
	Level	1st Difference	Conclusion	Level	1st Difference	Conclusion
LGINI	-2.13	-2.26	**I(2)**	2.03	-3.19	**I(2)**
LOPEN	-3.25	-7.07	**I(1)**	-3.46	-6.96	**I(1)**
LMANU	-1.69	-4.09	**I(1)**	-1.67	-4.07	**I(2)**
LSERV	-1.11	-4.70	**I(1)**	-4.64	-	**I(0)**
LGDPC	-2.26	-3.72	**I(1)**	-2.30	-3.77	**I(2)**
LGCF	-2.14	-4.61	**I(1)**	-2.10	-4.52	**I(1)**
LHCI	-1.71	-5.23	**I(1)**	-1.70	-5.44	**I(1)**

Source: Author's estimations using E-Views software

The results of Augmented Dickey-Fuller (ADF) Test of Model-I with intercept, and trend and intercept state that all variables are found stationary at 1st difference except LPOVT at 1 percent level of significance. While the results of Augmented Dickey-Fuller (ADF) Test of Model-II with intercept state that all variables are found stationary at 1st difference except LGINI at 1 percent level of significance. The results of ADF test with trend and intercept in model-II reveal that LGINI, LMANU and LGDPC are also stationary at 2nd difference, while LSERV is stationer at the level.

The ultimate result yields that variables cannot be co-integrated because not all variables are having the same order of integration. The ARDL model also cannot be employed because this method would be collapsed in the presence of I(2). Nevertheless in the presence variables having I(2), the computed F-statistic provided by Pearson, Shin and Smith (2001) are not valid because the Bounds Test is based on the assumption that underlying variables are either I(0) or I(1). Therefore, the best possibly, Autoregressive (AR) model would be an appropriate model as an alternate of error correction model for empirical estimations of the econometric models.

4.4 Short-Run and Long-Run Estimates of Using Autoregressive Models

Initially the method of Ordinary Least Squares (OLS) is employed for estimations without including the lagged dependent variable in order to examine the results whether these are spurious results or not. The regression results of both models yield that R^2 is greater than d-statistic and found spurious regression. Moreover the higher R^2 and significant t-ratios are also supporting the argument of spurious regression. Therefore, our analysis has shifted towards the application of time series techniques as have been examined in the previous section and now found that AR model is the best and suitable method of estimation for efficient and reliable results.

The both models are estimated for short-run and long-run estimates. The results of short-run estimates of Autoregressive (AR) model-I and Model-II are reported in table 8 and table 9 respectively. While the long-run results of the estimates of both models are given in equation (1) and (2) respectively.

The results reported in table 8 state that 85 percent variation in the poverty incidence is explained through the variables specified in the model. The overall model is also significant as F-statistic is significant at all levels. All estimates are estimated in the form

elasticities except inflation rate. The results state that trade liberalization has negative impact on the poverty levels but not significant. The foreign remittances as percentage of GDP significantly reduce poverty levels. The inflation rate and population size, agriculture production and previous year poverty levels are becoming the cause to increase poverty levels of the current year. Therefore, it is concluded that trade liberalization reduces poverty levels in the short-run but not to the level as it requires significantly.

Table 8: Results of Time Series Regression based on Model-I: Autoregressive (AR) Model (Short-Run Estimates)

Dependent Variable: LPOVT				
Sample: 1980-2010				
Explanatory Variables	**Coefficients**	**Std. Errors**	**t-Statistic**	**Prob.**
Constant	-1.608	2.190	-0.734	0.471
LOPEN	-0.043	0.178	-0.244	0.810
LREMT	-0.080	0.036	-2.202	0.039
INF	0.003	0.005	0.548	0.589
LFDI	-0.018	0.035	-0.514	0.612
LPOP	0.264	0.196	1.352	0.190
LAGRI	0.470	0.372	1.263	0.220
LPOVT(-1)	0.701	0.107	6.579	0.000
R-squared	0.858	F-statistic		18.984
Adjusted R-squared	0.813	Prob (F-statistic)		0.000
Durbin-Watson-stat	1.600	Durbin's h-statistic		1.340

Source: Author's estimations using E-Views software

4.5 Long-run estimates of Model-I (Adjustment Coefficient = .30 or 30 %)

The short-run estimates of model-I are reported in table 8 and from these results long-run estimates can be estimated through the estimate of adjustment coefficient (λ). The adjustment coefficient is estimated equals to 30 percent which tells us that 30 percent of the difference between the desired and actual poverty incidence is eliminated in each year. The long-run estimates can be obtained by dividing each of the short-run coefficients by the estimate of the adjustment coefficient ($\lambda = 0.30$).

$$LPOVT_t = -5.360 - 0.143\ LOPEN_t - 0.267\ LREMT_t + 0.010\ INF_t - 0.060\ LFDI_t + 0.880\ LPOP_t + 1.567\ LAGRI_t + \varepsilon t \quad \text{---------- (1)}$$

The long-run estimates reveal that all variables are having the same signs as were observed in the short-run but all are having more significant impact on the poverty incidence.

Table 9: Results of Time Series Regression based on Model-II: Autoregressive (AR) Model (Short-Run Estimates)

Dependent Variable: LGINI				
Sample: 1980-2010				
Explanatory Variables	**Coefficients**	**Std. Errors**	**t-Statistic**	**Prob.**
Constant	1.034	0.592	1.746	0.095
LOPEN	0.038	0.028	1.352	0.190
LGDPC	-0.081	0.073	-1.115	0.277
LMANU	0.068	0.055	1.243	0.227
LSERV	-0.067	0.150	-0.448	0.659
LGCF	-0.117	0.043	-2.735	0.012
LHCI	0.027	0.058	0.473	0.641
LGINI(-1)	1.037	0.097	10.689	0.000
R-squared	0.972	F-statistic		109.090
Adjusted R-squared	0.963	Prob (F-statistic)		0.000
Durbin-Watson-stat	2.323	Durbin's h-statistic		-1.032

Source: Author's estimations using E-Views software

The short-run results of model-II are reported in table 9 and state that the R^2 is very high indicating 97 percent variation in the income inequality is due to the variables included in the model. The overall model is also significant as shown by the F-statistic ratio. The trade liberalization, manufacturing value added, human capital index increase the income inequality while GDP per capita income, services value added and gross capital formation reduce the income inequality in Pakistan during the period 1980-2010. The gross capital formation reduces the income inequality significantly.

4.6 Long-run estimates of Model-II (Adjustment Coefficient = -0.037 or - 4 %)

The long-run estimates of model-II are estimated in equation (2) and state that trade liberalization, manufacturing value added and human capital index reduce income inequality significantly. The results stated that the variables affecting positively in the short-run to income inequality are now affecting negatively in the long-run and vice versa. The variables of model-II have become more elastic in affecting income inequality in the long-run. The results of both models are also consistent with the various studies reviewed in the review of literature.

$$LGINI_t = -27.946 - 1.027\ LOPEN_t + 2.189\ LGDPC_t - 1.838\ LMANU_t + 1.811\ LSERV_t + 3.162\ LGCF_t - 0.730\ LHCI_t + \upsilon_t \quad \text{----------} \quad (2)$$

4.7 Diagnostic Tests on the Short-Run Estimates of the Models

A number of short-run diagnostic tests have been performed in this study and results are reported in tables 10 and 11 respectively. Both Breusch-Godfrey Serial Correlation LM and ARCH LM tests are meant for to check the presence of serial correlation. Breusch-Godfrey Serial Correlation LM examined the presence of serial correlation in the error terms of the regression model while ARCH LM test investigates the presence of serial correlation in the variance of error terms. The results of diagnostic tests on both models

clearly state that there is no autocorrelation as the probability of F-statistic in both tests are more than 10%.

Table 10: Results of Diagnostic Tests for Econometric Problems on the Model-I

Breusch-Godfrey LM Test for Serial Correlation			
F-statistic	0.902	Probability	0.353
Obs*R-squared	1.236	Probability	0.266
White Heteroskedasticity Test			
F-statistic	1.114	Probability	0.417
Obs*R-squared	15.293	Probability	0.358
Engle's Autoregressive Conditional Heteroskedasticity (ARCH) Test			
F-statistic	0.756	Probability	0.392
Obs*R-squared	0.789	Probability	0.374
Ramsey RESET Test for General Misspecification			
F-statistic	0.503	Probability	0.485
Log likelihood ratio	0.710	Probability	0.399

Source: Author's estimations using E-Views software

Table 11: Results of Diagnostic Tests for Econometric Problems on the Model-II

Breusch-Godfrey LM Test for Serial Correlation			
F-statistic	1.500	Probability	0.234
Obs*R-squared	2.000	Probability	0.157
White Heteroskedasticity Test			
F-statistic	1.701	Probability	0.159
Obs*R-squared	18.407	Probability	0.189
Engle's Autoregressive Conditional Heteroskedasticity (ARCH) Test			
F-statistic	0.028	Probability	0.867
Obs*R-squared	0.030	Probability	0.861
Ramsey RESET Test for General Misspecification			
F-statistic	0.608	Probability	0.444
Log likelihood ratio	0.856	Probability	0.354

Source: Author's estimations using E-Views software

White Test is also a Langrage Multiplier (LM) test and it is more general test to examine the presence of Heteroskasticity in the regression models. The results of the test are in the both tables and conclude that the probability values are very high than the significance level. Therefore, the null hypothesis of the presence of heteroskadasticity is rejected in both models.

One of the most commonly test used for general misspecification is Ramsay's Regression Error Test (RESET). The results of the Ramsey's RESET test for functional form confirm that there is no specification problem in the short-run both models and therefore it is concluded that the models are well specified for the empirical analysis.

5. Conclusion and Policy Implications

The present study analyses the impact of trade liberalization on poverty and income inequality considering with some relevant control variables using time-series data and techniques. The published literature has painted the importance of trade liberalization in influencing poverty and income inequality (World Bank, 2002b; DFID, 2000; Dollar

and Kraay; 2002, 2004; Hertel and Reimer, 2004; Nissanke and Thorbecke, 2007; Harrison, 2007; Chaudhry, 2009). Enormous efforts have been made to investigate the various channels through which trade liberalization might affect the poor and inequality (Ravallion, 2006, Nissanke and Thorbecke, 2006; Winters et al., 2004; Bhagwati and Srinivasan, 2002; Bhagwati, 2004).

The results of correlation matrix state that there is moderate negative correlation between trade liberalization and poverty incidence. The agriculture value added is negatively correlated with foreign direct investment and population size. Moreover there is positive relationship between remittances and agriculture value added.

The results of correlation matrix also state that there is weak and negative correlation between trade liberalization and income inequality in Pakistan while trade liberalization has some positive relationship with the gross capital formation. The income inequality is positively correlated with the human capital formation.

The empirical evidence from time series regression analysis suggests that trade liberalization reduces poverty levels but does not having statistically significant impact on aggregate poverty and income inequality in Pakistan in short-run but in long run trade liberalization has some strong effects. Nevertheless, other control variables - foreign remittances and gross capital formation - are found statistically significant and become highly elastic in reducing poverty and income inequality respectively during the period in short-run. The results of this study are also consistent with a large number of studies who concluded that trade liberalization has least effect on the lives of poor in developing countries in short run but have some significant impact in long-run.

Keeping in view the results of the present study, we attempted to explore some policy implications to reduce poverty and income inequality through trade liberalization in Pakistan:

(i) Effective and well planned tariff reduction in developing country like Pakistan would increase its ability to purchase industrial and agricultural inputs. The increased supply of inputs in both the sectors increased the employment, finished goods and income which add to reduction in poverty.

(ii) Since considerable fall in poverty incidence was due to significant receipts of foreign remittances, the government should raise the level of capital inflows to Pakistan's economy.

(iii) The creation of human capital in the shape of better technical education increases the productivity of the poor, and it may be seen as the most effective, indirect way of addressing the problem of poverty.

(iv) Poverty elimination is impossible unless the economy generates opportunities for investment, entrepreneurship, job creation and sustainable livelihoods.

(v) The principal route out of poverty reduction is work and employment. There is a need to develop and promote micro and small-scale enterprises relating to informal sector. But it is impossible to build enterprises without access to credit. So the efforts should be made to acquire credit at a nominal markup. Hence, micro-finance activities will go hand in hand with

entrepreneurship, enabling the poor to borrow for productive purposes save and build their assets and as a result urban poverty will be alleviated.

Finally, although Pakistan has adopted the liberalized trade policies, Pakistan could potentially benefit from further reductions in tariff rates in line with China and other Asian countries for the reduction of poverty incidence and income inequality.

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