Export Diversification and Growth in Pakistan: An Empirical Investigation from 1972 to 2015[1]

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Abstract

This paper addresses three issues (a) it attempts to estimate whether product and geographical export diversification has contributed to GDP growth during the 1972-2015 period, (b) identify the determinants of export diversification during this period and (c) ascertain whether a structural break in the export diversification-GDP growth relationship has occurred after 2000, since when policy of liberalization has been pursued. We find a significant though modest positive association between export diversification and GDP growth during 1972-2015 and some evidence that this relationship though remaining statistically significant,however,it somewhat weakened during the liberalization period 2000-2015. We also find that private sector credit and human capital growth and favorable movements in Pakistan's aggregate terms of trade are negatively associated with product export diversification. Export diversification is currently a policy priority; however, the government's emphasis has been geographical – not product – export diversification. Our estimations show no positive significant relationship between geographical export diversification and GDP growth. We therefore suggest that incentives should be provided to induce Pakistani exporters to attempt to penetrate global value chain in product areas in which they already have a presence by linking their business strategies to carefully selected leading global market players.

1. Introduction

Pakistan is considered to be a low income developing country, which has some special characteristics. One of them is low level of diversification of exports in a typical year. 75% of the total exports consisting only five sectors; 40% of exports are of textiles and 23% are of apparel products, while other top sectors include leather and rice. This narrow base of the exports products profile is a matter of concern for

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policy makers. Export policy is being focused on market diversification, which is evident from the growing eagerness to sign of preferential trade agreement with several countries. Pakistan has qualified for duty free market access to the European Union's GSP+ program. One of the basic qualifications for this unilateral preference was that a country has export concentration in a few sectors to the EU member countries and one of the objectives of this unilateral duty free market access is that a beneficiary country may diversify its export profile.

There are several empirical studies which show that diversification contributes to economic growth. Amurgo-Pacheco and Pierola (2008) noted that developing countries' exports are highly concentrated and such products have very volatile demand, which leads to high instability of export earnings. Therefore export diversification would create a more stabilized export flow. Hausman and Klinger (2006) concluded that diversification creates spillover effect in the economy which further stimulates the diversified production structure. On the other hand the classical theories Adam Smith and David Ricardo's theory of comparative advantage advocates specialization. According to these theories specialization would lead to strong economic development.

There are some theoretical reasons as to why export diversification is beneficial for higher economic growth. One of the very important studies by Ghosh and Ostry (1994) explained that unstable export is one of the important reasons to necessitate the importance of export diversification. Export commodities of the developing countries often subject to volatile prices, therefore the dependency on these products would results in instability in export earnings. This trend discourages investment by risk-averse firms which leads to macroeconomic uncertainty and ultimately affects economic growth in the long run. This situation could therefore be avoided through export diversification.

Endogenous growth models (see, for example, Matsuyama, 1992) emphasized the importance of learning-by-doing for a sustainable economic growth. Pineres and Ferrantino (2000) argued that the Export diversification may results in knowledge spillovers through adopting new production practices, management and marketing. This trend could further benefit other industries. Similarly the expansion of manufacturing goods for exports showed a dynamic effect of export diversification on higher economic development. This was proved by Agosin (2007) through constructing a model for economic growth and export diversification nexus. The author found that the countries below the technological frontier, improve their comparative advantage by replicating and adapting existing products.

Furthermore Akbar and Naqvi (2000) have also attempted to analyze the export-led growth for Pakistan. They calculated export experience function at 2-digit HS level was used for the period 1972-99. The five-year interval variance of the values of index was

considered as structural change in export industries, which reduced the time series data from 27 observations to 24. The results showed a positive relationship between export growth and structural changes in export of Pakistan. The major critic is that the Export diversification measure was used to measure a variable of the model. No direct impact of export diversification was analyzed in the study. Furthermore, Khan and Afzal (2016) analyzed the hypothesis that low level of export diversification caused Pakistan's poor export performance. There study covers the period for 2000-2013 and based upon the data of "the Observatory of Economic Complexity" database". Their study has no empirical investigation, and results were based on some indexes and comparison with the export performance of India. The study concluded that Pakistan's export basket is not complex and technologically at lower end. Both these studies have smaller time period. Former study was much outdated, while later has very short time period coverage and have no empirical investigation. Both these study have not considered market diversification.

A very important study[3] was conducted by Velde (2010) to analyze how developing countries are affected by the global economic crises emerged in 2008. Among various economic variable researchers particularly focused on exports of the developing countries. They found that both product and geographical export diversification is very important for resilience to crises.

In view of the above, the main objective of this paper is to analyze the role of export diversification in economic growth, both in terms of product and markets diversification, or in other words the study focuses on commodities export diversification and geographical export diversification, which is the main contribution of this paper. To the best of our knowledge, this is the first study that has employed co-integration technique for estimating the long run effect of diversification on growth and determinants of export diversification. In case of Pakistan, there is relatively little attention given by the researchers to diversification (as our literature survey shows), although the narrow export structure both in terms of product and markets, is one of the key issues for policy makers.

This paper is designed as follows. Section II is the review of latest empirical studies, Section III explains Model specification, estimation methodology and data source, Section IV assesses estimation results. Section V is the conclusion.

2.   Literature Review

Hamed, Hadi, and Hossein (2014) investigated the effect of export diversification on economic growth in developing countries. Their study covered the period 2000-

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3   *Overseas Development Institute,UK conducted this monitoring study on the effects of the global financial crisis*

2009 for 23 developing countries from South Asia, South America and North Africa. They used a simple model where GDP per capita was the dependent variable and independent variables were physical capital, labour force and export diversification. For measuring export diversification they used standard deviation of the Revealed Comparative Advantage (RCA) Index. The result of the estimation showed a positive impact of export diversification on economic growth and therefore they conclude that developing countries should seek to diversify their export portfolio.

Balavac and Pugh (2016) analyzed the role of trade and institutions for output volatility of transition economies. They used both trade openness and export diversification indices to capture the effect of trade on output volatility. They choose 25 transition economies and covered the period from 1996 to 2010. A 3-year non-overlapping average of annual data was used for analysis. Output volatility was the dependent variable, while trade openness, diversification and institutions were independent variables. Diversification was calculated as export concentration index (HHI) and overall diversification by the Theil Index. Results of the estimation show a positive and significant relationship between output volatility and export diversifications (HHI and Theil Index).

Ahmed and Hamid (2014) assessed Pakistan's export diversification trend for the period 1972-2012. They estimated the degree of traditionality and structural change of Pakistan's export industries. Through this they explored the determinants of medium term structural change in the export sector. They used the cumulative export experience function at 2 digit level of SITC export statistics of Pakistan. Results showed only GDP and trade openness having a significant relationship with the Structural Change index. Most importantly the relationship of Structural Change Index and Product Concentration Index was found insignificant.

Hamid (2010) investigated both geographical and product diversification for exports of Malaysia for the period 1970 to 2003. The main objective of her research was to investigate as to how the pattern of trade and instability changed during the aforesaid period. She used the Gini-Hirschman coefficient of the concentration index to calculate product as well as geographical export diversification. She used the instability index as the dependent variable which was measured as annual percentage rate of change in export value. There were three independent variables commodity diversification index, geographical diversification index and share of primary commodity exports. The Auto Regressive Distributive Lag estimation confirmed a long run relationship. There was a negative and significant relationship between Instability in growth of export of manufacturing commodities and Concentration index of share and primary commodity exports.

Naude and Rossauw (2011) studied the relationship between export diversification and economic performance for four countries, Brazil, China, India and South Africa covering the period 1962 to 2000. They used three different types of diversification indices, (a) Herfindahl, (b) normalized-Hirschmann and (c) absolute deviation measures[4]. The granger causality tests show that export diversification granger caused per capita GDP for Brazil, China and South Africa, however, for India per capita GDP caused export diversification. Further the graph shows a U-shape relationship for China and South Africa, while for Brazil and India there was a negative non-linear relationship[5].

Benedictis, Gallegati, and Tamberi (2009) investigated the relationship between economic development and specialization. Their study is different in the way that it focuses on sectoral specialization. They choose export data for the period 1985 – 2001, for 39 developing countries at 2 and 4 digit SITC level. The authors used three different types of overall specialization measures derived from Revealed Comparative Advantage (RCA). The second is the country Gini, calculated by ranking sectors according to their growing RCA. Third index is derived from Theil, which is calculated as weighted sum of the logs of the sectoral RCA, where a higher value of this index shows higher specialization or low diversification. The graph shows a non-linear relationship and as the level of income increases the specialization index become flatter.

Forgha, Sama, and Atangana (2014) investigated the relationship between export diversification and economic growth of Cameron for the period 1980-2012. Their model has GDP per capita as dependent variable, while export diversification, investment, external debt, external deficit and labour productivity were independent variables. The authors used HHI index for measuring the export diversification. They used vector auto regression (VAR) and Granger causality tests to estimate the relationship between export diversification and economic growth. The results show that export diversification positively effects GDP per capita for Cameron. Granger causality test also showed the same result.

The above review shows on the whole a positive impact of export diversification on economic growth. The review also identifies some economic variables as determinants of export diversification. Some researchers have derived models from the Cobb-Douglas production functions and have found labour and capital productivity, human capital, level of development, terms of trade, openness, and exchange rate as determinant of export diversification. For single country studies most of the authors have used Herschman Index or Standard Deviation of Balassa index (i.e., the

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4   *Authors used these three indices being the most frequently used indices for measuring export diversification*
5   *A negative relationship between economic growth and concentration index shows a positive relationship with diversification.*

Revealed Comparative Advantage Index). Some of the authors also used number of commodities as proxy for export diversification. Studies of group of countries also used different proxies for export diversification, mostly Theil Index, Extensive margin and Intensive margin.

3. Methodology

On the basis of the above we will try to design an appropriate model, keeping in view the constraints and data availability, for this study. This section presents the model and technique of estimation and the measuring of the variables. Our research focuses on the following three issues.

a. Whether export diversification is a determinant of growth and vice versa

b. What are the determinants of export diversification.

c. Whether pattern of export diversification changes with growth and structural change

3.1 Measurement of diversification index

We will use two different Indices for Export diversification; one is product export diversification and second is the geographical export diversification, which will be measured by HHI which will be calculated through following:

$$HHI = \sum_{i=0}^{n} \left(\frac{x_{ij}}{X_j} \right)^2$$

Where x_{ij} is the export of commodity i of country j and X_j is the country's total exports in a given time period. Here we have used products at 4-digit SITC level, which is the most disaggregated level for the time period 1972 to 2015. This index is also used for the geographical concentration. For this purpose we have chosen following geographical location for Pakistan's exports.

North America,	South America,
Africa	Europe
Middle East	South Asia,
South East Asia	Oceania

3.2 Impact of export diversification on economic growth

We will follow the model used by Ferreira and Harrison (2012). They used the

simple neoclassical production function to study the growth process. We will use their model with an addition of important variable the nominal exchange rate. This variable is used by some studies which we have mentioned in our literature review. These include Balavac and Pugh (2016), Fonchamno (2015) and Ahmed and Hamid (2014), Equation (M.1) and (M.2) specify our model to test the hypothesis that export diversification effects economic growth:

$$lnGDP_t = \alpha_0 + \alpha_1 lnK_t + \alpha_2 lnL_t + \alpha_3 lnDIV_{pt} + \alpha_4 lnMX_t + lnEX + \delta_t \text{ ----(M.1)}$$

$$lnGDP_t = \alpha_0 + \alpha_1 lnK_t + \alpha_2 lnL_t + \alpha_3 lnDIV_{gt} + \alpha_4 lnMX_t + lnEX + \xi_t \text{ ----(M.2)}$$

where

GDP_t =   Gross domestic product (in current US$)

K_t =   Capital (measured by gross fixed capital formation in current US$)

L_t =   Labour (measured by total labour force)

DIV_{pt} =   Product export diversification (measured by HHI at 4-digit SITC Rev.1[6])

DIV_{gt} =   Geographical export diversification (measured by HHI)

MX_t =   share of manufactured exports in total exports

EX =   Exchange rate

δ= error term

The above two models are used to estimate the impact of both product and geographical export diversification, on GDP growth separately.

3.3 Determinants of export diversification

We have developed the following model for identifying the determinants of export diversification:

$$\boldsymbol{DIV_t = \beta X_t + \varepsilon_t} \qquad\qquad (3)$$

Where DIV_t indicates Export diversification, while X_t is a matrix of various economic variables with coefficient β, at time period t, which are the determinants of export diversification, and ε is the error term. Following the study of Agosin, Alvarez,

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6   *Only SITC Rev.1 gives the time series data from 1972,at 4-digit level*

and Ortega (2012), matrix X includes a set of variables which is divided into 3 broad categories. These categories are (i) economic reforms, (ii) the structural factor and (iii) macroeconomic variables. Economic reforms will be measured through openness (export plus import as share of GDP) and financial development (domestic credit to non-banking sectors as share of GDP), structural factor will be measured through human capital (Secondary School enrollment as share of total population)[7] and macroeconomic variables will be measured through nominal exchange rate and terms of trade. The final equation of the model will be as follows:

$$LDIV_p = \beta_0 + \beta_1(LOPEN) + \beta_3(LDCGDP) + \beta_4(LSSEN) + \beta_5(LEX) + \beta_6(LTOT) + \varepsilon_t \quad (4)$$

$$LDIV_g = \beta_0 + \beta_1(LOPEN) + \beta_3(LDCGDP) + \beta_4(LSSEN) + \beta_5(LEX) + \beta_6(LTOT) + \varepsilon_t \quad (5)$$

All the variables are in logarithmic form, Where;

$LDIV_p$ = Product Export diversification (HHI at 4-digit SITC level)

$LDIV_g$ = Geographical Export Diversification (measured by HHI)

LOPEN = Log of Openness (Export plus Import as share of GDP)

LDCGDP = Log of Domestic Credit to non-banking sector as share of GDP

LSSEN = Log of Secondary School Registration as share of total population

LEX = Log of nominal exchange rate in Pak Rupees per US$

LTOT = Log of terms of trade

3.4 GDP-Diversification relationship with structural changes

This section will try to identify the structural change in the GDP-Diversification (both product and geographical separately) relationship. This shall be done through introduction of dummy variable for structural change. This study will use year 2000 from which Pakistan's economy was extensively liberalized. For the analysis of structural change an interaction term (a product of diversification and dummy variable) will be added in the models M.1 and M.2, separately.

Interaction term is used for identifying structural change in the model this can

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7   *Agosin (2012) used this measure as human capital which effects export diversification.*

be understood through the following equation. Suppose Y_{it} is the income level, which is dependent upon export diversification X_{it}, where a dummy variable DUM is used for structural change when the political regime is changed. The interaction term is DUM*X_{it}, so the model will be as follows;

$$\sum Y_{it} = \alpha_0 + \alpha_1 \sum X_{it} + \alpha_2 \sum X_{it} * DUM + \epsilon_t \qquad (6)$$

If we apply change with respect to Xi when DUM variable value is zero the outcome will be

$$\Delta X_{it} = \alpha_1 \qquad (7)$$

If change is applied when DUM has the value 1, than

$$\Delta X_{it} = \alpha_1 + \alpha_2 \qquad (8)$$

Equation 8 shows that value of change in consumption with respect to change in income, when the value of dummy variable was zero (when there was no regime change), equals to a constant value of α_1, while in the time period when dummy variable is 1 (regime is changed) the value is $\alpha_1 + \alpha_2$. The higher intercept value due to change in income in the changed regime shows a shift by a value of α_2.

3.5 Econometric technique

We first checked the time series properties of each variable and found the order of integration. This property may suggest the adopting of Auto Regressive Distributive Lag (ARDL) approach to find cointegration in the model. The existence of co-integration estimates indicates existence of a long-run relationship among the variables. There are various advantages of using the ARDL approach over the conventional Engle and Granger (1987) procedure of testing for cointegration within the model. The ARDL does not require the same order of integration, it can be tested when variables are stationery at different levels of integration. Furthermore, this approach can be adopted even for small sample size.

Variables used in this study have been found to be stationary at different order of integration and furthermore we have a sufficiently large sample size. These two characteristics of our time series data enabled us to use the ARDL approach.

After confirmation of finding cointegration we used the Dynamic Ordinary Least Square (DOLS) technique to identify the relationship between dependent and independent variables of the models. DOLS procedure was developed by Stock and Watson (1993).

We will then attempt to find structural break in the GDP and export diversification relationship by adding an interaction dummy variable in the model M.1 and M.2 and will use the same DOLS technique to identify the structural break (if any) in 2000 onwards a period in trade liberalization was adopted severely by the government of Pakistan. A dummy variable will be created giving value 1 from 2000 and zero before this time period.

3.6 Data sources

Data on GDP per capita, nominal exchange rate, manufacturing value added is available on World Development Indicators (WDI), on the website of the World Bank data base. The variable Openness will be calculated as exports plus imports as share of GDP. Data on Gross fixed capital formation, total labour force of Pakistan, and Manufactured Export is also available on the WDI website. Data on Secondary School registration and terms of trade will be procured from the publications of the State Bank of Pakistan[8]. Product export diversification DIV_p will be calculated through HHI, by using SITC 4-digit level trade data from UNCOMTRADE database which is accessible through World Integrated Trade Solution (WITS) of the World Bank website. While Geographical diversification DIV_g will be calculated on the basis of regional exports to North America, South America & Carrabin, Europe, North Africa, Sab-Saharan Africa, South Asia, South East Asia, Middle East, East Asia and Oceania region. All the data will be time series for the year 1972 to 2015.

4.   Estimation and Results

We will first calculate Diversification Index for export of products and export markets using HHI. Higher value of the index refers as concentration and lower value refers as diversification. A summary of the HHI index is given in the table – 1:

This table shows, that index value for HHI-G is higher than HHI-P, which implies that product export diversification is greater than geographical diversification. This may be misleading because we have divided the whole world in to eight geographical regions, while the numbers of products are 350 to 450 at 4-digit SITC level during 1972-2015 period. However, trend of both these indices shows very modest tendency towards diversification, which can be seen in figure–1

Figure-1 shows that geographical concentration was highly concentrated in 1972 and decreased to its lowest point in 1979, which then increased to another high level in 1983. These fluctuations continued till 1990. After this a continuous moderate

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8   *Handbook of statistics on Pakistan economy,2015,(http://www.sbp.org.pk/departments/stats/PakEconomy_HandBook/)*

Table 1: HHI Concentration Index – A summary

Years	HHI-P (at 4 digit SITC level)	HHI-G (Geographical)
1972	0.1026	0.299
1980	0.0827	0.206
1990	0.0697	0.261
2000	0.0696	0.215
2005	0.0785	0.199
2010	0.0648	0.174
2015	0.0671	0.190
Average	0.0720	0.214

decrease in concentration was observed till 2012. After this year a slight and continuous increase in concentration was observed.

A slightly different trend is shown with respect to HHI-P. Concentration was
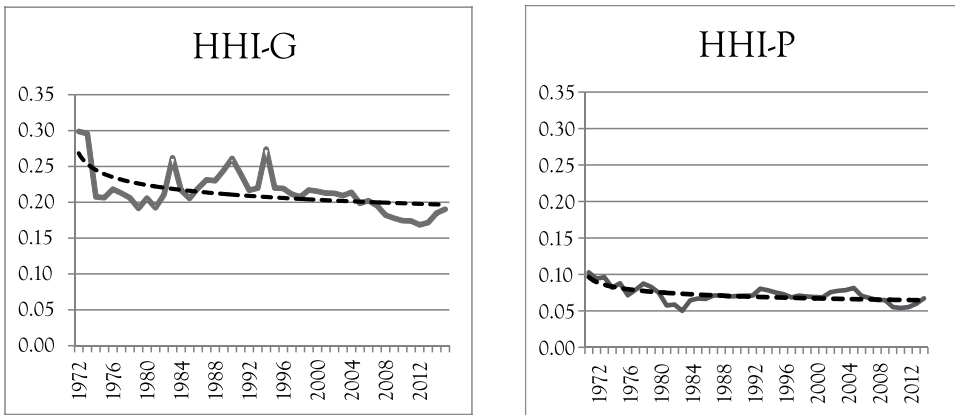
Figure 1: Trend of HHI-G and HHI-P

highest in 1972, which was then reduced and reached its lowest value in 1984. From this year to 2015 the concentration level remains almost stagnant.

If we analyze the trend line of both these graphs this will show almost identical situation, however changes in geographical concentration is less stable than the product concentration.

4.1 Impact of export diversification on economic growth:

We will start our analysis with the attempt at establishment of a long run rela-

tionship between growth and export diversification, which requires us to check for the stationarity of all variables in the models. As a first step we conducted Augmented Dickey Fuller (ADF) Test to test if the relevant variable has a unit root. This is the precondition for finding a long run relationship or co-integration in the models.

Table – 2 shows the order of integration where variables are stationary. Both product export diversification DIVp and geographical export diversification DIVg are stationary at I(0) while the rest of the variables are stationary at I(1). This different order of integration suggests using the ARDL approach to find cointegration (the long run relationship).

Table 2: Unit Root Test

Variables	ADF		Philips-Perron		Result
	Intercept	Inter-trend	Intercept	Inter-trend	
Variable-at Level					
LDIVP	-3.11**	-3.06	-3.11**	-3.06	I(0)
LDIVG	-3.38**	-3.69**	-3.34**	-3.69**	I(0)
Variable-1st Difference					
LLAB	-5.29***	-5.22***	-5.29***	-5.22***	I(1)
LMX	-7.66*	-6.22***	-7.60***	-7.60***	I(1)
LGDP$	-8.808***	-9.078***	-8.058***	-8.245***	I(1)
LGFCF	-6.762***	-7.275***	-6.595***	-6.961***	I(1)
LEX	-4.795***	4.785***	4.842***	4.832***	I(1)

In view of the above property we employ ARDL approach to find cointegration among the variables of the models M.1 and M.2.

4.1.1 MODEL-M.1

$$\Delta lgdp\$_t = \gamma_1 + \gamma_2 lgdp\$_{t-1} + \gamma_3 lgfcf_{t-1} + \gamma_4 llab_{t-1} + \gamma_5 ldiv_{Pt-1} + \gamma_6 lmx_{t-1}$$

$$+ \gamma_7 lex_{t-1} + \sum_{i=1}^{n} \partial_i \Delta lgdp\$_{t-i} + \sum_{i=1}^{n} \theta_i \Delta lgfcf_{t-i} + \sum_{i=1}^{n} \vartheta_i \Delta llab_{t-i}$$

$$+ \sum_{i=1}^{n} \pi_i \Delta ldiv_{pt-i} + \sum_{i=1}^{n} \tau_i \Delta lmx_{t-i} + \sum_{i=1}^{n} \omega_i \Delta lex_{t-i} + \epsilon_t$$

4.1.2 MODEL-M.2:

$$\Delta lgdp\$_t = \gamma_1 + \gamma_2 lgdp\$_{t-1} + \gamma_3 lgfcf_{t-1} + \gamma_4 llab_{t-1} + \gamma_5 ldiv_{gt-1} + \gamma_6 lmx_{t-1}$$

$$+ \gamma_7 lex_{t-1} + \sum_{i=1}^{n} \partial_i \Delta lgdp\$_{t-i} + \sum_{i=1}^{n} \theta_i \Delta lgfcf_{t-i} + \sum_{i=1}^{n} \vartheta_i \Delta llab_{t-i}$$

$$+ \sum_{i=1}^{n} \pi_i \Delta ldiv_{gt-i} + \sum_{i=1}^{n} \tau_i \Delta lmx_{t-i} + \sum_{i=1}^{n} \omega_i \Delta lex_{t-i} + \epsilon_t$$

Eviews-9 is used to confirm the existence of cointegration in the model. This is done using the ARDL bound test approach. This software automatically selects the number of optimal lags for each variable. First we run the model M.1 and results of such estimation are given in Table-3.

Table-3 shows that the calculated F-statistics value is greater than the I(1) Bound value at all levels of significance. This rejects the null hypothesis of nonexistence of a long-run relationship. Therefore it is confirmed that a long run relationship exist in the model M.1.

Table 3: ARDL Bounds Test (model M.1)

Sample: 1976 2015		
Included observations: 40		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	5.746748	5
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
1%	3.41	4.68

Table – 4 shows the ARDL estimation for model M.2, which also confirms the existence of a long run relationship in the model. The calculated F-statistics are greater than the I(1) Bound value measuring the existence of cointegration in the model.

After the confirmation of the existence of cointegration we estimate the nature of the long run relationship through Dynamic Ordinary Least Square method. Results of the DOLS will be further confirmed by the Fully Modified Least Square (FMOLS) and Canonical Cointegration Regression.

Masih and Masih (1996) indicated that DOLS allows for variables of different integrated orders and tackling the problem of simultaneity amongst the regressors as well. Furthermore, compared to a number of alternative estimators of long-run parameters, such as proposed by Engle and Granger (1987), Johansen (1988) and Phillips and Hansen (1990) based on Monte Carlo evidence, Stock and Watson (1993) show that DOLS is more favourable, particularly in small samples, therefore very much appropriate for this study.

Table 4: ARDL Bounds Test (model M.2)

Sample: 1976 2015		
Included observations: 40		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	k
F-statistic	4.810665	5
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
1%	3.41	4.68

Table-5 shows that in the long run three variables have significant relationship while two other have no significant relationship. Product diversification which is our main concern is found to be significant. Since this variable is measured through concentration index therefore a negative coefficient sign would indicate a positive relationship between diversification and the dependent variable GDP growth. Coef-

Table 5: Method: Dynamic Least Squares (DOLS) – Model M.1

Dependent Variable: LGDP$			
Sample (adjusted): 1975 2013			
Included observations: 39 after adjustments			
Cointegrating equation deterministics: C			
Automatic leads and lags specification (lead=2 and lag=2 based on AIC criterion, max=2)			
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)			
Variable	Coefficient	Prob.	
LGFCF	0.725708	0.0001	
LLAB	-0.61349	0.229	
LDIVP	-0.89451	0.0169	
LMX	-0.35006	0.1917	
LEX	0.652975	0.0035	
C	15.8048	0.03	
R-squared	0.999697	Mean dependent var	24.72805
Adjusted R-squared	0.998559	S.D. dependent var	0.810107
S.E. of regression	0.030748	Sum squared resid	0.007563
Long-run variance	0.000373		

ficient value of -0.89 for LDIVP, shows that 1 percent increase in diversification will cause 0.89% increase in GDP. This implies that had the diversification increased by 1%, the GDP would be increased from US$ 271.0 billion, in 2015, to US$ 273.5 billion in 2016 (current US$ prices).

On the other hand table–6 shows that the relationship between GDP and geographical export diversification (divg) is insignificant. This implies that geographical export diversification has no effect on GDP during the sample period. This result is further confirmed by applying FMOLS and CRR method of cointegration regression, results of which are given in table – 7.

Table 6: Method: Dynamic Least Squares (DOLS) – Model M.2

Method: Dynamic Least Squares (DOLS)			
Dependent Variable: LGDP$			
Sample (adjusted): 1975 2014			
Included observations: 40 after adjustments			
Cointegrating equation deterministics: C			
Automatic leads and lags specification (lead=1 and lag=2 based on AIC criterion, max=2)			
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)			
Variable	Coefficient	Prob.	
LGFCF	0.782210	0.0004	
LLAB	-0.016932	0.9836	
LDIVG	-0.036919	0.9399	
LMX	-0.704357	0.1517	
LEX	0.395034	0.2138	
C	8.809292	0.4563	
R-squared	0.999414	Mean dependent var	24.76540
Adjusted R-squared	0.998369	S.D. dependent var	0.833808
S.E. of regression	0.033676	Sum squared resid	0.015877
Long-run variance	0.001144		

This relationship has been further confirmed by estimating the coefficients through FMOLS and CCR methods. Table-7 shows the results of all three methods, according to which a significant and negative relationship is found between GDP growth and product export concentration index, which implies a significant and positive relationship between GDP and product export diversification.

However, the relationship between GDP and DIVg (geographical export diver-

sification) is found insignificant for all three cointegration regressions. The results confirm that there is no relationship between GDP and geographical export diversification or in other words the policy of geographical export diversification has not

Table 7: long run relationship through different Cointegration estimation methods

Model M.1						
Variable	DOLS		FMOLS		CCR	
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
LGFCF	0.726	0.000	0.593	0.000	0.599	0.000
LLAB	-0.613	0.330	0.871	0.007	0.822	0.020
LDIVP	-0.895	0.090	-0.207	0.003	-0.202	0.010
LMX	-0.350	0.335	-0.440	0.000	-0.457	0.000
LEX	0.653	0.014	0.119	0.281	0.137	0.251
C	15.805	0.067	-3.041	0.475	-2.322	0.620
Model-M.2						
LGFCF	0.782	0.000	0.669	0.000	0.692	0.000
LLAB	-0.017	0.984	0.652	0.087	0.531	0.238
LDIVG	-0.037	0.940	0.168	0.254	0.209	0.239
LMX	-0.704	0.152	-0.650	0.000	-0.709	0.001
LEX	0.395	0.214	0.202	0.155	0.248	0.139
C	8.809	0.456	0.445	0.933	2.178	0.730

been successful in the case of Pakistan.

At the third step we checked causality through Granger Causality method at different lags. We will report granger causality between our two main variables GDP and Diversification indices at different lags.

Table–8 shows that for Model M.1 there is one-way causality from product export diversification to GDP for all 5 time lags, except lag 1. However, for model M.2 there is no causality found for any time lag. This result further confirmed that there is no causality or relationship between GDP and geographical export diversification.

Since the GDP growth equation has shown insignificant relationship with the geographical export diversification, therefore we will now focus on product export diversification for determinants and the structural change between it and GDP.

Table 8: Pairwise Granger Causality Tests

Sample: 1972-2015			
Model M.1:			
Null Hypothesis:	Lags	F-Statistic	Prob.
LDIVP does not Granger Cause LGDP$	5	4.14543	0.0061
LGDP$ does not Granger Cause LDIVP		0.57745	0.7168
LDIVP does not Granger Cause LGDP$	4	1.93969	0.1287
LGDP$ does not Granger Cause LDIVP		1.05064	0.3973
LDIVP does not Granger Cause LGDP$	3	2.89924	0.0491
LGDP$ does not Granger Cause LDIVP		0.6565	0.5845
LDIVP does not Granger Cause LGDP$	2	7.94544	0.0013
LGDP$ does not Granger Cause LDIVP		2.34845	0.1096
LDIVP does not Granger Cause LGDP$	1	1.24592	0.271
LGDP$ does not Granger Cause LDIVP		1.7798	0.1897
LDIVP does not Granger Cause LGDP$	0	7.94544	0.0013
LGDP$ does not Granger Cause LDIVP		2.34845	0.1096
Model M.2:			
LDIVG does not Granger Cause LGDP$	5	1.05889	0.4038
LGDP$ does not Granger Cause LDIVG		1.09885	0.3831
LDIVG does not Granger Cause LGDP$	4	1.08631	0.3804
LGDP$ does not Granger Cause LDIVG		0.56103	0.6926
LDIVG does not Granger Cause LGDP$	3	0.64944	0.5888
LGDP$ does not Granger Cause LDIVG		0.72387	0.5448
LDIVG does not Granger Cause LGDP$	2	0.10894	0.8971
LGDP$ does not Granger Cause LDIVG		1.66151	0.2037
LDIVG does not Granger Cause LGDP$	1	2.31242	0.1362
LGDP$ does not Granger Cause LDIVG		1.29861	0.2612
LDIVG does not Granger Cause LGDP$	0	2.31242	0.1362
LGDP$ does not Granger Cause LDIVG		1.29861	0.2612

4.2 Determinants of export diversification

Here we have used the model of Agosin et al. (2012) for identifying the determinants of export diversification. According to them there are three broad categories which determine export diversification. These are (i) economic reforms, captured by

openness and domestic credit to non-banking sector as share of GDP, (ii) structural factors captured by human capital (secondary school enrollment as share of population) and (iii) macro-economic variables, captured by the exchange rate and terms of trade. The final equation of the model is as under.

$$LDIV_{pt} = \beta_0 + \beta_1\left(LOPEN_t\right) + \beta_2\left(LDCGDP_t\right) + \beta_3\left(LSSEN_t\right) + \beta_4\left(LEX_t\right) + \beta_5\left(LTOT_t\right) + \varepsilon_t \quad \text{(M.3)}$$

All the above variables are taken in logarithmic form where;

$LDIV_p$ =   Product Export diversification (HHI at SITC 4-digit level)

LOPEN   =   Log of Openness (export plus import as share of GDP)

LDCGDP =   Log of Domestic credit to non-banking sector as share of GDP

LEX   =   Log of nominal exchange rate (Pak Rupees per US$)

LTOT   =   Log of terms of trade (1990 as base year)

All the above data were taken from WDI except Terms of Trade. This variable is procured from the State Bank of Pakistan with 1990 as base year.

We will first test for the order of integration of all variables of the model, through Unit root test. Results of the unit root test (stationarity) is given in Table – 9. This table shows that three variables are stationary at level, while three are stationary at first difference. This different order of integration of the data complies to the condition of ARDL for estimating the existence of long run relationship in the model.

The second step is to find existence of cointegration in the model. This is done

Table 9: Unit Root test

Variables	ADF		Philips-Perron		Result
	Intercept	Inter-trend	Intercept	Inter-trend	
Variable at Level					
LDIVP	-3.11**	-3.06	-3.11**	-3.06	I(0)
LDIVG	-3.38**	-3.69**	-3.34**	-3.69**	I(0)
LOPEN	-2.949**	-2.831	-3.010**	2.823	I(0)
Variable-1st Difference					
LDCGDP	-5.032***	-5.060***	-5.029***	-5.062***	I(1)
LEX	-4.795***	4.785***	4.842***	4.832***	I(1)
LTOT	-7.624***	-7.647***	-7.683***	-7.706***	I(1)

by using Eviews-9 software, which by default selects the optimal number of lags for each variable directly. For this purpose we estimate model – M.3 through ARDL bound test method.

Table – 10 shows that the calculated F-statistic value is greater than the I(1) Bound value at all levels (10%, 5% and 1%) of significance which is rejecting the null hypothesis of no long run relationship and confirming the existence of long run relationship in the model M.3.

Table 10: ARDL Bounds Test (Model M.3)

Sample: 1976 2015		
Included observations: 40		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	K
F-statistic	5.814962	5
Critical Value Bounds		
Significance	I(0) Bound	I(1) Bound
10%	2.26	3.35
5%	2.62	3.79
1%	3.41	4.68

After confirming the existence of long run relationship in the model, we applied the Dynamic Ordinary Least Square estimation technique to estimate the coefficients of the variables. We have selected two lags and leads and Akaike criteria, as it is the maximum leads and lags which the system was accepting. Result of the estimation for model M.3 is given in table – 11:

Table – 11 shows Domestic credit to non-banking institute (LDCGDP), Human Capital (LSSEN) and Terms of Trade (LTOT) as significant determinants of Product Diversification. As stated earlier the variables for diversification are actually concentration index obverses therefore a negative sign of the coefficient would show a positive relationship with the diversification. Here all the significant variables have positive coefficient which implies a negative relationship with the product diversification. More domestic credit to non-banking sector, Human capital expenditures and increasing terms of trade has been found to have negative relationship with product export diversification. This implies that companies which acquire more credit concentrate on specialization and do not opt for diversification. Similarly government expenditures on human capital impact positively on product specialization and not on

Table 11: Dynamic Least Squares (DOLS) for model M.3

Dependent Variable: LDIVP			
Sample (adjusted): 1975 2013			
Included observations: 39 after adjustments			
Cointegrating equation deterministics: C			
Automatic leads and lags specification (lead=2 and lag=2 based on AIC criterion, max=2)			
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)			
Variable	Coefficient	Prob.	
LOPEN	1.316311	0.4439	
LDCGDP	1.080279	0.0185	
LSSEN	1.583559	0.0703	
LEX	-0.530521	0.1230	
LTOT	0.359507	0.0880	
C	-4.165353	0.0193	
R-squared	0.911212	Mean dependent var	-2.660480
Adjusted R-squared	0.578256	S.D. dependent var	0.133722
S.E. of regression	0.086842	Sum squared resid	0.060332
Long-run variance	0.003198		

diversification. Furthermore, a higher terms of trade (index of unit value of exports divided by index of unit value of imports) implies that there is negative relationship between product export diversification and unit value index of exports. A higher value of export unit value index leads to lower product export diversification. The results are simply indicating that domestic credit, human capital growth and improvements in the overall terms of trade are not leading to a diversification of our export profile.

4.3. Structural breaks

In this section we will study the structural break in the relationship of GDP and export diversification. We began by presenting a graph showing the relationship between GDP and HHI for product export diversification which is shown in figure 2.

Figure-2 shows a modest positive relationship between GDP and product export diversification. The vertical axis represents the concentration index and for HHI-P (index for product diversification) and its range is relatively small. However, the trend line is showing that as the GDP is increasing the diversification is also increasing and gradually the relationship becomes somewhat flat.

For a more rigorous investigation we add a dummy variable in the model M.1. We
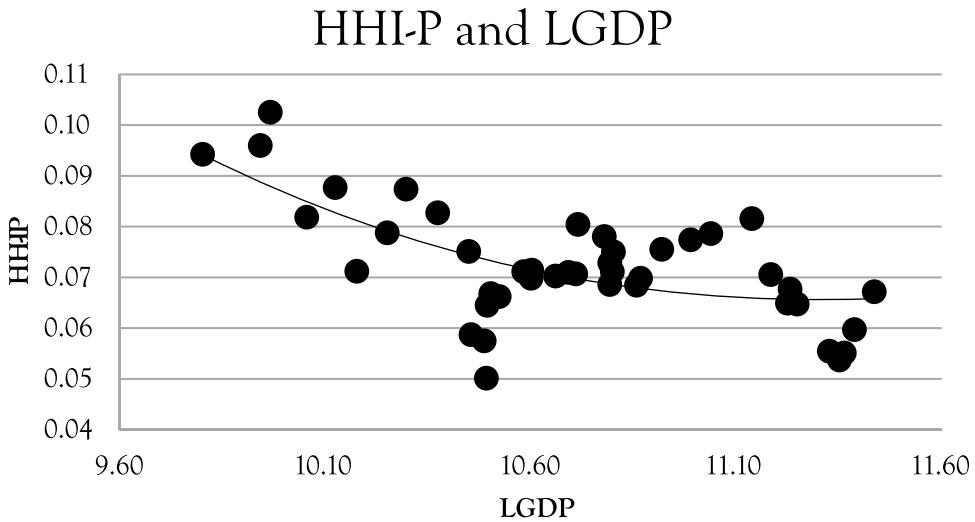
HHI-P and LGDP

Figure 2: Relationship between Export Diversification and GDP

Author's own calculation, GDP in log form and HHI-P is product concentration. The negative trend shows a positive relationship between GDP and HHI.

have taken the year 2000 as the year of structural break in the diversification-GDP relationship, took value 1 from 2000 and zero otherwise. To test its significance we have added an interaction term which is a product of diversification variable and dummy variable. A significant value of the interaction term would indicate the significance of the dummy variable. Here we have used the same model M.1 and run our model with DOLS for long run effect. Result of the estimation for long run effect of dummy variable is given in table-12;

Table 12: structural change GDP-Product Diversification relationship

Method: Dynamic Least Squares (DOLS)			
Sample (adjusted): 1975 2013			
Included observations: 39 after adjustments			
Cointegrating equation deterministics: C			
Automatic leads and lags specification (lead=2 and lag=2 based on AIC criterion, max=2)			
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)			
Dependent Variable: LGDP$			
Variable	Coefficient	Prob.	
LGFCF	0.869482	0.0101	
LLAB	-0.37084	0.5641	
LMX	-0.72525	0.0474	

Aamir Hussain Siddiqui

LEX	0.666329	0.066	
LDIVP	-0.97162	0.0258	
DUM2000*LDIVP	0.142183	0.0109	
C	9.469307	0.3396	
R-squared	0.999979	Mean dependent var	24.72805
Adjusted R-squared	0.999597	S.D. dependent var	0.810107
S.E. of regression	0.01627	Sum squared resid	0.000529
Long-run variance	4.27E-05		

Table–12 shows the interaction term (DUM2000*LDVIP) and product export diversification (LDIVP) to be significant. This implies that the relationship between GDP and diversification has changed after the year 2000. The negative sign of the coefficient shows a positive relationship between GDP and product export diversification. The impact of diversification on GDP is estimated -0.9716 before the year 2000, while after this year it is changed to -0.8294 (sum of the coefficient value of diversification and interaction term). These coefficient values are not substantially different. The coefficients of diversification indicate that before the year 2000 the impact of diversification on growth was stronger than after 2000.

5. Conclusion

The paper attempts to estimate whether product and geographical export diversification have contributed to GDP growth during the 1972-2015 period, identifying the determinants of export diversification during the same period and ascertaining whether a structural break in the export diversification-GDP growth relationship has occurred after 2000, when a policy of liberalization has been pursued severely in Pakistan.

Results show that product export diversification has a significant long run relationship with GDP growth. When product export diversification is replaced with geographical export diversification, results show an insignificant relationship. This trend is confirmed through the Granger causality test, which showed a unidirectional causality from product export diversification to GDP at various lag lengths.

Results for identifying determinants of product export diversification showed three variables, human capital, terms of trade, and domestic credit to manufacturing sector, as significant determinants of export diversification. The positive sign of coefficient of first two variables shows a significant relationship with export concentration, implying that companies acquiring credit concentrate on product export specialization and government investment incentives do not lead to export diversification. Enhancement

of human skills and improvements in terms of trade also do not contribute to the export diversification. This is an expected result given the predominance of a small number of products in Pakistan's export profile – just five product groups accounting for 75 percent of total export value in a typical year. We also find evidence of a small structural break in the relationship in export diversification-GDP growth relationship after 2000 – the year we presume to be the beginning of policy liberalization period in earnest – the modest positive impact of export product export diversification is somewhat reduced in the liberalization ear (2000-2015).

We conclude that the current policy emphasis on preferential trade agreements with various countries has very modest geographical export diversification. These policy initiatives do not significantly impact on GDP growth.

The paper suggests that government should focus on vertical product diversification. This requires that incentive should focus on products at micro level (6-digit HS level) within such strategically selected sectors (2-digit level) and sub-sectors (4-digit level) which provide for penetration within global supply chains. Pakistani export firms may be incentivized to move up these carefully selected global supplies by linking their investment technological and investment strategies with that of major players within the selected value chains.

References

Agosin, M., Alvarez, R., & Ortega C. (2012). Determinants of export diversification around the world: 1962-2000. *The World Economy, 35*(3), 295-315

Agosin, M. (2007). *Export diversification and growth in emerging economies.* Working Paper No. 233. Departamento de Economía, Universidad de Chile.

Ahmed, H., & Hamid, N. (2014). Patterns of export diversification: Evidence from Pakistan. *The Lahore Journal of Economics, 19*-SE, 307-326.

Akbar, M., & Zareen, F. (2000). Export diversification and structural dynamics in growth process: The case of Pakistan. *Pakistan Development Review, 39*(4), 573-589.

Amurgo-Pacheco, A. & Pierola, M. D. (2008). *Patterns of export diversification in developing countries: Intensive and extensive margins.* Policy Research Working Paper No. 4473, The World Bank International Trade Department.

Balavac, M., & Pugh, G. (2016). The link between trade openness, export diversification, institutions and output volatility in transition countries. *Economic Systems, 40*(2), 273-287.

Benedictis, L., Gallegati, M., & Tamberi, M. (2009). Overall trade specialization and economic development: Countries diversify. *Review of World Economics, 145*(1), 37-55.

Boehe, D. M., & Jiménez, A. (2016). How does the geographic export diversification–performance relationship vary at different levels of export intensity? *International Business Review, 25*(6), 1262-1272.

Engle, R., & Granger, C. (1987). Co-Integration and error correction: Representation, estimation, and testing. *Econometrica, 55*(2), 251-276.

Ferreira, G., & Harrison, R., (2012). From coffee beans to microchips: Export diversification and economic growth in Costa Rica. *Journal of Agricultural and Applied Economics, 44*(4), 517-531

Fonchamnyo, D. (2015). The export – diversifying effect of foreign direct investment in the CEMAC region. *Journal of Economics and International Finance, 7*(7), 157-166

Forgha, N., Sama, N., & Atangana, E. (2014). The effects of export diversification on economic growth in Cameroon. *International Invention Journal of Arts and Social Sciences, 1*(3), 54-69

Ghosh, A., & Jonathan D. (1994). Export instability and the external balance in developing countries. *IMF Staff paper, 41*(2). 214-235

Hamed, K., Hadi, D., & Hossein, K. (2014). Export diversification and economic growth in some selected developing countries. *African Journal of Business Management, 8*(17), 700-704

Hamid, Z. (2010). Concentration of exports and patterns of trade: A time series evidence of Malaysia. *The Journal of Developing Areas, 43*(2), 255-270

Hausman, R. & Klinger, B. (2006). *Structural transformation and patterns of comparative advantage in the product space.* Working Paper no. RWP06-041, John F. Kennedy School of Government - Harvard University.

Johansen, S. (1988). Identifying restrictions of linear equations with applications to simultaneous equations and cointegration. *Journal of Econometrics, 69*(1), 111-132

Khan, M., & Afzal, U. (2016). The diversification and sophistication of Pakistan's exports: The need for structural transformation. *Lahore Journal of Economics, 21*(SE), 99-127.

Masih, A. M., & Masih, R. (1996). Energy consumption, real income and temporal causality: results from a multi-country study based on cointegration and error-correction modelling techniques. *Energy Economics, 18*(3), 165-183.

Matsuyama, K. (1992). Agricultural productivity, comparative advantage, and economic Growth. *Journal of Economic Theory, 58*, 317–34

Naudé, W., & Rossouw, R. (2011). Export diversification and economic performance: evidence from Brazil, China, India and South Africa. *Economic Change and Restructuring, 44*(1-2), 99-134.

Phillips, P., & Hansen, B. (1990). Statistical inference in instrumental variables regression with I(1) processes. *The Review of Economic Studies, 57*(1), 99–125

Pineres, A., & Ferrantino, M. (2000). *Export dynamics and economic growth in Latin America.* Burlington, Vermont: Ashgate Publishing Ltd.

Stock, J., & Watson J. (1993). A Simple estimator of cointegrating vectors in higher order integrated systems. *Econometrica, 61*(4), 783-820

Velde, D. (2010). *The global financial crisis and developing countries: Synthesis of the findings of 11 country case studies.* Working Paper Series No. 316, Overseas Development Institute.