Does Financial Development Promote Industrial Production in Pakistan? Evidence from Combine Cointegration and Causality Approach.

Ahad, Muhammad and Dar, Adeel Ahmad and Imran, Muhammad

COMSATS Institute of Information Technology, Lahore Campus, Forman Christian College (A chartered university), Institute of Management Science (Pak-AIMS)

2017

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Muhammad Ahad
Department of Management Science
COMSATS Institute of Information Technology,
Lahore Campus, 54000-Lahore, Punjab, Pakistan
E-mail: m.ahad68@yahoo.com Phone: +92-332-690-5574

Adeel Ahmad Dar
Department of Economics,
Forman Christian College (A chartered university),
54000 Lahore, Punjab, Pakistan.
E-mail: adeel_dar211@outlook.com

Muhammad Imran
Institute of Management Science (Pak-AIMS),
54000-Lahore, Punjab, Pakistan
E-mail: mimran@pakaims.edu.pk

Abstract: This study investigates the impact of financial development on industrial production over the period of 1972-2014 in case of Pakistan. We use Bayer and Hanck (2013) combine cointegration technique to predict the long run relationship between financial development, saving and industrial production. The results predict three cointegration vectors which confirm the existence of long run relationship between underlying variables. The empirical evidence shows positive impact of financial development and savings on industrial growth in long run as well as in short run. The result of VECM Granger causality confirms the bidirectional causality between financial development and industrial production in long run. The variance decomposition approach shows that financial development has majour contribution in explaining industrial production. The impulse response function also confirms the results of variance decomposition. This research opens the new insights for policy making.

Key words: Industrial Production, Financial Development, Combine Cointegration, VECM Granger causality, Innovative Accounting Approach, Pakistan.

***JEL* Classification:** L11, G2, C22

1. Introduction

Over the years, financial development has appeared as a necessary condition for high economic growth (Chang, 2002). In terms of its role, financial development seems as either supply leading or demand following. Supply leading role drives financial development as a catalyst for growth process while demand following role explains financial development as a result of economic growth (Patrick, 1966). Financial development refers to the channelization of savings into productive investment areas. But, the speed along with the efficiency of savings transfers hold more importance for financial development (Hye & Dolgopolova, 2011). It helps to promote the growth process through more exports (Omran & Bolbol, 2003; Ljungwall & Li, 2007; and Shahbaz and Zur-Rahman, 2010). In developing economies, domestic industries are benefitted in the form of technological transfer and efficient human capital via financial development. Consequently, the provision of new technology and efficient human capital increase output greater than the domestic demand. Then excess production goes in foreign markets as exports that further have a direct and positive impact on the growth process (Shahbaz & Zur-Rahman, 2014). China is a prime example of developing financial sector led growth phenomena via technological advancements and efficient human capital (He, 2007)

Pakistan being an emerging economy has initiated economic reforms through structural adjustment programs since 1990s. These reforms have focused to boast an industrial production capacity (Khan & Qayyum, 2007). Initially, free market entry for private banks was ensured to create a competitive and efficient financial market. In 1991, 10 new private banks entered Pakistan's financial market with United Bank Limited (UBL), and Habib Bank Limited (HBL) being private domestically owned banks performing operation in Pakistan. Similarly, Allied Bank Limited (ABL) and Muslim Commercial Bank (MCB) were partly denationalized. Open Market Operation (OMO) was introduced as an instrument replacing credit selling used for credit control. Banking courts were instigated for loan recovery with absolute autonomy to State Bank of Pakistan (SBP). The second phase of financial sector reforms took place in 1997. This phase targeted structure of public funds, corporate governance, control of corruption in financial markets and further extension of SBP's autonomy to ensure integration of financial market. Similarly, foreign currency accounts (FCAs) became operational with no tax on transfer payments, income tax and wealth tax. Insurance companies, microfinance bodies and investment banks that were promoted to facilitate short term liquidity to strengthen money market.

Financial liberalization was a pivotal aspect of these reforms. The main idea was to increase financial support to boost domestic production. For this purpose, banking sector reforms introduced to upgrade the domestic financial industry (Iimi, 2004). Before these economic reforms, real interest rate usually remained negative through administrative interference. The money market was inefficient because banks ignored borrower's credit rating. National firms had owned almost 94% of the assets of the financial sector. These firms were characterized by over staffing, poor financial services and the accumulation of bad debts.

Generally, financial development is categorized in three forms: (i) financial deepening (ii) financial broadening (iii) financial liberalization.[1] The financial reforms encouraged free price mechanism for financial instruments. It observed financial deepening, financial broadening and financial liberalization. During 1995-2005, SBP followed easy monetary policy. This prompted weighted average lending rate to drop down to 8.8% from 14.8%. On the other hand, the weighted average deposit rate (saving rate) dropped to 1.37%, discouraging future investment because it resulted in more interest rate spread. Low deposit rate tends to provide low savings to the market and a result low investment hinders both bank statement and economic growth of the economy. The financial reforms also had a direct impact on domestic industries of Pakistan. The average tariff rate dropped to 25% from 225% in 2005 (Husain, 2005).

Similarly, trade was promoted in contention to the World Trade Organization (WTO) rules and regulations. In 2001, trade to GDP ratio was 29%, which rose to 38% in 2005. These reforms had a significant impact on the industrial output of Pakistan's economy. The industrial output was worth 1252886 million rupees in 1997. By 2005, it dramatically rose to 1913639 million rupees. Moreover, real domestic credit per capita was reached 8001 rupees from 5505 and real exports per capita grew at the rate of 5% during 1991-2012 (Shahbaz & Rur-Rahman, 2014). These statistics prompted to investigate the impact of financial development on industrial growth of Pakistan.

This study fills the gap in the existing literature by numerous ways: 1st, this study investigates the impact of financial development on industrial production in case of Pakistan; 2nd, the cointegration relationship is tested by newly developed Bayar-Hanck combined cointegration approach; 3rd, we evaluate long run and short run dynamics for mentioned variables; 4th, The direction of causality relationship between variables is tested by VECM Granger causality approach; 5th, Robustness of causality results are examined by using Innovative Accounting Approach (IAA) and Finally, this study explores the channels through which financial development has an impact on industrial production.

The rest of the paper is planned as follows: Section II covers the review of literature. Data collection, model construction and estimation strategy are explained in section III. Section IV covers the empirical estimations and results. Conclusion and recommendations are drawn in section V.

2. Literature Review

Schumpeter (1934) identified financial development as a catalyst for economic growth. Since then, financial development has been a continuous debate on theoretical and empirical fronts. There are many studies that investigated the relationship between financial development and economic growth such as Deidda and Fattouh (2002); Neusser and Kugler (1998) and Qayyum (2006) have documented a positive link between developed financial sector and economic growth. Similarly, economies having developed financial sectors get easy finance for investment ventures complementing growth process (Kletzer & Bardhan, 1987; Rajan & Zingales, 1998). Studies by

[1] The growth of financial instruments is known as financial deepening. Financial broadening refers to more financial transactions via financial instruments. While, removal of restrictions on financial transactions and movement of capital is called financial liberalization.

Shaw (1973); McKinnon (1973) and Abiad et al. (2004) conceptualized the flow of savings into investment as financial deepening leading to economic growth. These studies support liberal interest regimes for greater return of savings for investment purposes. Bencivenga and Smith (1992) attributed financial development with policies affecting taxation on financial products. The supply of financial services depends upon a right amount of taxation in order to provide incentive for everybody.
Aziz and Duenwald (2002) assessed different investment projects in China after reform period 1978 and concluded a positive interaction between financial development and economic growth. Calderon and Liu (2003) evaluated 109 industrial countries using GDP per capita as dependent variable and financial development, initial human capital, initial income level, black market exchange rate premium and government size as explanatory variables. The results revealed a positive relationship between financial development and economic growth. Moreover, many empirical researches found bidirectional causality between financial development and economic growth (Demetriades & Hussein, 1996; Luintel & Khan, 1999; FitzGerald, 2006). But Liang and Jian-Zhou (2006) found unidirectional causality from growth to financial development by applying multivariate vector autoregressive approach for China over the period of 1952-2001. After that Shan and Jianhong (2006) argued bidirectional causality between financial development and economic growth in the case of China.

Guryay et al. (2007) determined the link between financial development and growth for North Cyprus. Their results showed that causality running from economic growth to financial development. While, Kyophilavong et al. (2016) found feedback effect between financial development and economic growth in the case of Lao PDR using 1984-2012.

Odhiambo (2007) also highlighted the country bound factors for financial development-growth relationship. It found demand-following response in Kenya and South Africa, while supply-leading response came dominant in Tanzania. Jalil and Ma (2008) used credit to private sector and deposit liability ration as a financial development proxy for the Pakistani and Chinese economy. The results probed positive and significant impact of financial development on economic growth of both Pakistan and China. Polat et al. (2015) used Bayer-Hanck combined cointegration technique to analysis the relationship between financial development and economic growth of South African over the period of 1970-2015. The results suggested a positive relationship between financial development and economic growth in both short and long run. Lan et al. (2015) targeted quarterly data for the time period 2001-2015 in Taiwan. Using Johansen Cointegration approach and Error Correction Model (ECM), the results showed a positive long run and the short run relationship between domestic savings and economic growth.

In case of Pakistan, there are many studies that explored financial development-economic growth relationship such as Khan et al. (2005) probed financial development led growth hypothesis for the time period 1971-2004 using ARDL approach. The results showed a positive impact of financial development on Pakistan's economic growth in both short run and long run. Similarly, Khan and Qayyum (2007) evaluated the relationship between financial development and economic growth over the period of 1961-2005 by applying ARDL approach. Their results also confirmed a positive impact of financial development on economic growth of Pakistan in both short run and long run. Jalil and Feridun (2011) also confirmed a positive relationship between financial development and economic growth over the period of 1975-2008 for Pakistan. Further, Mahmood

(2013) argued that there is a positive and insignificant relationship between financial development and economic growth of Pakistan over the period of 1979-2008.

Similarly, there are many studies that examined the relationship between financial development and industrial growth such as Bagehot (1873) explored the role of financial development in the industrial revolution in Europe. This study concluded that the available monetary backup pushed the spectrum of industrial growth to a new level. It helped to reach raw materials from different parts of the world. The continuous financial backup kicked off innovative ideas and upgrading existing production methods. In addition, production of innovative ideas spurred technology and advanced production methods which boasted the parameter of industrial growth in Britain, then to other parts of Europe. While, Haber (1991) predicted that emergence of national corporations is an essential reason of financial development during the industrial revolution. The results concluded that incentives for savers will bring more savings and appropriate returns on investment will create an ideal environment for investors that will boast the spectrum of financial system and economic growth of economies. Schumpeter (1912) discovered that banks provided financial capital due to increase in financial demand to support industrial revolution. They also developed a smooth mechanism for funds availability.

Levine (1997) concluded that a more developed financial structure creates both forward and backward linkages. Going forward, it facilitates transactions, diversification of products and exerts corporate checks in the production process. On the other hand, it also promotes more flows of savings to continue a sustainable movement of capital in the market. Not surprisingly, nonfinancial developments in form of communication services, workstations, formal rules and regulations as well as growth itself, created a need for more stable and dynamic financial structure for sustainable industrial growth. Similarly, Chang (2002) evaluated both demand following and supply leading hypothesis for financial development and economic growth for China. Johansen cointegration has confirmed the long run relationship between financial development and economic growth. Becker and Greenberg (2003) targeted industry and country-pair data for financial development led exports relationship. Their results displayed that financial development is a main reason to decrease in exports. Rahman (2004) used structural VAR approach for Bangladesh over the period of 1976-2005. Their results confirmed supply leading hypothesis for Bangladesh.

Tadesse (2004) investigated the impact of financial development on the industrial sectors of 38 economies for the time period 1980-1995. The maximum likelihood approach predicted a positive long run as well as the short run relationship between credit availability to the manufacturing sector and its growth. The financial development also has a direct and positive relationship with technological advancement and total factor productivity of industrial sector. Kabango (2009) focused 20 Malawi industrial sectors over the period of 1970-2004. The results exposed that there is a bidirectional causality between financial development and industrial sector growth of Malawi economy. Further, the financial development improves the domestic industrial setup along with the cost of credit availability to industrial sector. Moreover, Udoh and Ogbuagu (2012) investigated the relationship between financial sector development and industrial production for the Nigerian economy over the period of 1970-2009. Their results confirmed the existence of the long run relationship between the variables. Financial development has negative, but significant impact on industrial production in the short run as well as in the long run.

Chen and Guariglia (2013) predicted that financial activities promoted industrial growth in China by making a panel of 144776 Chinese firms over the period 2001-2007. This study applied both direct and indirect approaches to estimate the relationship between financial development and industrial growth. Their results revealed that firms having financial access increase their productivity. Moreover, an increase in productivity of Chinese firms rises the supply to other markets. Similarly, He et al. (2014) analyzed the growth of Chinese industrial regions for the time period 1998-2010. Using Robust Standard Errors approach, their results indicated a strong positive impact of financial development on the industrial growth. It has concluded that Chinese industrial regions with the developed financial sector are attributed to more growth than others. Lee et al. (2015) used the time span 2003-2010 for disaggregated data on Chinese economy using traditional panel approach. The results confirmed a positive relationship of financial development with industrial growth.

After reviewing the literature, we determine that existing literature lacks to investigate the impact of financial development on industrial growth in case of Pakistan. The literature has predicted that countries with strong industrial sector show more economic growth. On the other hand, development in industrial production improves the standard of living. Financial development as one of the main determinant of industrial production in Pakistan has been ignored by previous literature that helped to promote industrial sector.

3. Data Collection, Model Development and Estimation Strategy:

Following the above discussion, this study has extended industrial production function by incorporating financial development as potential determinant of industrial sector growth. The general function of industrial production is given below:

$$Ip_t = f\,(Fd_t,\ sav_t\ ) \qquad (1)$$

$$Ip_t = \beta_0 + \beta_1\, Fd_t + \beta_2\, sav_t + \mu_t \qquad (2)$$

Further, we have transformed data series into logarithm to get elasticities. The estimated logarithm function is following:

$$\ln Ip_t = \beta_0 + \beta_1 \ln Fd_t + \beta_2 \ln sav_t + \mu_t \qquad (3)$$

Here, $\ln Ip_t$ is natural log of real industry value added proxy of industrial production, $\ln Fd_t$ is natural log of real domestic credit to private sector per capita proxy of financial development and $\ln sav_t$ is natural log of gross domestic saving percentage of GDP calculated as GDP less final consumption expenditure. All data series has obtained from world development indicators (CD-ROM, 2014). This study covers the time period of 1972-2014.

3.1. Bayer and Hanck Combined Cointegration

In econometric literature, there are many cointegration tests have been developed by Engle and Granger (1987), Johansen (1991), Phillips and Ouliaris (1990) cointegration, Error Correction

Mechanism (ECM) based on Boswijk (1994) F-statistics and Banerjee et al. (1998) t-statistics is generally used. These tests have different properties and provide different results.

To enhance the power of cointegration, Bayer and Hanck (2013) produced combined cointegration test based on several cointegration approaches. This approach provides joint statistics to test the null of no-cointegration for more comprehensive results. If the null is rejected means alternative is accepted that support existence of cointegration. Following Bayer and Hank (2013), the combination of the computed significance level (*p*-value) of individual cointegration test in this paper is in the Fisher's formulas as follows

$$EG - JOH = -2\ [\ln(P_{EG}) + (P_{JOH})] \tag{4}$$

$$EG - JOH - BO - BDM = -2[\ln(P_{EG}) + (P_{JOH}) + (P_{BO}) + (P_{BDM})] \tag{5}$$

Here, *EG* represents the statistics of Engle and Granger, *JOH* displays the statistics of Johansen, *BO* shows the statistics of Boswijk and *BDM* represents the statistics of Banerjee et al. Similarly, P_{EG}, P_{JOH}, P_{BO} and P_{BDM} are the p-values of various individual cointegration tests respectively. It is assumed that if the estimated Fisher statistics exceed the critical values provided by Bayer and Hanck (2013), the null hypothesis of no-cointegration is rejected.

3.2. VECM Granger Causality

If cointegration has confirmed between the variables, we may proceed to VECM Granger causality to test the direction of causality. The VECM Granger causality divides the direction of causality into the long and short run. The Granger causality test with VECM framework is as follows:

$$\Delta LIp_t = \vartheta_1 + \sum_{i=1}^{p} \vartheta_i \Delta LIp_{t=i} + \sum_{j=1}^{q} \vartheta_j \Delta LFd_{t=j} + \sum_{k=1}^{n} \vartheta_k \Delta Lsav_{t=k} + \eta_1 ECM_{t-1} + \mu_i \tag{6}$$

$$\Delta LFd_t = \lambda_1 + \sum_{i=1}^{p} \lambda_i \Delta LFd_{t=i} + \sum_{j=1}^{q} \lambda_j \Delta LIp_{t=j} + \sum_{k=1}^{n} \lambda_k \Delta Lsav_{t=k} + \eta_2 ECM_{t-1} + \mu_i \tag{7}$$

$$\Delta Lsav_t = \delta_1 + \sum_{i=1}^{p} \delta_i \Delta Lsav_{t=i} + \sum_{j=1}^{q} \delta_j \Delta LIp_{t=j} + \sum_{k=1}^{n} \delta_k \Delta LFd_{t=k} + \eta_3 ECM_{t-1} + \mu_i \tag{8}$$

Where, Δ is a difference, ECM denotes the error correction term that has derived from long run cointegration. $\vartheta_1, \lambda_1 and \delta_1$ are constant and η (i=1,2,3,) are uncorrelated error term with zero mean. The optimal lag *p* is determined by Akaike Information Criterion (AIC) because of its superior properties. The long run causality is displayed by the significance of lagged *ECM* terms using *t* test. For short run causality is determined by F-statistics or Wald test.

3.3. Innovative Accounting Approach (IAA) for Granger Causality

We apply innovative accounting approach (IAA) to investigate the causal relationship between industrial production, financial development and savings due to limitations of the Granger causality test. It avoids the problem of endogeneity and integration of the series. Granger causality only shows a causal relationship between variables within the sample period while innovative accounting approach extracts the causal relationship beyond the selected sample period. Further, this technique decomposes forecast error variance for each series following a standard deviation shock to a specific variable and enables us to test which series is strongly impacted and vice versa Arouri et al. (2014). In depth, impulse response function identifies the timeline that displays the impact of the shocks of the series in the VAR model. By applying this approach, we can explain the shock with its own series with the model and with other series in the model. A VAR approach representing the following arrangement (Shan, 2005):

$$\varphi_t = \sum_{i=1}^{k} \delta_i \varphi_{t-i} + \eta_t \qquad (9)$$

Where, $\varphi_t = (Ip_t, Fd_t, sav_t)$

$\eta_t = (\eta_{Ip}, \eta_{Fd}, \eta_{sav})$

δ_i are the estimated coefficient and η is the vector of the error terms.

4. Empirical Estimation and Results Interpretation:

Table-1 explains descriptive statistics. Jarque-Bera shows that the data series are normally distributed holding zero mean and constant variance. To examine the long run relationship between variables, it is necessary to check the stationary of data. Data series should be integrated at level i.e. *I (0)* or first difference i.e. *I (1)* or mix i.e. *I (0)/I (1)* but it should not be stationary at second difference. For this purpose, many tests have been developed such as ADF by Dicky and Fuller (1981), P-P by Philip and Perron (1988), DF-GLS by Elliot et al. (1996) and NG and Perron (2001). This study is applying the Ng-Perron unit root test because these traditional unit root tests provide vague results once data span is small but Ng-Peroon unit root test provides consistent and efficient results and suitable for small data set. The results of Ng-Perron unit root test are reported in table-2. Their results reveal that a series of data have a unit root problem at the level, but the unit root problem seems to be solved when we take data at first difference. It means that series are integrated at 1st difference *I(1)*.

Table-1. Descriptive Statistics

Variables	$\ln Ip_t$	$\ln Fd_t$	$\ln sav_t$
Mean	23.26193	4.217489	22.31148
Median	23.39074	4.131480	22.79499
Maximum	24.29928	5.995108	23.69204
Minimum	21.98352	2.788708	20.09159
Std. Dev.	0.706450	0.986332	1.115600
Skewness	-0.235347	0.401869	-0.486164
Kurtosis	1.879495	2.030535	1.942363
Jarque-Bera	2.523352	2.709171	3.526033
Probability	0.283179	0.258054	0.171527
Source: Author's calculations			

Table-2: Ng-Perron Unit Root Test

Variables	MZa	MZt	MSB	MPT
$\ln Ip_t$	-1.80422	-0.69034	0.38263	33.3590
$\ln Fd_t$	-8.66568	-2.02216	0.23335	10.7198
$\ln sav_t$	-8.92829	-1.99525	0.22347	10.6336
$\Delta \ln Ip_t$	-19.0124**	-3.07448	0.16171	4.84582
$\Delta \ln Fd_t$	-16.9797***	-2.88550	0.16994	5.53584
$\Delta \ln sav_t$	-19.4558**	-3.11838	0.16028	4.68723
Significance at 1%, 5% and 10% is shown by *, ** and *** respectively. **Source:** Author's calculations				

After confirming the stationary of data, we may proceed with cointegration test. This study is applying Bayer and Hanck (2013) combine cointegration test to investigate the long run relationship between variables because our data series is stationary at 1st difference I(1). For Bayer and Hanck, (2013) combine cointegration test, we need optimal lags that can be taken from lag length criteria. The results by Lag length criteria are displayed in table-4. The results provide different approaches such as sequential modified LR test statistic, final prediction error, Aaike information criterion, Schwarz information criterion and Hannan-Quinn information criterion to identify optimal lag. This study is following Aaike Information Criterion (AIC) for selection of optimal lags because Lütkepohl (2006) stated that Aaike Information Criterion (AIC) has superior properties for a small data set over any other lag length criteria.

Table-4: Lag Length Criteria

VAR Lag Order Selection Criteria						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	74.21585	NA	2.64e-07	-3.795451	-3.621298	-3.734054
1	251.4001	306.4808*	4.37e-11*	-12.50811*	-11.63735*	-12.20113*
2	267.2715	24.02156	4.55e-11	-12.50116	-10.93378	-11.94859
3	277.2900	12.99701	6.85e-11	-12.17784	-9.913845	-11.37967
4	283.7261	6.958002	1.36e-10	-11.66087	-8.700267	-10.61712
* 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 **Source:** Author's calculations						

The results of Bayer and Hanck (2013) combine cointegration test is presented in table-5. The results confirmed the existence of cointegration between variables because F-statistics for EG-JOH and EG-JOH-BO-BDM, in case of Ip_t, Fd_t and sav_t are greater than the critical values at 1%, 5 % and 10% level of significance. This indicates that F-statistics for EG-JOH and EG-JOH-BO-

BDM statistically reject the null hypothesis of no cointegration between variables. This suggests that the long run relationship exists between industrial production, financial development and saving over the period of 1972-2014 in case of Pakistan.

Table-5: Bayer and Hanck Combine Cointegration Test

Estimated models	EG-JOH-BO-BDM	EG-JOH	Optimal Lag	Cointegration
$Ip_t = f(Fd_t, sav_t)$	26.75**	23.89*	1	Yes
$Fd_t = f(Ip_t, sav_t)$	16.41***	14.24**	1	Yes
$sav_t = f(Fd_t, Ip_t)$	96.91*	23.23*	1	Yes
Significance Level	EG-JOH-BO-BDM		EG-JOH	
1%	31.169		16.259	
5%	20.486		10.637	
10%	16.097		8.363	
Note: *, ** and *** describe significant at 1%, 5% and 10% level of significance respectively. Optimal lag length is selected by AIC. **Source:** Author's calculations				

Table-6 explains the marginal contribution of independent variables to the dependent variable in the long run. We find financial development and savings have a positive and significant impact on industrial production. This predicts that financial development and saving contribute in industrial production. The coefficient of financial development explains that one percent increase in financial development leads to increase industrial production by 0.33 percent remaining other things constant. Similarly, the coefficient of savings shows that one percent rise in savings leads to increase industrial production by 0.34 percent remaining other things constant. It requires a long time to develop a financial system by providing long term loans for growth of industrial production. Moreover, savings also need many years to convert into investments that further enhance industrial production. The value of R-squared shows that 98 percent of model is explained by the explanatory variables. F-statistics illustrate that the overall model is good and significant at 1 percent significance level. The value of Durban Watson (DW) test confirms the absence of autocorrelation.

Table-6: Long Run Analysis

Dependent Variable: $\ln Ip_t$			
	Coefficient	Std. error	T-statistics
Constant			
$\ln Fd_t$	0.3332*	0.0405	8.2084
$\ln sav_t$	0.3450*	9.6144	9.6144
R-squared	0.9824		
Durbin-Watson	1.73546		
F-statistic	1062.95		
Prob.	0.00000		

Note: significance at 1% and 5% is shown by * and ** respectively. **Source:** Author's calculations

Table-7 describes the results of the short run relationship between variables. In the short run, only financial development has a positive and significant impact on industrial production. But savings have a positive and insignificant impact on industrial production in the short run. It explains that if people will increase savings in the short run, they will invest these savings that will lead to increase in industrial production. The value of lagged *ECM* is -0.18 that is negative and significant at the 1 percent level of significance. It indicates the speed of convergence from disequilibrium towards equilibrium from short run to long run. The model will move from disequilibrium to equilibrium with the speed of 18 percent each year. It will take approximately 5 years and 5 months to an reach equilibrium level in the long run. The F-statistics show overall model is significant in the short run. Durban-Watson confirms the absence of autocorrelation among the series.

When we compare long and short run results, we come to know that financial development increases industrial growth both in the short and long run but the coefficients are different. In the short run, both independent variables have a very less marginal impact on industrial production. In the long run, the impact of financial development and saving is much greater than short run because it takes many years to develop the industrial sectors via investments.

Table-7: Short Run Analysis

Dependent Variable: $\Delta \ln Ip_t$			
	Coefficient	Std. error	T-statistics
Constant	0.0508*	0.0070	7.2146
$\Delta \ln Fd_t$	0.0595*	0.0624	-3.3484
$\Delta \ln sav_t$	0.0327	0.0289	1.1318
ECM_{t-1}	-0.1842*	0.0675	-2.7271
R-squared	0.4017		
Durbin-Watson	1.3874		
F-statistics	3.0329		
Prob.	0.0416		
Note: significance at 1%, 5% and 10 % is shown by *, ** and *** respectively. **Source:** Author's calculations			

Once the cointegration has confirmed, there must be a causal relationship among variables. This relationship can be unidirectional or bidirectional depending on the nature of variation. The Granger (1969) revealed that this approach is appropriate once variables are integrated at the same level of integration. The existence of cointegration leads us to apply VECM granger causality. It provides a clear picture for policy makers to understand the direction of causal relationships between industrial production, financial development and saving. The results of VECM Granger causality are reported in table-8. The findings indicated that bidirectional causality exists between financial development and industrial production only in the long run. Similarly, unidirectional causality running from financial development to savings has found in both long and short run.

Table-8: VECM Granger Causality Analysis

Variables	Short Run			Long run
	$\ln Ip_t$	$\ln Fd_t$	$\ln sav_t$	ECM_{t-1}
$\Delta \ln Ip_t$	---	1.0512 (0.3620)	0.0173 (0.9828)	-0.7840** (-2.1894)
$\Delta \ln Fd_t$	1.0130 (0.3752)	---	1.3234 (0.2813)	-0.2209** (-2.5802)
$\Delta \ln sav_t$	0.5638 (0.5749)	2.6457*** (0.0874)	---	-0.7490* (-4.3977)
Note: Significance at 1%, 5% and 10% is shown by *, ** and *** respectively. **Source:** Author's calculations				

The existing literature argued that VECM Granger causality approach cannot capture the causal relationship between the variables beyond the selected time period. This deteriorates the effectiveness of casual results. To evaluate the causality relationship beyond the sample period, the innovative accounting approach is much better to test the power of causal relationship between financial development, industrial production and savings. The VECM Granger causality does not provide the magnitude of predicted error variance and effect of shocks. These deficiencies can be covered by applying the innovative accounting approach. We divide innovative accounting approach in two parts such as variance decomposition and the impulse response function. Pesaran and Shin (1999) have designated generalized forecast error variance decomposition method. It shows the proportional contribution in one variable due to innovative shocks stemming in other variables. Further, the generalized forecast error variance decomposition approach estimates the simultaneous shock effects. Engle and Granger (1987) and Ibrahim (2005) argued that with VAR framework, variance decomposition approach produces better results as compared to other traditional approaches.

The results of Variance Decomposition Approach (VDA) are presented in table-9. The results indicate that 81 % of industrial production is contributed by its own innovative shocks. The financial development contributes in explaining the industrial production by 17 percent. Similarly, 1.3 percent of industrial production is explained by savings. The contribution in financial development by industrial production is 20 percent. Similarly, savings contribute in financial development by 0.2 percent. Moreover, 79 percent of financial development is explained by its own innovative shocks. The share of industrial production and financial development to explain saving has increased by 42 percent and 16 percent, respectively due to one standard shock running in industrial production and saving.

Table-9: Variance Decomposition Approach

Variance Decomposition of $\ln Ip_t$

Period	S.E.	$\ln Ip_t$	$\ln Fd_t$	$\ln sav_t$
1	0.030981.	100.00	0.0000	0.0000
2	0.0488	87.738	10.461	1.8002
3	0.0642	78.369	19.204	2.4262
4	0.0769	75.746	22.065	2.1885
5	0.0875	76.147	21.977	1.8746
6	0.0967	77.259	21.082	1.6568
7	0.1046	78.350	20.124	1.5250
8	0.1116	79.326	19.228	1.4447
9	0.1178	80.226	18.382	1.3912
10	0.1234	81.070	17.576	1.3530
Variance Decomposition of $\ln Fd_t$				
Period	S.E.	$\ln Ip_t$	$\ln Fd_t$	$\ln sav_t$
1	0.0802	2.2127	97.989	0.0000
2	0.1315	4.0075	95.270	0.7222
3	0.1717	5.4852	93.902	0.6125
4	0.2009	7.8001	91.736	0.4631
5	0.2234	10.361	89.263	0.3752
6	0.2419	12.761	86.916	0.3218
7	0.2576	14.924	84.790	0.2890
8	0.2711	16.911	82.819	0.2692
9	0.2828	18.803	80.942	0.2572
10	0.2932	20.614	79.134	0.2506
Variance Decomposition of $\ln sav_t$				
Period	S.E.	$\ln Ip_t$	$\ln Fd_t$	$\ln sav_t$

1	0.1634	0.0690	5.0517	94.879
2	0.1894	0.0608	19.326	80.612
3	0.1983	8.6278	17.800	73.571
4	0.2159	19.632	18.201	62.166
5	0.2299	26.852	18.282	54.864
6	0.2396	31.495	17.820	50.683
7	0.2473	34.955	17.326	47.717
8	0.2543	37.798	16.950	45.251
9	0.2607	40.173	16.685	43.141
10	0.2664	42.149	16.485	41.364
Source: Author's calculations				

The impulse response function is alternative to Variance Decomposition Approach (VDA) that shows how long and to what extent dependent variable react due to shock stemming in the independent variable. Figur-1 showing the results of the impulse response function. The results predict that the response in industrial production due to shocks stemming in financial development is positive, initially goes upward by 3rd time horizon then decline. The response of industrial production to saving is also positive. The response in financial development due to shocks stemming in industrial production is positive all the time. The contribution of financial development to saving moves upward from zero. Industrial production contributes saving positively, but financial development contributes saving initially positively than negatively after a 3rd time horizon. These findings of the impulse response function confirm the finds of variance decomposition.

5. Conclusion and Recommendation:

The prime objective of this study is to check the impact of financial development on industrial production by adding savings as a supporting variable for the time period 1972-2014 in case of Pakistan. The stationary of data is checked by Ng-Perron unit root test and this test confirm integrated order at 1st difference. We have applied Bayer and Hanck (2013) combine cointegration to explore the cointegration between variables. The results confirm the existence of the long run relationship between financial development, industrial production and savings. In the long run, financial development and savings have a positive and significant impact on industrial production. In the short run, only financial development has a positive and significant impact on industrial production. The value of ECM_{t-1} is -0.18 that explain deviations from short run towards long run. It approximately takes 5 years and 5 months to reach an equilibrium level.

The direction of causal relationships, we have applied VECM Granger causality approach. The results reveal the bidirectional causal relationship between industrial production, financial development and savings in the long run. A unidirectional causality seems from financial development to savings. Due to some limitations of VECM, we apply innovative accounting approach to analysis the magnitude of predicted error variance and effect of shocks. The variance decomposition approach argues that financial development plays a vital role in explaining industrial production till 10-year time horizon. We also find a feedback effect between financial development and industrial production The impulse response function also confirms the results of variance decomposition.

The findings of this study strongly support the policies to enhance financial system that helps economic growth via industrial production in Pakistan. The well-established financial sector will have a positive impact on industrial production and ultimately on the economy in two ways. First, the financial sector provides the loans to the investors, which leads to industrial production. Second, efficient financial market motives households invest their savings in financial instruments leading to boost investment. The Government should reduce credit constrain that will increase investments in the industrial sector due to a reduction in capital cost. The developed financial sector will also help to allocate financial resources in Pakistan efficiently. Policy makers should eliminate ceiling on the interest rate and funds should be available at lower cost. In 2010, International Monitory funds (IMF) decoded to uplift of interest rate ceiling for more financial development. The availability of funds and credits at the lower rate will increase industrial production through productive investments. Moreover, introducing new technologies will also improve the financial system. Policy makers should consider these points to develop the financial sector in Pakistan, thus help to stimulate industrial growth.

Acknowledgement:
The authors are thankful to the anonymous referees of this journal for their extremely useful comments and suggestions to improve the quality of this article. The usual disclaimers apply.

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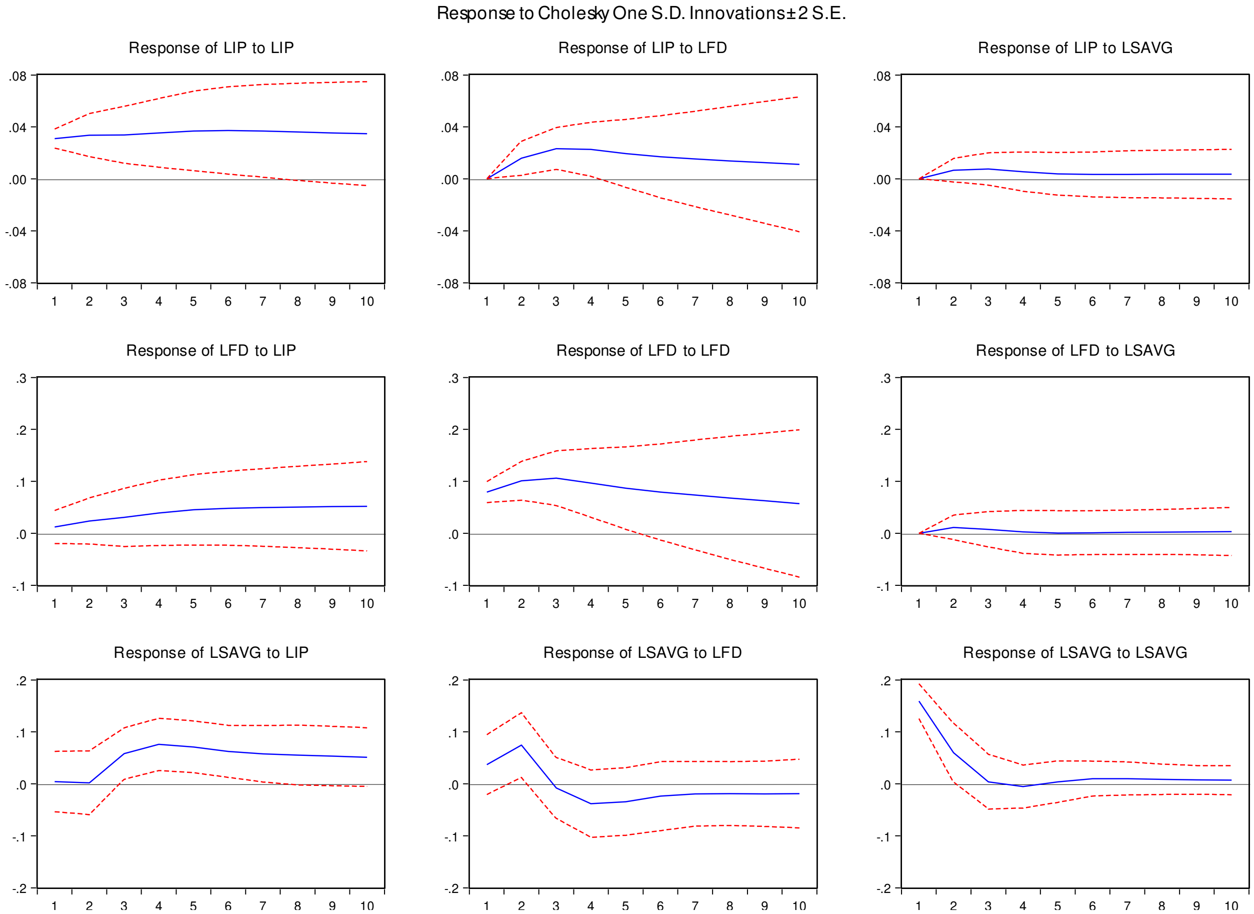
Appendix

Figure-1: Impulse response function



Source: Author's calculations