



**The Role of Commercial Banks in Determining the Industrial Productivity in Pakistan:  
A Time Series Analysis**

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**Abstract**

Industrial productivity is an important source of overall industrial growth. This paper has examined the role of commercial banks in determining the industrial productivity in the case of Pakistan. Partial productivity or total factor Productivity will be taken as a dependent variable and the impact of credit disbursed to industrial sector will be examined along with other institutional credits are selected as independent variables. Time series data from 1972-2015 has been obtained from Pakistan Economic Surveys and World Development Indicator to observe the long- run relationship among the variables. ADF has been applied for checking the stationary status of the data series. Diagnostic tests have been applied to examine the validity of the results. The estimated results show that commercial bank credit and labor force participation rate have a positive and significant impact on industrial productivity in the case of Pakistan. Income per capita has a negative and significant impact on industrial productivity in the case of Pakistan. So, if the government of Pakistan wants to enhance industrial productivity, it has to provide credit with skill labor force to its industrial sector.

**Keywords:** industrial production, labor force, income per capita, credit

**JEL Codes:** O14, J01, E51

## **I. Introduction**

Financial Sector is important for the economic development and prosperity of the country. Financial sector works as the backbone of the economy that controls the money supply. The Banks accept funding from surplus monetary units as deposits and give it to Business and Industries as advances. Banking is a very important sector because the development of the finance, and particularly the banking system, promote economic growth. Banks are important for the economy and organizations in particular at the time of declines and money related crisis. Industrial, agricultural and commercial development of a country is not imaginable without an efficient banking system. Sometimes bank truly don't respond to the crisis, comparing the later past financial crisis 2007-09, it makes the condition more terrible for economic improvement. Therefore, it is significant to observe the performance of the banks with the administrative prerequisites. The financial resources of the country can be properly utilized through banks because they serve as a backbone of the financial sector. The banking sector has attracted a huge amount of investments and expanded to a great extent. Nowadays banks are not only restricted to financial intermediary services, but also involved in providing specialized services to their customers in order to meet ever changing customer needs as the banking industry is innovating rapidly. A bank is an institution which receives deposits from customers and gives loan to the institutions. The word bank implies an association where individuals and business can contribute or borrow money; transform it to foreign cash and so forth. As indicated by the Halsbury's Law of England "A Banker is an individual, partnership or corporation, wholesale or predominating business is banking, that is, the receipt of money on current or deposit account and the payment of checks drawn by and the collection of checks paid in by a customer. Financial segment in broad and banking segment in particular is one of the energetic elements for the economic development of the country. So, it is important to control and regulate bank processes by an apex Bank to make sure customer's safety, strengthen and promote soundness, stability and efficiency of the banking system. This helps to decrease the hazards of banks becoming bankrupt. Banks are well known as financial intermediaries their role is to sell its own obligations and to buy from others. All over the world the banking segment is known for the appropriation of multidimensional techniques occasionally with fluctuating degrees of achievement.

Banks are vital for the efficient functioning of budgetary markets as they serve as stores of fundamental monetary data and can conceivably alleviate the issues made by data asymmetries. The central bank needs such great disclosures for early identification of issues confronted by banks in the business and decreases the seriousness of business sector disturbances. As per the report issued by Pakistan and Gulf economist on FEB 21st, 2015, the banking industry of Pakistan consists of 55 banks that include 5 public sector banks, 5 Islamic banks, 17 private banks, 6 foreign banks, 8 development financial institutions, 4 specialized banks and 10 micro finance banks. Caves (1971) conducted a study in which he explored that industrial productivity has been generally familiar by various governments of the world, even in developed countries, an increase in industrial productivity is main factor which lead towards higher economic growth. Developing countries can also move towards higher GDP and development through boosting in industrial productivity. Bank loans and advances provided by the financial institutions to the industrial sector in order to increase their industrial productivity which leads to economic development. Industrial productivity is output per unit of inputs (labor and capital), used in the production process (Farrell, 1957). Most of the studies find out the role of capital and labor efficiency in determining the industrial productivity, but in these studies availability of bank loans to industrial sector is ignored. So, in this study, we examine the role of bank credit disbursed to the industrial sector in determining industrial productivity. Financial institution, credit scores can also be described as an approach of creating Fund on hand to one other sector of the financial system situated in Some granted terms in appreciate of compensation with interest. Loan is also easy, constant cost, coupon bond and discount bond (Tawose, 2012).

There are growing empirical studies of the imperfection of financial markets and growth, suggesting a negative relationship. Although the exact transmission channel through which finance affects growth is still unclear, existing literature (Levine, 2002) recognize that a well-developed financial system can influence long-term growth through its ability to mitigate information and transaction costs, and to impact on savings rates, investment decisions and productivity. External financial constraints resulted from imperfect financial market are of particular interest to economists and policy makers because they have important implications for monetary policy transmission mechanism and tax policy. Industrial productivity is determined not only by labor and capital efficiency, but it also determined by availability of bank credits (Kumbhakar and Sarkar, 2003). Easier access to credit allows a producer to invest in better industrial inputs to increase their production level. However, there are many problems to get credit for investment in industrial sector i.e. Lack of formal banking services, many individuals have not access to credit due to lack of information and the high costs associated with running loans for small and frequently low returning projects pursued by poor individuals (Berger et al., 1999). Such individuals and small industries can get loans from informal institutions, banks and corporations, and through microfinance, but they have also faced problems getting loans and get a minor amount of credit (Blanchflower, et al., 2003). Through regulating the patterns of bank branching and setting lending quotas by

economic and demographic sectors, subsidizing government, banks, and governments are going to make easier financial access to industrial sector (Young, 2014; and Roland, 2007). However, access to bank credit brings sustained industrial finance, which is considered to be a bloodstream of an economy so as to link the gap between the borrower and lender, especially in a developing economy like Pakistan (Vora (2008). Therefore, credit management is sensitively managed by the monetary authority under the policy of the Central Bank of Pakistan (CBP). The credits provided by commercial banks are primarily for the short-term. For the high growth of industrial production, there is also need to increase the demand for bank credit on the part of industrial firms (Petersen et al 1995). Traditionally, in 1986, Structural Adjustment Programmers (SAP) was introduced (under IMF & WB just for two years in 1986) in Pakistan, which led to the deregulation of the financial sector and interest rate was also deregulated. The main focal point of SAP is to help the government of her financial burden, but also sustaining growth in the industrial sector and productivity of the economy (Ogechukwu, 2006).

The industrial sector wants to finance for either working capital or for enhancement in trade in order to increase its productivity. Due to the poor infrastructure and inadequate intermediate goods lack of credit facilities, high illiteracy rate and lower quality of industrial inputs in Pakistan, the cost of bank credit to the industrialist is so massive. So, the industrialists failed to achieve their targets of maximum production and profit and government policies of the bank credit are also failing to achieve their set targets. The govt. of Pakistan has to obtain a series of bank credit from the IMF, WB IBRD for the purpose of industrialized her economy (Stiglitz, 1996). Caves (1974) explored that Investment on capital in the manufacturing sector is greater than other sector of the economy. The banks play a vital role in funding the manufacturing sectors in Pakistan till up to date (Hassan, et al., 2012). Their primary responsibility of banks in industrial sectors is credit expansion. The various banking institutions in Pakistan, merchant, commercial and development banks have been the most valuable in running this function (Toby & Peterside, 2014). The manufacturing sector acts as a mechanism that accelerates the speed of structural transformation and diversification of the economy, thus a country can become self-sufficient through utilizing their resources fully and improving its industrial sector, which made it less dependent on foreign aid, imports of industrial goods and raw material (Adediran and Obasan, 2010). In Pakistan, high interest rate, high inflation, political instability, lack of technical education, and modern equipment of machinery, lower exchange rate, natural disasters and unfavorable law and order conditions for investments are responsible for lower industrial productivity as well as lower economic development (Ali & Rehman, 2015). The study covers a period of years between 1972 and 2015. Also, the research concentrates on all forms of loans issued out to industrial sector through a financial institution during the period of study. Data were of secondary obtained from various publications such as publication from the State Bank of Pakistan (SBP), economic survey of Pakistan, statistical handbook of Pakistan economy etc.

In this study, we are interested to find out whether the commercial banks funding to industrial sector improved significantly or increase industrial GDP. We also evaluate the relationship between commercial bank credits and industry GDP in Pakistan. The industrialists want to maximize their profits through increasing their productivity. The main objective of this is to investigate the role of commercial banks through funding to industrial sector. This study was also revealed that both individual industrialists and government are needed to finance their businesses through bank credit. Subsequently, it is necessary to find out the feedback of productivity of industries to the policy of bank credit. At the end, we characterize the difficulties of the industrial sector to get bank loans in Pakistan and make recommendations where necessary. This study is based on theoretical as well as empirical observations. So, this study will be of significantly helpful to monetary authority, policy makers, government and the general public. The results of this study will help government and the monetary authorities to see the effectiveness of a bank's policy in the management of the Pakistan's economy in terms of credit demand and supply to industrial zone which have a major effect on Pakistan economic augmentation. This piece of work further serves as a guide and provides approaching for future research on the topic and related fields for academia's and policy makers who are willing to improve on it. The study will also contribute to knowledge by appraising the function of bank funding to industries on the growth of industrial output in Pakistan and country's GDP.

## **II. Literature review**

Finance has been recognized in lots of industry surveys as probably the most major causes opting for the survival and progress of small and medium corporations (SME) in each constructing and developed countries (Smallbone & Welter, 2001). Regardless of their dominant numbers and importance in job construction, SMEs most of the time have faced the main issue in obtaining formal credit or fairness. That is, given that the maturities of industrial, financial institution loans improved to SME are almost always restricted to an interval some distance too short to pay off any substantial funding and dire guarantee (Imoughele et al., 2014) and (Arogundade, 2010). Conversely, the function of commercial, financial institution, credit in an economy quite a

lot of banking reforms has been founded by using the economic authority in Nigeria in bettering credit score accessibility. The overall intentions of those reforms were to be certain financial steadiness so as to have an effect on the development of the economic climate and also increase financial institution to play a significant function of monetary intermediation in the provision and accessibility of credit within the Nigerian financial system. These more than a few reforms have resulted in the development in banking services to monetary models. Nevertheless, regardless of this increase in credit give to the SMEs the performance of the sector in Nigeria has been dwindling (Mwakajumilo et al., 2011). Therefore, Mwakajumilo et al., (2011) examine the impact of commercial, financial institution, credit on the progress of small and medium scale organizations in Nigeria.

Butler et al., (2011) discover that the increased of corn yields in counties with high level of financial institution deposits is greater than in countries with low levels of bank deposits. Their findings offer stable evidence that expanded productivity is a key channel through which finance causes economic expansion. Cetorelli et al., (2006) measure banking structure at the local stage as an alternative at the national stage and investigate that Banking competition in local U.S. Markets has been associated with a larger number of companies, a smaller average institution measurement and a larger share of small establishments across the whole volume of distribution. They suggest that due to a reduction in state level restrictions, political, legal and regulatory barriers to bank expansion and competition in the 1970s-1980s, small and industrial firms gain access to credit from banks. It seems at least to hope that lower financial barriers to access financial institutions and greater entrepreneurship will lead to more rapid growth.

Ogar et al., (2014) uncover that due to insufficient financial credits low level of manufacturing output and higher level of unemployment in Nigeria. It means the manufacturing sector in Nigeria are not operating on their production possibility curve. They suggest that there is an increase in commercial bank credit to the manufacturing sector, encourage the manufacturing sector to expand their businesses and range of procedure which will ultimately lead to increased level of employment and output in Nigeria and vice versa.

Aurangzeb (2012) investigates the contributions of banking sector in economic growth of Pakistan find out that deposits, investments, advances, profitability and interest gains have gigantic optimistic an impact on economic growth of Pakistan. He recommends that the policy makers will have to make policies to increase the banking sector in Pakistan in view that the banking sector is enormous contributing within the economic development of Pakistan. According to the empirical study of Tawose, (2012) Industrial banks' loan and advances to the industrial sector, aggregate saving, and inflation fee are important long-term determinants of commercial performance in Nigeria as expressed through the extent of real gross domestic product manufacture in the economic system. As a consequence, the monetary authority is instructed to be sensitive to the habits of the aforementioned variables as a way to ensure industrial sector growth and economic progress.

Beck & Levine (2002) evaluate the bank-based, market-based, financial services, and law and finance theories of financial structure. The outcome supports the financial services and law and finance views. Industries which are heavy customers of external finance, develop rapid in nations with better total levels of economic progress and in nations with efficient legal programs. In contrast, they discover no support for either the bank-founded or the market-established views. There is no evidence for using coverage instruments to tip the taking part in subject in desire of banks or markets. Instead, insurance plan maker will have got to core of attention on approved reforms that foster the growth of fiscal intermediaries and markets.

Jayarathne et al (1998) find the evidence that long-standing branching restrictions in banking served as entry limitations that averted more effective banks from increasing at the price of their much less efficient competitors. By using retarding the "normal" evolution of the industry, such restrictions diminished the effectiveness of the typical banking asset. Once branching restrictions were lifted, the efficiency of the banking system expanded, and financial institution debtors benefited from slash mortgage rates.

The objective of productivity measurement is to identify output differences that cannot be explained by input differences (Biesebroeck 2007). There are some advantages of estimating TFP uses micro-level data. For instance, Gatto et al. (2011) argue that although the aggregate analysis plays an important role in the cross-country comparative analysis, firm-level analysis enables the investigation of TFP patterns at a deeper level controlling for issues like non-competitive markets, increasing returns, and heterogeneous firms. Ahmad et al (2009) cited in their paper that financial sector reforms are effective in improving the efficiency of the domestic industrial banks function as intimidation in Pakistan. Biatour et al (2011) empirically explore that R&D is a fundamental determinant, either R&D collected within the industry or R&D collectively via other domestic or international industries.

The empirical results of Oke (2015) suggest that industrial banks have significant have an effect on SMEs and their financing whatever the basic point of view that commercial banks shy away from lending to the SMEs. This confirms that commercial banks still stay a primary supply of finance for SMEs and an avenue via which SMEs can develop. In order for SMEs to experience higher benefits, they should see financial institution, credit scores as a source of finance to be utilized for the expansion of their industry. Govt. Should motivate business banks to lend to SMEs by offering incentives and persuade the banks to give choice to SMEs. The growth of the Nigerian economy does no longer depend upon the loan from commercial to small scale organizations. This is attributed to the info that smaller scale operators do no longer have access to credit score, which is an essential difficulty to small scale firms in Nigeria due to the fact that the normal economic institutions have now not been capable to meet their credit score needs. Nevertheless, access to capital or finance is crucial, but now not an adequate situation for effective operation. The government will have to motivate small scale enterprise via their micro credit score scheme to give tender loans. The executive must additionally re-introduce small trade credit score scheme in order for the beneficiaries to use them to run the small-scale companies. Government, chamber of commerce and industries and different non-governmental organization must most commonly prepare seminars for advantage and specific small and medium organization operators the place they must be proficient on easy methods to plan, organize, direct and manipulate their organizations to foster the Nigeria economic climate (Imafidon & Itoya, (2014).

### III. Economic Theory and Econometric Methodology

The most important objective of economic theory is to build economic models that describe the economic behavior of a society and individual as a whole. Usually, an economic model represents real economic situations of different units with some assumptions and restrictions. These abstractions rely upon on the idea for which the economic model has been constructed. The crucial objective of construction of an economic model is to analyze and predict for the future. The predicting power, provided information, realism and simplicity of assumptions and generality decide the validity of an Economic model. This study examines the role of commercial banks in determining the industrial productivity in Pakistan. The main objective of this study is to analyze the role of commercial banks in industrial production in Pakistan from 1972 to 2014. The data for all variables is collected from various issues of Pakistan Economic Survey, the international financial statistics (IFS) and World Bank (World Development Indicators) and statistical handbook of Pakistan.

#### III.I. The Model Specification

The Gross Domestic Product of industries (GDPI) is taken as industrial productivity, which is the dependent variable, while, the commercial banks' Credits, employment in industries, interest rate (INT) and an inflation rate (INF) are the independent variables. Thus, industrial productivity (GDPI) is a multivariate function banks' loan to Industrial sector, interest rate, inflation rate and random variables. Following the methodologies of Ali (2011), Ali (2015), Ali and Ahmad (2014), Ali and Audi (2016), Ali et al., (2016), Ali and Bibi (2017), Ali and Audi (2018), Ali (2018), Ali and Zulfikar (2018), Arshad and Ali (2016) and Haider and Ali (2015), the linear expression of the model becomes as:

$$\text{INDUSTRIAL}@ \% = f(\text{COMMERCIAL\_BANK\_CREDITS}@ \%, \text{INCOME\_PER\_CAPITIA}, \text{LABOR\_FORCE}) \quad (1)$$

For finding the responsiveness of dependent variable two independent variables, the equation can be written in the following form:

$$\text{INDUSTRIAL}@ \% = \lambda_0 + \lambda_1 \text{COMMERCIAL\_BANK\_CREDITS}@ \% + \lambda_2 \text{INCOME\_PER\_CAPITIA} + \lambda_3 \text{LABOR\_FORCE} + U_t \quad (2)$$

Where

INDUSTRIAL@% = industrial outcome as a percentage of GDP

COMMERCIAL\_BANK\_CREDITS@% = commercial bank credit provided to industrial sector

INCOME\_PER\_CAPITIA = income per capita growth rate

LABOR\_FORCE = labor force participation rate in the industrial sector

Ut is the random error term in time period 't'.

#### III.II. Unit Root Test

One of the main problems with the time series data, there may be unit root in the data and regression results of that data become spurious (Nelson and Ploser, 1982). This study has used time series of energy consumption, financial development, economic development, population density and secondary school education as

independent variables whereas environmental degradation is dependent variable. There are number of unit root tests available for removing non-stationarity problem in time series data. In this study we use Augmented Dickey-Fuller (ADF) (1981) without and with time trend. The possible equation of ADF are as follow:

$$\Delta X_t = \delta X_{t-1} + \sum_{j=1}^q \phi_j \Delta X_{t-j} + e_t \quad (3)$$

The null hypothesis in the data is non stationary.

With the help of OLS compute  $\tau$  statistic of  $X_{t-1}$  and compare it with critical  $\tau$  values. If calculated  $\tau$  is greater than the critical  $\tau$  reject null hypothesis and accepts the alternative. We can conclude that the data is stationary and vice-versa is non-stationary.

### III.III. Autoregressive Distributive Lag (ARDL) Approach to Co-Integration

In applied econometric number of co-integration tests are available. Most famous and traditional co-integration tests are the residual based Engle-Granger (1987) test, Maximum Likelihood based on Johansen (1991/1992) and Johansen-Juselius (1990) tests. One thing is common in these tests, they require same order of integration for their analysis. These co-integration tests become invalid and inefficient when the variables of the model have different level of integration. Moreover, these analyses of co-integration do not give information about the structural breaks of time series data and have low power of prediction. With the passage of time structural changes are occurring in time series such as economic crises, new institutional arrangements and changes in policy regime. The problem with these traditional methods is that the testing of the null hypothesis of structural stability against the alternative of a one-time structural break. If such structural changes are present in the data generating process, but not allowed for in the specification of an econometric model, results may be biased towards the erroneous non-rejection stationary hypothesis (Leybourne and Newbold, 2003 and Perron, 1989, 1997). Pesaran and Pesaran (1997), Pesaran and Shin (1999), Pesaran, Shin and Smith (2001) has introduced the most advance and recent method of co-integration known as the Autoregressive Distributive Lag (ARDL) bound testing approach. ARDL bound testing approach has numerous advantages over traditional methods of co-integration. At first, ARDL can be applied regardless by following the order of integration. It can be applied I(0), purely I(1) or mix order of integration (Pesaran and Shin, 1999). On second, ARDL bound testing approach to co-integration can be used for small sample size (Mah, 2000) rather than traditional methods. At third, this approach allows to take sufficient number of lags for capturing the data generating process in a general to specific modeling framework (Laurenceson et al., 2003). In the last, ARDL gives efficient and valid detailed information about the structural breaks in data. However, Pesaran and Shin (1999) contended that “appropriate modification of the orders of the ARDL model is sufficient to simultaneously correct for residual serial correlation and the problem of endogenous variables”.

This technique is based on Unrestricted Vector Error Correction Model (UVECM) which have better properties for short and long run equilibrium as compared to traditional techniques (Pattichis, 1999). Pesaran and Shin (1997) and later on Pesaran et al., (2001) mention that under certain environment long run correlation among macroeconomic variables can be found with the help of Autoregressive Distributive Lag Model (ARDL). After lag order selection for ARDL procedure, simply OLS can be used for identification and estimation. Valid estimates and inferences can be drawn through presence of unique long run alliance that is crucial for co-integration. Alam and Quazi (2003) reveal that ARDL estimation is possible even where explanatory variables are endogenous. Moreover, ARDL remains valid irrespective of the order of integration of the explanatory variables. But ARDL will fail if any variable is I(2). For applying the bounds testing procedure, it is necessary to represent equation in a conditional autoregressive distributed lag model as following:

$$\begin{aligned} \Delta \ln Y_t = & \beta_1 + \beta_2 t + \beta_3 \ln Y_{t-1} + \beta_4 \ln X_{t-1} + \beta_5 \ln Z_{t-1} + \dots \\ & + \sum_{h=1}^p \beta_h \Delta \ln Y_{t-h} + \sum_{j=0}^p \gamma_j \Delta \ln X_{t-j} + \sum_{k=0}^p \phi_k \Delta \ln Z_{t-k} + \dots + u_{it} \quad (4) \end{aligned}$$

Here  $\ln Y_t$  is used for different dependent  $t$  is for time of  $\ln Y_{t-1}$  representing the lag of dependent variable and  $\ln X_t$  is first independent variable and  $\ln Z_t$  is second independent variable so on.  $\Delta$  represents the rate of change in variables. At first the study will find the direction of relationship among the variables in case of Pakistan by applying the bounds test using Wald test. The Wald test for the bounds testing depends on some of the following factors: The order of integration I(d) of variables in the ARDL model, either the intercept or trend or both are included in the ARDL model and the number of regressors in ARDL model. This study uses

different proxies for social progress as dependent variable and every model has different control variable with macroeconomic instability. So above ARDL model can run for all models in this study.

The calculated F-Statistic is compared with the critical value tabulated by Pesaran and Pesaran (1997) or Pesaran et al., (2001) that is extended by Narayan (2005). If the F-test statistic exceeds the upper critical value, the null hypothesis of no co-integration is rejected regardless the order of integration I(0) or I(1). If the calculated F-test statistic is less than the lower critical value the null hypothesis is accepted and there is no co-integration among the variable of the model. However, if the sample F-test statistic falls between these two bounds, the conclusive decision is not made. When the order of integration of the variables is known and all the variables are I(1), the decision is made based on the upper bounds. If all the variables are I(0) then the decision is made based on the lower bounds. On the base of the above equation our null and alternative hypothesis for co-integration test are as given below:

$$H_0 : \beta_3 = \beta_4 = \beta_5 = 0 \text{ (no co-integration among the variables)}$$

$$H_A : \beta_3 \neq \beta_4 \neq \beta_5 \neq 0 \text{ (co-integration among variables)}$$

If there is long run co-integration relationship among the variables, for finding short run relationship we use the Vector Error Correction Model (VECM). The VECM is explained as under:

$$\Delta \ln Y_{it} = \beta_1 + \beta_2 t + \sum_{h=1}^p \beta_h \Delta \ln Y_{it-h} + \sum_{j=0}^p \gamma_j \Delta \ln X_{t-j} + \sum_{k=0}^p \phi_k \Delta \ln Z_{it-k} + \omega ECT_{t-1} + u_t \quad (5)$$

All the variables above except  $ECT_{t-1}$  which is one time period lagged error correction term. The error correction model results indicate the speed of adjustment back to the long run equilibrium after a short run shock. To determine the goodness of fit of the ARDL model, the diagnostic tests are conducted.

#### IV. Empirical Results

The Table 1 presents the descriptive statistics of the model. The results of the Table 1 reveal that commercial bank credit, income per capita and labor force participation rate are negatively skewed. Whereas industrial productivity is positively skewed. The results show that all variables of the model have positive Kurtosis. The values of Skewness and Kurtosis reveal that all the variables are statistically insignificant which means the model is normally distributed. The estimated values of Jarque-Bera indicate that all the variables have zero mean and finite covariance, this confirms that variables are normally distributed.

**Table 1**

Descriptive Statistics				
	INDUSTRIAL @%	COMMERCIAL_BANK_CRE DITS@%	INCOME_PER_CAPITIA	LABOR_FORCE
Mean	1.194813	3.697530	4.209178	4.048760
Median	1.184790	3.726329	4.259204	4.087018
Maximum	1.839279	4.553068	4.312173	4.196540
Minimum	0.693147	2.557670	3.956949	3.791098
Std. Dev.	0.428748	0.715461	0.104165	0.127676
Skewness	0.168727	-0.291729	-0.973710	-0.505734
Kurtosis	1.397105	1.630753	2.731963	1.874219
Jarque-Bera	4.807304	3.969007	6.923522	4.103724
Probability	0.090387	0.137449	0.031374	0.128495
Sum	51.37698	158.9938	180.9946	174.0967
Sum Sq. Dev.	7.720633	21.49912	0.455714	0.684650
Observations	43	43	43	43

For finding the stationarity of the variables, we have applied ADF unit root test. The results of the unit root test are presented in the table 2. The estimated results reveal that industrial productivity and labor force is not stationary at level. But at first difference all the selected variables of the model become stationary. The estimated results show that there is mixed order of integration which is suitable condition for apply the ARDL bound testing method of cointegration among the variables of the model.

**Table 2 Unit Root Results**

Variables	I(0)		I(1)	
Dependent Variable: INDUSTRIAL@%	-2.555411	0.1101	-2.808248	0.0223
COMMERCIAL_BANK_CREDITS@%	5.869756	0.0001	3.755813	.01200
INCOME_PER_CAPITIA	-3.898203	0.0048	-4.345130	0.0073
LABOR_FORCE	-1.078231	0.9210	2.321888	0.0099

Considering the number of variables and number of observations in mind and maximum lags required for co-integration approach, 2 maximum lags are allowed for Vector Auto-Regressive process. The results of lag selection criteria are presented in Table 3. Following LR, FPE, AIC and HQ optimal lag length 2 is selected for ARDL bound testing approach.

**Table 3**

**VAR Lag Order Selection Criteria**

Endogenous variables: INDUSTRIAL@%, COMMERCIAL\_BANK\_CREDITS@%, INCOME\_PER\_CAPITIA, LABOR\_FORCE

Lag	LogL	LR	FPE	AIC	SC	HQ
0	267.8451	NA	8.30e-14	-13.09226	-12.83892	-13.00066
1	654.7960	638.4689	2.03e-21	-30.63980	-28.86648*	-29.99862
2	703.2010	65.34667*	1.24e-21*	-31.26005*	-27.96673	-30.06929*
3	732.4349	30.69562	2.47e-21	-30.92174	-26.10844	-29.18140

\* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Autoregressive bound (ARDL) testing approach results are presented in table 4, here INDUSTRIAL@% is dependent variable and COMMERCIAL\_BANK\_CREDITS@%, INCOME\_PER\_CAPITIA and LABOR\_FORCE are independent variables. F-statistic is used for testing the null hypothesis of no co-integration among the variables of the model. The calculated F-statistic (24.93196) is greater than the upper bound. So null hypothesis of no co-integration is rejected and alternative hypothesis is accepted which supports co-integration among the variables of the model. This confirms that INDUSTRIAL@%, COMMERCIAL\_BANK\_CREDITS@%, INCOME\_PER\_CAPITIA and LABOR\_FORCE have long run relationship.

**Table 4**

ARDL Bounds Test		
Test Statistic	Value	k
F-statistic	24.93196	3
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

The estimated long run results are presented in the table 5. The estimated results show that commercial bank credit to industrial sector has positive and significant impact on industrial productivity. The estimated results reveal that 1 percent increase in commercial bank credit to industrial sector (1.5226) percent increase is occurring in industrial productivity in the case of Pakistan. As Levine (2005) emphasizes, the primary driver of the finance growth nexus is the allocation of capital. In better financial systems provide a better allocation of

capital, not necessarily more overall credit. This is consistent with the findings in Favara (2009) and Cecchetti and Kharroubi (2012) who argue that the relation between credit and growth is not monotonic. This fact is also related to the issue of credit booms. Schularick and Taylor (2012) document the risks involved in rapid credit expansions. These risks include decrease in lending standards (including outright fraud), over-exposure of the financial sector, and macro-economic imbalances, and all played an important role in the recent financial crisis. This is not to say that all credit booms are bad. Dell’Ariccia et al. (2016) find only one-third of credit booms end in a financial crisis, while many booms are associated with financial reform and economic growth. The estimated results reveal that income per capita growth has negative and significant impact on industrial productivity in the case of Pakistan. The results show that 1 percent increase in income per capita growth brings (1.4291) percent increase in industrial productivity in the case of Pakistan. The estimated results show that the labor force participation rate has a positive and significant impact on industrial productivity in the case of Pakistan. The estimated results show that 1 percent increase in labor force participation in Pakistan, brings (0.7830) percent increase in industrial productivity in the case of Pakistan. Productivity trends reflect cyclical changes as well as structural, long-term trends. Output and labor input typically increase during business cycle expansions and decline during recessions, although the magnitude and timing of output and input movements may differ—output usually falls earlier and faster than labor hours during a recession and, similarly, picks up in advance of hours during a recovery. Cyclical patterns in productivity growth, reflecting the underlying trends in output and labor hours, can be observed in individual industries and sectors as well as in the aggregate economy.

**Table 5**  
**Long Run Results**

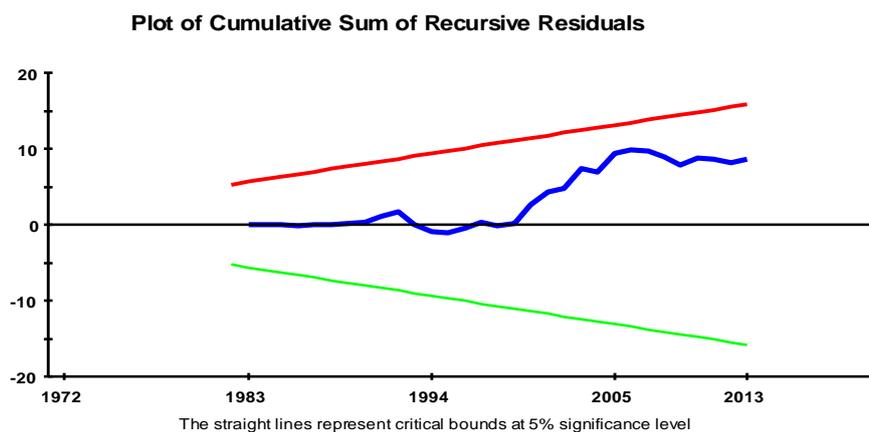
Dependent Variable: INDUSTRIAL@%				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
COMMERCIAL_BANK_CREDITS@%	1.5226	0.1477	10.3087	0.0033
INCOME_PER_CAPITIA	-1.4291	0.07528	-18.9844	0.0009
LABOR_FORCE	0.7830	0.0021	8.26151	0.0952
R-squared	0.968691	Mean dependent var		778293.6
Adjusted R-squared	0.963473	S.D. dependent var		864999.0
S.E. of regression	165319.4	Akaike info criterion		27.01705
Sum squared resid	9.84E+11	Schwarz criterion		27.30375
Log likelihood	-573.8665	Hannan-Quinn criter.		27.12278
F-statistic	185.6380	Durbin-Watson stat		1.766214
Prob(F-statistic)	0.000000			

Diagnostic tests are conducted to overview the problem of serial correlation, functional form, normality and Heteroscedasticity among the variables of the model. The estimated results are presented in Table 7. The results of the Lagrange multiplier test of residual serial correlation show that there is no serial correlation between the variables of the model. Ramsey’s RESET test, using the square of the fitted values, reveal that the model has a correct functional form. Normality based on Skewness and Kurtosis explains that the time series data of all variables are normally distributed. The results show that there is no heteroscedasticity in data.

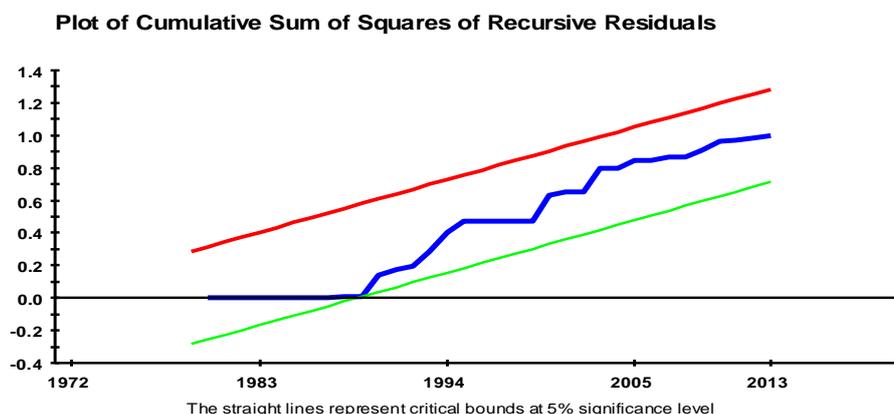
**Table 6**

Diagnostic Tests		
Test Statistics	LM-Version	F-Version
A-Serial Correlation CHSQ(1)	.049825[.823]*F(1,31)	.036819[.849]
B-Functional Form CHSQ(1)	.70090[.402]*F(1,31)	.52611[.474]
C-Normality CHSQ(2)	.50183[.778]	Not-applicable
D-Heteroscedasticity CHSQ(1)	3.6980[.054]*F(1,40)	3.8619[.056]
A: Lagrange multiplier test of residual serial correlation B: Ramsey's RESET test using the square of the fitted values C: Based on a test of skewness and kurtosis of residuals D: Based on the regression of squared residuals on squared fitted values		

**Figure 1**



**Figure 2**



Hansen (1996) mentioned that the misspecification of the model may provide biased results that influence the explanation of the results. The CUSUM and CUSUMsq tests are employed to test the parameters constancy. Further, Brown et al., (1975) pointed out that these tests provide help in testing the gradual changes in parameters. The expected value of recursive residual which is zero leads to accept that the null hypothesis of parameter constancy is correct, otherwise not. The plots of both CUSUM and CUSUMsq are shown by Figure-1 and 2 at 5 per cent level of significance. Results indicate that plots of both tests are within critical bounds at 5 per cent level of significance.

## V. Conclusions and Policy Recommendations

This paper has examined the impact of commercial bank credit provided to industrial sector productivity in the case of Pakistan. For empirical analysis data from 1972 to 2015 has been used. ADF unit test has been applied for checking the stationarity of the variables. The ARDL bound testing method has been used for checking the cointegration among the variables of the model. The estimated results show that commercial bank credit to industrial sector has positive and significant impact on industrial productivity. The estimated results show that the labor force participation rate has a positive and significant impact on industrial productivity in the case of Pakistan. Based on the findings of this paper, the commercial banks should be further empowered, so as to be ready to provide long-lasting-term loan that may raise industrial sector's efficiency and productivity. Stabilization policy should be left by the financial authority to manage inflation. The industrial sector wants to spend a lot on research and development in order to determine the new and novel way of production, the best method of use of new technology and strategies that may increase output. Government should encourage industries to more invest through providing infrastructural facilities and free health and technical education services. Interest rate ought to be allowed to operate through market mechanism to convinced that interest rate is

determined by demand for loan able fund and the supply of loan –able fund. The banks should also adopt flexible loan policy, as a result more industrial units are able to get loan and enhance their productivity. The govt. Should try to minimize risk premium, foreign investor encourages to invest within the country, and domestic investors are able to get loans from foreigner loan agencies such as the world bank, IMF etc. As a result, the output of industrial units and employment opportunities increases, improved health and education which lead a country towards development.

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