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Does Trade Openness Affect Long Run Growth?
Cointegration, Causality and Forecast Error Variance Decomposition Tests for Pakistan

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Abstract
The study investigates effect of trade openness on economic growth in the long run. We apply the ARDL bounds testing approach to test for a long run relationship and the augmented production function by incorporating financial development as an additional determinant of economic growth using the framework of Mankiw (1992). The results confirm cointegration among the series. In long run, trade openness promotes economic growth. The growth-led-trade hypothesis is vindicated by VECM Granger causality test. The causality is also checked by using the innovative accounting approach.

Keyword: Trade, Growth, Cointegration, Causality, Pakistan

I. Introduction

The contemporary effort to make it easy to exchange goods and services, capital, labor, information, and ideas across the borders is known as trade openness. The aim is to integrate economies and societies at global level. Openness has helped movement of resources from developed to developing economies and helped technological advancement. Now-a-days, world economies are reaping fruits of openness by due to the diffusion and absorption of technology. Improvement of transportation and communication has helped rediscover the opportunities at global level and identify new international markets for exchange of goods and services. Openness allows foreign direct investment in host country which contributes to economic growth by supplementing domestic capital, redefining the concept of economic efficiency, boosting productivity and bringing the world together. In this landscape, the importance of a well-developed financial market can hardly be overemphasized in the spheres of economic growth. This implies that openness adds to the meaning of economic cooperation on a larger scale where careful and well managed trade liberalization can be crucial to achieving sustainable economic growth in the long run.

The relationship between trade openness and economic growth has drawn a great deal of interest from academicians and policymakers since the 1950s. Despite the proliferation of a bourgeoning literature on this topic the findings failed to pin down the nature of the exact relationship between the series. However, the research produced two strands to better understand the relationship: trade-led growth or growth-led trade hypotheses[1]. That trade openness is an engine of economic growth is now well established in the literature. Through trade the partners can mutually benefit and help increase the size of the pie. Trade openness affects economic growth

by adopting advance technology and know-how from the technologically advanced countries which enhances the total factor productivity[2].

The main objective of our study is to examine the impact of trade openness on economic growth in the long run using Cobb-Douglas production function following Mankiw (1992) for Pakistan. The study implements an elaborative econometric investigations contributing to economic literature by four folds: (a) we apply structural break unit roots tests provided by Zivot-Andrews, (1992) and Clemente et al., (1998) to establish stationarity properties of the series;(b) Gregory-Hansen (1996)cointegration approach is applied to confirm established long run relation among the series; (c) we use four indicators of trade openness (exports, imports, terms of trade, trade) and apply them to our models; d)finally, we test the direction of causality applying VECM Granger causality framework. We find cointegration among the series. The causality analysis confirms the growth-led-exports, growth-led-imports, and trade-led-growth hypotheses in case of Pakistan. The authors are now aware of any comprehensive study, as done here to examine the relation between trade openness and economic growth thus is contributes to the literature.

II. Trade Policy in Pakistan

The policy making authorities of Pakistan launched highly protected trade policy to save infant industries in 1950s. The domestic producers gained benefit from such trade policy by purchasing agriculture and manufacturing raw materials at low prices compared to international market prices[3]. In 1960s, exports promotion schemes such exports bonus, devaluation of local currency and import substitution policies were introduced. Through trade liberalization, imports quota on non-capital import items was eliminated and regulations were followed to liberalize restricted

import items in late 1980s (Little et al. 1970 and Balassa, 1971). The tariff rate was reduced to 10per cent from 17per cent by introducing comprehensive trade reforms in 1987. The rate of sales tax was linked with the nature of goods and relaxed tariff rate to 125per cent from 225per cent in June 1987. In 2005, optimal tariff rate was restricted to 25per cent (Kemal et al. 2002 and Hussain, 2003) and further, it was lowered to 14.7per cent in 2007 (Baig, 2009)[4].

This shows that trade reforms forced by IMF were fairly deep and wide ranging. These reforms had played their role to open the Pakistani borders for trade trough the removal of quantitative restrictions. There was rise in trade (exports + imports) as share of GDP from 25.7per cent in 2001-02 to 32.7 in 2005-06 but lowered to 30.4per cent in 2006-07. The trade as share of GDP rose to 36.73per cent in 2007-08 while share of imports is 23.88 and rest is the exports' share in total trade (GoP, 2011).The reduction in tariff rates could have adversely affected the imports related revenues, however, the total tariff revenue as share of total tax receipts rose to 20per cent in 2006-07 from 15.3per cent in 2001-02 due to greater volume of imports and implementation of GST on various products at the stage of import (Baig, 2009).

In 2011, Pakistan enjoyed commodity exports due to high demand in world market. The merchandise exports share has been increased to $20.2 billion in July-April 2010-11 while earnings from merchandise exports were $15.8 billion in July-April 2009-10. This shows 27.8per cent growth in the earnings of merchandise exports that has a positive impact on macroeconomic performance of country. The major share of exports in 2011 has been contributed by textile (61.8per cent) and food groups (18.1per cent). The consistent rise in volume of foreign remittances and exports' growth has improved terms of trade and stabilized the exchange rate. Of

course, external current account has improved[5]. The reductions in trade deficit by $240 billion in July-April 2010-11 and unprecedented increase in remittances have reduced the current account deficit by $5.3 billion in 2009-10 and so on. In addition,, the continuous improvements in current account deficit raised foreign exchange reserves to $17 billion in 2011 while it was $6.4 billion in 2008 (GoP, 2011). The exports volume in US and European markets declined to $17.8 billion (2008-09) from $19.1 billion (2007-08) due to energy crisis, availability of poor quality of infrastructure, terrorists' activities which worsened the situation of law and order as well as economic decline[6].The decline was also found in imports from $40.9 billion in 2007-08 to $34.9 billion in 2008-09 i.e. almost 13per cent.

III. Literature Review

Economic literature provides empirical evidence of productivity and supply-side effects of trade openness on domestic output and hence on economic growth by increasing capital formation and total factor productivity. In cross-countries studies, for example, Krueger (1978) and Bhagwati (1978) concluded that trade liberalization encourages specialization in industries which have economies of scale that leads to improve the efficiency and productivity in long run. Tyler (1981) used data of OPEC and middle income economies and concludes that a growth in manufacturing exports leads technological progress which increases absorptive capacity and in resulting, raises economic growth. In case of Japan, Korea, Turkey and Yugoslavia, Nishimizu and Robinson (1984) showed that growth in exports raises total factor productivity growth by increasing competitiveness and economies of scale while imports' growth retards growth in total factor productivity.

Theoretical literature on economic development also reveals that international trade may have long run effect on economic growth. For instance, Grossman and Helpman (1990), Rovera-Batiz and Romer (1991), Barro and Sala-i-Martin (1997) argued that in long run, trade openness may contribute economic growth by diffusing technical knowledge by importing high-tech import items and from the spillover effects of foreign direct investment i.e. financial openness, from the collaboration with the sources of innovations (Almeida and Fernandes, 2008), increasing market size to reap fruits from trade openness by increasing returns to scale and economies of scale (Bond et al. 2005). Sachs and Warner (1995) and, Rajan and Zingales (2003) pointed out that trade liberalization pushes the governments to launch a reforms program to face the competition in international market. On contrary, Redding (1999) documented that trade openness impedes economic growth through comparative disadvantage in the growth of productivity in specialized sectors of an economy. In such scenario, selective protection policies may stimulate technological advancements and hence economic growth (Locus, 1988 and Young, 1991).

Using cross-section data of 90 countries, Romer (1990) investigated the relation between trade openness and economic growth. Romer pointed out that trade openness helps in getting a wide rage of innovations to raise domestic production and hence rate of economic growth. Edward, (1989) and Villanueva, (1994) argued that human capital formation tends to increase the positive effect of trade openness on economic growth. Greenaway et al. (2002) investigated long-and-short run effects of trade liberalization using panel data approach and reported that there is j-curve relationship between trade liberalization and economic growth i.e. trade increases economic growth at certain levels of trade liberalization and then declines it. Moreover, Irwin and Tervio (2002) considered the trade-growth nexus using data from the pre-World War I, the

interwar, and the post-war periods and found that trade openness stimulates economic growth even after controlling endogeneity of trade between the countries of globe. But, Brunner (2003) investigated the relationship between trade and economic growth by extending Frankel and Romer's (1999) model and reported effect of trade on economic growth is not robust due to specification problem. Apart from that Dowrick and Golley, (2004) reported that trade openness contributes to economic growth by improving productivity growth and investment also raises economic growth but relatively less.

Dollar and Kraay (2003) investigated the effect of trade openness and institutions on economic growth and reported that more open economies with better institutions develop faster and countries trade more with better institutions. Using panel data, Barro (2003) considered the determinants of economic growth concluding that economic growth is positively affected with favorable terms of trade but statistical effect is weak. Yanikkaya (2003) collected data of 120 countries of the globe to examine the impact of trade openness on economic growth using two indicators of trade openness such as volume of trade (exports + imports) as share of GDP and trade restriction on foreign exchange on bilateral payments. The results indicated that both indicators of trade have positive effect on economic growth through the improvement in total factor productivity. Karras (2003) collected the data of 105 countries of the globe reporting that trade openness improves TFP and then raises economic growth i.e. impact of trade openness on economic growth is between 0.25-0.30 percent with a 1 percent increase in trade openness.

Santos-Paulino and Thirlwall (2004) realized the impact of trade liberalization on economic performance for 22 developing economies. Their results indicated favorable effects of trade

liberalization on exports growth which raises economic growth. Alcalà and Ciccone (2004) examined the impact of trade openness on labour productivity and economic growth. Their results showed that trade openness leads labour productivity i.e. a 1 per cent increase in trade openness raises labour productivity by 1.45 per cent which raises economic growth. Also, Dollar and Kraay (2004) considered the relationship between changes in growth rates and trade openness while controlling the effect of economic shocks. Their empirical evidence indicated positive relationship between both variables[7]. Rassekh, (2007) applied the growth model developed by Frankel and Romer (1999) using the data of 150 countries to explore the relation between trade openness and economic growth. The empirical evidence pointed out that low income countries benefit more from international trade as compared to developed economies due to distance from equator and quality of institutions. Kneller et al. (2008) investigated non-linear relationship between trade openness and economic growth using the liberalization indicators developed by Wacziarg and Welch (2003). Their results showed that the countries benefit more from trade liberalization who have high levels of human capital, lower rates of trade tax and import raw material to stimulate their industrial and manufacturing sectors. Apart from that, Chang and Ying (2008) investigated the trade-growth relationship in African countries by incorporating air freight in growth function. Their analysis revealed that trade and improvements in cargo services have positive and significant effect on economic growth. In case of African countries, Chang and Ying (2008) analyzed the relationship between openness and economic growth incorporating air freight as additional variable. Their findings showed that the positive correlation exists between the both variables in the presence of air freight.

Economidou and Murshid, (2008) used the data of 12 OECD countries to check whether trade raises manufacturing productivity or not. The results indicated positive effect of trade on productivity growth of manufacturing industries but effect is rather minimal. Foster (2008) applied quintile regression approach to test the impact of trade liberalization on economic growth using cross-section data. The results indicated that countries with low rate of economic growth benefit more from trade liberalization in the long run and trade liberalization has negative effect on economic growth in short span of time. Kim and Lin (2009) reinvestigated that whether trade openness contributes to economic growth or not, using data of 61 countries and applying instrument-variable threshold regression procedure. Their results concluded that a stable relationship exists between international trade and economic growth and found a threshold point i.e. $780-$820 per capita. Below that point, trade openness retards economic growth; otherwise improves it. Dufrenot et al. (2010) applied quintile regression approach to consider the determinants of economic growth such as investment, government balance, terms of trade, inflation, and population growth. Their findings indicated that developing countries are obtaining more fruits of trade openness as compared to developed economies.

Wacziaring (2011) examined the effect of trade policy on economic growth using data of 57 countries using tariff barrier, non-tariff barriers and dummy for trade liberalization and found positive impact of trade policy on economic growth. Das and Paul (2011) used data of 12 emerging Asian economies to find the effect of trade openness on economic growth by applying GMM approach to avoid endogeneity problem[8].They found positive impact of trade openness on economic growth; capital stock also plays an important role to accelerate domestic output. Chansomphou and Ichihashi (2011) considered structural break point to examine impact of trade

openness on economic growth of South East Asian economies before and after the Asian financial crisis applying Carrion-i-Silvestre and Sanso (2006) structural break cointegration approach[9]. Their results disclosed that financial crisis affected Indonesia, Malaysia, and Philippines economies while performance of Thailand is better before and after the crisis. Trade openness has positive impact on the output in Indonesia and Malaysia but effect is smaller in Thailand, and trade openness accelerates economic growth in the Philippines before the crisis and after that economic growth is inversely impacted by trade. Kim et al. (2011) revisited trade-growth nexuses by applying threshold regression approach in low and high income countries. Their analysis indicated that trade openness boosts financial development, capitalization, productivity growth and economic growth in high income countries, and in low income countries the effect is negative and significant. Similarly, Squalli and Wilson (2011) scrutinized openness-growth nexus by introducing new measure of openness including Pakistan in their data sample. After their analysis, they documented positive correlation between trade openness and economic growth.

In case of single-country studies, Deme (2002) considered trade and growth nexus for investigation by testing exports and imports led-growth hypothesis in case of Nigeria. The results confirmed long run relationship between trade and economic growth i.e. trade plays an important role to raise economic growth. Jin, (2003) used data of North Korean economy to realize the effect of trade liberalization on economic growth. The results indicated that trade openness increases domestic productivity which leads the improvements in living standards of the nation by increasing per capita income. This implies that an increase in trade openness boosts the rate of economic growth. Pernia and Quising (2003) considered the nexus between trade openness and

regional economic development in case of the Philippines. Their results indicated that trade openness promotes regional development by enhancing human capital formation and reducing poverty.

In case of Turkey, Utkulu and Ozdemir (2004) extended data sample, utilized by Ghatak et al. (1995) to consider the relationship between trade openness and economic growth applying endogenous growth theory. Their results showed that trade policy have long-and-short run effects on economic growth while investments in physical and human capital are determinants of economic growth. In case of Indonesia, Simorangkir (2006) applied SVAR model to explore relationship between trade openness and economic growth. The results indicated negative effect of trade and financial openness on domestic output and hence on economic growth. This shows that lack of diversification in Indonesian products created low demand in international market and resulted in low domestic production. Financial openness could not stop capital outflow and this in turn, impeded economic performance. Jin (2006) used data of Korea and Japan to examine the relationship between trade openness and economic growth. The analysis showed that trade openness has negative impact on economic growth due to inverse effect of financial markets over macroeconomic performance.

Awokuse, (2008) reexamined the trade proxies by exports as share of GDP as an indicator of trade openness and growth nexus in case of Argentina, Colombia and Peru using time series data and Granger causality tests and impulse response function. The analysis revealed the exports led-growth hypothesis in Argentina and Peru. Rao and Rao (2009) estimated the impact of trade openness on economic growth in Fiji island and concluded that trade openness contributes to

economic growth significantly as well as to total factor productivity. Daumal and Ozyurt, (2010) explored the relationship between trade and economic growth using the data of 26 Brazilian states. Their results reported that trade openness has positive impact on economic growth by improving quality of human capital and boosting the industrial sector. This effect is more prevalent in well-developed states.

In case of India, Katireioglu et al. (2007) examined relationship between international trade and economic growth and concluded that exports and imports are main drivers of long run growth. Similarly, Jenkins and Katireioglu (2010) used data of Cyprus to examine the long run effect of trade openness on economic growth and direction of causality between trade openness, exchange rate and economic growth. The empirical results confirmed the stable long run relation between these variables and validated the exports-led growth while imports do not Granger cause economic growth. Additionally, Katireioglu (2010) considered a relationship between trade openness and economic growth in case of North Cyprus. The findings reported the existence of exports-led-growth effect and reject the hypothesis of import-led-growth does not exist.

Recently, Singh (2011) investigated relationship between trade openness and economic growth using robust time series estimates for Australia. He used single-equation IV-GMM, DOLS, FMOLS, NLLS and system-based ML approaches and results confirmed the presence of long run relationship between the variables. The results indicated that exports have positive and significant impact on economic growth supporting exports promotion policies to raise exports and output. The VECM granger causality analysis revealed unidirectional causality running from imports to economic growth while exports and imports Granger cause each other. The negative

estimate of imports seems to suggest the Keynesian demand-reducing effect of imports on domestic output. Similarly, Adhikary, (2011) enriched trade literature by investigating relationship between trade and economic growth incorporating FDI, capital formation as other stimulus of economic growth in case of Bangladesh. The empirical evidence confirmed long run relationship and reported that trade openness impedes economic growth while FDI and capital formation has positive impact on economic growth. The findings of the study suggested that government of Bangladesh should provide incentives to enhance foreign direct investment and higher capital formation must be ensured to reap larger fruits of trade openness. In addition, Oladipo (2011) realized relationship between trade liberalization, investment, human capital and economic growth using Mexican data. The results indicated cointegration between the variables and trade liberalization, investment and human capital have positive and significant effect on economic growth over study period. Moreover, Sakyi (2011) scrutinized the relationship between trade and growth by incorporating foreign aid as an additional variable in case of Ghana in post-liberalization regime and found that trade and foreign aid inflows contribute economic growth both in long and short runs.

In case of Pakistan, Din et al. (2003) found bidirectional causality between trade and economic growth and, Siddiqui and Iqbal (2005) found no causal relationship between both the variables. Din (2004) also examined causality association between exports, imports and economic growth. After finding cointegration between these variables, Din documented no causality between exports and economic growth while growth-led-imports hypothesis existed in case of Pakistan. Dutta and Ahmad (2004) investigated the trade-growth nexus using endogenous growth theory. They reported that trade liberalization has positive effect on industrial growth while capital stock

and labour force also contribute in enhancing the productivity of industrial sector. Chaudhary et al. (2010) analyzed relationship between trade liberalization and economic growth by incorporating human capital as potential input in production function. Their results showed that trade openness and human capital play a vital role to sustain economic growth supporting growth theories incorporated in economic literature[10].

In recent wave, Hye (2011) tested trade-led growth hypothesis in case of Pakistan using an index of trade openness[11]. The results indicated negative effect of trade openness on economic growth but combined effect of human capital and trade openness accelerate economic growth suggesting that the performance of human capital must be improved through education and technical training to attain fruits of trade openness on economic growth[12]. In case of Pakistan, Shahbaz et al. (2011) investigated the effect of trade openness on economic growth by considering exports as an indicator of trade openness after financial reforms regime i.e. 1990-2008. Their findings indicated long run relationship between openness and growth. Further, results showed the existence of exports-led growth hypothesis and exchange rate changes decrease domestic output while capital stock improves the volume of domestic output and hence economic growth. Finally, Klasra (2011) also investigated the association between trade and economic growth in Pakistan and Turkey and reported positive impact of trade on economic growth in both countries.

IV. Theoretical Framework and Estimation Strategy

A voluminous literature is available describing relationship between international trade and economic growth using growth accounting approach. The nature of relationship between trade openness and economic growth is an open question for researchers and academicians. The

ambiguity in findings may be due to various definitions of indicator of trade openness and misspecification of models. The empirical studies indicated exports-led growth or import-led growth or trade-led growth hypotheses assuming exports, imports or trade are main determinants to enhance domestic production following different growth models. For example, neoclassical Solow-growth model by Das and Paul (2011) for Asian countries[13], Lucas' endogenous-growth model by Ghataket al. (1995) for Turkey, Yanikkaya (2003) for cross-country; Chaudhary et al. (2010) and Hye (2011) for Pakistan and many others were applied to investigate the effect of trade openness on economic growth ignoring the role of financial development on trade openness and hence on economic growth.

Following Mankiw et al. (1992), we use Cobb-Douglas production function assuming marginal contribution of capital and labor in production, production function in period *t*is given below:

$$G(t) = A(t)K(t)^{\beta} L(t)^{1-\beta} \qquad 0 < \beta < 1 \qquad (1)$$

Where G is domestic output, A is technological progress, K is capital stock and labor is L[14]. We extend the Cobb-Douglas production function by assuming that technology can be determined by level of financial development, international trade and skilled human capital. Financial development contributes economic growth by enhancing capital formation in an economy. This shows that financial development transfers the incentives of producers towards the goods with increasing returns to scale, the inter-sectoral specialization and therefore structure of trade flows, is determined by relative level of financialintermediation[15].Well-developed financial sector enhances the capacity of an economy to reap fruits from international trade by diffusing technological advancements to stimulate economic growth. International trade is also

contributing economic growth by efficient allocation of internal and external resources, shift of technological advancements from developed countries to developing economies and less developed countries exploit innovations by developed countries i.e. learning by doing effects. This leads us to model the empirical equation as follows:

$$A(t) = \phi.T(t)^{\alpha} F(t)^{\delta} \quad (2)$$

Where ϕ is time-invariant constant, T is indicator of trade openness and F is financial development[16]. Substituting equation-2 from equation-1:

$$G(t) = \phi.T(t)^{\delta_1} F(t)^{\delta_2} K(t)^{\beta} L(t)^{1-\beta} \quad (3)$$

Dividing both sides by population and taking logs, equation-2 can be modeled as follows:

$$\ln G_t = \varphi_1 + \varphi_2 \ln T_t + \varphi_3 \ln F_t + \varphi_4 \ln K_t + \varphi_5 \ln L_t + u_i \quad (4)$$

Where, $\varphi_1 = \log\phi$ is constant term, $\ln G_t$ is log of real GDP per capita, $\ln T_t$ is log of trade openness, $\ln F_t$ is real domestic credit to private sector per capita, $\ln K_t$ is real capital stock per capita, $\ln L_t$ is skilled labor proxies by secondary enrollment and u_i is error term assumed to be constant.

Search for cointegration among the time series must be preceded by testing the stationarity properties of each of variables. Of the more commonly used tests are the ADF (Dicky and Fuller, 1981)**;** PP (Philip and Perron, 1988); DF-GLS (Elliot et al. 1996) and Ng-Perron (Ng and Perron, 2001). Results from these unit root tests would be biased in many of the situations. For example,

Dejong et al. (1992) pointed out that these tests results are unreliable due to small sample size and poor power properties. Unit root tests such as ADF, PP and DF-GLS may over-reject the true null hypothesis or accept the null when it is false. Ng-Perron (2001) unit root test does not suffer from this problem. The Ng-Perron (2001) is also inappropriate in the presence of structural breaks in the series. The Clemente et al. (1998) test is better suited when problems are due to structural break. This test has more power, compared to the Perron and Volgelsang (1992), Zivot-Andrews (1992), ADF, PP and Ng-Perron unit root tests. Perron and Volgelsang (1992) and Zivot-Andrews (1992) unit root tests are appropriate if the series has one potential structural break. Clemente et al. (1998) extended the Perron and Volgelsang (1992) method to allow for two structural breaks in the mean. The null hypothesis H_0 against alternate H_a is stated as follows:

$$H_0 : x_t = x_{t-1} + a_1 DTB_{1t} + a_2 DTB_{2t} + \mu_t \tag{5}$$

$$H_a : x_t = u + b_1 DU_{1t} + b_2 DTB_{2t} + \mu_t \tag{6}$$

In equation-5 and equation-6, DTB_{1t} is the pulse variable which equals 1 if $t = TB_i + 1$ and zero otherwise. Moreover, $DU_{it} = 1$ if $TB_i < t (i = 1,2)$ and zero otherwise. Modification of mean is represented by TB_1 and TB_2 time periods. To further simplify, we assume that $TB_i = \delta_i T (i = 1,2)$ where $1 > \delta_i > 0$ while $\delta_1 < \delta_2$ (see Clemente et al. 1998). If two structural breaks are contained by innovative outlier, then unit root hypothesis can be investigated by applying equation-5, as provided in the following model:

$$x_t = u + \rho x_{t-1} + d_1 DTB_{1t} + a_2 DTB_{2t} + d_3 DU_{1t} + d_4 DU_{2t} + \sum_{i=1}^{k} c_j \Delta x_{t-1} + \mu_t \tag{7}$$

This equation helps us to estimate minimum value of t-ratio through simulations and the value of simulated t-ratio can be utilized to identify all break points if the value of autoregressive parameter is constrained to 1. For the derivation of the asymptotic distribution of the estimate, we assume that $\delta_2 > \delta_1 > 0, 1 > \delta_2 - 1 > \delta_0$ where, δ_1 and δ_2 obtain the values in interval i.e. $[(t+2)/T, (T-1)/T]$ by applying the largest window size. The assumption i.e. $\delta_1 < \delta_2 + 1$ is used to show that cases where break points exist in repeated periods are purged (see Clemente et al. 1998). Two steps approach is used to test the unit root hypothesis, if shifts can explain the additive outliers. In 1st step, we remove deterministic trend, following equation-8 for estimation as follows:

$$x_t = u + d_5 DU_{1t} + d_6 DU_{2t} + \hat{x} \tag{8}$$

The second step involves search for the minimum t-ratio to test the hypothesis that $\rho = 1$, using the following equation:

$$\hat{x}_t = \sum_{i=1}^{k} \phi_{1i} DTB_{1t-1} + \sum_{i=1}^{k} \phi_{2i} DTB_{2t-1} + \rho \hat{x}_{t-1} + \sum_{i=1}^{k} c_i \Delta \hat{x}_{t-1} + \mu_t \tag{9}$$

To make sure that the $\min t_{\rho\ t}^{IO}(\delta_1, \delta_2)$ congregates i.e. converges in distribution, we have included dummy variable in estimated equation for estimation: $\min t_{\rho\ t}^{IO}(\delta_1, \delta_2) \to \inf_{\gamma} = \wedge \dfrac{H}{[\delta_1(\delta_2 - \delta_1)]^{1/2} K^{1/2}}$

Avoiding traditional approaches to cointegration due to their demerits, we apply autoregressive distributed lag model or ARDL bounds testing approach to cointegration. The ARDL bounds testing approach to cointegration is preferred due to its certain advantages. For example, the

ARDL bounds testing is flexible regarding the integrating order of the variables whether variables are found to be stationary at I(1) or I(0) or I(1) / I(0)[17].The Monte Carlo investigation shows that this approach is superior and provides consistent results for small sample (Pesaran and Shin, 1999). Moreover, a dynamic unrestricted error correction model (UECM) can be derived from the ARDL bounds testing through a simple linear transformation. The UECM integrates the short run dynamics with the long run equilibrium without losing any information for long run. The empirical formulation of ARDL bounds testing approach to cointegration is given below:

$$\Delta \ln G_t = \alpha_1 + \alpha_T T + \alpha_G \ln G_{t-1} + \alpha_F \ln F_{t-1} + \alpha_T \ln T_{t-1} + \alpha_K \ln K_{t-1} + \alpha_L \ln L_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta \ln G_{t-i} + \sum_{j=0}^{q} \alpha_j \Delta \ln F_{t-j} + \sum_{k=0}^{r} \alpha_k \Delta \ln T_{t-k} + \sum_{l=0}^{s} \alpha_l \Delta \ln K_{t-l} + \sum_{m=0}^{t} \alpha_m \Delta \ln L_{t-m} + \mu_t \quad (5)$$

$$\Delta \ln T_t = \alpha_1 + \alpha_T T + \alpha_G \ln G_{t-1} + \alpha_T \ln T_{t-1} + \alpha_F \ln F_{t-1} + \alpha_K \ln K_{t-1} + \alpha_L \ln L_{t-1} + \sum_{i=1}^{p} \beta_i \Delta \ln T_{t-i} + \sum_{j=0}^{q} \beta_j \Delta \ln G_{t-j} + \sum_{k=0}^{r} \beta_k \Delta \ln F_{t-k} + \sum_{l=0}^{s} \beta_l \Delta \ln K_{t-l} + \sum_{m=0}^{t} \beta_m \Delta \ln L_{t-l} + \mu_t \quad (6)$$

$$\Delta \ln F_t = \alpha_1 + \alpha_T T + \alpha_G \ln G_{t-1} + \alpha_T \ln T_{t-1} + \alpha_F \ln F_{t-1} + \alpha_K \ln K_{t-1} + \alpha_L \ln L_{t-1} + \sum_{i=1}^{p} \beta_i \Delta \ln F_{t-i} + \sum_{j=0}^{q} \beta_j \Delta \ln G_{t-j} + \sum_{k=0}^{r} \beta_k \Delta \ln T_{t-k} + \sum_{l=0}^{s} \beta_l \Delta \ln K_{t-l} + \sum_{m=0}^{t} \beta_m \Delta \ln L_{t-m} + \mu_t \quad (7)$$

$$\Delta \ln K_t = \alpha_1 + \alpha_T T + \alpha_G \ln G_{t-1} + \alpha_T \ln T_{t-1} + \alpha_F \ln F_{t-1} + \alpha_K \ln K_{t-1} + \alpha_L \ln L_{t-1} + \sum_{i=1}^{p} \vartheta_i \Delta \ln K_{t-i} + \sum_{j=0}^{q} \vartheta_j \Delta \ln G_{t-j} + \sum_{k=0}^{r} \vartheta_k \Delta \ln T_{t-k} + \sum_{l=0}^{s} \vartheta_l \Delta \ln F_{t-l} + \sum_{m=0}^{t} \vartheta_m \Delta \ln L_{t-m} + \mu_t \quad (8)$$

$$\Delta \ln L_t = \alpha_1 + \alpha_T T + \alpha_G \ln G_{t-1} + \alpha_T \ln T_{t-1} + \alpha_F \ln F_{t-1} + \alpha_K \ln K_{t-1} + \alpha_L \ln L_{t-1} + \sum_{i=1}^{p} \rho_i \Delta \ln L_{t-i} + \sum_{j=0}^{q} \rho_j \Delta \ln G_{t-j} + \sum_{k=0}^{r} \rho_k \Delta \ln T_{t-k} + \sum_{l=0}^{s} \rho_l \Delta \ln F_{t-l} + \sum_{m=0}^{t} \rho_m \Delta \ln K_{t-m} + \mu_t \quad (9)$$

Here, we compute F-statistic to compare with critical bounds generated by Pesaran et al. (2001) to test whether cointegration exists or not. Pesaran et al. (2001) developed upper critical bound (UCB) and lower critical bound (LCB). We use F-test to examine the existence of long run relationship between the variables of interest following null hypothesis i.e. $H_0 : \varphi_2 = \varphi_3 = \varphi_4 = \varphi_5 = 0$ against alternate hypothesis ($H_1 : \varphi_2 \neq \varphi_3 \neq \varphi_4 \neq \varphi_5 \neq 0$) of cointegration for equation-4.The F-test is non-standard and we may use the LCB and UCB developed by Pesaran et al. (2001)[18]. Using Pesaran et al. (2001) critical bounds, there is cointegration between the variables if computed F-statistic is more than upper critical bound (UCB). The variables are not cointegrated for long run relationship if computed F-statistic does not exceed the lower critical bound (LCB). If computed F-statistic falls between lower and upper critical bounds then decision regarding cointegration between the variables is uncertain[19]. The critical bounds generated by Pesaran et al. (2001) may be appropriate for small sample like ours case which has 41 observations in case of Pakistan. Therefore, we used lower and upper critical bounds developed by Narayan (2005). The stability tests, to scrutinize the stability of ARDL bounds testing estimates, have been applied i.e. CUSUM and CUSUMSQ (Brown et al. 1975).

The ARDL bounds testing approach can be used to estimate long run relationships between the variables. For instance, if there is cointegration in equation-4 where trade openness (T_t), financial development (F_t), capital stock (K_t) and skilled labor (L_t) are used as forcing variables then there is established long run relationship between the variables that can be molded in following equation given below:

$$\ln G_t = \theta_0 + \theta_1 \ln T_t + \theta_2 \ln F_t + \theta_3 \ln K_t + \theta_4 \ln L_t + \mu_i \qquad (10)$$

where $\theta_0 = -\alpha_1 / \alpha_G, \theta_1 = -\alpha_T / \alpha_1, \theta_2 = -\alpha_F / \alpha_1, \theta_3 = -\alpha_K / \alpha_1, \theta_4 = -\alpha_L / \alpha_1$ and μ_t is the error term supposed to be normally distributed. These long run estimates are computed using ARDL bounds testing approach to cointegration when real GDP per capita (G_t) used dependent variables. This process can be enhanced by using other variables as dependent ones. Once, long run relationship is found between the variables, next is to test direction of causality between the variables following error correction representation given below[20]:

$$(1-L)\begin{bmatrix} \ln G_t \\ \ln T_t \\ \ln F_t \\ \ln K_t \\ \ln L_t \end{bmatrix} = \begin{bmatrix} a_1 \\ a_2 \\ a_3 \\ a_4 \\ a_5 \end{bmatrix} + \sum_{i=1}^{p} (1-L) \begin{bmatrix} b_{11i} b_{12i} b_{13i} b_{14i} b_{15i} \\ b_{21i} b_{22i} b_{23i} b_{24i} b_{25i} \\ b_{31i} b_{32i} b_{33i} b_{34i} b_{35i} \\ b_{41i} b_{42i} b_{43i} b_{44i} b_{45i} \\ b_{51i} b_{52i} b_{53i} b_{54i} b_{55i} \end{bmatrix} \times \begin{bmatrix} \ln G_{t-1} \\ \ln T_{t-1} \\ \ln F_{t-1} \\ \ln K_{t-1} \\ \ln L_{t-1} \end{bmatrix} + \begin{bmatrix} \alpha \\ \beta \\ \delta \\ \phi \\ \varphi \end{bmatrix} ECT_{t-1} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \end{bmatrix} \qquad (11)$$

Where difference operator is indicated by $(1-L)$ andECT_{t-1} is lagged residual term generated from long run relationship while $\varepsilon_{1t}, \varepsilon_{2t}, \varepsilon_{3t}, \varepsilon_{4t}$, and ε_{5t} are error terms assumed to be normally distributed with mean zero and finite covariance matrix. The long run causality is indicated by the significance of t-statistic connecting to the coefficient of the error correction term (ECT_{t-1}) and statistical significance of F-statistic in first differences of the variables shows the evidence of short run causality between variables of interest. Additionally, joint long-and-short runs causal relationship can be estimated by joint significance of both ECT_{t-1} and the estimate of lagged independent variables. For instance, $b_{12,i} \neq 0 \forall_i$ shows that economic growth Granger-causes trade openness and causality is running from trade openness to economic growth indicated by $b_{21,i} \neq 0 \forall_i$.

We have used four indicators of trade openness i.e. real exports per capita, real imports per capita[21], terms of trade and real trade per capita (real exports per capita + real imports per capita)[22]. The data on these variables has been collected from world development indicators (CD-ROM, 2011).Further, world development indicates has been used to collect data on real GDP per capita, domestic credit to private sector per capita proxy for financial development, real capital stock per capita. The data on labour force i.e. secondary enrolment is chosen from economic survey of Pakistan (2010-2011). The study covers the period of 1971-2011.

V. Empirical Results and Discussions

The primary step is to test the integration order of the variables to ensure that no variables is integrated at I(2) before applying ARDL bounds testing approach to cointegration. The assumption of bounds test is that the variables should be stationary at I(0) or I(1) or I(0) / I(1). If any variable is found to be integrated at I(2) or beyond then F-test provides biased results that makes long run relationship inappropriate and unreliable. We have applied ADF with intercept and, with intercept and trend to avoid this problem. The results are reported in Table-1. The results shows that the variables have indicated unit root problem at their level form and found to be integrated at I(1).

Table-1: ADF Unit Root Test Analysis

Variables	ADF Test with Intercept		ADF Test with Intercept and Trend	
	T-Statistics	Prob. values	T-Statistics	Prob. values
$\ln G_t$	-0.5405 (1)	0.8721	-1.0829 (1)	0.9191
$\Delta \ln G_t$	-5.4954 (1)*	0.0000	-5.5494 (1)*	0.0003
$\ln E_t$	-0.6226 (2)	0.8239	-2.8368 (2)	0.1945
$\Delta \ln E_t$	-6.5645 (1)*	0.0000	-6.4305 (1)*	0.0000
$\ln I_t$	-2.6002 (1)	0.1025	-3.6651 (1)	0.1391
$\Delta \ln I_t$	-3.6297 (2)*	0.0099	-5.9308 (2)*	0.0001

$\ln TT$	-1.1213 (1)	0.6974	-2.6575 (1)	0.2589
$\Delta \ln TT_t$	-3.3232 (3)**	0.0211	-5.8342 (3)*	0.0001
$\ln T_t$	-1.3644 (1)	0.5895	-2.8387 (1)	0.1913
$\Delta \ln T_t$	-4.4591 (1)*	0.0011	-4.2999 (2)*	0.0083
$\ln F_t$	-1.6305 (1)	0.4576	-3.0028 (1)	0.1447
$\Delta \ln F_t$	-3.4648 (2)**	0.0146	-3.4568 (2)***	0.0589
$\ln K_t$	-2.3818 (1)	0.1534	-2.3416 (2)	0.4026
$\Delta \ln K_t$	-3.8808 (3)*	0.0058	-3.9375 (3)**	0.0119
$\ln S_t$	-0.1634 (1)	0.9348	-1.6017 (1)	0.7741
$\Delta \ln S_t$	-5.9062 (3)*	0.0002	-5.0318 (2)*	0.0012
Note: * and ** represent significant at 1 and 5 per cent respectively.				

The ADF unit root test provides biased results about order of integration when data shows structural break in the series. The ADF unit root test does not fit and less powerful for small sample data like in our case using Pakistani data. This problem has been solved by applying Clemente et al. (1998) and Zivot-Andrews (1992) structural break unit root tests. The former has information about two structural breaks and latter contains information about one structural break occurred in the series. Therefore, we prefer to apply Clemente et al. (1998) unit root test to test stationarity properties of the series[23].

The Table-2 reports results of Clemente et al. (1998) unit root test. The results revealed that all the series are non-stationary at level but stationarity of the variables is fulfilled at their 1st differenced form with intercept and trend. This implies that the variables are integrated at I(1). We can apply ARDL bounds testing approach to cointegration following the unique order of integration of the variables. This shows that there is no violation of Pesaran et al. (2001) cointegration test's assumptions.

Table-2: Clemente-Montanes-Reyes Structural Break Unit Root Analysis

Variable	Innovative Outliers			Additive Outlier		
	T-statistic	TB1	TB2	T-statistic	TB1	TB2
$\ln G_t$	-5.02 (2)	1978	2002	-6.769 (3)*	1991	2003
$\ln E_t$	-3.454 (2)	1984	2001	-6.782 (2)*	1993	1982
$\ln I_t$	-6.471 (5)*	1978	2003	-6.881 (3)*	1991	2002
$\ln TT_t$	-4.441 (2)	1984	1998	-7.834 (2)*	1978	1990
$\ln T_t$	-2.826 (3)	1984	2004	-5.974 (3)*	1994	2000
$\ln F_t$	-3.905 (6)	1980	2002	-5.917 (5)**	1973	2008
$\ln K_t$	-3.827 (1)	1980	2003	-8.532 (6)*	1995	2003
$\ln S_t$	-1.957 (2)	1979	1987	-5.833 (2) **	1981	1994
Note: * and ** indicate significant at 1per centand 5per centlevel of significance.						

The computation of ARDL bounds testing is sensitive with lag length selection. The inappropriate selection of lag length may provide biased results. Therefore, it is necessary to have exact information about lag order of the series to avoid the problem of biasedness of ARDL F-statistics (Shahbaz, 2010). We follow AIC criteria for selection of lag length. Lütkepohl, (2006) documented that dynamic link between the series can be captured by lag length selection. The information about lag order is given in column-2 of Table-3 following AIC criterion. The results of ARDL bounds tests are explained in Table-3. We have used critical bounds generated by Narayan (2005) to test cointegration rather than Pesaran et al. (2001). The critical bounds generated by Pesaran et al. (2001) are suitable large sample size (T = 500 to T = 40, 000). It is pointed out by Narayan and Narayan (2005) that the critical values computed by Pesaran et al. (2001) may provide biased decision regarding cointegration between the series. The critical bounds by Pesaran et al. (2011) are significantly downwards (Narayan and Narayan, 2004). The upper and lower critical bounds computed by Narayan (2005) are more appropriate for small sample rages from T = 30 to T = 80. Our empirical exercise shows that in exports model, we have four cointegrating vectors as our computed F-statistics are more than upper critical bound at

1per cent and 5per cent levels, once, exports, financial development, labor and capital are used predicted variables. The same inference can be drawn for models when we use imports, terms of trade and trade (exports per capita + imports per capita) as indicators of trade openness at 1per cent, 5per cent and 10per cent level of significance. This leads us to conclude that presence of cointegration validates the existence of long run relationship between economic growth, trade openness, financial development, labour and capital in case of Pakistan over study period of 1971-2011.

Table-3: ARDL bounds Testing Cointegration Approach Analysis

Bounds Testing to Cointegration			Diagnostic tests			
Estimated Models	Optimal lag length	F-statistics	χ^2_{NORMAL}	χ^2_{ARCH}	χ^2_{RESET}	χ^2_{SERIAL}
$F_G(G/E,F,K,S)$	2, 2, 1, 2, 2	4.7898	0.2204	[1]: 0.7508	[1]: 0.3028	[2]: 3.2164; [3]: 2.7661
$F_E(E/G,F,K,S)$	2, 2, 1, 1, 2	6.6851**	0.1938	[1]: 0.1298	[1]: 0.8668	[1]: 0.1048; [2]: 3.0078
$F_F(F/G,E,K,S)$	3, 2, 2, 1, 2	7.0268**	0.8259	[1]: 1.0248	[2]: 2.1298	[1]: 3.2668; [2]: 5.2643
$F_K(K/G,E,F,S)$	2, 2, 2, 2, 2	13.9885*	0.0720	[1]: 0.1652	[1]: 0.0930	[1]: 0.6886; [2]: 0.5756
$F_S(S/G,E,F,K)$	1, 0, 1, 0, 3	10.7746*	1.3666	[1]: 0.4331	[1]: 0.2195	[1]: 1.1107; [2]: 0.5301
$F_G(G/I,F,K,S)$	2, 2, 2, 2, 1,	5.2633	2.2089	[1]: 0.4610	[1]: 0.0420	[1]: 3.7176; [2]: 2.7906
$F_I(I/G,F,K,S)$	2, 2, 1, 2, 1	7.2891**	0.2337	[1]: 1.3039	[1]: 2.7211	[1]: 2.1592; [2]: 2.6231
$F_F(F/G,I,K,S)$	2, 1, 2, 2, 1	7.5948**	0.6913	[1]: 0.2314	[3]: 3.7259	[1]: 0.0528; [4]: 2.0844
$F_K(K/G,I,F,S)$	2, 2, 2, 2, 2	7.5942**	0.8016	[1]: 0.4095	[1]: 2.2558	[1]: 3.3304; [2]: 2.2611
$F_S(S/G,I,F,K)$	2, 1, 1, 1, 2,	7.9278**	0.6097	[1]: 0.8426	[1]: 1.4319	[3]: 2.1487; [4]: 2.6595
$F_G(G/E,F,K,TT)$	2, 2, 2, 2, 2	3.9256	0.3288	[1]: 1.2077	[1]: 0.4847	[1]: 4.8619; [2]: 2.7770
$F_{TT}(TT/G,F,K,S)$	2, 2, 1, 1, 1	7.6659**	1.0094	[1]: 0.0002	[4]:2.4790	[1]: 0.1357; [2]: 3.9629
$F_F(F/G,TT,K,S)$	2, 2,12, 1, 1	11.9374*	1.8106	[1]: 0.0004	[4]: 2.1818	[1]: 0.5312; [2]: 0.3133
$F_K(K/G,TT,F,S)$	2, 2, 2, 2, 2	9.3989*	2.4593	[1]: 0.2389	[1]: 0.2406	[1]: 0.2100; [2]: 0.1359
$F_S(S/G,TT,F,K)$	2, 1, 1, 2, 2	6.5064**	0.4405	[3]:2.0173	[1]: 2.5964	[1]: 1.2830; [2]: 0.8005
$F_G(G/E,F,K,T)$	2, 2, 2, 2, 2	4.3153	0.6305	[1]:2.6031	[1]: 0.3807	[1]: 4.0751; [2]: 2.3559
$F_T(T/G,F,K,S)$	2, 2, 2, 1, 1	6.0531***	0.0653	[1]: 0.0567	[1]:1.7224	[1]: 0.9185; [2]: 0.4470
$F_F(F/G,T,K,S)$	2, 2, 2, 2, 2	6.4922**	3.2816	[1]: 0.4044	[4]: 2.0245	[1]: 0.6852; [2]: 1.5412
$F_K(K/G,T,F,S)$	2, 2, 2, 2, 2	6.9103**	0.3119	[1]: 0.0155	[1]:0.0044	[1]: 0.7642; [2]: 1.7101
$F_S(S/G,T,F,K)$	2, 2, 2, 2, 1	16.4194*	1.1995	[1]: 0.3055	[1]:0.0507	[1]: 0.8843; [2]: 0.6001
Significant level	Critical values (T=41)					
	Lower bounds *I*(0)	Upper bounds *I*(1)				
1 per cent level	7.527	8.803				
5 per cent level	5.387	6.437				
10 per cent level	4.477	5.420				
Note: *, **, *** represent significance at 1, 5, 10 per cent levels respectively. Appropriate lag length of the variables is selected following AIC.						

Table-4: Gregory-Hansen Structural Break Cointegration Test

Estimated Model	$T_G(G/E,F,K,S)$	$T_G(G/I,F,K,S)$	$T_G(G/TR,F,K,S)$	$T_G(G/TT,F,K,S)$
ADF-Test	-3.7956	-4.0299	-5.3917	-3.8126
Prob. values	0.0004	0.0002	0.0000*	0.0004

Note: * shows significance at the 1per cent level. The ADF statistics show the Gregory-Hansen tests of cointegration with an endogenous break in the intercept. Critical values for the ADF test at 1per cent, 5per cent and 10per cent are -5.13, -4.61 and -4.34 respectively.

The results of ARDL bounds test may be inefficient and unreliable, once the series has structural break point. This lack of ARDL bounds test moves us to applying Gregory-Hansen (1996) structural break cointegration approach to test the robustness of cointegration relation between economic growth, trade openness, financial development, labour and capital in long run. This approach is superior to conventional Engle-Granger residual based cointegration test. The Gregory-Hansen cointegration approach has information about one structural break in the series. The empirical evidence detailed in Table-4 that there is no cointegration found in trade openness and economic growth once we used exports, imports and terms of trade as indicators of trade openness. The results indicated cointegration for long run relationship between economic growth, trade openness, financial development, capital and labour as we used trade (exports + imports) treated as indictor of trade openness after allowing break in 1995[24]. The break point in trade series is due to the implementation of trade reforms in removing trade deficit under the umbrella of structural adjustment program forced by IMF. This implies that long run results are robust.

After finding the existence of cointegration between the economic growth and trade openness, next task is to explore the long run marginal effects of trade, financial development, capital and labor on economic growth in case of Pakistan. The results documented in Table-5 show that export is positively linked to economic growth and it is statistically significant at 1 per cent

significance level. It implies that keeping other things constant, a 0.1449 economic growth is stimulated by a 1 per cent growth in exports. These findings are consistent with Shahbaz et al. (2011a) who also reported positive impact of imports on economic growth. The effect of imports on economic growth is negative and statistically significant at 10 per cent level. A 0.0830 per cent decline in economic growth is due to a rise of 1per cent in imports keeping all else same. The main reason of inverse effect of imports on economic growth is that Pakistan imports more than 50 per cent share of consumer items of total imports that creates heavy burden on trade bill and hence balance of payments and lowers economic growth in the country (Shahbaz et al. 2011b).

Table-5: Long Run Effect of Trade Openness on Economic Growth

Dependent variable = $\ln G_t$								
Variables	Exports Model		Imports Model		Terms of Trade Model		Trade Openness Model	
	Coefficients	T-values	Coefficients	T-values	Coefficients	T-values	Coefficients	T-values
Constant	4.3942*	12.888	4.355*	7.0909	4.9012*	12.588	3.9471*	10.113
$\ln E_t$	0.1449*	3.7265	….	….	….	….	….	….
$\ln I_t$	….	….	-0.0830***	-1.9824	….	….	….	….
$\ln TT_t$	….	….	….	….	0.1023*	3.1578	….	….
$\ln T_t$	….	….	….	….	….	….	0.0707**	2.1403
$\ln F_t$	0.1580*	3.1738	0.2209*	3.2863	0.1433*	3.0358	0.1744*	3.2593
$\ln K_t$	0.1921*	3.1396	0.3082*	3.1124	0.2587*	3.9787	0.1965**	2.3051
$\ln S_t$	0.2175*	7.6841	0.2735*	8.3937	0.2556*	9.9853	0.2560*	9.8734
R^2	0.9871		0.9828		0.9864		0.9836	
Adjusted R^2	0.9856		0.9807		0.9849		0.9817	
F-statistic	651.7569*		485.7094*		637.8764*		511.0765*	
Note: The 1per cent, 5per cent and 10per cent level of significance is indicated by *, ** an *** respectively.								

The impact of terms of trade on economic growth is positive. This relation is also significant at 1 per cent level of significance. This shows that a 1per cent improvement in terms of trade raises economic growth by 0.1023 by remaining other things constant. On contrary, Duasa (2011) reported that terms of trade i.e. prices of export and import of mineral fuels, lubricants and

related materials (SITC3) impedes economic growth in case of Malaysia and same findings are reported by Dufrenot et al. (2010) in case of developing economies[25].

The empirical exercise opines that trade spurs economic growth at 1 per cent level of significance. Other things remain same; 0.0707 per cent economic growth is increased by expanding 1 per cent of trade. This result is contrary with Hye (2011) who reported that a 0.145 per cent is impeded by opening the economy for trade by 1 percent and consistent with findings by Khan and Qayyum (2007).The relationship between financial development and economic growth is positive and statistically significant at 1 per cent level of significant. All else is same, a 1 per cent rise in financial development increases economic growth by 0.1433-0.2209 per cent. This implies that financial development promotes economic growth by enhancing capital formation and directing/allocating financial resources to productive ventures. Secondly, financial development mobilizes domestic resources which increases capital formation by lowering borrowing cost and stimulates economic growth. The coefficient of capital shows positive effect on economic growth. A 1 per cent increase in capitalization raises economic growth by 0.1925-0.3082 per cent. The relation between skilled labour and economic growth is positive and it is statistically significant at 1 per cent. An increase of 0.2175-0.2735 per cent economic growth is linked with a 1 per cent enhancement in skilled labour in the country.

Table-6 reveals the results of interaction between skilled labor and indicators of trade openness. The coefficient of interactions between exports and skilled labour, imports and skilled labour, terms of trade and skilled labour and, trade and skilled labour are 0.0241, 0.0286, 0.0139 and 0.0391 respectively. This shows that all integrations have positive affect on economic growth

and it is statistically significant. The results show that the interaction term between trade and skilled labour has greater impact on economic growth. This implies that Pakistan can attain fruitful effects of trade openness to sustain economic growth rate for long span of time by enhancing skilled labor in the country. For example, skilled labour helps an economy in obtaining fruits of foreign direct investment through technology diffusions and spillover effects under the umbrella of trade openness (Barro and Sala-i-Martin, 1995 and, Hermes and Lensink, 2003). This indicates that skilled labour is complementary to obtain fruitful impacts of trade openness to spur economic growth in the country.

Table-6: Results of Interaction between Trade Openness and Skilled Labour

Dependent variable = $\ln G_t$								
Variables	Exports Model		Imports Model		Terms of Trade Model		Trade Openness Model	
	Coefficients	T-values	Coefficients	T-values	Coefficients	T-values	Coefficients	T-values
Constant	5.3833*	9.3690	4.3502*	7.7047	3.8871*	6.2216	5.1451*	11.1271
$\ln E_t * \ln S_t$	0.0241*	8.8995	….	….	….	….	….	….
$\ln I_t * \ln S_t$	….	….	0.0286*	8.2133	….	….	….	….
$\ln TT_t * \ln S_t$	….	….	….	….	0.0139*	11.4146	….	….
$\ln T_t * \ln S_t$	….	….	….	….	….	….	0.0391*	6.7251
$\ln K_t$	0.2453*	2.8141	0.2084**	2.1158	0.2154*	2.9588	0.4260*	3.7960
$\ln F_t$	0.1448**	2.1973	0.2620*	3.8379	0.1722*	3.0251	0.3107*	4.0324
R^2	0.9844		0.9665		0.9797		0.9641	
Adjusted R^2	0.9830		0.9636		0.9780		0.9611	
F-statistic	737.7567*		336.5945*		565.2082*		314.0021*	
Note: The 1per cent, 5per cent and 10per cent level of significance is indicated by *, ** an *** respectively.								

Table-7 adds the results of interaction between financial development and skilled labour. The results show that all else is same, a 0.0264-0.0326 per cent economic growth is spurred by a 1 per cent joint increase in financial development and skilled labour. It is pointed out by Choong and Lim (2009) that as skilled labour is complementary with financial development to diffuse technological advancements and hence to contribute to economic growth. This implies that

human capital enhances the absorptive capacity of an economy. So, sound financial sector stimulates an economy to enhance this capacity by offering loans at cheaper cost not only to establish new ventures but also to attain higher education. This discloses that skilled labour is complementary in attaining fruitful effects of financial development to speed up economic growth. It may be documented that financial development stimulates the process of technological distribution by attracting foreign capital direct investment while skilled labour utilizes the advanced technology to raise domestic production and hence economic growth (Shahbaz and Rahman, 2010, 2012).

Table-7: Results of Interaction between Financial Development and Skilled Labour

Dependent variable = $\ln G_t$								
Variables	Exports Model		Imports Model		Terms of Trade Model		Trade Openness Model	
	Coefficients	T-values	Coefficients	T-values	Coefficients	T-values	Coefficients	T-values
Constant	5.8849*	12.879	6.4559*	12.542	6.3708*	12.867	5.4410*	12.1800
$\ln E_t$	0.1065**	2.3657	….	….	….	….	….	….
$\ln I_t$	….	….	-0.1000***	-1.9164	….	….	….	….
$\ln TT_t$	….	….	….	….	0.1168*	4.1746	….	….
$\ln T_t$	….	….	….	….	….	….	0.0669**	2.1600
$\ln F_t * \ln S_t$	0.0274*	9.3622	0.0326*	8.1668	0.0264*	10.7609	0.0283*	11.0510
$\ln K_t$	0.1967*	2.9183	0.2947*	4.1083	0.2540*	3.8391	0.2143*	3.8538
R^2	0.9821		0.9813		0.9846		0.9795	
Adjusted R^2	0.9807		0.9797		0.9834		0.9778	
F-statistic	662.0775*		630.8943*		771.6907*		559.7394*	
Note: The 1per cent, 5per cent and 10per cent level of significance is indicated by *, ** and *** respectively.								

The results of Table-8 indicate that the interaction of exports and financial development has positive effect on economic growth. A 1 percent increase in combined affect of exports and financial development is linked with 0.0130 per cent boost in economic growth. This shows that financial development enhances capital formation in the country which increases domestic output and hence exports that contributes to economic growth. The sign of interaction term of

imports and financial development is positive and statistically significant at 1 per cent level of significance.

The interaction term between terms of trade and financial development improves economic growth significantly at 1% level. A 1 per cent improvements in terms of trade with financial development stimulated economic activity and hence economic growth by 0.0148 percent keeping other agents of macroeconomy constant. Finally, the joint effect of financial development and trade openness (exports + imports) is positive and statistically significant. The results show that a 0.0064 per cent economic growth is promoted by trade openness and financial development in Pakistan.

Table-8: Results of Interaction between Financial Development and Trade Openness

Dependent variable = $\ln G_t$								
Variables	Exports Model		Imports Model		Terms of Trade Model		Trade Openness Model	
	Coefficients	T-values	Coefficients	T-values	Coefficients	T-values	Coefficients	T-values
Constant	5.3365*	12.323	4.7881*	9.9703	4.8981*	11.556	5.0401*	11.105
$\ln E_t * \ln F_t$	0.0130*	4.4343	….	….	….	….	….	….
$\ln I_t * \ln F_t$	….	….	0.0138*	3.4048	….	….	….	….
$\ln TT_t * \ln F_t$	….	….	….	….	0.0148*	3.5377	….	….
$\ln T_t * \ln F_t$	….	….	….	….	….	….	0.0064*	3.3505
$\ln S_t$	0.2656*	10.2816	0.3207*	12.134	0.2742*	9.6232	0.2997*	12.396
$\ln K_t$	0.2334*	3.5469	0.2412*	2.9557	0.3929*	6.8213	0.2390*	3.1496
R^2	0.9846		0.9749		0.9824		0.9819	
Adjusted R^2	0.9833		0.9227		0.9809		0.9804	
F-statistic	770.7149		453.5062*		670.1981		652.0732*	
Note: The 1per cent level of significance is indicated by *.								

Overall results imply that trade openness stimulates economic growth through economies of scale, efficient allocation of resources, increase in domestic capacity utilization, improved productivity due to spillover effects, further direct foreign investment, technological

advancement and innovation. All these factors create ground for competitive environment in domestic industries and thereby enhance share in international market (Din, 2004). Financial development opens opportunities for entrepreneurial talent, allows human capital formation and facilitates trade related activity by offering financial resources at cheaper cost. The enhancement of physical and human capital in the country not only adds the confidence of foreigners but also to the local investors. These together create synergy for enhanced domestic output and hence economic growth (Shahbaz, 2009).

The VECM Granger Causality Approach

The presence of cointegration for long run relationship between economic growth, trade openness, financial development, capital and labour leads us to apply VECM Granger causality approach to test the direction of casual relation between the series. The exact direction of causality between the variables helps policy making authorities to sustain economic growth attaining fruitful impacts of trade openness through sound financial developing and improving the quality of human capital. It is disclosed by Granger (1969) that the VECM Granger causality test is appropriate once variables are integrated at same level of integration.

Table-9: The VECM Granger Causality Analysis: Exports is as an indicator of Trade Openness

Dependent Variable	Direction of Causality										
	Short Run					Long Run	Joint Long-and-Short Run Causality				
	$\Delta \ln G_{t-1}$	$\Delta \ln E_{t-1}$	$\Delta \ln F_{t-1}$	$\Delta \ln K_{t-1}$	$\Delta \ln S_{t-1}$	ECT_{t-1}	$\Delta \ln G_{t-1}, ECT_{t-1}$	$\Delta \ln E_{t-1}, ECT_{t-1}$	$\Delta \ln F_{t-1}, ECT_{t-1}$	$\Delta \ln K_{t-1}, ECT_{t-1}$	$\Delta \ln S_{t-1}, ECT_{t-1}$
$\Delta \ln G_t$	....	1.5240 [0.2354]	2.4125*** [0.1080]	4.8515** [0.0155]	1.0345 [0.3686]	....	....	....	....	....	....
$\Delta \ln E_t$	1.8961 [0.1696]	....	0.8247 [0.4491]	0.7597 [0.4777]	2.0941 [0.1427]	-0.3803** [-2.3782]	4.7789* [0.0085]	....	2.5470*** [0.0769]	2.9556** [0.0502]	5.4970* [0.0044]
$\Delta \ln F_t$	1.1674 [0.3264]	0.2927 [0.7486]	....	3.4902** [0.0449]	0.3578 [0.7025]	-0.6443* [-3.9227]	5.3554* [0.0046]	5.8274* [0.0033]	....	8.2165* [0.0005]	5.3512* [0.0050]
$\Delta \ln K_t$	0.0066 [0.9934]	0.3692 [0.6947]	2.5861*** [0.0961]	....	1.5985 [0.2207]	-0.4226* [-3.1095]	3.9387** [0.0181]	7.7112** [0.0235]	5.1363* [0.0061]	....	3.8397** [0.0207]
$\Delta \ln S_t$	3.6609** [0.0329]	3.1621*** [0.0584]	0.0807 [0.9226]	1.2308 [0.3079]	....	-0.3843* [-4.1338]	5.4915* [0.0045]	5.7011* [0.0037]	5.5112* [0.0044]	5.4602* [0.0046]	....
Note: *, ** and *** show significance at 1, 5 and 10 per cent levels respectively.											

The causality analysis indicates that feedback hypothesis is validated between exports, financial development, capital and labour. The bidirectional causal relationship between exports, financial development and capital suggests that government should direct state bank of Pakistan to launch loose monetary policy to enhance capitalization in the country which not only promotes exports volume of the country but also contributes to economic growth. The feedback effect between exports and labour discloses that education is prerequisite to attain benefits of population by training the rising labour force. This will not only promote the absorptive capacity of an economy but also enhances domestic production at cheaper cost and hence exports in international market. In economic literature, Din (2004) does not agree with our findings. Din (2004) reported neutral hypothesis between exports and economic growth in case of Pakistan but Klasra (2009) found growth-led exports hypothesis in short run. The demand-side hypothesis is validated for long run because Granger causality is running from economic growth to financial development.

In short run, feedback effect is found between financial development and capital formation in the country. The unidirectional causal relation exists running from financial development and capital to economic growth. Exports and economic growth granger cause skilled labour. The supply-side hypothesis also works in case of Pakistan in short run. The joint long-and-short run causality results confirm the long run and short run causal analysis.

Table-10: The VECM Granger Causality Analysis: Imports is as an indicator of Trade Openness

Dependent Variable	Direction of Causality										
	Short Run					Long Run	Joint Long-and-Short Run Causality				
	$\Delta \ln G_{t-1}$	$\Delta \ln I_{t-1}$	$\Delta \ln F_{t-1}$	$\Delta \ln K_{t-1}$	$\Delta \ln S_{t-1}$	ECT_{t-1}	$\Delta \ln G_{t-1}, ECT_{t-1}$	$\Delta \ln I_{t-1}, ECT_{t-1}$	$\Delta \ln F_{t-1}, ECT_{t-1}$	$\Delta \ln K_{t-1}, ECT_{t-1}$	$\Delta \ln S_{t-1}, ECT_{t-1}$
$\Delta \ln G_t$	....	0.5019 [0.6107]	3.5340** [0.0482]	2.6253*** [0.015]	0.1029 [0.9025]	....	....	....	....	....	....
$\Delta \ln I_t$	2.0589 [0.1472]	....	0.0508 [0.9505]	5.6131* [0.0092]	1.5916 [0.2221]	-0.6176* [-3.6416]	5.8916* [0.0031]	....	4.6273* [0.0089]	8.3943* [0.0004]	7.2107* [0.0010]
$\Delta \ln F_t$	1.3181 [0.2843]	0.6415 [0.5343]	....	2.7486*** [0.0819]	0.1213 [0.8862]	-0.7159* [-4.2478]	6.6447* [0.0017]	6.1257* [0.0026]	....	8.9293* [0.0003]	6.6423* [0.0017]
$\Delta \ln K_t$	0.4784 [0.6249]	4.0408** [0.0209]	2.9755** [0.0461]	....	1.0834 [0.2207]	-0.4778* [-3.3360]	4.4715** [0.0113]	6.7093* [0.0016]	5.0886* [0.0064]	....	4.1711** [0.0150]
$\Delta \ln S_t$	3.1479*** [0.0590]	4.5417** [0.0199]	0.2456 [0.7839]	0.0242 [0.9761]	....	-0.2911* [-3.7128]	4.7490* [0.0087]	9.6392* [0.0002]	5.1155* [0.0062]	4.9328* [0.0074]	....
Note: *, ** and *** show significance at 1, 5 and 10 per cent levels respectively.											

The results of imports model are explained in Table-10. The findings indicated bidirectional causality between financial development and imports. This implies that financial development and imports are interdependent. The rest causal relation between financial

development, capital and labour are same as discussed above in Table-9. The causality runs from economic growth to imports validating growth-led imports hypothesis and is contradictory with view of Din (2004) in case of Pakistan. Din (2004) found causal relation between both the variables. In short run, neutral hypothesis exists between imports and economic growth. These findings are consistent with existing literature such as Din (2004) in case of Pakistan. Like economic growth, imports also granger causes the labor to improve their skills.

Table-11 explains the causal analysis of terms of trade model. The findings are same except that economic growth does Granger cause trade (terms of trade) in long run as well as in short run. The Rest of the findings are same for short run except terms of trade (trade) Granger causes skilled labour.

Table-11: The VECM Granger Causality Analysis: Terms of Trade is as an indicator of Trade Openness

Dependent Variable	Direction of Causality										
	Short Run					Long Run	Joint Long-and-Short Run Causality				
	$\Delta \ln G_{t-1}$	$\Delta \ln TT_{t-1}$	$\Delta \ln F_{t-1}$	$\Delta \ln K_{t-1}$	$\Delta \ln S_{t-1}$	ECT_{t-1}	$\Delta \ln G_{t-1}, ECT_{t-1}$	$\Delta \ln TT_{t-1}, ECT_{t-1}$	$\Delta \ln F_{t-1}, ECT_{t-1}$	$\Delta \ln K_{t-1}, ECT_{t-1}$	$\Delta \ln S_{t-1}, ECT_{t-1}$
$\Delta \ln G_t$	....	1.6884 [0.2038]	2.6946*** [0.0851]	4.9295* [0.0146]	0.2062 [0.8148]	....	....	....	....	....	....
$\Delta \ln TT_t$	5.1377** [0.0129]	….	0.3478 [0.7093]	0.7396 [0.0092]	2.1423 [0.1369]	-0.6692* [-3.6416]	12.7952* [0.0000]	….	6.8071* [0.0015]	9.6443* [0.0002]	8.6263* [0.0004]
$\Delta \ln F_t$	0.8112 [0.4463]	0.0220 [0.9782]	....	2.9604*** [0.0668]	0.2046 [0.8162]	-0.6144* [-5.0443]	8.5599* [0.0004]	9.0323* [0.0000]	....	12.3711* [0.0000]	8.9211* [0.0003]
$\Delta \ln K_t$	0.2921 [0.7490]	1.4104 [0.2615]	2.9755** [0.0461]	....	2.8717*** [0.0740]	-0.4934* [-4.0888]	8.9306* [0.0003]	6.2145* [0.0024]	5.0886* [0.0064]	....	8.1155* [0.0005]
$\Delta \ln S_t$	2.6358*** [0.0900]	0.2794* [0.7583]	0.3624 [0.6993]	0.7674 [0.4741]	....	-0.3533* [-3.4129]	5.4945* [0.0044]	6.4170* [0.0020]	6.7686* [0.0015]	5.5783* [0.0041]	....
Note: *, ** and *** show significance at 1, 5 and 10 per cent levels respectively.											

Table-12: The VECM Granger Causality Analysis: Trade is as an indicator of Trade Openness

Dependent Variable	Direction of Causality											
	Short Run					Long Run	Joint Long-and-Short Run Causality					
	$\Delta \ln G_{t-1}$	$\Delta \ln T_{t-1}$	$\Delta \ln F_{t-1}$	$\Delta \ln K_{t-1}$	$\Delta \ln S_{t-1}$	ECT_{t-1}	$\Delta \ln G_{t-1}, ECT_{t-1}$	$\Delta \ln T_{t-1}, ECT_{t-1}$	$\Delta \ln F_{t-1}, ECT_{t-1}$	$\Delta \ln K_{t-1}, ECT_{t-1}$	$\Delta \ln S_{t-1}, ECT_{t-1}$	
$\Delta \ln G_t$	....	0.6110 [0.5499]	2.8700*** [0.0735]	2.6401*** [0.0890]	1.4789 [0.2451]	....	....	....	....	....	....	
$\Delta \ln T_t$	0.9105 [0.4143]	....	0.5223 [0.5990]	3.9172** [0.0321]	2.7697*** [0.0805]	-0.3472** [-2.2814]	2.4739*** [0.0830]	....	2.7336*** [0.0632]	6.9204* [0.0013]	6.5178* [0.0018]	
$\Delta \ln F_t$	0.9074 [0.4155]	0.5178 [0.6018]	....	2.7921*** [0.0790]	0.2967 [0.7456]	-0.7143* [-6.0088]	12.3531* [0.0000]	6.2071* [0.0024]	....	7.5048* [0.0008]	5.8534* [0.0032]	
$\Delta \ln K_t$	0.0678 [0.9345]	1.9445 [0.1557]	0.8897 [0.4224]	....	3.6152** [0.0306]	-0.3743* [-2.9837]	3.1770** [0.0401]	9.6224* [0.0002]	4.1821** [0.0149]	....	5.2639* [0.0054]	
$\Delta \ln S_t$	3.1857*** [0.0573]	6.3858* [0.0054]	0.0959 [0.9088]	0.3671 [0.7031]	....	-0.3125* [-4.4752]	7.1977* [0.0011]	9.9795* [0.0001]	7.4312* [0.0009]	6.9863* [0.0013]	....	
Note: *, ** and *** show significance at 1, 5 and 10 per cent levels respectively.												

Finally, in trade (exports + imports) model, feedback effect exists between financial development and trade, trade and capital, skilled labor and trade, financial development and capital, capital and skilled labour, financial development and skilled labour in long run. This implies the interdependence of financial development, trade, capital and skilled labour. The trade openness is being Granger caused by economic growth suggesting the presence of growth-led trade hypothesis in case of Pakistan. In case of Pakistan, Shaheen et al. (2011) found trade-led growth hypothesis which is contradictory with our findings. They also documented unidirectional causality running from financial development to international trade but we found bidirectional causality between both variables. Additionally, Klasra (2011) also found feedback hypothesis between trade openness and economic growth in short run.

Variance Decomposition Method (VDM)

It is argued in economic literature that the Granger causality approaches such as VECM Granger causality test has some limitations. The causality test cannot capture the relative strength of causal relation between the variables beyond the selected time period. This weakens the reliability of causality results by VECM Granger approach. We have implemented the generalized forecast error variance decomposition method using vector autoregressive (VAR) system to test the strength of causal relationship between trade openness, financial development, capital and labor in case of Pakistan. The variance decomposition approach indicates the magnitude of the predicted error variance for a series accounted for by innovations from each of the independent variable over different time-horizons beyond the selected time period. It is pointed by Pesaran and Shin (1998) that the generalized forecast error variance decomposition method shows proportional contribution in one variable due to innovative stemming in other variables. The main advantage of this approach is that like orthogonalized forecast error variance decomposition approach; it is insensitive with ordering of the variables because ordering of the variables is uniquely determined by VAR system. Further, the generalized forecast error variance decomposition approach estimates the simultaneous shock affects. Engle and Granger (1987) and Ibrahim (2005) argued that with VAR framework, variance decomposition approach produces better results as compared to other traditional approaches.

The results of variance decomposition approach start from Table-13 treating exports as an indicator of trade openness. The results consider that a 66.88 per cent portion of economic growth is explained by its own innovative shocks while innovative shocks of exports contribute to economic growth by 18.62 per cent. The role of financial development, capital and skilled

labour is less important. These variables by their shocks contribute to economic growth by 6.48 per cent, 5.11 per cent and 2.62 per cent respectively. The contribution of economic growth to exports is 32.14 per cent and 38.51 per cent portion of exports is being explained by its own shocks. It implies that growth-led hypothesis exists and validates that our findings of VECM Granger causality analysis are robust. Financial development, capital and skilled labour explain exports by 13.51 per cent, 8.51 per cent and 6.94 per cent respectively.

Table-13: Variance Decomposition Approach (VDA): Exports Model

Variance Decomposition of $\ln G_t$						
Period	S.E.	$\ln G_t$	$\ln EX_t$	$\ln FD_t$	$\ln K_t$	$\ln S_t$
1	0.0184	100.0000	0.0000	0.0000	0.0000	0.0000
3	0.0344	90.8494	0.1567	2.9405	4.0620	1.9912
5	0.0477	83.5681	2.3836	2.7793	6.7396	4.5292
7	0.0575	75.4813	8.4387	3.1569	8.4697	4.4531
9	0.0658	67.6492	15.9783	6.0207	6.8525	3.4990
11	0.0724	65.3261	18.7799	7.0911	5.6785	3.1241
13	0.0767	66.1181	18.7902	7.0666	5.1850	2.8392
14	0.0785	66.5893	18.6248	6.9489	5.1185	2.7178
15	0.0800	66.8886	18.5171	6.8498	5.1190	2.6252
Variance Decomposition of $\ln EX_t$						
Period	S.E.	$\ln G_t$	$\ln EX_t$	$\ln FD_t$	$\ln K_t$	$\ln S_t$
1	0.1060	17.8736	82.1263	0.0000	0.0000	0.0000
3	0.1435	23.2055	53.2358	10.559	4.4712	8.5279
5	0.1640	23.4487	42.5161	11.2201	12.9871	9.8279
7	0.1813	22.1636	42.7082	15.6547	10.7588	8.7145
9	0.1947	26.0826	41.5137	15.1137	9.3468	7.9429
11	0.2007	28.9909	40.0682	14.5683	8.8612	7.5111
13	0.2051	30.9222	39.1089	14.0908	8.6823	7.1955
14	0.2071	31.5857	38.7812	13.9522	8.6140	7.0666
15	0.2090	32.1486	38.5156	13.8755	8.5176	6.9426
Variance Decomposition of $\ln FD_t$						
Period	S.E.	$\ln G_t$	$\ln EX_t$	$\ln FD_t$	$\ln K_t$	$\ln S_t$
1	0.0835	9.8273	1.9783	88.1942	0.0000	0.0000
3	0.1343	33.7371	2.0331	58.4215	2.4377	3.3703
5	0.1646	34.9438	1.5115	45.0869	13.0597	5.3979
7	0.1763	30.6856	8.8803	42.2412	12.4412	5.7516
9	0.1909	27.4622	14.2326	39.3740	11.8817	7.0492
11	0.1952	29.0009	13.8718	37.9447	11.6197	7.5628

13	0.1977	30.0118	13.6909	37.1713	11.6495	7.4761
14	0.1986	30.1266	13.5711	36.8704	11.8549	7.5767
15	0.1992	30.1681	13.5675	36.6520	11.9584	7.6538
Variance Decomposition of $\ln K_t$						
Period	S.E.	$\ln G_t$	$\ln EX_t$	$\ln FD_t$	$\ln K_t$	$\ln S_t$
1	0.0538	3.3835	5.9009	16.8539	73.8615	0.0000
3	0.0899	40.5497	2.3651	9.5272	43.7524	3.8053
5	0.1043	46.3686	2.4708	9.9289	36.3960	4.8354
7	0.1122	43.3602	5.2026	11.0823	32.1931	8.1616
9	0.1188	41.2965	11.259	11.0728	28.9832	7.3881
11	0.1236	38.8448	14.8175	12.1290	27.0771	7.1313
13	0.1258	38.4571	15.5107	12.1245	26.4148	7.4927
14	0.1261	38.6340	15.4601	12.0720	26.2962	7.5375
15	0.1262	38.78423	15.4209	12.0413	26.2304	7.5229
Variance Decomposition of $\ln S_t$						
Period	S.E.	$\ln G_t$	$\ln EX_t$	$\ln FD_t$	$\ln K_t$	$\ln S_t$
1	0.0438	4.0903	13.7831	0.0427	0.4754	81.6083
3	0.0526	6.7817	14.7266	2.3389	1.2365	74.9161
5	0.0697	24.5192	23.0077	3.8281	4.7236	43.9212
7	0.0893	37.2698	17.1455	3.4718	12.0421	30.0698
9	0.1052	43.4794	13.6727	2.9291	15.1079	24.8106
11	0.1213	46.7158	16.4507	4.5173	13.1392	19.1767
13	0.1368	49.5016	18.8304	5.8180	10.7607	15.0890
14	0.1434	51.0282	19.2305	6.0715	9.9352	13.7343
15	0.1493	52.5117	19.3265	6.1503	9.3335	12.6778

The variance decomposition of financial development reveals that economic growth significantly attributes to financial development by 30.16 through its innovative shocks and confirms that demand-side hypothesis exists. The relationship between exports and financial development is neutral. This shows that both variables are not interdependent on each other. A 11.95 per cent (7.65 per cent) of financial development is attributed by capital (skilled labour). Economic growth and exports explain 38.78 and 15.42 per cent portion of capital by their innovations. The contribution of financial development to capital is 12.04 per cent. The share of skilled labour to capital is minimal i.e. 7.522 per cent and a 26.23 per cent portion of capital contributed by its innovative shocks. The results reveal that rise in income level boost skilled labour as economic

growth contributes to skilled labour by 52.51 per cent and share of capital is 9.33 per cent. Financial development powers labour negligibly by its innovative shocks and innovative shocks of exports stimulates labour by 19.32 per cent, a second higher impact after economic growth.

In imports model (Table-14), the contribution of financial development, capital and labour is ignorable like exports model discussed above. The innovative shock of economic growth explains itself by 67.63 per cent while a 10.81 per cent portion of economic growth is attributed to imports. The hypothesis of growth-led-imports is validated by 18.22 per cent contribution of economic growth to imports. The innovations in financial development, capital and labour explain the variations in imports by 12.65, 11.68 and 10.68 per cent respectively. The innovative shocks stemming in imports explain financial development, capital and labour by 19.58, 16.59 and 8.41 per cent respectively.

Table-14: Variance Decomposition Approach (VDA): Imports Model

Variance Decomposition of $\ln G_t$						
Period	S.E.	$\ln G_t$	$\ln IM_t$	$\ln FD_t$	$\ln K_t$	$\ln SE_t$
1	0.0190	100.0000	0.0000	0.0000	0.0000	0.0000
3	0.0370	90.4082	0.4275	1.2410	4.3152	3.6079
5	0.0551	84.6282	1.3142	2.0509	2.2921	9.7143
7	0.0688	77.0795	4.8861	2.6415	1.8825	13.5103
9	0.0777	71.3906	8.1591	3.1438	2.4921	14.8141
11	0.0835	68.5701	9.8935	3.4474	3.0981	14.9907
13	0.0879	67.6352	10.590	3.5616	3.2443	14.9684
14	0.0901	67.3851	10.7322	3.6067	3.2562	15.0195
15	0.0922	67.1542	10.8165	3.6538	3.2621	15.1132
Variance Decomposition of $\ln IM_t$						
Period	S.E.	$\ln G_t$	$\ln IM_t$	$\ln FD_t$	$\ln K_t$	$\ln SE_t$
1	0.1008	1.8387	98.1612	0.0000	0.0000	0.0000
3	0.1411	23.0147	66.1156	3.1249	0.0463	7.6983
5	0.1506	22.1964	58.8136	7.7142	3.9057	7.3698
7	0.1637	19.6369	53.8471	12.1749	5.4459	8.8950
9	0.1714	18.9321	49.7019	12.6633	10.063	8.6393
11	0.1761	18.7087	47.9887	12.3264	10.7217	10.2543

13	0.1780	18.3529	47.0746	12.4822	11.7518	10.3384
14	0.1787	18.2291	46.8291	12.6797	11.6532	10.6087
15	0.1790	18.2232	46.7480	12.6594	11.6801	10.6891
Variance Decomposition of $\ln FD_t$						
Period	S.E.	$\ln G_t$	$\ln IM_t$	$\ln FD_t$	$\ln K_t$	$\ln SE_t$
1	0.0776	5.6535	11.1226	83.2237	0.0000	0.0000
3	0.1291	29.0627	8.11079	58.5655	2.3735	1.8873
5	0.1701	36.8534	15.4880	33.8752	4.4029	9.3802
7	0.1958	27.8855	20.2909	26.0536	9.9859	15.7838
9	0.2031	26.4624	20.1165	25.3231	13.1498	14.9479
11	0.2044	26.5723	19.8997	25.6370	13.0183	14.8725
13	0.2073	27.4736	19.7835	25.0271	12.6776	15.0381
14	0.2090	27.7599	19.7607	24.6210	12.4938	15.3644
15	0.2108	27.8496	19.5856	24.4073	12.5469	15.6103
Variance Decomposition of $\ln K_t$						
Period	S.E.	$\ln G_t$	$\ln IM_t$	$\ln FD_t$	$\ln K_t$	$\ln SE_t$
1	0.0497	2.6562	39.7976	0.2886	57.2573	0.0000
3	0.0817	33.6378	19.6108	1.0274	40.8468	4.8768
5	0.1038	44.3204	12.8821	1.9627	33.4639	7.3706
7	0.1226	38.5338	12.9933	2.0743	27.3035	19.0949
9	0.1352	36.0949	13.2781	4.7597	27.3279	18.5392
11	0.1394	34.6146	14.4580	6.1285	26.8243	17.9743
13	0.1420	33.4867	16.1780	5.9372	26.3780	18.0199
14	0.1428	33.1125	16.5750	5.8708	26.3823	18.0591
15	0.1434	32.8410	16.5933	5.9243	26.6098	18.0313
Variance Decomposition of $\ln S_t$						
Period	S.E.	$\ln G_t$	$\ln IM_t$	$\ln FD_t$	$\ln K_t$	$\ln SE_t$
1	0.0397	0.5761	0.8658	2.3701	1.1557	95.0320
3	0.0772	2.3825	8.2902	10.3455	30.9568	48.0247
5	0.1050	10.6312	9.2878	14.8070	37.5048	27.7690
7	0.1247	28.6934	10.7844	10.699	30.0391	19.7834
9	0.1484	45.6465	8.0970	7.7487	23.8135	14.6940
11	0.1652	51.8681	7.4178	6.3497	19.7832	14.5808
13	0.1778	54.1833	8.2280	5.5660	17.1126	14.9098
14	0.1826	55.0146	8.4155	5.4502	16.3140	14.8055
15	0.1869	55.9329	8.4151	5.4219	15.6451	14.5847

Table-15: Variance Decomposition Approach (VDA): Terms of Trade Model

Variance Decomposition of $\ln G_t$						
Period	S.E.	$\ln G_t$	$\ln TT_t$	$\ln FD_t$	$\ln K_t$	$\ln S_t$
1	0.0187	100.0000	0.0000	0.0000	0.0000	0.0000
3	0.0323	78.4294	1.1018	1.7609	10.428	8.2790
5	0.0461	59.1935	4.6096	3.0892	9.7450	23.3625
7	0.0614	48.7353	8.4531	2.0248	16.0702	24.7163
9	0.0697	46.0111	11.7061	1.9600	19.1435	21.1791
11	0.0746	45.6768	15.2027	1.7744	18.7333	18.6125
13	0.0775	46.2824	15.7202	2.0426	18.3751	17.5794
14	0.0784	46.9626	15.3639	2.1130	18.3051	17.2551
15	0.0794	47.1100	15.0592	2.0586	18.3775	17.3945
Variance Decomposition of $\ln TT_t$						
Period	S.E.	$\ln G_t$	$\ln TT_t$	$\ln FD_t$	$\ln K_t$	$\ln S_t$
1	0.1330	10.2592	89.7407	0.0000	0.0000	0.0000
3	0.1578	8.1699	67.7835	1.0214	3.0754	19.9495
5	0.1835	11.7126	54.9771	2.4547	10.7417	20.1136
7	0.2041	11.6664	55.0523	6.7924	9.9630	16.5257
9	0.2268	20.7270	50.1423	5.7649	9.8319	13.5336
11	0.2369	22.5835	47.1865	5.3919	10.0208	14.8171
13	0.2569	20.8084	40.7812	6.8442	11.9752	19.5908
14	0.2619	20.0183	39.7661	7.2523	13.9406	19.0224
15	0.2651	19.7765	40.3259	7.0826	13.8770	18.9378
Variance Decomposition of $\ln FD_t$						
Period	S.E.	$\ln G_t$	$\ln TT_t$	$\ln FD_t$	$\ln K_t$	$\ln S_t$
1	0.0630	0.9948	4.9338	94.0713	0.0000	0.0000
3	0.1075	5.2975	5.3435	59.4679	6.5398	23.3511
5	0.1519	11.5018	3.5294	30.9943	11.5665	42.4077
7	0.1759	10.2658	5.2585	30.7215	16.4386	37.3153
9	0.1905	9.5285	10.5233	27.4981	15.6161	36.8338
11	0.2147	7.5692	12.4422	26.6171	14.2330	39.1383
13	0.2232	9.5487	12.9797	26.5079	13.8608	37.1026
14	0.2331	9.4175	15.7606	24.4394	13.3378	37.0445
15	0.2465	8.4885	17.3447	22.9886	13.1235	38.0545
Variance Decomposition of $\ln K_t$						
Period	S.E.	$\ln G_t$	$\ln TT_t$	$\ln FD_t$	$\ln K_t$	$\ln S_t$
1	0.0468	0.1893	2.5476	7.8529	89.4100	0.0000
3	0.0851	49.8705	3.7005	9.7015	36.5406	0.1867
5	0.1068	47.0372	4.6443	9.0604	36.6257	2.6322
7	0.1204	39.3099	5.7272	8.0842	29.4525	17.4260
9	0.1401	32.8072	12.0688	7.0071	32.2519	15.8648

11	0.1431	31.5861	13.9299	6.9658	32.1825	15.3354
13	0.1467	31.7980	14.7873	6.7301	31.2764	15.4079
14	0.1481	31.4761	14.4993	6.6186	31.4753	15.9305
15	0.1487	31.2212	15.1278	6.5799	31.2312	15.8397
Variance Decomposition of $\ln S_t$						
Period	S.E.	$\ln G_t$	$\ln TT_t$	$\ln FD_t$	$\ln K_t$	$\ln S_t$
1	0.0514	2.0427	0.8260	2.7819	2.4091	91.9401
3	0.0722	1.3331	8.2974	3.3042	2.9287	84.1363
5	0.0859	6.0747	19.6697	8.8559	5.5465	59.8529
7	0.0989	9.0093	15.3224	7.9194	8.9767	58.7719
9	0.1196	14.1751	11.1855	5.6936	12.4775	56.4680
11	0.1357	17.6767	17.2231	4.4887	13.9744	46.6369
13	0.1519	22.6614	22.3694	3.9739	13.4599	37.5352
14	0.1569	25.4481	22.1385	4.3994	12.8118	35.2021
15	0.1611	28.1515	21.2849	4.5201	12.4975	33.5457

Table-16: Variance Decomposition Approach (VDA): Trade Openness Model

Variance Decomposition of $\ln G_t$						
Period	S.E.	$\ln G_t$	$\ln TR_t$	$\ln FD_t$	$\ln K_t$	$\ln S_t$
1	0.0188	100.0000	0.0000	0.0000	0.0000	0.0000
3	0.0306	82.9785	1.7343	3.6769	8.7873	2.8227
5	0.0434	74.8588	2.1162	7.6521	4.9182	10.4544
7	0.0548	69.6378	9.0596	6.5440	3.2481	11.5102
9	0.0635	55.8668	16.8258	11.7421	3.4692	12.0959
11	0.0713	44.4184	17.1549	21.1034	6.6226	10.7004
13	0.0741	41.0713	16.5959	25.2775	7.0071	10.0481
14	0.0746	40.5784	16.6584	25.7248	6.9387	10.0994
15	0.0751	40.4565	16.9145	25.5780	6.8729	10.1779
Variance Decomposition of $\ln TR_t$						
Period	S.E.	$\ln G_t$	$\ln TR_t$	$\ln FD_t$	$\ln K_t$	$\ln S_t$
1	0.1533	4.4676	95.5323	0.0000	0.0000	0.0000
3	0.2411	35.8848	47.1091	5.9050	10.8291	0.2718
5	0.2721	37.3400	38.2708	6.6816	13.0261	4.6812
7	0.3022	40.7843	36.6923	6.5725	10.5786	5.3720
9	0.3288	35.4241	32.2722	16.7629	10.7867	4.7539
11	0.3465	33.2421	29.1276	21.6482	11.5195	4.4625
13	0.3529	33.2377	28.4460	21.6304	12.2917	4.3940
14	0.3565	32.9673	28.8723	21.4794	12.1759	4.5049
15	0.3594	32.5446	29.4755	21.1291	12.3101	4.5405
Variance Decomposition of $\ln FD_t$						
Period	S.E.	$\ln G_t$	$\ln TR_t$	$\ln FD_t$	$\ln K_t$	$\ln S_t$

1	0.0683	1.6115	3.9532	94.4352	0.0000	0.0000
3	0.1134	2.2965	6.4880	77.4756	6.6034	7.1363
5	0.1482	25.2909	7.9820	47.1982	8.8369	10.691
7	0.1809	21.8608	27.3038	33.1181	7.9027	9.8144
9	0.2133	19.7806	22.9991	34.8469	15.1227	7.2504
11	0.2342	21.8902	20.8958	36.8160	13.7811	6.6168
13	0.2391	21.9319	20.8555	36.7296	14.0363	6.4464
14	0.2471	22.9046	19.7895	37.2429	13.9083	6.1545
15	0.2535	23.7182	19.8371	37.0818	13.4732	5.8895
Variance Decomposition of $\ln K_t$						
Period	S.E.	$\ln G_t$	$\ln TR_t$	$\ln FD_t$	$\ln K_t$	$\ln S_t$
1	0.0483	0.0139	21.5977	17.7228	60.6655	0.0000
3	0.0665	20.6048	15.3550	14.183	44.3517	5.5047
5	0.0885	22.7783	10.7743	9.1306	46.0675	11.2492
7	0.1092	31.9253	13.4604	6.0894	31.4443	17.0804
9	0.1229	27.5833	18.8848	11.7672	27.5779	14.1865
11	0.1415	26.2404	15.1080	23.3335	24.2496	11.0684
13	0.1453	26.0314	14.5244	24.3978	24.3831	10.6631
14	0.1457	25.8965	14.7866	24.3950	24.3125	10.6092
15	0.1461	25.7678	15.1908	24.3349	24.1635	10.5428
Variance Decomposition of $\ln S_t$						
Period	S.E.	$\ln G_t$	$\ln TR_t$	$\ln FD_t$	$\ln K_t$	$\ln S_t$
1	0.0382	0.9905	18.6067	0.6251	0.0117	79.7657
3	0.0536	5.8118	23.4527	8.4471	14.3480	47.9401
5	0.0970	34.2308	15.5150	15.7665	19.8439	14.6435
7	0.1195	48.0212	10.7881	12.1083	18.9789	10.1032
9	0.1364	56.5433	8.6448	9.3313	16.0309	9.4494
11	0.1495	57.7683	8.8733	9.11276	14.1739	10.0715
13	0.1599	54.0867	10.5315	11.7111	12.6539	11.0166
14	0.1641	52.3873	11.4754	12.8547	12.2456	11.0368
15	0.1672	51.0253	12.2124	13.9432	11.9033	10.9156

Table-15 reports the results of terms of trade model, it is documented on basis of empirical exercise that improvements in terms of trade shows its contribution to economic growth by 15.05 per cent and innovations stemming in economic growth explain terms of trade by 19.77 per cent. The terms of trade affect financial development by 17.34 per cent, capital by 31.23 per cent and labor by 21.28 per cent separately. Finally, Table-16 reports the results of trade model and indicate that contribution of financial development and trade is larger as compared to capital and

labor. A 25.57 (16.91)per cent share of economic growth is attributed by financial development (trade) and innovations stemming in economic growth explain itself by 40.45 per cent. The shocks in economic growth confirm the growth-led-trade effect by contributing trade by 32.54 per cent. Financial development promotes trade openness by 21.12 per cent. The contribution of trade to financial development, capital and labor is 19.83, 15.19 and 12.21 per cent respectively.

Overall results of VDM regarding growth-led-exports, growth-led-imports, growth-led-terms of trade, and growth-led-trade validate that results of VECM granger causality are robust and reliable. The contribution of financial development, capital and labor is sensitive with the use of indicator of trade openness and same is the case with other variables.

VI. Conclusion and Policy Implications

Trade openness promotes economic growth through various channels e.g., achieving efficiency in the allocation of resources due to export oriented policies; attracting foreign direct investment; providing access to advanced technology to enhance domestic production; creating economic and financial integration; enhancing total factor productivity, to name a few. In line with the theoretical arguments, the present study examines whether trade openness promotes or impedes economic growth in the long run. Using Cobb-Douglas production function framework of Mankiw (1992) the paper includes financial development and four indicators of trade openness [exports, imports, terms of trade and trade (exports + imports)]. To the knowledge of the author, this is the only study to use this specification to derive meaningful results, thereby contributes to the literature.

Using four different specifications we find long run relationship between trade openness, financial development, capital, labour and economic growth. The results suggest that exports, imports, terms of trade and trade have positive impact on economic growth. These findings are consistent with Khan and Qayyum (2007) and Chaudhary et al. (2010) in case of Pakistan and lends support the view of Romer (1990), Edwards (1989); Villanueva (1994); Edward (1992); Wacziarg and Welch, (2003) and Yanikkaya (2003).However the finding contrasts with that of Hye (2011) who find that trade openness impedes economic growth.

The findings suggest that economic growth gets boost from capital formation, labor, financial development, and trade openness which help sustained economic growth in the long run. Although trade openness in Pakistan has positive impact on economic growth in the long run, it is not necessarily the desirable outcome. Batra (1992), Batra and Slottje (1993), Leamer (1995) and Vamvakidis (2002) argue that that proper implementation of economic and trade policies enables an economy neutralize external shocks and the benefit from trade openness. For trade to have meaningful effect on economic growth, Pakistan should focus more on financial development. The latter not only contributes to economic growth through capital formation but also promotes trade activity by making financial resources available at lower cost; attracting foreign direct investment as well as facilitating development of advanced technology.

Grossman and Helpman (1991), Young (1991) and Rivera-Batiz (1995) highlight the role of human capital in economic development. Trade openness promotes economic growth through spillover effects and diffusion of advanced technology brought from the developed world. Our findings confirm positive and strong complementarity between trade openness and labour as well

as financial development and labour in accelerating economic growth in the long run. This shows that human capital plays a vital role in financial development and economic growth. The magnitude of economic growth due to trade openness and financial development depends upon the availability of human capital in the country especially skilled ones. The government should focus on developing human capital, financial sector and trade expansion through appropriate economic and trade policies for sustained long run economic growth. Other regional partners such as India, Bangladesh and Nepal have increased their spending on education to promote skilled human capital; Pakistan's share is at dismal 2.1% of GDP. The government should invest in agriculture, manufacturing and in energy sector. Energy sector is an important component of economic growth.

Footnotes

1. For example see, Sinha and Sinha, 1996; Liu et al. 1997; Bahmani-Oskooee and Niroomand, 1999; Sinha and Sinha, 1999; Yanikkaya, 2003; Wang et al. 2004 and Tsen, 2006
2. See for more details, Xu, 1998; Proudman et al. 1998; Balaguer and Cantavella-Jorda, 2002 and Yanikkaya, 2003
3. See for more details DRI-McGraw Hill, (1997)
4. For more details about reforms extent, see Box-3 (Baig, 2009, p.15).
5. The improvements in terms of trade increased the unit value of exports index and lower the unit value of imports index. The growth unit values of exports index (imports index) is 23.5% (16.8%). The unit value of exports index is stimulated by manufacturing indices increased by 55%.
6. Pakistan has paid high cost of war on terrorism. A rise in terrorists' activities has shattered trust of both local and foreign investors and reduced public and private investment as well as

foreign direct investment in the country. This also declined exports' volume due to decline in overall economic activity which also reduced the demand for import items (GoP, 2011).

7. Dollar and Kraay (2004) noted that lack of instruments in a regressions restrict to separate the effect of trade openness on economic growth.
8. Bangladesh, China, India, Indonesia, Korean Republic, Malaysia, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, and Thailand.
9. Indonesia, Malaysia, the Philippines, and Thailand.
10. Shahbaz and Rahman (2010) found positive effect of foreign capital inflows, financial development, investment and inflation on economic growth in case of Pakistan.
11. He used principle component approach to generate an index of trade openness consisting on exports as share, imports as share of GDP and trade (exports + imports) as share of GDP.
12. These findings are inconsistent and unreliable and are helpful for policy makers that how can we make trade openness beneficial for economic growth. The main reason is that there is structural break in time series data such trade openness as Pakistan implemented financial reforms in 1990s and trade liberalization in 1995. So following these information, Hye (2011) should use structural break unit root and cointegration approaches to test whether structural break has significant effect on economy or not. Further, study ignored the important role financial development and its impact on trade and economic growth through capital-enhancing effect.
13. The savings rate, population growth rate and rate of technical progress are assumed to be exogenous in Solow's growth model while Locus growth model focuses mainly on human capital.
14. We have used secondary enrollment as a proxy for skilled labor.
15. Goldsmith, 1969; King and Levine, 1993; Rajan and Zingales, 1998; Wurgler, 2000; Goodhart, 2004

16. We have used four indicators of trade openness such real exports per capita, real imports per capita, terms of trade and real trade per capita (exports + imports).
17. The ARDL approach to cointegration is applicable if variables are integrated at I(1) or I(0) or I(1) / I(0).
18. Pesaran et al. (2001) have computed two asymptotic critical values - one when the variables are assumed to be *I(0)* and the other when the variables are assumed to be *I(1).*
19. In such case, error correction method is appropriate method to investigate the cointegration (Bannerjee et al. 1998). This indicates that error correction term will be a useful way of establishing cointegration between the variables.
20. If cointegration is not detected, the causality test is performed without an error correction term (*ECT*).
21. Awokuse, 2008 used both exports and imports as indicators of trade openness
22. See for more details Frankel and Romer, (1999); Barro, (2003); Rao and Rao, (2010); Skayi, (2011) and many more.
23. The main advantage of Clemente-Montanes-Reyes (1998) unit root test is that it has information about two possible structural break points in the series by offering two models i.e. an additive outliers (AO) model informs about a sudden change in the mean of a series and an innovational outliers (IO) model indicates about the gradual shift in the mean of the series. The additive outlier model is more suitable for the variables having sudden structural changes as compared to gradual shifts.
24. The results of FMOLS regression are available from authors upon request.
25. They did not include Pakistan in their analysis.

Reference

1. Adhikary, B. K. (2011), 'FDI, Trade Openness, Capital Formation, and Economic Growth in Bangladesh: A Linkage Analysis', *International Journal of Business and Management*, 6, 17-28.
2. Alcalà, F. and A. Ciccone, (2004), 'Trade and Productivity', *Quarterly Journal of Economics*, 119, 612-645.
3. Almeida, R. and A. Fernandes, (2008), 'Openness and Technological Innovations in Developing Countries: Evidence from Firm-level Surveys', *Journal of Development Studies*, 44, 701-727.
4. Awokuse, T. O. (2008), 'Trade Openness and Economic Growth: Is Growth Export-led or Import-led?*Applied Economics*, 40, 161-173.
5. Bahmani-Oskooee, M. and F. Niroomand, (1999), 'Openness and Economic Growth: An Empirical Investigation', *Applied Economics Letters*, 6, 557-561.
6. Baig, M. Q. (2009), 'Pakistan's Trade Policy, 1999–2008: An Assessment', PIDE Working Papers, no-55, Pakistan Institute of Development Economics, Islamabad, Pakistan.
7. Balaguer, J. and M. Cantavella-Jorda, (2002), 'Tourism as a Long-run Economic Growth Factor: The Spanish Case', *Applied Economics*, 34, 877-888.
8. Balassa, B. (1971), 'The Structure of Protection in Developing Countries', Johns Hopkins University Press, Baltimore.
9. Bannerjee, A., J. Dolado and R. Mestre, (1998), 'Error-correction Mechanism Tests for Cointegration in Single Equation Framework', *Journal of Time Series Analysis,* 19, 267-283.
10. Barro, R. (2003), 'Determinants of Economic Growth in a Panel of Countries', *Annals of Economics and Finance*, 4, 231-274.
11. Barro, R. J. and X. Sala-i-Martin, (1995), 'Technological Diffusion, Convergence and Growth," CEPR Discussion Papers 1255, C.E.P.R. Discussion Papers.
12. Barro, R. J. and X. Sala-i-Martin, (1997), 'Technological Diffusion, Convergence and Growth', *Journal of Economic Growth*, 2, 1-26.
13. Batra, R. (1992), 'The fallacy of free trade', Review of International Economics, 1, 19-31.
14. Batra, R. and D. J. Slottje, (1993), 'Trade policy and poverty in the United States: theory and evidence, 1947–1990,' *Review of International Economics*, 1, 189-208.
15. Bhagwati, J. N. (1978), 'Foreign Trade Regimes and Economic Development: Anatomy and Consequences of Exchange Control Regimes', (Cambridge, MA: Ballinger).
16. Bond, E.W., Jones, R. W. and W. Ping, (2005), 'Economic Takeoffs in a Dynamic Process of Globalization', *Review of International Economics*, 13, 1-19.
17. Brown, R.L., Durbin, J. and J. M. Evans, (1975), 'Techniques for Testing the Constancy of Regression Relations over time', *Journal of the Royal Statistical Society*, 37, 149-163.
18. Brunner, A. D. (2003), 'The Long-Run Effects of Trade on Income and Income Growth', IMF Working Paper 03-37.
19. Carrion-i-Silvestre, J. and A. Sanso, (2006), 'Testing the null of cointegration with structural breaks,' *Oxford Bulletin of Economics and Statistics*, 68, 642-646.
20. Chang, C-P. and Y-H. Ying, (2008), 'The generative power of air freight in the trade openness-economic growth nexus in African countries', *South African Journal of Economics*, 76, 493-512.

21. Chansomphou, V. and M. Ichihashi, (2011) 'The impact of trade openness on the incomes of four South East Asian countries before and after the Asian financial crisis', *Economics Bulletin*, 31, 2890-2902.
22. Chaudhary, I. S., Malik, A. and M. Z. Faridi, (2010), 'Exploring the causality relationship between trade liberalization, human capital and economic growth: empirical evidence from Pakistan', *Journal of Economics and International Finance*, 2, 175-182.
23. Choong, C-K. and K-P. Lim, (2009), 'Foreign direct investment, financial development, and economic growth: the case of Malaysia,'*Macroeconomics and Finance in Emerging Market Economies*, 2, 13-30.
24. Clemente, J., Montanes, A. and M. Reyes, (1998), 'Testing for a unit root in variables with a double change in the mean', *Economics Letters,*59, 175-182.
25. Das, A. and B. P. Paul, (2011), 'Openness and growth in emerging Asian economies: evidence from GMM estimation of a dynamic panel', *Economics Bulletin*, 31, 2219-2228.
26. Daumal, M. and S. Ozyurt, (2010), 'The impact of international trade flows on growth of Brazilian states, 'Document De Travail, DT/ 2010-01.
27. DeJong, D. N., Nankervis, J. C., Savin, N. E and C. H. Whiteman, (1992), 'Integration versus trend stationarity in time series', *Econometrica,*60, 423-433.
28. Deme, M., (2002), 'Anexamination of the trade-led growth hypothesis in Nigeria: A co-integration, causality, and impulse response analysis', *The Journal of Developing Areas*, 36, 1-15.
29. Dickey, D. A. and W. A. Fuller, (1981), 'Likelihood ratio statistics for autoregressive time series with a unit root', *Econometrica,* 49, 1057-1079.
30. Din, M. (2004), 'Exports, imports and economic growth in South Asia: Evidence using a multivariate time-series framework' *The Pakistan Development Review*, 43, 105-124.
31. Din, M., E, Ghani and O. Siddiqui, (2003), 'Openness and economic growth in Pakistan', *The Pakistan Development Review,* 42, 795-807.
32. Dollar, D. and A. Kraay, (2003), 'Institutions, trade and growth', *Journal of Monetary Economics*, 50, 133-162.
33. Dollar, D. and A. Kraay, (2004), 'Trade, growth and poverty', *The Economic Journal*, 114, 22-44.
34. Dowrick, S. and J. Golley, (2004), 'Openness and growth: Who benefits?' *Oxford Review of Economic Policy*, 20, 38-56.
35. DRI/McGraw Hill: Building Pakistan's Technological Competence (1997).
36. Duasa, J. (2011), 'Terms of trade and economic growth: An estimate of the threshold level of terms of trade for Malaysia', *International Journal of Economic Perspective*, 5, forthcoming.
37. Dufrenot. G., Mignon,V. and C. Tsangarides, (2010), 'The trade-growth nexus in the developing countries: a quantile regression approach', *Review of World Economics*, 146,731–761.
38. Dutta, D. and N. Ahmed, (2004), 'Trade liberalization and industrial growth in Pakistan: A cointegration analysis', *Applied Economics*, 36, 1421-1429.
39. Economidou, C. and A. P. Murshid, (2008), 'Testing the linkages between trade and productivity growth', *Review of Development Economics*, 12, 845-860.
40. Edwards, S. (1989), 'Trade orientation, distortions and growth in Developing economies', *Journal of Development Economics*, 31, 31-57.

41. Elliott, G. R., Thomas, J. and J. H. Stock, (1996), 'Efficient tests for an autoregressive unit root', *Econometrica,*64, 813-836.
42. Engle, R.F., and C.W.J. Granger, (1987), 'Cointegration and error correction representation: Estimation and testing,' *Econometrica*, 55, 251-276.
43. Foster, N. (2008), 'Theimpact of trade liberalisation on economic growth: Evidence from a quantileregression analysis', *Kyklos*, 61, 543–567.
44. Frankel, J. and D. Romer, (1999), 'Does trade cause convergence', *American Economic Review*, 89, 379-399.
45. Ghatak. S., Milner, C. and U. Utkulu, (1995), 'Trade liberalization and endogenous growth: Some evidence for Turkey', *Economic Planning*, 28, 147-167.
46. Goldsmith, R. (1969). *Financial Structure and Development*. A Handbook, Yale University Press, 1969.
47. Goodhart, C. A. E. (2004), 'Financialdevelopment and growth: Explaining the links, Palgrave Macmillan, New York.
48. Granger, C. W. J. (1969), 'Investigating causal relations by econometric models and cross-spectral methods,' *Econometrica*, 37, 424-438.
49. Greenaway, D., C.W. Morgan and P.W. Wright, (2002), 'Trade liberalisation and growth: New methods, new evidence', *Journal of Development Economics*, 67, 229-244.
50. Gregory, A. W. and B. E. Hansen (1996), 'Residual-based tests for cointegration in models with regime shifts', *Journal of Econometrics*, 70, 99-126.
51. Grossman, G. M. and E.Helpman, (1990), 'Comparative advantage and long-run growth', *American Economic Review*, 80, 796-815.
52. Grossman, G. M. and E. Helpman, (1991), 'Growth and welfare in a small open economy. In: Helpman, E., Razin, A. (eds.) International Trade and Trade Policy, pp.141–163. MIT Press, Cambridge.
53. Hermes, N. and R. Lensink, (2003), 'Foreign direct investment, financial development and economic growth,' *The Journal of Development Studies*, 40, 142-163.
54. Hussain, I. (2003), 'Pakistan's Exports Competitiveness in Global Market. in key issues in Pakistan's Economy. State Bank of Pakistan, Karachi (2003).
55. Hye, Q. M. A. (2011), 'Long run effect of trade openness on economic growth in case of Pakistan', *Quality & Quantity*, DOI 10.1007/s11135-011-9612-0.
56. Ibrahim, M. H. (2005), 'Sectoral effects of monetary policy: evidence from Malaysia', *Asian Economic Journal*, 19, 83-102.
57. Irwin, D. A. and M. Tervio, (2002), 'Does trade raise income? Evidence from the twentieth century', *Journal of International Economics*, 58, 1-18.
58. Jenkins, H. P. and S. T. Katircioglu, (2010), 'The bounds test approach for cointegration and causality between financial development, international trade and economic growth: the case of Cyprus,' *Applied Economics*, 42, 1699-1707.
59. Jin, C. (2006), 'Can openness be an engine of sustained high growth rates and inflation? Evidence from Japan and Korea', *International Review of Economics and Finance*, 15, 228-240.
60. Jin, J. C. (2003), 'Openness and growth in North Korea: Evidence from time-series data', *Review of International Economics*, 11,18-27.
61. Karras, G. (2003), 'Trade openness and economic growth: Can we estimate the precise effect? *Applied Econometrics and International Development*, 3, 7-24.

62. Katircioglu, S. (2009), 'Trade, tourism and growth: The case of Cyprus', *Applied Economics*, 41, 2741–2750.
63. Katırcıoglu, S. (2010), 'Trade and growth in a non-recognized small island state: Evidence from the Turkish republic of northern Cyprus', *Journal of Business Economics and Management*, 11, 112–130.
64. Katircioglu, S. T., Kahyalar, N. and H. Benar, (2007), 'Financial development, trade and growth triangle: the case of India,' *International Journal of Social Economics*, 34, 586-598.
65. Kemal, A. R., Din, M. Qadir, U. and S. Colombage, (2002), 'Exports and economic growth in South Asia', a paper prepared for the South Asia Network of Economic Research Institute. Pakistan Institute of Development Economics (PIDE), Islamabad, Pakistan.
66. Khan, M. A. and A. Qayyum, (2007), 'Trade liberalisation, financial development and economic growth,' Trade Working Papers 22204, East Asian Bureau of Economic Research.
67. Kim, D-H. and S-C. Lin, (2009), 'Trade and growth at different stages of economic development', *Journal of Development Studies*, 45, 1211-1224.
68. Kim, D-H., S-C Lin, and Y-B. Suen, (2011), 'Nonlinearity between trade openness and economic development', *Review of Development Economics*, 15,279-292.
69. King, R. G. and Levine, R. (1993). Finance and growth: Schumpeter might be right. *The Quarterly Journal of Economics*, 108, 717-737.
70. Klasra, M. A, (2011), 'Foreign direct investment, trade openness and economic growth in Pakistan and turkey: an investigation using bounds test, Quality & Quantity, 45, 223–231.
71. Kneller, R., C. W. Morgan and S. Kanchanahatakij, (2008), 'Trade liberalisation and economic growth', *The World Economy*, 31, 701–719.
72. Krueger, A. O. (1978), 'Foreign trade regimes and economic development: Liberalization attempts and consequences', (Cambridge, MA: Ballinger).
73. Leamer, E. E. (1995), 'A trade economist's view of U.S wages and globalisation. In Brooking Conference Proceedings, Brookings.
74. Little, I. M. D., Scitovsky, T. and M. Scott, (1970), 'Industry and trade in some developing countries: A comparative study', Oxford University Press, London, England.
75. Liu, X., Song, H. and P. Romilly, (1997), 'An empirical investigation of the causal relationship between openness and economic growth in China', *Applied Economics,* 29, 1679-1686.
76. Lucas, R.E. (1988), 'On the mechanic of economic development', *Journal of Monetary Economics*, 22, 3-42.
77. Lütkepohl, H., 2006. Structural vector autoregressive analysis for cointegrated variables, *AStA Advances in Statistical Analysis*, 90, 75-88.
78. Mankiw, N.G., Romer, D. and D. N. Weil, (1992), 'A contribution to the empirics of economic growth', *Quarterly Journal of Economics*, 107, 407-437.
79. Narayan, P. K. (2005), 'The savings and investment nexus for China: Evidence from co-integration tests,'*Applied Economics, 37,* 1979-1990.
80. Narayan, P.K., Narayan, S., (2005),'Estimating income and price elasticities of imports for Fiji in a cointegration framework,'*Economic Modelling*, 22, 423–438.
81. Ng, S. and P. Perron, (2001), 'Lag length selection and the construction of unit root test with good size and power', *Econometrica,*69, 1519-1554.
82. Nishimizu, M. and S. Robinson, (1984), 'Trade policies and productivity change in semi-industrialized countries', *Journal of Development Economics*, 30, 93-102.

83. Oladipo, O. S. (2011), 'Does trade liberalization cause long run economic growth in Mexico? An empirical investigation', *International Journal of Economics and Finance*, 3, 63-74.
84. Pernia, M. E. and Quising, F. P., (2003), 'Trade openness and regional development in a developing economy,'*Annals of Regional Science*, 37, 391-406.
85. Perron, P. and T. J. Vogelsang, (1992), 'Testing for a unit root in a time series with a changing mean: Corrections and extensions', *Journal of Business & Economic Statistics,*10, 467-470.
86. Pesaran, M. H., Shin, Y. and R. J. Smith, (2001), 'Bounds testing approaches to the analysis of long run relationships', *Journal of Applied Econometrics,* 16, 289-326.
87. Pesaran, M.H. and Shin, Y. (1999), 'An autoregressive distributed-led modeling approach to cointegration analysis. In *Econometrics and Economic Theory in the 20th Century. The Ragnar Frisch Centennial Symposium*, ed. Steinar Strom. Cambridge: Cambridge University Press.
88. Phillips, P. C. B. and P. Perron, (1988), 'Testing for a unit root in time series regressions', *Biometrika,* 75, 335-346.
89. Proudman, J., S. Redding and M. Bianchi, (1998), 'Openness and growth,' in Proceedings of the Bank of England Academic Conference on the Relationship between Openness and Growth in the United Kingdom, September 15th, 1997. Bank of England: Martins Printing Group: U.K.
90. Rajan, R. G. and L. Zingales, (2003), 'Thegreat reversals: The politics of financial development in the Twentieth century', *Journal of Financial Economics*, 69, 5-50.
91. Rajan, R. G. and L. Zingales, L. (1998),'Financial dependence and growth,'*American Economic Review*, 88, 559-586.
92. Rao, B. and M. Rao, (2009), 'Openness and growth in Fiji: Some time series evidence', *Applied Economics*, 41, 1653-1662.
93. Rassekh, F. (2007), 'Is international trade more beneficial to lower income economies? An empirical inquiry', *Review of Development Economics,* 11, 159-169.
94. Redding, S. (1999), 'Dynamic comparative advantage and the welfare effects of trade', *Oxford Economic Papers*, 51, 15-39.
95. Rivera-Batiz, F. L. (1995), 'The economics of technological progress and endogenous growth in open economies, Union College, Mimeo.
96. Rivera-Batiz, L. A. and P. M. Romer, (1991), 'International trade with endogenous technological change', *European Economic Review*, 35, 971-1001.
97. Romer, P. M. (1990), 'The problem of development: A conference of the institute for the study of free enterprise system', *Journal of Political Economy*, 98, 1-11.
98. Sachs, J. D. and A. Warner, (1995), 'Economic reform and the process of global integration', *Brookings Papers on Economic Activity*, 1, 1–118.
99. Sakyi, D. (2011), 'Trade openness, foreign aid and economic growth in post-liberalisation Ghana: An application of ARDL bounds test', *Journal of Economics and International Finance*, 3, 146-156.
100. Santos-Paulino, A. and A. P. Thirlwall, (2004), 'Trade liberalisation and economic performance in developing countries', *The Economic Journal*, 114, 493, 1-3.
101. Shahbaz, M. (2009a), "A reassessment of finance-growth nexus for Pakistan: Under the investigation of FMOLS and DOLS techniques,'*Journal of Applied Economics*, 65-80.

102. Shahbaz, M. (2010), 'Income inequality-economic growth and non-linearity: A case of Pakistan,' *International Journal of Social Economics*, 37, 613-736.
103. Shahbaz, M. and M. Rehman, (2010), 'Foreign capital inflows-growth nexus and role of domestic financial sector: an ARDL co-integration approach for Pakistan,' *Journal of Economic Research,* 15, 207-231.
104. Shahbaz, M. and N. M. Rahman, (2012), 'The dynamic of financial development, imports, foreign direct investment and economic growth: Cointegration and causality analysis in Pakistan,' *Global Business Review*, 13, May-August (forthcoming).
105. Shahbaz, M., P. Azim, and K. Ahmad, (2011a), 'Exports-led growth hypothesis in Pakistan: Further evidence', *Asian Economic and Financial Review*, 1, 182-197.
106. Shahbaz. M, Awan. R and Ahmad. K, (2011b), "The exchange value of the Pak-rupee & Pak-trade balance: An ARDL bounds testing approach", *Journal of Developing Areas*, 44, 69-93.
107. Shaheen, S., Awan, M. S., Waqas, M. and Aslam, M. A. (2011), 'Financial development, international trade and economic growth: Empirical evidence from Pakistan,' *Romanian Journal of Fiscal Policy*, 2, 11-19.
108. Siddiqui, A. H. and J. Iqbal, (2005), 'Impact of trade openness on output growth for Pakistan: An empirical investigation', *Market Forces*, 1, 1-8.
109. Simorangkir, I. (2006), 'The openness and its impact to Indonesian economy: A SVAR approach', Center for Central Banking Education and Studies, Bank Indonesia, Indonesia.
110. Singh. T. (2011), 'International trade and economic growth nexus in Australia: A robust evidence from time-series estimator', *The World Economy*, 1348-1394.
111. Sinha, T. and D. Sinha, (1996), 'An empirical investigation into the relationship between openness and economic growth: Evidence from Asia', *International Review of Economics and Business*, 43, 359-370.
112. Sinha, T. and D. Sinha, (1999), 'The relation between openness and economic growth: Postwar evidence from 124 countries', *Seoul Journal of Economics*, 12, 67-83.
113. Squalli. J. and K. Wilson, (2011), 'A new measure of trade openness', *The World Economy*, 20, 1745-1770.
114. Tsen, W. H. (2006), 'Granger causality tests among openness to international trade, human capital accumulation and economic growth in China: 1952-1999', *International Economic Journal*, 20, 285-302.
115. Tyler, W. J. (1981), 'Growth and exports expansion in Developing economies: Some empirical evidence', *Journal of Development Economics*, 9, 121-130.
116. Utkulu, U and D. Ozdemir, (2004), 'Does trade liberalization cause a long run economic growth in Turkey', *Economics of Planning*, 37, 245-266.
117. Villanueva, D. (1994), 'Openness, human development and fiscal policies', *IMF Staff Papers*, 41, 1-29.
118. Wacziarg, R. and K. H. Welch, (2003), 'Trade liberalization and growth: New evidence', Working Paper No. 10152 (Washington, DC: National Bureau of Economic Research).
119. Wang, C., Liu, X. and Y. Wei, (2004), 'Impact of openness on growth in different country groups', *The World Economy* 27, 567-585.
120. Wurgler, J. (2000),'Financial markets and the allocation of capital,'*Journal of Financial Economics*, 58, 187-214.
121. Xu, Z. (1998), 'Export and income growth in Japan and Taiwan', *Review of International Economics,* 6, 220-233.

122. Yanikkaya, H. (2003), 'Trade openness and economic growth: A cross country empirical investigation', *Journal of Development Economics*, 72, 57-89.
123. Young, A. (1991), 'Learning by doing and the dynamic effects of international trade', *Quarterly Journal of Economics*, 106, 369-405.
124. Young, A. (1991), 'Learning by doing and the dynamics effects of international trade,' *Quarterly Journal of Economics*, 106, 369-405.
125. Zivot, E. and D. Andrews, (1992), 'Further evidence of great crash, the oil price shock and unit root hypothesis', *Journal of Business and Economic Statistics*, 10, 251-270.