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Trade Liberalization, Manufacturing Value Addition, and Economic Growth: Empirical Evidence in Case of Pakistan

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Abstract

Soon after independence, the economy of Pakistan was regarded as a weedy manufacturing sector. The key drive of trade policies, therefore, keeps on improving and enhancing value addition and growth of manufacturing sector. To achieve this target, the government exercised trade liberalization measures in 1970s that gained momentum in mid 1990s when the country joined world trade organization. Switching to outer-oriented trade regime poses the question of "whether trade liberalization affects economic growth through its effect on manufacturing value addition". This paper addresses the question by testing the hypothesis "trade liberalization affects economic growth through its effects on manufacturing value addition." The hypothesis is tested empirically by using time series data spanning from 1972 to 2012. The empirical estimation has been carried out through ARDL bound testing approach and UECM estimation technique. The estimates indicate that trade liberalization enhances manufacturing value added and consequently economic growth through its effect on manufacturing value addition.

Keywords: Trade Liberalization, Value Addition, Economic Growth, ARDL

JEL Classification: F15, N65, O47, C22

1. Introduction

The initial explanation on the relationship between international trade and economic growth comes from classical (i.e. Smith 1776, Ricardo 1817) and neoclassical (Heckscher 1919, Ohlin 1933) trade models. These trade models tend to describe the part of international trade in the progression of long run economic growth in twofold. On the one hand, Smith (1776) explains the part of international trade in the development of long run economic growth through promoting research and learning activities (productivity doctrine). On the other

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hand, the comparative advantage doctrine (Ricardo 1817; Heckscher 1919; and Ohlin 1933) emphasises the role of international trade in improving resource allocation. However, both the productivity and comparative advantage doctrines agree that integration in international market always promotes economic growth[2].

Later on, a number of growth models looked at the scope of trade liberalization in the process of long run economic growth. For instance, Romer (1986) recommended that international trade expands the extent of business sectors, raises the level of product, prompts and expands learning-by-doing, which in turn increases the allocative efficiency, hence and contributes in economic growth positively. Lucas (1993) explained the Romer's (1986) idea further and argued that since learning process exhibits diminishing returns to scale, opening up economies to international trade provides opportunities for workers to move from one product to another and subsequently prevents the learning process from diminishing. This first generation of endogenous growth models explains the influences of trade in the progression of growth through the positive externalities associated with the build-up of both human and physical capital. The second generation of endogenous growth models emphasizes the endogenous technological change and explains the part of trade in the development of growth by way of the enhancement and allocation of research and development (R&D) activities. For instance, Romer's (1990) model suggests that growth of knowledge (R&D) which is essential for the process of invention and innovation and hence for long run economic growth does not only originate from learning by doing but also from the introduction of greater variety of goods. Romer argues that as the usage of human capital is competitor between final goods sector and R&D sectors, therefore long run economic growth rest on the allocation of human capital. According to this framework, an economy with greater human capital stock can earn high rate of output by allocating more human capital in the R&D sector. One implication of the model is that, as developing countries cannot allocate a reasonable stock of human capital to R&D sector, therefore developing countries come to be advantageous of international trade through the arrangement of foreign R&D in its growth process.

Upon the advent of endogenous growth models in mid 1980s, numerous studies have been done on the effects of trade liberalization to economic growth process, most of which agree that trade liberalization is good for economic

[2] Singer (1950) followed by Prebish (1950) attacked the optimistic classical view and proposed that a significant strategy that countries can extract in the dynamic global trading system is to protect and encourage domestic manufacturing sector through import substitution policies.

growth. However, as much as the effect of trade liberalization on manufacturing sector is apprehensive; studies are still away from consensus. Studies that followed the Smith (1776) productivity doctrine are affirmative on the positive effect of trade openness on manufacturing value addition. For instance, "Romer (1990), Grossman and Helpman (1991), and Aghion and Howitt (1992)" argue that trade liberalization helps to improve manufacturing sector of trade partners through the provision of technological expansions. Some other studies, Harrison (1996), Chenery and Stout (1996) examine the value addition effect of trade liberalization. Their central argument is that trade liberalization enlarges the market size of trading partners, enhances innovation, energizes new creation that in turn increases specialization, and therefore improves value addition in the manufacturing sector. On the other hand, some studies hold contentions that liberalized trade strategies do not always have positive effects on manufacturing and hence on economic growth performances. For instance, "Riveria-Batiz and Romer (1991), and Rivera-Batiz and Xie (1993)" argue that economic integration is not always beneficial for trading partners.

Pakistan, exercised trade liberalization measures in early 1970s that gained momentum over time as the country entered into several multi and unilateral trade agreements. Keeping in view this liberalized trade tendency from the last four decades, this study addresses the question: whether trade liberalization affects economic growth through its effect on manufacturing value addition. The empirical estimation has been carried out through Autoregressive Distributed Lag (ARDL) bound testing approach and Unrestricted Error Correction Model (UECM) estimation technique using a time series data set of Pakistan spanning over 40 years from 1972–2012. The rest of the study is organized as follows. Section 2examines some key empirical studies especially in the context of Pakistan. Section 3 offers model specification and methodology. Sections 4 and 5 describe estimation technique, and definition of variables respectively. Section 6 presents empirical findings and a comprehensive discussion. Section 7 discusses diagnostic tests used in the study. Section 8concludes the study.

2. Brief Literature Review

As discussed earlier in introductory section that a well-established segment of relevant literature has examined the scope of trade in the development of industry and economic growth. Within this literature, a number of studies analyzed the role of international trade in the growth process through its effects on manufacturing value addition of trading partners. However, the existing

literature is still away from the consensus on the positive impact of international trade on value addition of manufacturing sector. These studies have proposed different mechanisms through which economic growth is affected by international trade as per manufacturing value addition. In this association, one comprehensive work has been carried out by Adhikary (2011), which argue that exchange rate depreciation occurs as a result of liberalized trade that consecutively increases prices of imported machinery. Less and costly supply of production inputs decreases production capacity and competitiveness of domestic production line[3].

Some other empirical studies such as Edwards (1992); Sinha and Sinha (1996); Wacziarg (2001); Sinha and Sinha (2000) come up with an optimistic view in the trade liberalization, value addition, and economic growth nexus. These studies find that growth and value addition effects of trade liberalization are always positive and significant. To support their claim, these studies argue that liberalization of international trade create opportunities for trading partners to develop its technology according to international standards.

Some empirical studies have a stance that trade openness effectively fosters value addition and economic growth if certain policy reforms are undertaken. For instance, Rodrik (1997) argue that the potential gain of trade liberalization is conditioned with build-up of human capital, physical infrastructures advancement, rule of law, macroeconomic permanence, and private sector progress. Moreover, Howitt (2000), argue for social capability in order to successfully employ foreign technologies. Some studies (Keller, 1998; Mayer, 2001 among others) find that growth effect of trade liberalization is significantly positive if the host country possesses high absorptive capacity.

Various empirical analyses on the growth effectiveness of trade openness were done in case of Pakistan. On trade openness Dutta&Ahmed 2004; Ilyas et al. 2010; Muhammad et al. 2012; Ramzan and Kiani, 2012; Shaheen et al.2013; Shah and Sajid 2013; find that growth effect of trade openness is significantly positive in case of Pakistan. The empirical contribution of these studies lies in providing direct link concerning trade openness and economic growth. Instead of direct relationship, in this study we analyzed the growth effectiveness of trade

[3] Some earlier studies express concerns about the positive growth effectiveness of trade liberalization. Rodrik, 1992 indicate that trade openness may cause macroeconomic instability as it augment inflation; depreciate exchange rates, which cause balance payment crisis. On growth effectiveness of trade openness Levine and Renelt, 1992; Battra and Slottje, 1993; and Leamer, 1995 claim that trade openness is one of the primary causes of economic down turn because it discourages domestic investment.

liberalization through its effect on manufacturing value addition. Hence, the empirical contribution of this study lies in offering new empirical indication on how trade liberalization affect economic growth in Pakistan through its effects on manufacturing value addition.

3. Model Specification, Methodology and Data

As the study basically attempt to answer the question "whether trade liberalization affect economic growth through its effect on manufacturing value addition". In order to response this query the empirical model is derived from several different growth models, which enable us to look at the waves of trade liberalization on economic growth through its effects on value addition. To begin we take a Hicks-neutral production function as follows:[4]

$$Y_t = A_t F(K_t, L_t) \quad (1)$$

Where Y_t , $A_t, K_t and\ L_t$ represents total production, total factor productivity (TFP), physical capital stock, and labour respectively. Assume Cobb-Douglas specification, equation (1) will take the following form;

$$Y_t = A_t(K_t)^{\alpha}(L_t)^{\beta} \quad (2)$$

Here we explain the growth of TFP in the prospect of neoclassical setup, in which TFP is exogenously determined and time driven $A_t(t)$, with this modification equation 2 can be written as;

$$Y_t = A_t(t)(K_t)^{\alpha}(L_t)^{\beta} \quad (3)$$

Next we incorporate human capital H_t as specified by Mankiw et al. (1992), hence equation (3) will take the following form;

$$Y_t = A_t(t)(K_t)^{\alpha}(L_t)^{\beta}\ (H_t)^{\gamma} \quad (4)$$

Equation 3 is still in neoclassical erection, hence still we preserve the claim that TFP is time driven, which is determined exogenously. Now departing the assumption that growth of TFP is time driven, we are considering the view of the endogenous growth frame work that have neoclassical view Romer, 1986; Lucas, 1988 that growth of TFP is not only time driven (exogenous), but also determined by an allocation of human capital decision of an economy. Incorporating this assessment of endogenous growth models, equation (4) specifies as;

[4]We assume Hick-neutral technology, that knowledge is both capital and labor saving.

$$Y_t = A_t(t,h)\ (K_t)^{\alpha}\ (L_t)^{\beta}\ (H_t)^{\gamma} \quad (5)$$

Where h is the accumulation of human capital. Subsequent to the first generation of endogenous growth models, the second generation of endogenous growth model, Romer, 1990; Aghion and Howitt, 1992; argue that growth of TFP emerges as an externality when R&D investment takes place in intermediate or capital goods, which are utilized as factor of production in manufacturing sector. Hence, along with time (t), and accumulation of human capital (h), TFP is also explained by R&D effort $A_t(t,h,r)$,with the extension of TFP, equation 5 specify as follows;

$$Y_t = A_t(t,h,r)\ F\ (K_t)^{\alpha}\ (L_t)^{\beta}\ (H_t)^{\gamma} \quad (6)$$

Where r is the stock of domestic R&D. Grossman and Helpman (1991), Coe and Helpman (1995) claimed that along with these traditional and domestic inputs, TFP is also explained by foreign R&D efforts, which is transmitted to an economy through different channels. International trade is one of these channels through which foreign R&D is transmitted to an economy. They advocate the claim that an economy more opens to international trade, the more an economy yield foreign R&D efforts in its growth process. Consequently, trade openness $to$is one of the factors that explain TFP, $A_t(t,h,r,to)$. Hence, equation 6 take the following form;

$$Y_t = A_t(t,h,r,to)(K_t)^{\alpha}(L_t)^{\beta}(H_t)^{\gamma} \quad (7)$$

Taking log of both sides of equation 7 presents as;

$$LnY_t = LnA_t(t,h,r,to) + \alpha Ln\ K_t + \beta LnL_t + \gamma Ln\ H_t \quad (8)$$

Equation 8 is our log linear model, which presents the consequence of openness to trade on economic growth via TFP. Trade openness causes growth in TFP through foreign R&D spill-over since the domestic manufacturing sector along with own R&D yield the benefit of foreign R&D when making manufacturing production decision. In this theoretical formation, trade openness which is defined as one of the key channel of transmission of technology spill over proves beneficial to aggregate output using its effect on value addition in manufacturing sector.

3.1. Empirical Model

Based on above theoretical configuration, following base line model is empirically estimated using data set spanning from 1972 and 2012.

$$\ln Y_t = \beta_0 + \beta_1 \ln X_t + \beta_2 \ln MV_t + \beta_6 \ln (MV * TO)_t + \varepsilon_t \quad (9)$$

Where lnY_t real GDP per capita is our dependent variable,$X_t$is vector of control variables that includes physical capital, human capital, trade openness and labor. $\mathrm{MV_t}$ is manufacturing value added, $MV_t * TO_t$ is interactive term of manufacturing value added and trade openness. Whereas ε_t is the error term.

3.2. Estimation Technique

As variables under consideration are time series in nature, hence it is important to check their stationarity before selection of any appropriate estimation technique. If all variables are non-stationary and integrated of order one I (1), then Johansen maximum likelihood procedure is the appropriate estimation technique of integration proposed by "Johansen (1988) and Johansen and Juselius (1990)". Conversely, if variables have mixed order of integration i. e. I (0) and I (1) then Auto Regressive Distributed Lag (ARDL) is the proper estimation technique, which is also known as bound testing approach, introduced by Pesaran et al. (2001).[5]The ARDL approach has some benefits over other approaches. First, the ARDL provides reliable results even in the case of small sample size.[6]Second, the ARDL approach assumes all the variables to be endogenous; hence, this approach provides correct and precise estimates of long run parameters and valid inference evenif the model suffers from endogenity issue. This approach also involves the short-run dynamics in the estimation of long run parameters. The empirical model (equation 9) under the ARDL approach is presented as follows;

$$\begin{aligned}\Delta Y_t = {} & \beta_0 + \sum_{i=1}^{n} \beta_{1i}\, \Delta Y_{t-i} + \sum_{i=0}^{n} \beta_{2i}\, \Delta PhyC_{t-i} + \sum_{i=0}^{n} \beta_{3i}\, \Delta HC_{t-i} + \sum_{i=0}^{n} \beta_{4i}\, \Delta LF_{t-i} \\ & + \sum_{i=0}^{n} \beta_{5i}\, \Delta TO_{t-i} + \sum_{i=0}^{n} \beta_{6i}\, \Delta MV_{t-i} \sum_{i=0}^{n} \beta_{7i}\, \Delta (MV * TO)_{t-i} \\ & + \beta_8 Y_{t-1} + \beta_9 PhyC_{t-1} + \beta_{10} HC_{t-1} + \beta_{11} LF_{t-1} + \beta_{12} TO_{t-1} \\ & + \beta_{13} MV_{t-1} + \beta_{14} (MV * TO)_{t-1} \\ & + \varepsilon_t \end{aligned} \qquad (10)$$

[5] In our case some of the variables are I (0), and some are I (1), hence the empirical estimations have been carried out with ARDL con-integration technique.

[6] Pesaran and Shin, 1999 argue that in case of small sample short run ARDL based estimators are super consistent.

Where Δ indicates first difference, n is the lag length, $t-1$ is lag length of corresponding variables, β_i are the parameters. Under ARDL, the null hypothesis "no long run relationship between Y_t and its determinants" are as follows.

$$H_O : \beta_8 = \beta_9 = \beta_{10} = \beta_{11} = \beta_{12} = \beta_{13} = \beta_{14} = 0$$

$$H_1: \beta_i \neq 0 \quad \text{For at least one i, where i} \quad 8,9,10,11,12,13,14$$

The presence of co-integration can be checked, testing the above null and alternative hypothesis by using the F test. If the test statistics exceeds their respective upper critical values then the null hypothesis is rejected and we can conclude that there exists a long run relationship. On the other hand if the calculated value of F test falls below the lower bound critical value, then we will conclude no long run relationship exists among the variables. If co-integration is established, we can find long run elastiities by normalizing on β_8 as follows:

$$Y_{t-1} = \frac{\beta_9}{\beta_8} PhyC_{t-1} + \frac{\beta_{10}}{\beta_8} HC_{t-1} + \frac{\beta_{11}}{\beta_8} LF_{t-1} + \frac{\beta_{12}}{\beta_8} TO_{t-1} + \frac{\beta_{13}}{\beta_8} MV_{t-1} + \frac{\beta_{14}}{\beta_8} (MV * TO)_{t-1} \quad (11)$$

3.3. Short Run Analysis of the Model

The ECM model is used to examine the short run dynamics, which is formulated for our model 1 as follows.

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta Y_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta PhyC_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta HC_{t-i} + \sum_{i=0}^{n} \beta_{4i} \Delta LF_{t-i} + \sum_{i=0}^{n} \beta_{5i} \Delta TO_{t-i} + \sum_{i=0}^{n} \beta_{6i} \Delta MV_{t-i} + \sum_{i=0}^{n} \beta_{7i} \Delta (MV * TO)_{t-i} + \theta ECT_{t-1} + \mu_{1t} \quad (12)$$

Where ECT_{t-1} is an error correction term. The sign of the parameters θ is expected to be negative.Whereas ECT term is formulated as:

$$ECT = Y_t - \left(\frac{\beta_9}{\beta_8} PhyC_{t-1} + \frac{\beta_{10}}{\beta_8} HC_{t-1} + \frac{\beta_{11}}{\beta_8} LF_{t-1} \frac{\beta_{12}}{\beta_8} TO_{t-1} + + \frac{\beta_{13}}{\beta_8} MV_{t-1} + \frac{\beta_{14}}{\beta_8} (MV * TO)_{t-1}\right) \quad (13)$$

4. Definition of Variables and Data Sources

Data on variables under consideration are collected from the secondary official sources, World Development Indicators (WDI), and Penn World Table version 7.1. Data of labour force participation, gross fixed capital formation, and real manufacturing value added, and secondary school enrolment ratio are taken from WDI. The data of real GDP per capita and trade openness are collected from the Penn World Table version 7.1. Following relevant literature on the topic, physical capital ($PhyC_t$)is measured with gross fixed capital formation, whereas human capital(HC_t) is captured with secondary school enrolment ratio.[7]Among explanatory variables, manufacturing value added (MV_t) is the variable of interest, which is measured at 2005 constant prices and following the empirical study (Muhammad et al. 2013) we have used the real manufacturing value added as a proxy measure for manufacturing sector growth. In existing literature trade openness (TO_t) has been measured with different ways, the most common measure is trade to GDP ratio. In this study trade to GDP ratio is used to measure trade openness. We used labour force participation rate as the proxy for labour input(LF_t).

5. Empirical Findings

The empirical analysis has been attained in three phases. In the first step, we have checked the time series properties of variables under consideration. Based on these results we used ARDL bounds test for long run relationship. Whereas for short run analysis, we used an Error Correction approach.

5.1. Test of Unit Root

We begin our empirical analysis by checking stationarity of the variables under consideration. Even though pretesting stationarity of variables is not required in the ARDL approach, however, unit root testing is required to identify the order of integration of the underlying variables. In case if any variable is integrated of order two I (2), then ARDL results would be spurious. The variables

[7]A number of studies used secondary school enrolment ratio as a proxy of human capital, for instance "Barro, 1991; Mankiw et al. 1992; Levine and Renelt, 1992; Lee, 2010" among others.

order of integration is checked through Augmented Dickey Fuller (ADF) test presented in Table 1.

Table 1: Augmented Dickey Fuller (ADF) Test

Variables	Level	1st Difference
Y_t	0.692 (0.837)	-6.272 (0.000)
MV_t	-0.811 (0.805)	-3.670 (0.008)
TO_t	-3.666 (0.006)	-------
$PhyC_t$	-1.183 (0.997)	-4.493 (0.000)
HC_t	-2.182 (0.968)	-6.966 (0.000)
LF_t	-1.253 (0.959)	-5.604 (0.000)
TO*MV	0.038 (0.956)	2.94 (0.004)

Note: p values in parenthesis.

Results of ADF test indicate that all the variables are integrated of order one or I(1) except the trade openness TO_t which is stationary at level or I(0). These findings allow us to use the ARDL bound testing approach, as this technique requires the variables to be less than I(2).

5.2. Auto Regressive Distributed Lag : The Bound Testing Approach

5.2.1. Lag Length Selection Criteria

The initial phase in ARDL Bound Testing approach is the selection of optimal lag length. We have chosen two lag based on Akaike information criterion (AIC), and Schwarz Bayesian Criteria (SBC).

5.2.2. Bound Test for Co-Integration

After the selection of lag length, the next step is the Bound test for co-integration. To find co-integration in the Bounds Testing approach we used the Wald-test to compute the F-statistics of co-integration. Results presented in Table 3 shows that for all three specifications the Bound test rejects the null hypothesis of "no co-integration" as the computed F-statistic through the Wald test is higher than the upper bounds critical values at both 1 and 5 percent.

Table 2: Selection of Lag Length

Lag	LR	AIC	SBC	HQ
0	NA	1.33	1.63	1.43
1	425.57	-10.27	-5.93	-9.41
2	63.53	-16.36*	-7.86*	-8.84
3	72.12	-10.46	-5.74	-10.02
4	59.05	-12.38	-7.62	-13.25

* indicates lag order selected by the criterion.

Table 3: Bound Testing Approach of Co-Integration

	Model 1		Model 2		Model 3	
F-Statistic	19.67		6.72		6.25	
Critical bound	Lower bound	Upper bound	Lower bound	Upper bound	Lower bound	Upper bound
Critical bound's value at 1%	3.03	4.06	3.03	4.06	2.53	3.59
Critical bound's value at 5%	3.47	4.57	3.47	4.57	2.87	4.00

Note: Computed, critical bound are obtained from Pesaran *et al*. (2001).

5.3. Causality Test

After performing the Bound test for co-integration analysis, the relationship between real GDP per capita, the manufacturing value added and trade openness was examined by performing causality test. The result of causality test indicates that in all specifications (taking each one dependent) the null hypothesis of "no long run con-integration" cannot be rejected, as the value of calculated F-statistics lies below the lower bound of tabulated F-statistic at 5% level of significance (see appendix A).

5.4. Results of ARDL Approach

Table 4 presents the ARDL results of our empirical model. The dynamics of long and short run are based on the SBIC. Results show that trade opennessTO_t, enters in our base line model Model-1 (column-2) with predictable sign that is significant at one percent level. Based on the findings we accept the hypothesis that in both short and long run, trade openness is good for economic growth in the case of Pakistan. The results are in line with findings of Haq &

Luqman (2014), Ramzan and Kiyani (2012), Muhammad et al. (2012), Manni and Afzal (2012), Iftikhar (2012).

Table 4: Empirical Findings (Dependent Variable is Real GDP per Capita)

Variables	Model 1		Model 2		Model 3	
	Long run	Short run	Long run	Short run	Long run	Short run
TO_t	0.115** (0.015)	0.056** (0.015)	-------	------	0.011*** (0.000)	0.616 (0.974)
MV_t	0.213*** (0.002)	0.122*** (0.009)	0.351*** (0.000)	0.148*** (0.000)	------	------
HC_t	0.017*** (0.000)	0.009*** (0.004)	0.015* (0.069)	0.006 (0.605)	0.016*** (0.000)	0.011*** (0.005)
$PhyC_t$	0.146*** (.001)	0.084*** (.001)	0.097** (.049)	0.041 (0.166)	0.283*** (0.000)	0.191*** (0.000)
LF_t	0.013*** (0.002)	0.452*** (0.000)	0.142* (0.004)	0.446** (0.030)	0.0862 (0.000)	0.924 (0.000)
$MV_t * TO_t$	3.320** (.027)	1.906*** (.012)	-------	------	------	------
R^2	0.792	0.603	0.982	0.374	0.895	0.734
Log L Hood	95.9950	95.995	86.937	86.937	104.055	104.055
DW Stat	1.952	1.952	1.891	1.991	2.208	1.208
F-Stat	607.308 (0.000)	8.077 (0.000)	571.868 (0.000)	4.071 (0.005)	664.289 (0.000)	10.360 (0.000)

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

Our second variable manufacturing value addedMV_t, which is our variable of interest, enters the model significantly and with positive sign. The result indicates that manufacture value addition plays a starring role in the growth development of Pakistan. Value addition in manufacturing sector contributes to economic growth through various channels. For instance, value addition in manufacturing sector increases value addition in exports, which improve balance of payments and therefore provides fiscal space for development expenditure. Second, value addition in manufacturing sector enhances skill and efficiency of workers through learning by doing and hence accumulates human capital that is one of the standard factors in long run economic growth. The results are in step with the findings of Sultan (2008), Nazish et al. (2013), Khan and Siddique (2011), Illahi et al. (2011).

The findings illustrate that human capital HC_t, which is measured through secondary school enrolment ratio, enters in each of the three specifications in a statistically significant manner and turn out with expected positive sign. In similar lines in all of the three specifications, $PhyC_t$ (physical capital) enters with expected signs, which are statistically significant. The result indicates that physical capital is the one key determinant that explains economic growth in Pakistan. Similarly, labour force LF_t holds expected positive sign, which is statistically significant.

As mentioned earlier that the key objective of the study is to test the hypothesis that "trade liberalization affect economic growth through its effects on value addition." To test the hypothesis we developed an interactive term of manufacturing vale addition and trade openness $MV_t * TO_t$. The result presented in our base line model (Model_1) column two and three shows that the interactive term holds positive sing, which is statistically significant. The result indicates that the impact of manufacture value addition on economic growth is larger when an economy is more open to international trade. Define it alternatively, the one potential benefit that developing country like Pakistan can reap from trade openness is value addition in its manufacturing sector. The results can be justified in the productivity doctrine of Smith (1776), which explained the role of international trade in the process of long run economic growth through promoting and enhancing the research and learning activities. According to the productivity doctrine of Smith (1776) international trade is beneficial for economic growth since it expands market size, improve workers specialization and innovation activities.

This result is also justifiable in the framework of the second-generation of endogenous growth models. For instance, "Romer (1990), Grossman and Helpman (1991), and Aghion and Howitt (1992)" argued for the favourability of trade openness to economic growth in the sense that it improve manufacturing sector of trade partners having providing innovation and technological advancement opportunities to trading partners. Some empirical studies, Harrison (1996), Chenery and Stout (1996) hold the same findings, which came with the conclusion that trade liberalization enlarges market size of trading partners, enhances innovation, energizes new creation that in turn increases specialization, and therefore increases economic growth through value addition in the manufacturing sector. Base on the study findings we can safely conclude that manufacturing value addition is the main channel by which trade openness influence economic growth in case of Pakistan.

5.5. Diagnostic Tests

To verify the validity of empirical estimates, we applied some diagnostic tests. Results demonstrate that our all models fulfil all the indicative tests.[8] The results of LM test demonstrate that there is no issue of auto correlation. The plots of auto correlation (ACF) and partial auto correlation (PACF) of residual point toward no issues of correlation up to lag of order k.[9]The values of normality test shows that models are normally distributed. The results of the White test demonstrate that there is no issue of heteroscedasticity, whereas the results of Ramsey Reset test demonstrates that all models are free from the miss-specification problem. The CUSUM and CUSUMSAQ plots are presented to check the structural stability. The figures of CUSUM and QUSUMQ presented in appendix B discard the risk of structural instability of the estimated models.

6. Conclusions

Although, various studies have examined empirically, the waves of trade openness on economic growth in Pakistan, however most of these studies examined direct association between economic growth and trade openness. In this study we analysed the question of whether trade liberalization affect economic growth through its effect on manufacturing value addition. To examine, this question we tested the hypothesis "trade liberalization affect economic growth through its effects on manufacturing value addition." The hypothesis was tested empirically in case of Pakistan using time series data spanning from 1972 to 2012. Taking into account the above connection, the findings of the study offer new knowledge with regards to trade openness, manufacturing value addition, and economic growth of Pakistan's economy. The basic results of the study are as follows. First, the empirical findings substantiate the fact that manufacturing value addition affects economic growth positively. Second, the positive impact of manufacturing value addition on economic growth is larger when an economy is more open to international trade. These finding uncover the fact that one potential channel though which trade openness affects economic growth in Pakistan is manufacturing value addition. In addition, the findings indicate that the other core factors such as physical capital and human capital have a positive contribution in the process of economic growth in Pakistan.

[8]See Appendix B, and C.
[9]See Appendix D.

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Appendix A: Causality Test

Specification	**Lower bound**	**Upper bound**	**F-stat.**	**Decision**
TO/MV,GDP,LFP,GFCF,SSIR,MT	2.53	3.59	0.569	No Co integration
MV/TO,GDP,LFP,GFCF,SSIR,MT	2.87	4.00	2.847	No Co integration
GFCF/MV,TO,GDP,LFP,SSIR,MT	2.53	3.59	0.208	No Co integration
SSIR/MV, TO,GDP,LFP,GFCF,MT	2.87	4.00	0.005	No Co integration
LFP/MV, TO, GDP,GFCF ,MT,SSIR	2.53	3.59	0.073	No Co integration
MT/MV, TO, GDP,LFP,GFCF ,SSIR	2.87	4.00	1.322	No Co integration

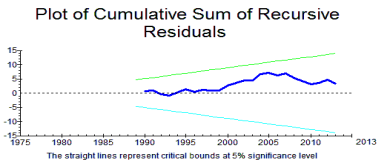
Appendix B: Diagnostic Test

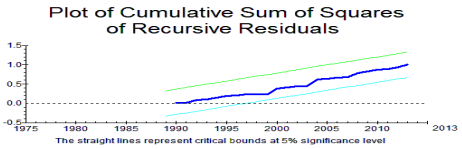
Diagnostic Test of the Long and Short Run Estimates			
Diagnostic Test	Model-1	Model-2	Model-3
	Long and short run	Long and short run	Long & short run
LM test	0.001 (0.973)	0.0202 (0.887)	1.085 (0.298)
Ramsey Reset	1.273 (0.259)	2.087 (0.149)	0.833 (0.361)
Normality	0.313 (0.855)	0.433 (0.647)	1.157 (0.561)
White test	0.690 (0.993)	0.620 (0.431)	0.101 (0.751)

Note: Values in parentheses are probabilities.

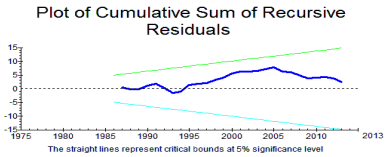
Appendix C: Stability Tests

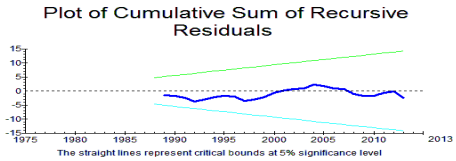
Model- 1



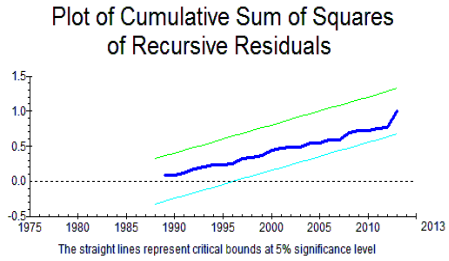


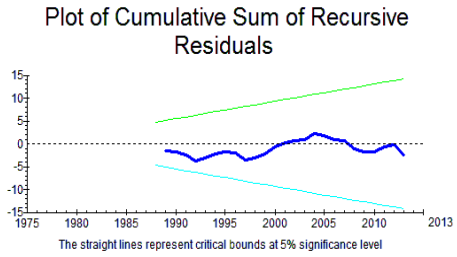
Model-2





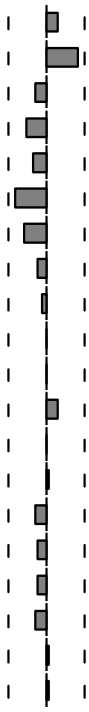
Model-3





Appendix D

Included observations: 42

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.084	0.084	0.3169	0.573
		2	0.257	0.252	3.3728	0.185
		3	-0.08...	-0.12...	3.6990	0.296
		4	-0.17...	-0.24...	5.1216	0.275
		5	-0.10...	-0.02...	5.6741	0.339
		6	-0.25...	-0.16...	9.0670	0.170
		7	-0.18...	-0.18...	10.823	0.147
		8	-0.07...	0.014	11.106	0.196
		9	-0.04...	-0.00...	11.195	0.263
		1...	0.001	-0.12...	11.196	0.342
		1...	-0.00...	-0.09...	11.199	0.427
		1...	0.090	0.059	11.699	0.470
		1...	-0.00...	-0.09...	11.699	0.552
		1...	0.010	-0.12...	11.705	0.630
		1...	-0.09...	-0.12...	12.359	0.652
		1...	-0.07...	-0.09...	12.755	0.691
		1...	-0.07...	-0.13...	13.207	0.722
		1...	-0.09...	-0.14...	13.830	0.740
		1...	0.011	-0.04...	13.840	0.793
		2...	0.020	-0.08...	13.874	0.837