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Exports-Led Growth Hypothesis: The Econometric Evidence From Pakistan

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Abstract

The study aims at investigating the Export-led growth hypothesis in Pakistan by applying Unit root test, Co-integration, Vector error model and Granger causality tests. Time series data of the selected variables (Real GDP, capital, employed labor force, exports, consumer price index and terms of trade) for the period of 1972-2012 is used for analysis. The export-led growth hypothesis claims that exports positively contribute to economic growth. The results revealed that there is a strong positive long run as well as short run relationship between exports and economic growth in Pakistan. It is recommended on the basis of findings that the government should announce export bonus, export financing and export credit guarantee schemes to encourage the exports. Export processing zones should be established. These zones will not only catch the attention of foreign investors but also provide access to international markets to Pakistani exporters.

Key words: Export-led growth; Co-integration; Vector error model; Granger causality; Econometric evidence;

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INTRODUCTION

In this era of globalization nations want to improve the living standards of their public. Improvements in the living standards come from economic development. Thus, economic development is the primary objective of all nations in this world. Economic development requires economic growth and structural adjustments. So, economic growth is essential for economic development. Here a question arises, that, how nations can promote economic growth? There are so many sectors of the economy which can make contribution to the economic growth. Export sector is one of the most important sectors which can accelerate the economic growth. This answer started a debate among economists, researchers, policy makers and think tanks, whether exports orientation leads to economic growth or economic growth lead to exports promotion.

Thus, economists put forward different opinions regarding exports and economic growth. One group of economists is in favor of exports-led growth hypothesis, while the other group is in favor of growth-led exports hypothesis. The exports-led growth hypothesis advocates the causality from exports to economic growth. It is also termed as unidirectional causality from exports to economic growth but not vise-versa. These studies (Vohra, 2001; Siliverstovs and Herzer, (2005) confirmed the export-led growth hypothesis. Causality from exports to economic growth and economic growth to exports is termed as bidirectional causality.

On the contrary, growth-led export hypothesis advocates the causality from economic growth to exports. These studies (Mishra, 2011; Iqbal, 2012; Santos, 2013) confirmed the growth-led exports hypothesis.

Table 1
Average Growth of Real GDP and Exports in HPEA's

Country name	Growth of real GDP		Growth of exports	
	1980-1990	1991-1995	1980-1990	1991-1995
Hong kong	6.9*	5.6*	14.4*	13.5*
Indonesia	6.1	7.6	5.3	21.3
Korea	9.4	7.2	12.0	13.4
Malaysia	5.2	8.7	10.9	14.4
Singapore	6.4	8.7	10.0	13.3
Thailand	7.6	8.4	14.0	14.2
Average	6.9	7.7	11.1	15.0
China	10.2	12.8	11.5	15.6
Developing countries	2.3	2.1	7.3	5.2
Industrial countries	3.2	2.0	5.2	6.4

Note: All values in above take are in percentage.

Nurkse (1970) was of view that exports played an essential role for swift growth and economic development of region of recent settlements (USA, Canada, Australia, New Zealand, Argentina, Uruguay, and South Africa). Haberler (1964) pointed out that the trade leads to full deployment of resources, growth of market size and betterment in economies of scales. It stimulates the flow of capital from developed to developing nations. Endogenous growth theories of Romer (1986) and Lucas (1988) offer realistic and accurate theoretical basis for the positive relationship among global trade and economic growth.

Growth rate of real GDP in high-performance Asian economies (HPAE's) shows that exports growth played a fundamental role in their growth during 1980-1995. Following table shows the Average growth of real gross domestic product and growth of exports of High-performance Asian economies and China. These achievements strongly convince that exports promotion is essential for economic growth.

The objective of this study is to investigate the export-led growth hypothesis in Pakistan. Co integration, Vector Error Correction Model and Granger Causality techniques are applied in this study. So far only few researchers have applied these techniques in case of Pakistan. Thus it is expected that this study will make enormous contribution to the pragmatic literature.

The rest of study is organized as follows: Few studies are reviewed in 2nd section. Model building, Variables and Data Sources are discussed in 3rd section. Econometric and Economic criterion Analysis is explained in 4th section. Concluding remarks and policy implication are given in 5th section.

1. LITERATURE REVIEW

The view regarding the role of exports as one of the deterministic feature of economic growth is not new. It goes back to the Mercantilists and Classical school of thought. A vast literature is available on exports and economic growth. The studies diverge regarding the variables and time period. Some of these are offered below:

In 17th and 18th centuries a group of bankers, govt officials and philosophers (famously known as mercantilist) was of view that exports promotion is a powerful tool for a nation to become rich and influential. They established their view on the ground that export promotion would result in inflows of valued metals (gold and silver). Heaps of Gold and silver were the symbol of power and richness.

Classical economists Adam Smith (1776) and David Ricardo (1817) were of view that international trade has a major impact on economic development. They demonstrated that a country can increase exports of products in which they have comparative advantage and thus faster their development process.

Khan et al. (1995) investigated the direction of causation between exports growth and economic growth in Pakistan. The researchers adopted Co-integration and Error-correction model for examination. The study found a stable, long-run two-way relationship between exports and output, but an one-way stable relationship between output and primary exports. Furthermore, the study also found bi-directional causation between exports growth and economic growth.

Anwar and Sampath (1997) traced the causal link between exports and economic growth. The time series data of 96 countries for the period of 1960 to 1992 are used for analysis. The researchers applied unit root test and co-integration techniques. Study explored that 20 countries are experiencing causality only in one direction , 12 countries with unidirectional causality from GDP to exports , from exports to GDP 6 countries and bidirectional causality for 2 countries and 11 countries do not show any relationship between exports and growth.

Ekanayake (1999) has shed light on the causal relationship between exports and economic growth in eight Asian developing countries. Time series data has been chosen from 1960 to 1997 for this study. The authors selected Co-integration and error-correction model to analyze the results. The study revealed bi-directional causality between exports and economic growth in India, Indonesia, Korea, Pakistan, Philippines, Sri Lanka and Thailand. The study also explored short-run Granger causality from economic growth to exports in all countries under study except Sri Lanka.

Chemeda (2001) tried to assess the Export-Led Growth hypothesis for Ethiopian country. The author used unit root tests, Co-integration and error correction model supported by Cobb Douglas function. The analysis is based on time series data (1950-1986). The author suggested that the growth of real exports has a positive

effect on economic growth in short run as well as in long run.

Vohra (2001) evaluated the link between exports and economic growth in India, Pakistan, Philippine, Malaysia and Thailand. The scholar used the time series data for period of 1973 to 1993 for examination. The study recommends that, when a country has achieved some stages of development, then exports have a positive relationship with economic growth.

Zentos and Tao (2002) illustrated the causal link between growth rate of exports, imports and GDP of Canada and USA .They selected time series data (1948-1996). The analysis was based on unit root tests, Co-integration, vector error model and Granger causality test. The study exposed strong bidirectional causality for Canada between trade to GDP and GDP to trade and weak causality for USA between trade and GDP growth.

Siliverstovs and Herzer (2005) have critically focused on the export-led growth hypothesis using annual time series data from Chile. The authors employed Toda and Yamamoto (1995) procedure for testing Granger non causality in Vector Error Model. The results confirmed the export-led growth hypothesis for Chile.

Shirazi and Manap (2005) studied the export-led growth hypothesis for five South Asian countries. They practiced Co-integration and multivariate Granger causality tests for assessment. The study found long run relationship between exports and outputs for all countries expect Sri- Lanka.

Tsen (2010) exemplified the Granger causality among exports, domestic demand and economic growth in China. Time series data over the period of 1978-2002 was chosen. The examination resulted in bidirectional Granger Causality among above mentioned variables.

Stait (2007) examined the export-led growth hypothesis for Egypt using data from 1977 to 2003. Researcher employed various analytical tools including Co-integration, granger causality, unit root tests, vector auto regression and impulse response function. Researcher concluded that exports, imports and GDP growth are Co-integrated and that exports causes GDP growth.

Li et al. (2010) conducted a research on the relationship between foreign trade and growth of East China .The researchers endorsed the hypothesis by confirming a positive and strong relation between foreign trade and GDP growth. The researchers applied unit root test, time series Co-integration and Error Correction Model to time series data (1981-2008).The study determined that there is a long run as well as short run bidirectional causality between foreign trade and GDP growth.

Mishra (2011) reinvestigated the dynamics of relationship between exports and economic growth in case of India for period of 1970 to 2009. The author exercised the techniques of Co-integration and vector error correction estimation. Results of the study lead to denial of export-led growth hypothesis for India.

Iqbal et al. (2012) analyzed the relationship between exports and economic growth in Pakistan. The analysis was based on the time series data for the period of 1970 to 2009. Granger causality method is being used in this study. The analysis showed that, there exists a unidirectional causation from GDP to exports called growth-led exports.

Sahni and Atri (2012) studied the mechanism of export-led growth in India. The authors chosen time series data from 1980-81 to 2008-09 for analysis .Ordinary Least square method is used to examine the results. The study confirmed the export-led growth hypothesis in India.

Kalaitzi (2013) examined the relationship between exports and economic growth in the United Arab Emirates. Time series data of exports and economic growth for the period of 1980-2010 is used for assessment. The Researcher applied the two step Engle Granger Co-integration and Johansen co-integration techniques. The findings established the long run relationship between exports and economic growth.

Alimi and Muse (2013) checked the role of exports in economic growth in Nigeria. They used the unit root tests, co-integration and VAR Granger causality / Exogeneity Wald tests for the period of 1970 to 2009. The study supported the growth-led export hypothesis in case of Nigeria.

In nutshell Khan et al., Anwar and Sampath, Ekanayake, Chemeda, Vohra, Zentos and Tao, Siliverstovs and Herzer, Shirazi and Manap, Tsen, Stait, Li et al., Iqbal et al., Sahni and Atri, Kalaitzi analyzed the export-led growth hypothesis. Few researchers applied Co-integration, vector error model, Engle granger co-integration and others used granger causality model mostly on time series data. These researches were conducted in India, China, Indonesia, Thailand, Sri-lanka, Philippine, Canada, USA and Arb Emirates. A few no of researches are being conducted on export-led growth hypothesis in Pakistan.

2. MODEL BUILDING, VARIABLES AND DATA SOURCES

2.1 Model Specification

The current study aims at investigating the export-led growth hypothesis in Pakistan. Based on the objective the study follows the Solow long run growth model that hypothesize a production function relating output to the inputs. The Solow Growth model in general form can be presented as follows:

$$\text{GDP} = f(K, L) .$$

Solow Growth Model is extended by adding three more vital variables fundamental for economic growth in Pakistan.

Solow Growth Model in extended form is presented in following equation form:

$$GDP = f(K, L, X, C, T).$$

GDP stands for real gross domestic product taken in million rupees used as the proxy of economic growth, *L* signifies employed labor force of Pakistan taken in million, used as the proxy of labor. *K* indicates the gross capital formation at constant market price calculated in million rupees. It is taken as the proxy of capital. *X* shows the real exports taken in million rupees. *C* stands for consumer price index and *T* for terms of trade. Extended Solow growth is presented in the Cob-Douglas production function form as follows:

$$GDP = aK^b L^c X^d C^e T^f e^{ui}.$$

In above model α is total productivity factor. *b* is output elasticity of capital, *c* is output elasticity of labor, *d* is output elasticity of exports, *e* is output elasticity of consumer price index and f is the output elasticity of terms of trade. We have to take natural log of above model to make it linear. Thus final model for estimation is as under;

$$GDP = \ln a + b\ln K + c\ln L + d\ln X + e\ln C + f\ln T + u_i \ln e.$$

Where lne is equal 1. Where GDP* is log natural of gross domestic product, *α** is log natural of intercept term, *K** is log natural of capital, *L** is log natural of labor, *X** log natural of exports, *I** is log natural of consumer price index and *T** is log natural of terms of trade. Slope Coefficients are indicated by

2.2 Priori expectations

Capital is considered as the blood of the economy. It is hypothesized that Gross Capital Formation (*K*) and Gross Domestic Product are positively related. Increase in capital leads to higher level of investment, construction of new production plants and new employment opportunities. Thus capital and output are directly associated.

Table 2
Expected Relations

Variables	Expected relationship	Same previous results
Capital (*K*)	Positive	Li (1998), Anwar and Sampath (1999), Faridi et al. (2011)
Labor (*L*)	Positive	Faridi et al. (2011)
Exports (*X*)	Positive	Khan et al. (1995), Anwar and Sampath (1997), Ekanayake (1999), Chemeda (2001), Vohra (2001), Zentos and Tao (2002), Siliverstovs and Herzer (2005), Shirazi and Manap (2005), Tsen (2010), Stait (2007), Li et al. (2010), Iqbal et al. (2012), Sahni and Atri (2012), Kalaitzi (2013).
Consumer price index (*CPI*)	Positive negative	Sattarow (2011), Bashir (2011) Min Li (...)
Terms of trade (*T*)	Positive negative	Fosu and Gyapong (2010), Fatima (2010)

Labor is the most important source of production in less developed countries. Employed labor force and output are also hypothesized to be positively allied. If trained and educated labor force is employed in different sectors of economy productivity is expected to increase many folds. Skilled labor force that actively takes part in economic activities, will not only increase the output and productivity but also decrease the cost of production.

It is also expected that exports are directly correlated with the Gross Domestic Product. Exports to triumph over the compactness of the domestic market. Exports of manufactured goods boost the efficiency throughout the economy. Exports bring foreign earnings, which in turn enhance the level of domestic investment output and employment.

Consumer price index can have both positive and negative relation with gross domestic product. On supply side consumer price index is directly related to output but on the demand side it is inversely associated with the output. Increase in consumer price index signals the producers to increase the supply to maximize profit. On the other increasing consumer price index not only discourages the investment but hampers the efficiency of investment. Price instability in the market leads to distortion and misdirection in allocation of economic resources. Unstable prices create uncertainties and unrest in the business sphere. Price instability also results in speculative investment which is verse for growth in the economy.

It is expected that terms of trade can have both positive and negative relation with economic growth. Deterioration of terms of trade is negatively allied with economic growth and vice versa.

2.3 Data Sources

Time series data for the period 1972 to 2012 is collected. Data source for Gross domestic product, Exports and Gross capital Formation is World Development Indicator. Employed Labor Force, consumer price index and in terms of trade's data is obtained from the Handbook of statistics on Pakistan Economy 2010, Pakistan Economic survey of 2010-2011, 2011-2012 and monthly bulletin of Pakistan Bureau of Statistics.

Table 3
Unit of Measurement and Data Sources

Variable	Unit of measurement	Data source
Gross domestic product	Million rupees	World development indicator
Gross capital formation	Million rupees	World development indicator
Employed labor force	Millions	Hand book of statistics of Pakistan 2010
Exports	Million rupees	World development indicator
Consumer price index	Ratio of prices	Hand book of statistics of Pakistan 2010
Terms of trade	Ratio of prices	Hand book of statistics of Pakistan 2010

2.4 Estimation Procedure

2.4.1 Steps in Johansen and Juselius Co-Integration Technique

There are five different steps in Johansen and Juselius Co-integration Technique given below:

- All variables included in study should be of integrated of order one I (1).
- Appropriate lag length should be chosen for model selection.
- Selecting suitable model for deterministic components in multivariate format.
- Determining the no of Co-integrating vectors through Trace and Eigenvalue statistics.
- Testing of variables that are weakly exogenous.

2.4.2 Augmented Dickey Fuller Test

Augmented Dickey Fuller Unit Root test is based on the estimation of regression as under:

$$\Delta yt = \alpha y_{t-1} + x_t'\delta + \epsilon_t .$$

Where $\alpha = \rho$-1. The null hypothesis is "series is non stationary" and alternative hypotheses is "series is stationary".

2.4.3 Information Criteria

Information criteria's are used as a steer in model selection. The information criteria's are applied to endow with the information that strikes a sense of balance between measure of goodness of fit and prudent specification of model.

The basic information criterions are as follows:

Akaike Information Criterion:

$$ALC = -2l/T + 2k/T \ .$$

2.4.4 Johansen Co Integration Method

Johansen (1988) and Johansen & Juselius (1990) presented a procedure for co integration for long run and short run liaison. Consider a VAR of order p;

$$y_t = A_1 y_{t-1} + \cdots\cdots + A_p t_{t-p} + Bx_t + E \ .$$

Where y_t is a k vector of non stationary $I(1)$ variables, x_t is a d vector of deterministic variables, and E_t is a vector of innovations. We may rewrite this VAR as,

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{p-1}\Gamma \Delta y_{t-1} + Bx_t + E_t .$$

Where:

$$\Pi = \sum_{i=1}^{p} A_i - I \text{ and } \Gamma_i = -\sum_{j=i+1}^{p} A_j .$$

2.4.5 Vector Error Correction Model

Vector error correction model is formed for non stationary series that are co integrating. Co integrating terms is termed as error correction term or speed of adjustment term. Divergence from long run equilibrium is corrected by short run adjustments.

$$\Delta y_{1,t} = \alpha_1 (y_{2,t-1} - \beta y_{1,t-1}) + E_{1,t} \ ,$$

$$\Delta y_{2,t} = \alpha_2 (y_{2,t-1} - \beta y_{1,t-1}) + E_{2,t} \ .$$

Where denotes the difference, p is selected lag length, is speed of adjustment term and $E_{1,2}$ is error term.

2.4.6 Granger Causality Test

In case of two variable stationary and granger causality test engages the estimation following VAR model:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \cdots\ldots\ldots + \alpha_l y_{t-1} + \beta_1 x_{t-1} + \cdots\ldots + \beta_l x_{t-1} + E_t,$$

$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \cdots\ldots\ldots + \alpha_l x_{t-1} + \beta_1 y_{t-1} + \cdots\ldots + \beta_l y_{t-1} + u_t.$$

Where E_t and u_t are uncorrelated error terms.

3 ECONOMETRIC AND ECONOMIC CRITERION ANALYSIS

3.1 Descriptive Statistics

Table 4 shows distinctiveness of time series data and general tendency of Pakistan Economy. On average Gross Domestic Product is 4,821,869 million rupees, Gross capital formation is 4,821,869 million rupees, exports are 554,892.2 million rupees, and employed labor force is 33.27 million. Inflation (CPI) and TOT on average are 71.65, 88.06, respectively.

Table 4
Descriptive Statistics

VARIABLES	GDP(M)	(GFCM)	EXP(M)	ELF(M)	CPI	TOT
Mean	4,821,869	968,172.5	554,892.2	33.27	71.65	88.06
Median	4,663,074	1,056,303	532,965.4	31.00	47.41	89.79
Standard Deviation	2,558,027	411,358.8	375,891.9	10.73	62.98	18.46

3.2 ADF test for Unit Root

Johansen Co-integration technique requires that all variables must be integrated of order one. Table 5 shows the results of ADF unit root test. Estimates indicate that at 1st difference, the null hypothesis which is "the series is non-stationary" is rejected as absolute value of ADF T Statistics is greater than that of the absolute value of ADF critical value. Thus all variables included in our study are integrated of order one.

Table 5
Augmented Dickey Fuller Test

Variables	Test for unit root	Included in test equation	*P*- statistics		Results
			ADF test statistics	Critical value	
LNGDP	Level	Intercept	-1.91	- 3.61*	*I*(1)
		Trend and intercept	- 0.73	- 4.21*	
	1st difference	intercept	- 4.21	- 2.60***	
LNEXP	Level	Intercept	-0.91	-2.93**	*I*(1)
		Trend and intercept	-1.89	-4.20*	
	1st difference	Intercept	-6.25	-2.93**	
LNGCF	Level	intercept	-1.97	- 2.60***	*I*(1)
		Trend and intercept	-0.91	- 4.20*	
	1st difference	Intercept	-5.84	-3.61*	
LNCPI	Level	Intercept	-1.79	-2.93**	*I*(1)
		Trend and intercept	-5.89	- 3.19***	
	1st difference	Intercept	-3.11	- 2.93**	
LNELF	Level	Intercept	- 0.24	-3.60*	*I*(1)
		Trend and intercept	-2.27	-3.52**	
	1stdifference	Intercept	-6.79	-3.61*	
LNTOT	Level	Intercept	-1.48	-2.93**	*I*(1)
		Trend and intercept	-2.39	-4.20*	
	1st difference	Intercept	-6.52	-2.60***	

Note. *, **, *** indicate the critical value at 1%, 5% and 10% significance level, respectively.

3.3 Lag Length Selection Method

Lag length selection is the second step of Johansen co integration. Final Prediction error and Akaike information criterion is used in the study. Calculations are shown in Table 6. Lag length selected in following is supposed to be 2. The values of information criterions are minimum at lag length 2.

Table 6
Lag Length Selection

Lag	Final Prediction Error (FPE)	Akaike Information Criterion (AIC)
0	7.31×10^{-12}	-8.6148
1	1.35×10^{-16}	-19.533
2	$1.15\times10^{-16*}$	-19.830*

Note. * indicates lag order selected by the criterion calculated by EViews-5

3.4 No. of Co-Integration Equations

Numbers of co-integration equations are found by trace and maximum eigenvalue statistics. In table 7null hypothesis, eigenvalue, trace statics, critical values and probabilities are shown in 1st, 2nd, 3rd, 4th and 5th column respectively. Max-Eigen Statistic is shown in 3rd column of Table 8.

Table 7
Trace Statistics

Unrestricted co-integration rank test (trace)				
Null hypothesis	**Eigenvalue**	**Trace statistics**	**0.05 critical value**	**Prob****
None *	0.668	134.175	103.847	0.000
At most 1*	0.524	92.241	76.972	0.002
At most 2*	0.456	63.979	54.079	0.005
At most 3*	0.397	40.823	35.192	0.011
At most 4*	0.299	21.544	20.261	0.033
At most 5	0.189	7.999	9.164	0.082

Table 8
Eigenvalue Statistics

Unrestricted co-integration rank test (maximum eigenvalue)				
Null hypothesis	**Eigenvalue**	**Max-eigen statistic**	**0.05 critcal value**	**Prob****
None *	0.668	41.933	40.956	0.038
At most 1	0.524	28.261	34.805	0.244
At most 2	0.456	23.156	28.588	0.211
At most 3	0.397	19.279	22.299	0.125
At most 4	0.299	13.544	15.892	0.112
At most 5	0.189	7.999	9.164	0.082

Probabilities shown in Tables 7 and 8 leads to the rejection of null hypothesis which is "there is no long run relationship among variables". Trace statistics indicate that there are five Co-integrated vectors in the long run. Eigenvalue statistics indicate one Co-integrated vector in long run results. Thus analysis shows that there is strong relationship between dependent and independent variable used in the present study.

3.5 Johansen Co-Integration (Long Run Analysis)

Long run results of exports and economic growth model are projected in tables 9. Variables name, Co-efficient values, standard errors, *t*-statistics values and concluding remarks are shown in 1st, 2nd, 3rd, 4th and 5th column respectively.

Capital and Gross domestic product are positively related in the case of Pakistan. The elasticity of Gross Domestic Product regarding gross capital formation is 0.247 which is significant at 1% level of significance. The co-efficient anticipate 0.247% growth in Gross Domestic Product as a result of 1% increase in gross capital formation in the long run. Capital is considered as the blood of the economy. It is empirically proved that gross capital formation and gross domestic product are positively related. Increase in capital leads to higher level of investment, construction of new production plants and new employment opportunities. Thus capital and output are directly associated. Our findings are consistent with Li (1998), Anwar and Sampath (1999), Faridi et al. (2011).

Results reveal that labor is positively allied with gross domestic of Pakistan. Elasticity of gross domestic product with respect to employ labor force is 1.159. This proposes that 1% increase in the employed labor force will boost gross domestic product by 1.159 percent on average. Labor is the most important source of production in less developed countries. Employed labor force and output are pragmatically found to be positively allied. If trained and educated labor force is employed in different sectors of economic productivity is expected to increase many folds. Skilled labor force that actively takes part in economic activities, will not only increase the output and productivity but also decrease the cost of production. Our results are persistent with Faridi et al. (2011).

Exports are positively associated with gross domestic product of Pakistan. Exports inducing gross domestic product are significant at 1% level of significance. Thus there is significant positive relationship between exports and economic growth. Co-efficient value of exports is 0.353, which predicts 0.353% increase on average in gross domestic product due to 1% expansion in exports in the long run. It is proved that exports are directly correlated with Gross Domestic Product of Pakistan. Exports to triumph over the compactness of the domestic market. Exports of manufactured goods boost the efficiency throughout the economy. Exports bring foreign earnings, which in turn enhance the level of domestic investment output and employment. Our findings are similar with Khan et al (1995), Anwar and Sampath (1997), Ekanayake (1999), Chemeda (2001), Vohra (2001), Zentos and Tao (2002), Siliverstovs and Herzer (2005), Shirazi and Manap (2005), Tsen (2010), Stait (2007), Li et al (2010), Iqbal et al (2012), Sahni and Atri (2012), Kalaitzi (2013).

Findings indicate that the consumer price index and gross domestic product are negatively related. Elasticity of gross domestic product with respect to the consumer price index is -0.158, which is significant at 1% level significance. It means that gross domestic product will fall by 1.58% on average due to one percent increase in the consumer price index. Increasing consumer price index not only discourages the investment but hampers the efficiency of investment. Price instability in the market leads to distortion and misdirection in allocation of economic resources. Unstable prices create uncertainties and unrest in the business sphere. Price instability also results in speculative investment which is verse for growth in the economy. Same results were traced by Min Li (...).

Terms of trade are positively associated to gross domestic product of Pakistan. Co-efficient is 0.276 is of positive value which is significant at one percent level of significant. Gross domestic product elasticity with respect to terms of trade is 0.278. It suggests that one percent increase in terms of trade index will cause GDP to rise to 0.278 on average in the long run. Same results were found by Fosu and Gyapong (2010).

Table 9
Johansen Long Run Results

Variables	Co-efficient	Standard error	*T* - statistics	Remarks
LNGCF	0.247	0.042	5.82	SIGNIFICANT
LNELF	1.159	0.127	9.06	SIGNIFICANT
LNEXP	0.353	0.031	11.08	SIGNIFICANT
LNCPI	-0.158	0.043	-3.66	SIGNIFICANT
LNTOT	0.278	0.041	6.64	SIGNIFICANT
CONSTANT	2.711	0.539	5.02	SIGNIFICANT

3.6 Vector Error Correction Model (Short Run Analysis)

Table 10 shows the vector error correction model results. Speed of adjustment indicates the time that the economy will take to move towards the long run equilibrium. Speed of adjustment value (-0.089) tells that economy will converge to long run equilibrium by taking 9% annual adjustments, in other words we can say that it will take 12 years to reach the equilibrium.

Table 10
Vector Error Correction Short Run Results

Variables	Co-efficient	Standard error	*T*-statistics
Speed of adjustment	-0.089	0.153	-0.585
D(LNGDP(-1))	0.182	0.168	1.083
D(LNGDP(-2))	0.428	0.189	2.258
D(LNGCF(-1))	-0.043	0.064	-0.675
D(LNGCF(-2))	-0.149	0.062	-2.404
D(LNELF(-1))	0.295	0.187	1.574
D(LNELF(-2))	-0.007	0.134	-0.055
D(LNEXP(-1))	0.084	0.060	1.395
D(LNEXP(-2))	0.071	0.046	1.549
D(LNCPI(-1))	0.026	0.080	0.333
D(LNCPI(-2))	-0.013	0.071	-0.182
D(LNTOT(-1))	0.032	0.044	0.716
D(LNTOT(-2))	0.046	0.039	1.177

VECM analysis discloses that gross domestic product, Exports, and Terms of Trade of 2011 and 2010 are positively affecting the real gross domestic product of 2012. Gross capital formation of 2011 and 2010 are negatively related with real gross domestic product of 2012. Employed labor force and consumer price index of 2011 positively but of 2010 are negatively related to gross domestic product of 2012.

3.7 Granger Causality Analysis

Table 11 depicts the granger causality results. Granger causality analysis is based on 10 percent significant probabilities values. Results reveal that exports are significantly affected by the real GDP. There is a one way causality gross domestic product to exports. There is also one way causality from gross domestic to gross capital formation, gross domestic product to the consumer price index, gross capital formation to exports, exports to the consumer price index and from the consumer price index to terms of trade. Bidirectional causality found between exports and terms of trade.

Table 11
Granger Causality Results

Null hypothesis	Obs	*F* - statistic	Probability
LNGCF does not Granger Cause LNGDP	39	0.251	0.779
LNGDP does not Granger Cause LNGCF		4.691	0.015
LNELF does not Granger Cause LNGDP	39	0.154	0.857
LNGDP does not Granger Cause LNELF		0.757	0.476
LNEXP does not Granger Cause LNGDP	39	0.320	0.727
LNGDP does not Granger Cause LNEXP		6.114	0.005
LNCPI does not Granger Cause LNGDP	39	1.788	0.182
LNGDP does not Granger Cause LNCPI		5.746	0.007
LNTOT does not Granger Cause LNGDP	39	0.529	0.593
LNGDP does not Granger Cause LNTOT		1.627	0.211
LNELF does not Granger Cause LNGCF	39	2.202	0.126
LNGCF does not Granger Cause LNELF		1.974	0.154
LNEXP does not Granger Cause LNGCF	39	0.826	0.446
LNGCF does not Granger Cause LNEXP		2.843	0.072
LNCPI does not Granger Cause LNGCF	39	0.172	0.842
LNGCF does not Granger Cause LNCPI		2.409	0.105
LNTOT does not Granger Cause LNGCF	39	0.504	0.608
LNGCF does not Granger Cause LNTOT		0.816	0.450
LNEXP does not Granger Cause LNELF	39	1.174	0.321
LNELF does not Granger Cause LNEXP		0.847	0.437
LNCPI does not Granger Cause LNELF	39	1.808	0.179
LNELF does not Granger Cause LNCPI		2.050	0.144
LNTOT does not Granger Cause LNELF	39	1.192	0.315
LNELF does not Granger Cause LNTOT		2.068	0.141
LNCPI does not Granger Cause LNEXP	39	1.417	0.256
LNEXP does not Granger Cause LNCPI		10.179	0.000
LNTOT does not Granger Cause LNEXP	39	2.783	0.075
LNEXP does not Granger Cause LNTOT		3.089	0.058
LNTOT does not Granger Cause LNCPI	39	1.371	0.267
LNCPI does not Granger Cause LNTOT		3.197	0.053

CONCLUSION AND POLICY IMPLICATION

The objective of this study is to investigate the export-led growth hypothesis in Pakistan. By Johansen Co-integration, Vector Error Correction Model and Granger causality, Extended Solow growth model is empirically analyzed in the case of Pakistan. Time series data is collected from 1972-2012 from Pakistan. The results of the study proved the export-led growth hypothesis in the case of Pakistan. It is found that gross capital formation, the employed labor force, consumer price index and in terms of trade are positively influencing economic growth in the long run. Short run results are also evident in presence of exports led growth hypothesis in Pakistan. Johansen co-integration results show a strong long run relationship between exports and economic growth.

It is recommended on the basis of findings that the government should take strict measures to control the prices. High prices are harmful for economic growth. The government should make export oriented policies to promote exports. Exports facilitating schemes like export bonus. Export financing and export credit guarantee schemes should be promptly announced to encourage the exports. Export processing zones should be established. These zones will not only catch the attention of foreign investors but also provide access to international markets to Pakistani exporters.

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