IMPACT OF TRADE LIBERALIZATION ON EXPORT OF COTTON FROM PAKISTAN: A TIME SERIES ANALYSIS

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ABSTRACT

The study analyzed impact of trade liberalization on export of cotton lint from Pakistan over the period of 1971-2008. The effect of trade policy reforms were analyzed in terms of competitiveness, concentration of exports and openness of agricultural trade. The quantitative analysis of the study showed that both domestic and international trade policies had impact on export of cotton lint. World demand for cotton positively affected the export of cotton. Export competitiveness and increase in trade openness led to higher export of cotton. Competitiveness (LCM) showed the maximum contribution towards the increase in export of cotton lint.

Key Words: Cotton, Pakistan, Trade liberalization, Competitiveness, Error correction Model, Cointegration

INTRODUCTION

Free and fair trade under trade liberalization can lead to the prosperity and economic growth of all participating countries (Bashir, 2003). In last few years economic reforms and liberalization policies are widely adopted in the developing countries regarding the economic growth. Before the 1980s, government intervention was higher in agriculture in both developed and less developed countries. That was reduced after 1980s in many less developed countries along with decrease in tariff and non-tariff barriers (NTBs) to trade, Pakistan also followed and liberalized its trade and investment regime in late 1980s. Tight monetary and fiscal policies were adopted as short run stabilization measures. Long term measures included tariff rate reduction, price controls and removal of exchange rate distortions (Anwar, 2002).

Over the globe cotton demand is increasing with the population growth (Baffes, 2004). This silver fiber has involved about 7 million rural households in its production in Pakistan (Orden et al. 2006). Pakistan currently is fourth largest exporter with a share of 7 % in world cotton production. It provides the raw materials to 400 textiles mills and 1000 ginneries. Cotton accounts for 7.5% of the value added in agriculture and 1.6% in GDP (GoP 2008). In the past, cotton production and marketing was subjected to many public policy interventions. An export tax was levied (1988 to 1995) to provide the cheaper raw material for domestic textile industry (Qureshi, 1992, Hudson and Ethridge, 1998). Trade liberalization helped cotton growers to receive international price for 1994-95 crop (Sadiq, 1995).

The global economic scenario is under change, resulting in an increased competition and relative competitiveness of different countries. This warrants a significant change in country’s pattern of production, marketing and trade flows. A good cotton crop is a vital force to provide earnings and food to a great chunk of people of Pakistan (Salam, 2008). There is a need for a policy change to boost the export of cotton (Hussain et al. 2006). The general objective of the study is to determine the dynamic effects of trade liberalization on export of cotton lint. While the specific objectives of the study, are to determine the impact of international market conditions and domestic policy on agricultural export performance.

At international level, various studies (Alexander and Warwick (2007), Sarkar (2005), Hassler (2004), Marhubi (2000) and Tanaka (2007) showed the positive relationship among the trade liberalization, trade openness and economic growth. Edwards and Alves (2006) found the positive impact of trade liberalization on the export growth of South Africa. The exporters were responsive to trade policies and favorable economic environment. Mwaba (2000) concluded that adoption of trade liberalization policies promoted export from African countries. The persistent export performance required the export diversification, Product promotion and quality improvement in Algeria, Tunisia and Morocco (Mouna and Reza, 2001). The export performance of any sector of a country can be measured through estimating growth, the change in market shares and commodity composition of that sector.
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MATERIAL AND METHODS

Data Sources

The main sources of time series data on all variables, obtained over the period 1971-2008 were Economic Surveys of Pakistan (various issues), State Bank of Pakistan, Food and Agricultural Organization (FAO), All Pakistan Textile Mills Association (APTMA) and International Cotton Advisory Committee (ICAC).

Specification of Variables

The impact of domestic supply related factors and external demand related factors on cotton were analyzed in terms of changes in export composition and growth rate of its exports following Authukorala, 1991. All the variables used in the analysis were in log form and exports were expressed in value form and in national currency. Four time series were generated from which world demand variable captures the net effects of world demand conditions defining the potential of Pakistan in export market of cotton. The other three variables Competitiveness, Export concentration and openness of agricultural trade, explicate net effect of domestic supply side factors on export performance of cotton.

World Demand of cotton lint

World demand or export market potential for cotton (DX) was measured in terms of weighted-average index of world export price for cotton lint

\[ DX_t = aW_X \]  

(1)

Where,  

\[ a = \text{share of cotton in country’s total agricultural exports} \]  

\[ W_X = \text{constant price index of world exports for cotton.} \]  

Supply Side

i) Competitiveness

Competitiveness was measured through the ratio of country’s export of cotton lint in its relevant sector at national level and then at world level.

\[ C_M_t = \frac{\sum_{i}^{x} \sum_{j}^{i} x_{ij} \sum_{j}^{i} \sum_{j}^{i} x_{ij}}{\sum_{j}^{i} \sum_{j}^{i} x_{ij}} \]  

(2)

Where,  

\[ x = \text{export value of cotton lint} \]  

\[ I = \text{commodity class (Cotton Sector)} \]  

\[ J = \text{country (Pakistan)} \]  

ii) Concentration Index

This variable was constructed to depict the density and share of cotton export in total exports of the country. Following formula was utilized to estimate the concentration index.
\[ CI = \sqrt{\text{sum} \left( \frac{X_i}{X_j} \right)^2} \]  

(3)  

Where,  
\[ X_i = \text{country } j\text{’s exports of product } i \text{ (at three digit)} \]  
\[ X_j = \text{country } j\text{’s total exports} \]  

iii) Trade Openness

Ratio of agricultural exports to agricultural sector GDP was taken as it represented the average share of agricultural exports in agricultural sector GDP.

\[ Op_t = \frac{\text{Total Agricultural exports}}{\text{Agricultural Sector GDP}} \]  

(4)  

Model Structure

The four variables were used in the model adapted from Kravis (1970), with some modification to estimate the change in real cotton lint export \( (CX_t) \) through liberalization policies

\[ CX_t = f(DX_t, CM_t, CI_t, OP_t) \]  

(5)  

Where,  
\[ CX_t = \text{Export of cotton lint} \]  
\[ DW_t = \text{World demand for cotton lint} \]  
\[ CM_t = \text{Competitiveness of cotton lint in international market} \]  
\[ CI_t = \text{Concentration of export} \]  
\[ OP_t = \text{Openness of agricultural sector} \]  

Stationarity Check

To check the stationarity of the data, Augmented Dickey-Fuller (ADF) unit root test was applied. ADF test was preferred over the DF test, as it considers the problem of correlation between the error terms and includes the lagged value of dependent variable in the regression.

Cointegration

After checking the hypothesis of non stationarity, the time series were examined for the co-integration. Co-integration analyzes the relationship between integrated series and explores a linear combination of integrated time series that was itself stationary. For cointegration Johansen (1990, 1995) maximum likelihood procedure was used. Johansson’s procedure for co-integration utilizes the two test statistics for deciding the number of co-integrating vectors;

i) Trace test \( (\lambda_{trace}) \)

The null hypothesis \( (H_0) \) is that the number of co-integrating vectors is less than or equal to \( r \) and alternative hypothesis \( (H_1) \) is that the number of co-integrating vectors is more than \( r \). \( (\lambda_{trace}) \) statistics tests the null hypothesis against alternative hypothesis.
ii) Maximum Eigen value ($\lambda_{\text{max}}$) test.

In Maximum Eigen value ($\lambda_{\text{max}}$) test, the null hypothesis ($H_0$) is that the number of co-integrating vectors is $r$ and the alternative hypothesis ($H_1$) is that the number of co-integrating vectors is $r+1$. ($\lambda_{\text{max}}$) statistics tests the null hypothesis against alternative hypothesis.

RESULTS AND DISCUSSION

The unit root test was performed on the level values of all time series to identify the stationarity of time series data. The result of Augmented Dickey-Fuller Statistics (Table I) showed that all the time series are non-stationary. First difference of these variables was taken in order to make them stationary.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Type of test</th>
<th>With out trend</th>
<th>With trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCX</td>
<td>DF ADF(1)</td>
<td>-3.9961</td>
<td>-2.3948</td>
</tr>
<tr>
<td>LDX</td>
<td>DF ADF(1)</td>
<td>-3.2977</td>
<td>-1.7162</td>
</tr>
<tr>
<td>LCM</td>
<td>DF ADF(1)</td>
<td>-3.9677</td>
<td>-2.1703</td>
</tr>
<tr>
<td>LCI</td>
<td>DF ADF(1)</td>
<td>-3.7599</td>
<td>-2.7118</td>
</tr>
<tr>
<td>LOP</td>
<td>DF ADF(1)</td>
<td>-2.3247</td>
<td>-1.7436</td>
</tr>
</tbody>
</table>

Critical value for the augmented Dickey-Fuller statistics (p=0.05) with out trend = -2.9472
Critical value for the augmented Dickey-Fuller statistics (p=0.05) with trend = -3.5426

<table>
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<th>Type of test</th>
<th>With out trend</th>
<th>With trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLCX</td>
<td>DF ADF(1)</td>
<td>-10.6787</td>
<td>-6.9296</td>
</tr>
<tr>
<td>DLDX</td>
<td>DF ADF(1)</td>
<td>-10.5295</td>
<td>-7.0422</td>
</tr>
<tr>
<td>DLCM</td>
<td>DF ADF(1)</td>
<td>-10.1000</td>
<td>-6.7976</td>
</tr>
<tr>
<td>DLCI</td>
<td>DF ADF(1)</td>
<td>-8.1141</td>
<td>-5.6413</td>
</tr>
<tr>
<td>DLOP</td>
<td>DF ADF(1)</td>
<td>-9.1331</td>
<td>-6.5528</td>
</tr>
</tbody>
</table>

Critical value of Augmented Dickey-Fuller statistics with out Trend (p=0.05) = -2.9472
Critical value of Augmented Dickey-Fuller statistics with Trend (p=0.05) = -3.5426

The Augmented Dickey fuller (ADF) was applied at the differenced values to ascertain the order of integration. The results of Augmented Dickey fuller (ADF) test with first difference value (Table II) showed that after taking the first difference, all time series became stationary and integrated of order [I(1)]. Since the variables were non-stationary and integrated of order 1, Johansen co-integration test was applied to check whether the variables were co-integrated or not, suggesting the long run relationship among the variables.

**Co integration Analysis**

The process of differencing the time series in order to make them stationary, involved the loss of some long run information. To overcome this problem, the process of co-integration was followed. The Co-integration leads to error correction model and the lagged error correction term integrated short run dynamics in to long-run function (Ahmed, 2008).

The co integration equation is: \[ LCX_t = \alpha + \beta X_t + u_t \] (6)

Where,
- $X_t$ = Explanatory variable (LDX, LCM, LOP and LCI)
- $\alpha$ = Constant
- $\beta$ = long run relation ship between the variables
- $u_t$ = Deviation from long-run equilibrium path
Before applying the Johansen cointegration mechanism, it is imperative to know the optimal lag length or the order of VAR. To determine the order of VAR, the AIC (Akaike information criterion), and SBC (Schwarz Bayesian Criterion) were applied as follows. Test statistics of AIC and ABC are shown in the Table III.

<table>
<thead>
<tr>
<th>Order</th>
<th>Lag Length (L.L)</th>
<th>AIC</th>
<th>SBC</th>
<th>Adjusted LR test</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>181.5404</td>
<td>31.5404</td>
<td>-82.9367</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>83.1288</td>
<td>-30.8712</td>
<td>-117.8738</td>
<td>52.1003[.040]</td>
</tr>
<tr>
<td>2</td>
<td>37.9231</td>
<td>-40.0769</td>
<td>-99.6049</td>
<td>76.0327[.350]</td>
</tr>
<tr>
<td>1</td>
<td>8.9090</td>
<td>-33.0910</td>
<td>-65.1446</td>
<td>91.3931[.874]</td>
</tr>
<tr>
<td>0</td>
<td>-87.8616</td>
<td>-93.8616</td>
<td>-98.4407</td>
<td>142.6246[.517]</td>
</tr>
</tbody>
</table>

AIC=Akaike Information criterion  SBC=Schwarz Bayesian Criterion

According to SBC criterion, the lags \((\rho)\) of VAR model were 1 and according to AIC criterion the lags \((\rho)\) of VAR were 4. The two criterions gave the different results, so the lag \((\rho)\) of 2 was used in the model as the order of VAR. Then the Johansen (1990) test of co-integration was applied and results are shown in the Table IV.

<table>
<thead>
<tr>
<th>Trace test</th>
<th>H0 H1 Test statistics</th>
<th>Critical value 95%</th>
<th>Maximum Eigen value test</th>
<th>Critical value 95%</th>
</tr>
</thead>
<tbody>
<tr>
<td>r=0 r=1</td>
<td>138.54</td>
<td>115.85</td>
<td>62.34</td>
<td>43.61</td>
</tr>
<tr>
<td>r≤2 r=3</td>
<td>76.19</td>
<td>87.17</td>
<td>22.91</td>
<td>37.86</td>
</tr>
<tr>
<td>r≤3 r=4</td>
<td>53.27</td>
<td>63.00</td>
<td>19.71</td>
<td>31.79</td>
</tr>
<tr>
<td>r≤4 r=5</td>
<td>33.51</td>
<td>42.34</td>
<td>16.59</td>
<td>25.42</td>
</tr>
<tr>
<td>r≤5 r=6</td>
<td>16.91</td>
<td>25.77</td>
<td>10.43</td>
<td>19.22</td>
</tr>
</tbody>
</table>

The maximum value was greater than critical value at one co-integrating vector \((r=1)\) for both trace test and Maximum-Eigen value test. This indicated the existence of one co-integrating relationship. Thus all the variables were co-integrated having the long run relationship.

**Long Run Relationship**

Variables in model were co integrated, suggesting a relationship between the dependent and explanatory variables over the longer duration. The coefficients of this relationship were estimated through ordinary least square (OLS) method. The results of OLS estimation are shown in Table V. The adjusted R-square (0.97) showed that 97% variations in export of cotton lint \((CX)\) are explained through the variables included in the model. The value of Durbin Watson statistics (2.46) showed the absence of first order-order auto correlation at 1%. The intercept and all variables were statistically significant at 1% probability level except LDX which was significant at 5% probability level. The world demand \((LDX)\) for cotton lint for a 1 per cent increase augmented the export of cotton lint by 23%. It implied that increase in demand for domestic cotton in international market, can increase export of cotton lint if positively responded through supply side factors. There was a supply constraint to meet the world demand leading to low export of cotton lint. The results were in line with Edward and Alves (2006) that export demand was not a constraint to South Africa’s export performance. Rather real constraint to export growth was supply side of exports.

The export of cotton lint was also positively related to concentration index \((LCI)\) of exports. This variable for a 1 per cent increase resulted in 49% increase in export of cotton lint. The main factor responsible for low export was high domestic consumption of lint cotton. Over the period of 1990-2005 production of value added products of cotton increased in Pakistan. The export of cotton lint as a percentage of total cotton sector exports declined from 13.1% in 1991-92 to 3.3% in 2003-05. On contrary for the same period manufactured products export increased from 3.3% to 96.7% (Cororaton and Orden, 2008).

The competitiveness in international market for 1% increase caused 83% increase in cotton export. The openness \((LOP)\) of agriculture sector showed 14% increase in cotton export for a 1% increase. The results were consistent with Alexander and Warwick (2007) that higher gains were possible from specialization and value added products if trade was open. Korea with open trade gained rising share of trade in their total production (Sarker 2005).
Table V  
Results of regression analysis to estimate the impact of trade liberalization policies on cotton lint export (cx) from Pakistan

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Std.Error</th>
<th>t-Statistics</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>9.194***</td>
<td>1.199</td>
<td>7.66</td>
<td>0.00</td>
</tr>
<tr>
<td>LDX</td>
<td>0.233**</td>
<td>0.120</td>
<td>1.945</td>
<td>0.06</td>
</tr>
<tr>
<td>LCI</td>
<td>0.487***</td>
<td>0.101</td>
<td>4.813</td>
<td>0.00</td>
</tr>
<tr>
<td>LCM</td>
<td>0.823***</td>
<td>0.13</td>
<td>6.308</td>
<td>0.00</td>
</tr>
<tr>
<td>LOP</td>
<td>0.140***</td>
<td>0.05</td>
<td>2.518</td>
<td>0.0017</td>
</tr>
<tr>
<td>R²</td>
<td>0.97</td>
<td>Adjusted R²²</td>
<td>0.97</td>
<td></td>
</tr>
<tr>
<td>S.E of regression</td>
<td>0.19</td>
<td>Durbin-Watson</td>
<td>2.46</td>
<td></td>
</tr>
</tbody>
</table>

* shows the coefficient was significantly different from zero at 10% probability level  
** shows the coefficient was significantly different from zero at 5% Probability level  
*** shows the coefficient was significantly different from zero at 1% Probability level

Short Run Relationship through Error Correction Mechanism

An error correction mechanism (ECM) was estimated to determine the short run dynamics in behavior of cotton export. The potential effects through the ECM represented deviations from the long-run equilibrium and adjustment of these variables to correct the disequilibrium. The general specification of the ECM model was:

\[
\Delta LCX_t = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta LCX_{t-i} + \sum_{i=0}^{n} \beta_2 \Delta LDX_{t-i} + \sum_{i=0}^{n} \beta_3 \Delta LCM_{t-i} \\
+ \sum_{i=0}^{n} \beta_4 \Delta LCI_{t-i} + \sum_{i=0}^{n} \beta_5 \Delta LOP_{t-i} + \beta_6 e(-1) + \epsilon_t
\] (7)

Error Correction Model

The ECM equation of the estimated model is

\[
DLCX_t = \beta_0 + \beta_1 DLCX_{t-1} + \beta_2 DLDX_{t} + \beta_3 DLCM_{t} + \beta_4 DLCI_{t} + \beta_5 DLOP_{t} + e(-1) + \epsilon_t
\] (8)

This equation also have the first difference of dependent variable (DLCX) with one lag as an independent variable along with lagged value of error term e(-1) that is obtained from the long run relationship among the variables. The results of ECM mechanism are shown in Table VI. The export of cotton lint was positively related with world demand for cotton in the short run. There was 0.21% increase in export of cotton lint from Pakistan for 1% increase in world demand of cotton. It implied that increased demand for domestic cotton in international market, lead to increase in export of cotton lint. The coefficient value of competitiveness (0.803) depicted the importance of competitiveness in enhancing the cotton export. Results showed that 1% increase in competitiveness (LCM) lead to 0.80% increase in cotton export. The openness (LOP) for a 1% increase gave rise to cotton export 0.2%. The results were consistent with Mwaba (2000), Alexander and Warwick (2007) and Sarker (2005). The coefficient value of Concentration index (LCI) for cotton lint export showed that 1% increase in concentration (LCI) led to 0.36% increase in cotton export.

Table VI  
Results of error correction mechanism to estimate the short run dynamics between trade liberalization policies on cotton lint export (cx) from Pakistan (1971-2008)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-statistics</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.068***</td>
<td>0.029</td>
<td>2.342</td>
<td>0.02</td>
</tr>
<tr>
<td>DLCX(-1)</td>
<td>-0.035*</td>
<td>0.025</td>
<td>-1.424</td>
<td>0.16</td>
</tr>
<tr>
<td>DLDX</td>
<td>0.216***</td>
<td>0.103</td>
<td>2.089</td>
<td>0.04</td>
</tr>
<tr>
<td>DLCM</td>
<td>0.803***</td>
<td>0.112</td>
<td>7.132</td>
<td>0.01</td>
</tr>
<tr>
<td>DLCI</td>
<td>0.360***</td>
<td>0.112</td>
<td>3.216</td>
<td>0.01</td>
</tr>
<tr>
<td>DLOP</td>
<td>0.209***</td>
<td>0.055</td>
<td>3.782</td>
<td>0.01</td>
</tr>
<tr>
<td>E(-1)</td>
<td>-0.318***</td>
<td>0.117</td>
<td>-2.704</td>
<td>0.01</td>
</tr>
<tr>
<td>R²</td>
<td>0.98</td>
<td>Adjusted R²²</td>
<td>0.98</td>
<td></td>
</tr>
<tr>
<td>S.E of regression</td>
<td>0.17</td>
<td>Durbin-Watson</td>
<td>2.26</td>
<td></td>
</tr>
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</table>

* shows the coefficient was significantly different from zero at 10% probability level  
** shows the coefficient was significantly different from zero at 5% Probability level  
*** shows the coefficient was significantly different from zero at 1% Probability level
The value of error correction term showed correct sign and suggested the validity of long run relationship among the variables. The coefficient value of 0.31 showed that system corrected its previous period’s disequilibrium by 31% over a year. In other words system required three years to adjust the shocks and changes.

CONCLUSION AND RECOMMENDATIONS

The impact of domestic and international policies was studied on export of cotton lint from Pakistan. World demand for cotton lint showed the impact of international policies on export of cotton lint while competitiveness, diversification and agricultural openness showed the impact of domestic policies on cotton lint export. There was cointegration between the cotton exports in Pakistan with competitiveness (CM), World’s demand for cotton (DW), openness (OP), and export concentration. The short run relationship was estimated using the error correction mechanism (ECM). Domestic policies which have positive impact on supply side performance also lead to better export performance. Agricultural export was responsive to domestic and international policies. The competitiveness in cotton export showed its maximum contribution in increasing the cotton lint export from the Pakistan along with agricultural export openness. One % increase in world’s demand for cotton caused the 0.23 % increase in export of cotton lint in Pakistan. Where as, competitiveness and openness for 1 % increase positively increased cotton export by 0.82 and 0.14 % respectively. The above findings suggest that cotton export of Pakistan can be improved through adoption of favorable domestic policies affecting supply side. It implies that Pakistan can achieve a profound rise in its exports with the adoption of trade liberalization policies.

i. Agricultural policies should focus on the increased production of agricultural products and agricultural trade in consistent with trade liberalization policies.

ii. The infrastructure facilities required to improve the productivity and marketing should be improved to boost the exports of the country.

iii. Tariffs reductions by importing countries and removal of export and production subsidies in many developed countries.

iv. Development of new technologies with high productive potentials and comparative advantage both in production and processing sectors are required

v. To maintain and further improve the competitiveness of Pakistan in Cotton Sector investment in research in agriculture production and marketing mechanism is imperative.

REFERENCES


