Natural resources as blessings and finance-growth nexus: A bootstrap ARDL approach in an emerging economy

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Abstract:

This paper examines the link between financial development and economic growth in Pakistan by considering important role of natural resources in production function for the period of 1972-2017. Capital and labour are additional contributing factors of economic growth. To determine the integrating properties of the variables, we apply SOR unit root test containing information for sharp and smooth structural breaks in the series. We also employ the bootstrapping ARDL bounds testing approach to examine the cointegration between the factors of production. The causal relationship between financial development, natural resources, capital, labour and economic growth is tested by applying the VECM Granger causality test in the presence of structural breaks.

The empirical findings indicate that financial development, natural resources, capital, labour and economic growth are cointegrated for long-run association. Additionally, financial development enhances domestic production as well as economic growth. Natural resources as blessings hypothesis is validated. Capital and labour also add to economic growth. The VECM Granger causality test results show the bidirectional causal relationship between financial development and economic growth. The feedback effect also exists between natural resources and economic growth. This paper helps policy makers in designing a comprehensive policy for strengthening finance-growth by using natural resources as an economic tool.

Keywords: Financial Development, Natural Resources, Economic Growth, blessings hypothesis
JEL Classification: O13, O40, C12, C22

1. Introduction

Every country needs an efficient and sound financial system to stimulate economic activity. A developed and sound financial system enables an economy to stimulate economic growth (Pradhan et al., 2014). In Pakistan, financial system is denominated by banking sector, which constitutes 88% of the share of total financial sector, which comprises 34 commercial banks and 4 specialized banks. The share of the non-banking sector is almost 12%, which includes Mudarbas, insurance companies, housing finance companies, leasing companies, mutual funds companies, and venture capital companies. Moreover, Pakistan's stock market is considered a developing and emerging stock market. Both of the markets (i.e., capital and money) set investment opportunities to enhance economic growth. The financial system of Pakistan remains resilient while facing uncertainties at local and international levels. These uncertainties include continuous fiscal deficit, an energy crisis, financial instability, and security challenges. The country has relied heavily on the banking sector, which has caused insufficient external inflows, due to heavy debt payments and the continuous falling of foreign reserves (Government of Pakistan, 2018).

Pakistan is located in South Asia, and its land contains important and valuable natural resources, such as natural gas, oil, hydro power potential, coal, iron, copper, salt, and limestone. Pakistan has 175 billion tons of coal reserve, which is equal to 618 billion barrels of crude oil (Government of Pakistan, 2018). This coal, known as black gold, is more than double the value of oil reserves held by top four richest countries. These coal reserves have the ability to produce electricity for more than 200 years. Pakistan's 885.3 billion cubic meters of natural gas reserves can be utilized for the next 20 years. Pakistan contains gold/copper reserves in Saindak along with rock salt in the Pothohar Plateau. Mineral resources include gypsum, uranium, limestone, chromite, iron ore, rock salt, silver, precious stones, gems, marbles, tiles, sulphur, fire clay, and silica sand. In addition to its diverse natural resources Pakistan's growing urban middle class and intelligent youth population are likely to make it an important hub of culture, knowledge, and wealth. This crucial human aspect along with its natural resources will lead to long-run economic development in Pakistan (Government of Pakistan, 2018).

Financial development can affect economic growth in four ways: First, investors invest their money in long-term investment projects due to the potential impact of liquidity shocks on financial markets. Long-run investment projects tend to be less affected by liquidity shocks. The investors invest their money in different modes of financing, thus diversifying the risk. This tool is called "financial intermediaries facilitate pooling and trading of risk" (Obstfeld, 1994). Second, on the basis of ex-ante information, financial mediators advise investors how to efficiently allocate resources. There exists an association among finance, entrepreneurship, and economic growth (King and Levin, 1993). According to King and Levin (1993), monetary structure manipulates productivity-enhancing activities via prospective entrepreneurs. This theory implies that the cost of investing in productivity-enhancing activities becomes lower, leading to economic growth (Levine, 2005). Third, the development of stock markets efficiently endows corporate control and equity markets align the interests of management and firm owners (Buelens, 2006). Fourth, financial markets provide the opportunity to organize the savings to bring in more profits which of course, fosters economic growth (Buelens, 2006).

Sachs (2007) notes that natural resources may positively affect economic growth. For instance, oil and gas extraction revenues lead to real income which in return, improves earnings for the poorer population segment, which can improve living standards. Income from natural resources helps in finance public and private consumption and generates possibilities of borrowing money from financial institutions for capital investments. The income from natural resources can finance core public goods to stimulate economic growth. A well-developed infrastructure strengthens the domestic financial sector, which boosts economic activity. This shows that natural resources affect economic growth directly via capitalization and indirectly via financial development. Badeeb et al. (2016) note that natural resources are ruminated as additional sources for financial institutions, which can enhance the finance-growth linkage.

This paper is contributing in the following five ways: (i), It is a pioneering effort to examine the relationship between financial development and economic growth using annual Pakistani data from 1972 to 2017 by considering the vital role of natural resources in augmented production. (ii), We have developed a financial development index using the principal component analysis. The sub-indices of the financial development index include broad money as a share of GDP

captures of an economy's money supply; domestic credit to the private sector shows the allocated savings level for productive investment projects; bank nonperforming loans as share of total loans; stock market capitalisation as the share of GDP which indicates the size of a stock market; and stock market traded value and stock market turnover illustrate the profitability in stock markets. (iii), This study examines the unit root properties of financial development, economic growth, natural resources, capital, and labour by applying the sharp and smooth structural break unit root test developed by Shahbaz et al. (2018). (iv) In order to examine cointegration, we apply the bootstrapping ARDL bounds testing approach to validate the existence of a cointegration relationship amid the variables. (v), We employ the bootstrapping based VECM Granger causality approach to examine the causal linkages among the variables. Empirical evidence reveals that financial development boosts economic growth. Natural resources are also positively linked with economic growth, which validates that natural resources are blessings. Capital and labour add to economic growth. The causality test indicates the presence of a feedback effect between financial development and economic growth. Natural resources and economic growth are interdependent. A bidirectional causal relationship also exists between financial development and natural resources.

The rest of the paper is divided into five sections: Section 2 reviews the related literature. Section 3 describes the data, empirical modelling and methodology. Section 4 discusses the results; and Section 5 provides conclusion with policy implications.

2. Literature Review

This paper addresses the finance-growth nexus by incorporating natural resources as an additional determinant of financial development and economic growth. In doing so, we divide the literature review section into three sub-sections: financial development and economic growth nexus; natural resources and economic growth nexus; and natural resources, financial development, and economic growth nexus.

2.1. Financial Development and Economic Growth Nexus

Plenty of studies in the existing literature use various measures of financial development to investigate the relationship between financial development and economic growth and provided

mixed empirical findings. This finance-growth debate goes back to Schumpeter (1912), who indicates that financial development plays an important role in promoting economic activity via capitalisation. Later, McKinnon and Shaw (1973) highlight that financial system spurs economic growth by financial liberalisations. Furthermore, Lee et al. (2004) indicate that financial development helps move capital from the developed world to developing economies, which enhances domestic production and adds to economic growth. Shan and Jianhong, (2006) conclude that financial development positively impacts economic growth. On the other hand, Gantman and Dabos (2012) note that financial development does not significantly impact economic growth. However, Law and Singh (2014) report that financial development impedes economic growth due to unproductive and wasteful use of domestic credit.

For individual country analyses, studies present ambiguous empirical findings. For instance, Masih and Haider (2009) focus on export production to examine financial development and economic growth. They apply the variance decomposition approach and find that financial development, exports, and innovative shocks contribute to economic growth by 34.93%, 13.15%, and 41.89%, respectively. Their empirical evidence indicates the presence of a supply-side hypothesis, as financial development causes economic growth. Hye and Dolgopolova (2011) report the positive impact of financial development on economic growth in China. Uddin et al. (2013) apply the production function to investigate the nexus between financial development and economic growth in Kenya from 1971 to 2011. Their findings suggest a cointegration between the variables and that financial development is the main contributor to economic growth in the long and short run[1]. Polat et al. (2015) report the positive role financial development plays in augmenting economic growth in South Africa. Further, they note that economic growth Granger-causes financial development, leading to trade openness. On the contrary, Shahbaz et al. (2015) found that financial development encourages loans at cheaper costs, spurring capitalisation, which in turn boosts domestic output and increases economic growth in Bangladesh. Moreover, their results indicate a feedback effect between financial development and economic growth. Kandil et al. (2017) reinvestigate the main determinants of economic growth for India and China, finding that financial development positively affects economic growth.

[1]Tinoco-Zermeno et al. (2014) explore the relationship between economic growth, bank credit (i.e. financial development), and inflation in Mexico using the bounds testing approach. They note that the variables cointegrated for the long run. Their empirical exercise indicates financial development has a positive effect on economic growth.

In the case of Pakistan, only a few studies have investigated the relationship between financial development and economic growth by using various measures of financial development. For example, Husain and Mahmood (2001) revisit the impact of financial market development (measuring by stock market prices) on economic growth and find that stock market development plays an insignificant role in enhancing economic growth. Later, Khan et al. (2005) report that financial depth and real interest rate positively contribute to economic growth, but the impact of investment is insignificant. Khan et al. (2007) incorporate trade openness in the production function and find that trade openness strengthens the finance-growth relationship, but in the short run, this openness impacts economic growth minimally. Shahbaz et al. (2008a) investigate the contributing factors of economic growth. They note that foreign direct investment and foreign remittances strengthen the nexus between financial development and economic growth[2].

Jalil and Feridun (2011) re-examine the finance-growth nexus from 1975 to 2008 by using a PCA-generated financial development index. Their results validate the existence of cointegration and showed that financial development spurs economic growth. Anwar et al. (2011) report that financial development plays an important role in stimulating economic growth via capitalisation, and a supply-side effect is validated. Shahbaz (2012) argue that trade openness leads to financial development, which further leads to economic growth. This confirms the validity of a supply-side effect, while a demand-side effect is not valid.

2.2. Natural Resources and Economic Growth Nexus

Scholars have debated the "resources curse" hypothesis for more than three decades. The resources curse hypothesis reveals that resources-rich countries experience lower economic growth compared to countries with no primary resources. This hypothesis argues that natural resources do not stimulate economic growth according to classical growth theory (Ascher 1999). Sachs and Andrew (1997) note that corruption, inefficient bureaucracy, and poor management restricting growth in resource-abundant countries. In such situations, resource abundance is linked with high income inequality due to corruption and mismanagement, which impedes

[2] Shahbaz et al. (2008b) use stock market capitalisation as a measure of financial development to re-examine the finance-growth nexus. They apply the VECM Granger causality test and find the presence of a feedback effect between the variables, as well as cointegration.

economic growth. This shows that government wastes natural resources, i.e. minerals, oil, metals and energy (Rutland 2008). There are many studies that validate the resource curse hypothesis, such as Arezki and van der Ploeg (2011) and Badeeb et al. (2016).

Economists, such as Adam Smith and David Ricardo, also observe that valuable natural resources positively affect growth development. Many other post-war economic analysts also supported this phenomenon in the 1970's. Rostow (1960) summarizes that natural resources endowment would improve fundamental change in under-developed economies by creating new market and investment opportunities, citing countries such as Britain, the US, and Australia (Viner, 1952). Brunnschweiler (2008) find that natural resource abundance stimulates economic growth via institutional quality. Mehrara (2009) report that oil revenues are positively linked to economic growth; in other words, natural resources are blessings. Similarly, Philippot (2010) also negates the resource curse hypothesis and found that natural resources are blessings in transitory countries. Zagozina (2014) also reports that natural resources, such as agricultural exports, minerals, and fuel exports add to economic growth in Soviet countries. Furthermore, Koitsiwe and Adachi, (2015) find that change in mining revenues is responsible for economic growth variation as mining revenues Granger-cause economic growth. Moshiri and Hayati (2017) consider the importance of institutional quality while investigating the effect of natural resources on economic growth using cross-country data for 1996-2010. They find that natural resource wealth is positively linked to economic growth, but institutional quality insignificantly impacts economic growth. Recently, findings of Arin and Braunfels (2018) negate the natural resource curse and confirm that natural resources have a positive effect on economic growth, but it is linked with better quality of institutions.

2.3. Natural Resources, Financial Development and Economic Growth Nexus

Existing empirical literature includes various studies which consider financial development as an important determinant of economic growth while investigating the resources-growth nexus. For example, Satti et al. (2014) examine the resources-growth nexus in the Venezuelan economy by including financial development in an augmented production function. They note that all the variables are cointegrated for the long-run relationship. Their empirical analysis further exposes that financial development could not nullify the negative effect of natural resources on economic growth. In Yemen, Badeeb and Lean (2017a) find that natural resources are negatively linked

with economic growth, but a developed financial sector can transform that curse into a blessing with the proper allocation of domestic savings into productive investment ventures. Badeeb and Lean (2017b) find a long run relationship between sectoral growth and its determinants. Their empirical findings further reveal that natural resources have a negative impact on agricultural and manufacturing sectors, confirming what has been coined the "Dutch Disease".

On the contrary, Quixina and Almeida (2014) use oil revenues as a measure of natural resources and assess financial development as an important determinant of economic growth. They find that natural resources lead to economic growth, but financial development is ineffective in promoting economic growth. Badeeb et al. (2016) find that oil dependence has a positive but weak effect on economic growth via investment, but financial development is negatively linked with economic growth. Rustamov and Adaoglu (2018) investigate the relationship between oil production cost, financial development, and economic growth for the Russian economy. They also include oil prices, natural gas prices, education, and effectiveness of public institutions by applying the Toda and Yamamoto (1995) Granger causality test. They find that natural gas prices and financial development lead to positive economic growth.

3. Empirical Modelling, Data and Methodology

3.1 Empirical Modelling

Existing applied economics literature is full of studies investigating the association between financial development and economic growth using time series, cross-sectional, and panel data sets (Adu et al., 2013). The natural resources-finance-growth nexus is an open question, not only for researchers but also for academicians and practitioners when considering appropriate policy guidelines to achieve sustainable long-run economic development (Al-Yousif, 2002; Khan, 2008). Studies in existing literature provide ambiguous findings due to specification problems and different sample sizes for empirical analysis.

The debate on growth accounting goes back to Solow (1956), who developed a growth model by assuming that saving rates, population growth, and technological development play vital roles in enhancing domestic production. This growth model presents a comprehensive but simple picture of growth accounting and explains why economies have different income levels. Solow's model

is criticized due to the constant nature of economic growth determinants (Acemoglu, 2008). Later, Mankiw et al. (1992) augment the production function by introducing human capital as an important factor of domestic production. The general form of the production function is as follows:

$$Y(t) = A(t)K(t)^{\beta}L(t)^{1-\beta} \quad \text{with} \quad 0 < \beta < 1 \tag{1}$$

where capital stock (K) and labour (L) are the main determinants of domestic production (Y), while technological development (A) also contributes to economic growth by stimulating economic activity. We augment the Cobb-Douglas production function by incorporating financial development, capital, and labour. It is assumed that technological advancement is affected by financial development, skilled human capital, and the openness of an economy. Financial development stimulates economic activity via capitalisation and provides financial resources at cheaper production costs by importing advanced technology from developed countries (Shahbaz, 2012). This indicates that financial development plays a key role in increasing returns to scale and inter-sectoral specialization and strengthening the trade flow structure by improving financial intermediation (King and Levine, 1993; Levine, 1997). Financial sector development helps an economy reap the fruits from technological development, and globalisation provides access to advanced technology, which affects domestic production. Globalisation via trade flows, as well as foreign capital flows, contributes to economic growth. Natural resources also contribute to economic growth directly and indirectly. Natural resources directly contribute to economic growth via several ways: (i) Natural resources are a source of income to finance public and private consumption. (ii) Natural resources are helpful in financing public investment ventures. (iii) Income from natural resources is a sustainable financial source for core public goods such as infrastructure, etc. Natural resources expedite economic growth process by stimulating consumption and investment activities (Adams et al., 2018). Indirectly, natural resources contribute to economic growth via financial development. Financial sector is helpful in transforming natural resources revenues into productive investment projects (Law and Moradbeigi, 2017), which stimulates economic activity. In doing so, Shahbaz et al. (2018a) argue that a well-developed financial sector is a way to escape natural resource curse. It seems that exclusion of financial development when investigating the relationship between natural

resources and economic growth may provide ambiguous empirical evidence. The above discussion directs us to construct a general model as follows:

$$A(t) = \emptyset . R(t)^{\alpha} F(t)^{\delta} \quad (2)$$

where $\emptyset$ is a time-invariant constant, R is a measure of natural resources, and F indicates financial development. Substituting Equation 2 with Equation 1 and incorporating capital and labour as additional contributing factors of economic growth, we formulate a general form of the Cobb-Douglas production function as follows:

$$Y(t) = \emptyset . R(t)^{\alpha} F(t)^{\delta} K(t)^{\beta} L(t)^{1-\beta} \quad (3)$$

We have divided Equation 3 by population on both sides and then transformed all of the variables into a natural logarithmic. Equation 3 can be constructed for empirical purposes as follows:

$$lnY_t = \beta_1 + \beta_2 lnF_t + \beta_3 lnR_t + \beta_5 lnK_t + \beta_6 lnL_t + \varepsilon_t \quad (4)$$

where ln and ε_t refer to natural logarithm and error term, respectively. Economic growth is measured by real GDP per capita, financial development is produced using the PCA technique, natural resources are calculated as real natural resources revenue per capita, and capitalisation denotes real gross fixed capital formation per capita. Natural resources, capitalisation and labour are factors of production. Financial development affects economic growth by activating investment opportunities. Financial stability is key element for sustainable economic growth in long run (Nasir et al. 2015).

3.2. The Data Collection

This study uses time series data from 1972 to 2017. The data on real GDP (constant 2010, LCU), gross fixed capital formation (constant 2010, LCU) and labour (% of total population ages 15-64) and natural resources revenues (constant 2010, LCU) have been collected from the Economic Survey of Pakistan (Government of Pakistan, 2018). For the measuring index of financial

development, we use the following sub-indices: broad money (M_2) as a share of GDP; domestic credit to private sector as a share of GDP; nonperforming loans as share of total loans (NL); stock market capitalisation as a share of GDP; stock market traded value as a share of GDP; and stock market turnover as a share of GDP. The data for financial indicators is obtained from the Economic Survey of Pakistan (Government of Pakistan, 2018). Before taking the natural logarithm of each variable, all units of the series have been placed into per capita units including financial development sub-indices.

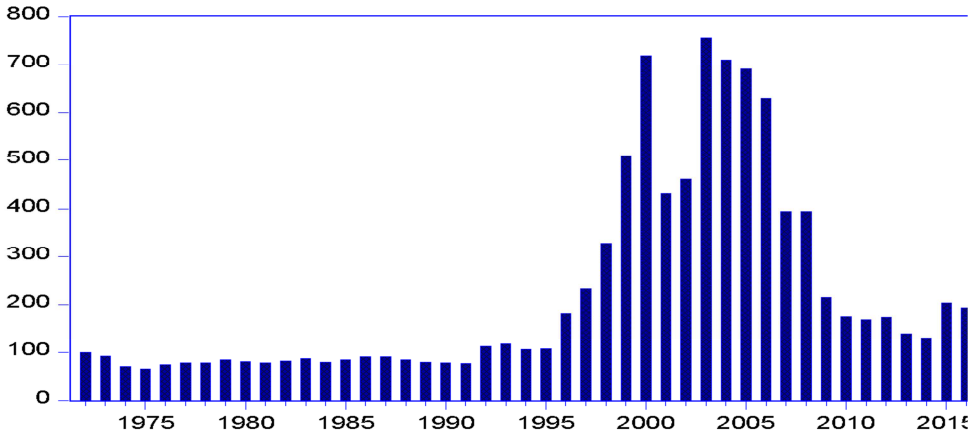
3.3. Financial Development Index

Existing applied economics literature fails to provide a unique measure of financial development. Various researchers have used different measures of financial development. For example, Narayan and Narayan (2013) use domestic credit provided by the banking sector as a percentage of GDP, market capitalisation, and stock trade as assessments of financial development. Lawrence et al. (2014) find that liquid liabilities, credit to private sectors, market capitalisation, turnover ratio, and the value of share trade are suitable measures of financial development. Gantman and Dabós (2012) select domestic credit to private sector and other financial variables as a percentage of GDP to measure financial development. Karima and Ken (2008) evaluate financial development using commercial bank assets (commercial central bank assets), credit to private sector/liquid liabilities, domestic credit to the private sector/GDP, foreign direct investment/GDP, broad money/narrow money, liquid liabilities/GDP, stock market capitalisation/GDP, total value of shares traded/average market capitalisation, and values of stocks traded/GDP. Masih and Haider (2009) use money stock over GDP for calculating financial system development. Liang and Jian-Zhou (2010) find credit to the private sector by banking institutions divided by GDP and the ratio of total deposit liabilities of banking institutions to GDP are appropriate gauges of financial development. Chang and Caudill (2005) calculate financial development using a ratio of M_2 to GDP. This indicates that no measure properly defines financial development. All of the measures may be highly correlated and show the problem of multi-collinearity (Adu et al., 2013, Tyavambiza and Nyangara, 2015).

Table-1: Principal Component Analysis and Correlation Matrix

Principal Components Analysis						
Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion	
1	3.5057	2.1526	0.5843	3.5057	0.5843	
2	1.3531	0.3908	0.2255	4.8588	0.8098	
3	0.9623	0.8600	0.1604	5.8212	0.9702	
4	0.1022	0.0371	0.0170	5.9234	0.9872	
5	0.0650	0.0536	0.0108	5.9885	0.9981	
6	0.0114	---	0.0019	6.0000	1.0000	
Eigenvectors (Loadings)						
Variable	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6
DC_t	0.4328	0.4090	-0.2975	0.5091	0.1809	0.5146
BM_t	0.2242	-0.6466	-0.4991	-0.0656	0.5210	-0.0815
BN_t	-0.4701	0.3297	0.1956	0.0115	0.7936	-0.0440
M_t	0.2174	-0.4540	0.7513	0.3128	0.1417	0.2531
S_t	0.4893	0.2115	0.1949	-0.7696	0.1779	0.2318
SR_t	0.5045	0.2342	0.1465	0.2148	0.1190	-0.7802
Ordinary Correlations						
	DC	BM	BNL	MC	ST	STR
DC_t	1.0000					
BM_t	0.1274	1.0000				
BN_t	-0.5772	-0.7252	1.0000			
M_t	-0.1171	0.2097	-0.4119	1.0000		
S_t	0.7672	0.1169	-0.6674	0.3617	1.0000	
SR_t	0.8612	0.1245	-0.6927	0.3523	0.9425	1.0000

Figure-1: Financial Development Index



Source: Calculated by Authors

We use a Principal Component Analysis (PCA) to generate a financial development index. The PCA is mostly used to overcome the issue of multi-collinearity, as well as the degree of freedom, by generating an appropriate index for a particular variable. For example, in our case, broad money (BM_t) as a share of GDP captures money supply in an economy, domestic credit to private sector (DC_t) shows the allocated savings level to private sector for productive investment projects, bank nonperforming loans as share of total loans (BN_t), stock market capitalisation indicates the size of a stock market (M_t), while stock market traded value (S_t) and stock market turnover (SR_t) illustrate the profitability in stock markets. There may be a problem of multi-collinearity if these variables are used together in a regression analysis (Polat et al., 2015)[3]. These correlated variables are transformed into small uncorrelated variables without any change in variations of the original data by using a PCA[4].

In the lower segment of Table 1, an analysis of a pair-wise correlation is reported. It is noted that broad money (BM_t) and domestic credit to private sector (DC_t) are positively correlated. The correlation between domestic credit to private sector (DC_t) and bank non-performing loans (BN_t) is highly negative. Stock market capitalisation (M_t) and domestic credit to private sector (DC_t) are also negatively correlated. Stock market traded value (S_t) is highly and positively correlated with domestic credit to private sector (DC_t). The correlation is high and positive between stock market turnover (SR_t) and domestic credit to private sector (DC_t). Similarly, a negative correlation exists between broad money and bank nonperforming loans. A negative and high correlation is found between bank nonperforming loans, stock market traded value, and stock market turnover. Stock market traded value and stock market turnover are positively and highly correlated.

The presence of a high correlation amid the variables may be a cause of multi-collinearity while using these variables simultaneously in a regression analysis to capture financial development. The presence of multi-collinearity not only weakens the empirical analysis, but it also makes the analysis inefficient. This issue is solved by applying a PCA to generate an index of financial

[3] We have transformed all of the variables into real terms and converted them into per capita units by dividing each series by total population.

[4] For more details, see Sricharsoen and Buchenrieder, 2005.

development. The results of the PCA are detailed in the upper portion of Table 1. The first principal component explains 58.43% of the variability of an individual variable. The second principal and third components explain 22.55% and 16.04%, respectively, of total variability. The explanation of the total variability by the rest of the principal components is minimal. This suggests to us to first use a PCA as a weight to generate an index of financial development. Financial development improved in Pakistan from 1972 until 2005. After 2005, the development shows a downward trend, which indicates the heavy reliance of government on public debt form the domestic financial sector to meet its budget deficit. This public debt increases the cost of private sector share from domestic credit. Following the "Fiscal Responsibility and Debt Limitation Act 2005," the government needed to maintain public debt below 60% of GDP until June 2013. The government was required to reduce public debt by 2.5% of GDP each year afterwards; however, public debt stood at 63.3% of GDP in December 2013, which further impacted financial development and caused a downward trend in 2014, although it rose after 2015 (Figure 1).

3.4. SOR Unit Root Test with Sharp and Smooth Breaks

We use the sharp and smooth structural breaks unit root test developed by Shahbaz, Omay, and Roubaud (hereafter SOR, 2018b) to examine the integrating properties of our variables. Although various unit root tests are available for testing the stationarity properties of variables, such tests provide biased empirical results due to their low explanatory power (Shahbaz et al., 2018b). The uniqueness of SOR is that it is a nonlinear-unit root test accounting for sharp and smooth breaks occurring in a times series. The SOR test (following Leybourne et al., 1998) entails a two-step approach which is as follows:

Step-1. This step involves using the constrained nonlinear optimization algorithm via genetic algorithm[5]. Subsequently, the deterministic component of the preferred model is estimated, and its residuals are calculated using Models A, B, and C as shown below:

$$\text{Model A: } \hat{\varepsilon}_t = y_t - \hat{\alpha}_1 - \hat{\alpha}_2 F_t(\hat{\gamma}, \hat{\tau}) \quad (4)$$

[5] We use the genetic algorithm in our estimation process of the smooth transition trend because it is shown to be the best performing algorithm in estimating LST types of equations. For details, see Omay and Emirmahmutoglu (2017).

Model B: $\hat{\varepsilon}_t = y_t + \hat{\alpha}_t + \hat{\beta}_t + \hat{\alpha}_2 F(\hat{\gamma}, \hat{\tau})$ (5)

Model C: $\hat{\varepsilon}_t = y_t - \hat{\alpha}_1 - \hat{\beta}_1 t - \hat{\alpha}_2 F_t(\hat{\gamma}, \hat{\tau}) - \hat{\beta}_2 F_t(\hat{\gamma}, \hat{\tau}) t$ (6)

Step-2. Here we compute the Enders and Lee, hereafter, EL (2012) test statistic, that is the *t*-ratio associated with $\widehat{\emptyset}$ in OLS regression:

$$\hat{\varepsilon}_t = d(t) + \emptyset \varepsilon_{t-1} + v_t \quad (7)$$

where $d(t)$ is a deterministic function of t and v_t is a stationary disturbance with constant variance σ^2, noting that ε_t is weakly dependent with a fixed initial value. Equation 7 is estimated directly to test the null hypothesis of a unit root (i.e. $\emptyset = 1$ if functional form of $d(t)$ is known. But, because we do not know the form of $d(t)$, any testing could be challenging for $\emptyset = 1$ if $d(t)$ is incorrectly specified. Thus far, the approach used in this study is based on the assumption that it is possible to approximate $d(t)$ using the Fourier expansion:

$$d(t) = \alpha_0 + \sum_{k=1}^{n} \alpha_k sin\left(\frac{2\pi kt}{T}\right) + \sum_{k=1}^{n} \beta_k cos\left(\frac{2\pi kt}{T}\right), \; n \leq T/2 \quad (8)$$

where the number of cumulative occurrences in the approximation are represented by n, k portrays a specific frequency, and the number of observations are shown by T. In this situation, where we don't have a nonlinear trend, all the values of $\alpha_k = \beta_k = 0$, specification becomes a special case. It is advisable not to use a large value of n as this can lead to a problem of over-fitting. A number of notable studies such as Bierens (1997), Gallant and Souza (1991), and Davies (1987), empirically show the functional form of smooth break using the Fourier approximation. In addition, n should be small, as this will allow the evolution of nonlinear trend to be steady. Finally, the resulting equation is shown by the following form:

$$\Delta\hat{\varepsilon}_t = \alpha_0 + \sum_{k=1}^{n} \alpha_k sin\left(\frac{2\pi kt}{T}\right) + \sum_{k=1}^{n} \beta_k cos\left(\frac{2\pi kt}{T}\right) + \emptyset \hat{\varepsilon}_{t-1} + \sum_{i=1}^{p} \varphi_k \Delta\hat{\varepsilon}_{t-i} + \vartheta_t \quad (9)$$

The dependent variables' lag value in testing the equation is amplified to account for any stationary dynamics in $\hat{\varepsilon}_t$. Concurrently, the value of the EL test statistic is depicted as $s\tau_\alpha$ in Model A and is used to construct $\hat{\varepsilon}_t$, $s\tau_{\alpha(\beta)}$ when Model B is used, and $s\tau_{\alpha,\beta}$ when Model C is used. It is vital to know whether a small number of frequency components would duplicate the types of breaks often detected in economic data when the SOR unit root test is used.

To take care of this, we consider a Fourier approximation using a single frequency component represented by k. The amplitude and displacement of the sinusoidal component of the deterministic term is shown by α_k and β_k. This enables us to allow for several smooth breaks even with a single frequency $k = 1$. We can state the hypotheses of unit root testing based on our three models with the Fourier transforms in the subsequent form:

$$H_0: Unit\ Root \qquad (Linear\ Nonstationary) \tag{10}$$
$$H_1: Nonlinear\ Stationary \begin{pmatrix} Nonlinear\ and\ Stationary\ around \\ simulatenously\ changing\ sharp\ and\ smooth\ trend \end{pmatrix}$$

We test the hypothesis against the critical values using the values for the SOR test for Model A* provided by Shahbaz et al. (2018b).

3.5. The Bootstrapping ARDL Bounds Testing Approach to Cointegration

To examine the cointegration relationship between the variables, we use the bootstrapping ARDL cointegration approach of McNown et al. (2018). The originality of the bootstrapping ARDL approach is its ability to deal with weak size and power properties that are faced in the conventional ARDL approach of Pesaran and Shin (1999) and Pesaran et al. (2001). Furthermore, in order to increase the power of T-test and F-test, this approach has the ability to integrate a new cointegration test while drawing on and adding to the conventional ARDL bounds testing approach cointegration framework. Pesaran et al. (2001) entail two conditions for the identification of cointegration. First, the coefficients of error-correction terms must be statistically significant. Second, the coefficients of lagged explanatory variables must also be statistically significant. Pesaran et al. (2001) suggest that one should use the critical bounds (upper and lower bounds) for the second case, but for the first case, there is no bounds test or

critical bounds. In the first situation, where coefficients on error-correction terms are statistically significant, the test can be used if all the variables in the model are integrated of order 1. However, the conventional unit root tests could be awkward due to the low explanatory and power properties they have, as shown by Goh et al. (2017). This can be unravelled by using the bootstrapping ARDL bounds test developed by McNown et al. (2018).

By not being sensitive to the order of integration properties of the variables and suitable for dynamic time-series models, the bootstrapping ARDL bounds testing approach is unique. Furthermore, this approach addresses the issue of inconclusive cases, which may arise while using a conventional ARDL bounds testing approach (McNown et al., 2018)[6]. One benefit of employing bootstrapping ARDL bounds testing is that the critical values are generated by eliminating the possibility of indecision cases (areas), which occur in traditional bounds testing approach. Furthermore, the bounds testing is useful for dynamic models with more than one explanatory variable. The traditional bootstrapping ARDL bounds testing procedure can be mathematically specified, following Goh et al. (2017), with three variables as follows:

$$y_t = \sum_{i=1}^{p} \alpha_i y_{t-i} + \sum_{j=0}^{q} \beta_j x_{t-j} + \sum_{k=0}^{r} \gamma_k z_{t-k} + \sum_{i=1}^{s} \tau_i D_{t,l} + \mu_t \quad (11)$$

where *i, j, k,* and *l denote* the lags (*i* = 1, 2… p; *j* = 0, 1, 2, …, q; *k* = 0, 1, 2,…r; *l* = 0, 1, 2,…s; and *t* represents time, y_t is the response variable, x_t and z_t are the explanatory variables, $D_{t,l}$ is a dummy variable that represents the break year based on Kim and Perron's (2009) unit root test, β and γ represent the coefficients of the lagged explanatory variables, τ is the coefficient of dummy variable. Lastly, μ_t shows the error-term with zero mean and finite variance. An error correction form of this model can be stated as follows:

$$\Delta y_t = \emptyset y_{t-1} + \gamma x_{t-1} + \Psi z_{t-1} + \sum_{i=1}^{p-1} \lambda_i y_{t-i} + \sum_{j=1}^{q-1} \delta_j x_{t-j} + \sum_{i=1}^{r-1} \pi_k z_{t-k} + \sum_{i=1}^{s} \omega_i D_{t,l} + \mu_t \quad (12)$$

[6] It is well-known that the traditional ARDL bounds testing approach can successfully be applied to empirical models if the variables have mixed order of integration.

In Equation 12, $\emptyset = \sum_{i=1}^{p} \alpha_i$, $\gamma = \sum_{i=1}^{q} \beta_i$, and $\Psi = \sum_{i=0}^{r} \gamma_i$. At this point, λ_i, δ_j, π_k, and ω_i account for the associated functions in Equation 1. By transforming a vector auto-regression in the levels into its error-correction form, the derivation of Equation 12 from Equation 1 is estimated. Whereas, Equation 12 can be estimated by using a constant term ($\tilde{c}$) in the unconditional model given below:

$$\Delta y_t = \tilde{c} + \widetilde{\emptyset} y_{t-1} + \tilde{\gamma} x_{t-1} + \widetilde{\Psi} z_{t-1} + \sum_{i=1}^{p-1} \tilde{\lambda}_i y_{t-i} + \sum_{j=1}^{q-1} \tilde{\delta}_i x_{t-j} + \sum_{k=1}^{r-1} \tilde{\pi}_i z_{t-k} + \sum_{i=1}^{s} \widetilde{\omega}_i D_{t,l} + \tilde{\mu}_t \quad (13)$$

Equation 13 requires the rejection of the three null hypotheses to confirm the cointegration among the variables y_t, x_t and z_t. The hypotheses can be stated as:

I) The F_1 test which is based on all the relevant error-correction terms ($H_0: \emptyset = \gamma = \Psi = 0$ against $H_1: \emptyset \neq \gamma \neq \Psi \neq 0$ meaning any of $\emptyset, \gamma$ and Ψ (are) different from zero),

II) The F_2 test which is based on all of the explanatory variables terms ($H_0: \emptyset = \gamma = 0$ against $H_1: \gamma \neq \Psi \neq 0$ meaning either γ and Ψ is different from zero),

III) The T-test which is based on the lagged dependent variable ($H_0: \emptyset = 0$ against $H_1: \emptyset \neq 0$ meaning that $\emptyset$ is different from zero).

A point to note here is that only the critical values of bounds test for F_1 and T-tests are generated in the traditional ARDL approach, yet it ignores the test statistic for F_2 test on the lagged explanatory variables. However, by employing the bootstrapping ARDL approach proposed by McNown et al. (2018), one can provide the critical values for all three tests. Concurrently, to provide empirically vigorous results, we employ the critical values tabulated by McNown et al. (2018).

4. Empirical Analysis and Results Discussion

The results reported in Table 2 show the descriptive statistics and pair-wise correlations. We find that financial development is more volatile compared to natural resources. Capitalisation and labour are less volatile compared to economic growth. The results of the Jarque-Bera test reveal

that economic growth, financial development, natural resources, capitalisation, and labour have a normal distribution. The empirical analysis of pair-wise correlations indicates a positive correlation between financial development and economic growth. The correlation between natural resources and economic growth is also positive. Capital is positively correlated with economic growth. The correlation between labour and economic growth is positive. Natural resources, capital, and labour are positively linked with financial development. The correlation of natural resources with capital and labour is positive. The negative correlation is found between capital and labour.

Table-2: Descriptive Statistics and Pair-wise Correlations

Variable	lnY_t	lnF_t	lnR_t	lnK_t	lnL_t
Mean	2.6465	1.2668	1.5433	2.2321	1.0034
Median	2.6586	1.1943	1.5184	2.2380	0.9967
Maximum	2.7601	1.6727	1.8578	2.2921	1.0259
Minimum	2.5095	1.0438	0.8257	2.1378	0.9926
Std. Dev.	0.0707	0.1921	0.1911	0.0383	0.0111
Skewness	-0.2958	0.7672	-0.5337	-0.7556	0.8503
Kurtosis	1.9762	2.2200	3.6958	2.9681	2.0699
Sum	486.9701	233.1074	283.9735	410.7189	184.6263
Sum Sq. Dev.	0.9172	6.7557	6.6844	0.2687	0.0225
lnY_t	1.0000				
lnF_t	0.2649	1.0000			
lnR_t	0.2941	0.0952	1.0000		
lnK_t	0.3090	0.3217	0.11791	1.0000	
lnL_t	0.3777	0.0853	0.00183	-0.05000	1.0000

Table-3: Unit Root Analysis

Variable	**ADF at Level with Break**			**ADF at 1st Diff. with Break**		
	T-statistic	**P. value**	**Break Year**	**T-statistic**	**P. value**	**Break Year**
lnY_t	-4.6644 (4)	0.1478	$1992Q_{II}$	-5.5543 (7)**	0.0312	$1992Q_I$
lnF_t	-4.7962 (5)	0.1235	$1995Q_I$	-6.0814 (6)*	0.0012	$2006Q_I$
lnR_t	-4.6042 (3)	0.1508	$2004Q_I$	-5.3617 (3)**	0.0415	$1999Q_I$
lnK_t	-4.7309 (3)	0.1311	$1996Q_I$	-5.6357 (5)**	0.0287	$2008Q_I$
lnL_t	-3.9397 (6)	0.2457	$1985Q_I$	-5.5867 (3)**	0.0301	$1991Q_I$

Variable	SOR Sharp-Smooth Structural Break Test					
	T-statistic	$\bar{\alpha}_2$	T	$\bar{\gamma}$	α_k	
lnY_t	-2.6263	3.0916	-0.5665	30.7563	-0.0498	
lnF_t	-1.9776	2.0445	-0.8245	-0.0888	0.4974	
lnR_t	-2.4265	4.5654	-0.3268	1.6824	-2.1094	
lnK_t	-3.7914	2.8359	-0.6412	7.7539	-0.3739	
lnL_t	-4.0138	1.3576	-0.3703	-2.5534	0.8716	

Note: * and ** show significance at the 1% and 5% levels, respectively. The optimal lag lengths used are shown in (). $\bar{\alpha}_2$, T, $\bar{\gamma}$ and α_k are intercept, trend, slope parameter and threshold parameter, respectively.

The next step is to examine the stationary properties of economic growth, financial development, natural resources, capital, and labour. The investigation of the order of integration of the variables helps us decide which cointegration approach is suitable to examine the cointegration relationship between economic growth and its determinants. The inappropriate order of integration of the variables provides ambiguous empirical results. To overcome these issues, we have applied the ADF unit root test, which accommodates a single unknown structural break in the series (Kim-Perron, 2009). This test is applied to examine if the variables are stationary at level, first difference, or if the variables contain mixed order of integration. This test is appropriate for small sample-size data. Traditional unit root tests, such as ADF (Dickey and Fuller, 1981) and PP (Philips and Perron, 1988) tests, over-reject or under-reject the null hypotheses due to their low explanatory power (Ng-Perron, 2001). The ADF unit root test addresses these issues by its superior explanatory power and provides consistent empirical evidence in the presence of structural breaks in the series.

Table 3 shows the results of the ADF unit root test with structural break. We find that economic growth, financial development, natural resources, capital and labour contain a unit root problem at level with intercept and trend in the presence of structural breaks. These structural breaks are the outcome of economic reforms, such as the Economic Reform Protection Act 1992, implemented to maintain the macroeconomic performance of Pakistan and hence, economic growth affected. The structural reforms primarily range from 1985 to 2004, which was the main era of economic, financial, and capital reforms in Pakistan. After first difference, we find that all the variables are integrated at I(1) in the presence of structural breaks in the series. In order to

test the robustness of the unit root analysis, we have also applied the SOR unit root test, which accounts for the sharp and smooth breaks. The empirical results of SOR unit root test are reported in the lower segment of Table 3. The results noted in Table 3 reveal that the null hypothesis of unit root may not be rejected for financial development and public budget in energy research and development expenditures, as the calculated t-statistics are less than the critical t-values generated by Shahbaz et al. (2018b)[7]. Further, the empirical results show that economic growth, financial development, natural resources, capital, and labour contain unit root processes. The information of nonlinear parameters estimated in Model A* validate the presence of sharp and smooth breaks in the series.[8] The SOR unit root test confirms that at level, all the variables contain unit root problems in the presence of sharp and smooth structural breaks in the series. This implies that all the variables have a unique order of integration i.e. I(1).

This unique order of variable integration leads us to proceed by applying a cointegration approach to examine the presence of cointegration between the variables. In doing so, we have applied the bootstrapping ARDL bounds testing approach developed by McNown et al. (2018). This cointegration test provides empirically reliable results compared to ARDL bounds testing approach developed by Pesaran et al. (2001). The bootstrapping ARDL contemplates the joint F-test and T-test. The F-test and T-test consider lagged values for all level variables and dependent variable, respectively. The T-test (new test) on lagged level of the independent variables is helpful in deciding if cointegration is present between the variables. This shows the superiority of the bootstrapping ARDL over traditional ARDL for examining cointegration between the variables.

The empirical results of the bootstrapping ARDL bounds testing for cointegration are reported in Table 4. Our findings from of the F-test and T-test by bootstrapping ARDL may reject the null hypothesis of no cointegration as we treated economic growth, financial development, natural resources, and capital as dependent variables. We fail to reject the null hypothesis as labour is treated as a dependent variable. This indicates that joint F-test and T-test on lagged dependent and t-test on lagged independent variables show the presence of four cointegrating vectors in the

[7] Critical T-statistics are found in Shahbaz et al. (2018b) from Table 5.
[8] For more details (see Shahbaz et al., 2018b)

framework of Pakistan's domestic production function. We may conclude that economic growth, financial development, natural resources, capital and labour have a long-run relationship during 1972-2017 in Pakistan. The value of R^2 ranges from 0.5808 to 0.7345, which shows that all the variables explain the dependent variables simultaneously. Further, the J-B test confirms the normality of residual terms for all the models.

Table-4: Bootstrap ARDL Cointegration Analysis

Bounds Testing Approach to Cointegration						Diagnostic Tests			
Estimated Models	Lag Length	Break Year	F_{PSS}	T_{DV}	T_{IV}	$\bar{R}^2$	$Q-stat$	$LM(2)$	JB
$Y_t = f(F_t, R_t, K_t, L_t)$	2, 2, 2, 2, 1	$1992Q_{II}$[9]	24.7326*	-3.9595*	3.8094*	0.6463	7.5139	0.3529	0.4206
$F_t = f(Y_t, R_t, K_t, L_t)$	2, 2, 2, 1, 2	$1995Q_{I}$	11.0616*	-4.0851*	2.6504**	0.6765	5.2041	2.2207	1.09
$R_t = f(Y_t, F_t, K_t, L_t)$	2, 2, 1, 2, 2	$2004Q_{I}$	5.2463**	-3.7743**	2.7378**	0.6269	6.4550	3.0654	0.4242
$K_t = f(Y_t, F_t, R_t, L_t)$	2, 2, 2, 1, 2	$1996Q_{I}$	13.0975*	-3.7240**	2.9090***	0.7345	5.3452	2.2324	0.1609
$L_t = f(Y_t, F_t, R_t, K_t)$	2, 2, 1, 2, 2	$1985Q_{I}$	2.0218	-1.0100	-1.1619	0.5808	1.1101	2.0270	0.1377

Note: *, ** and *** show significance at 1%, 5%, and 10% levels, respectively. We follow AIC to choose optimal lag lengths. F_{PSS} is F-statistic based on the asymptotic critical bounds, which is generated from the bootstrap method. T_{DV} and T_{IV} are T-statistics for the dependent and independent variables. The LM and JB refer to Lagrange Multiplier test and Jarque-Bera test.

Table 5 deals with a long-run analysis, and we find that financial development has a significant and positive effect on economic growth. Keeping other things constant, a 1% increase in economic growth is accompanied by a 0.4733% improvement in financial development. These findings are similar with Khan et al. (2005), Khan and Qayyum (2007), Jalil and Feridun (2011), Shahbaz (2012), and Shahbaz et al. (2016), who all report that stable financial development spurs economic growth. Furthermore, Polat et al. (2015) argue that financial system development promotes capitalisation, resulting in a boost in economic growth, as their study indicated in Bangladesh. The relationship between natural resources and economic growth is positive and statistically significant, implying that natural resources are blessings rather than a curse. This confirms the presence of the resources-led growth hypothesis. Keeping other things constant, a 1% increase in natural resources abundance increases economic growth by 0.4547%. This confirms the appropriate implementation of resources extraction and usage of resources revenues in productive venture to expedite economic activity and increase economic growth. This empirical evidence is similar with Humphreys et al. (2007), Brunnschweiler (2008), Mehrara

[9] The critical values of F_{PSS}, T_{DV} and T_{IV} are available upon request.

(2009), Philippot (2010), Zagozina (2014), Koitsiwe and Adachi (2015), Moshiri and Hayati (2017), and Arin and Braunfels (2018), who report that natural resources are blessings rather than a curse.

Capital is positively and significantly linked with economic growth dominantly at the 1% level of significance, which identifies the importance of capital in augmented production function. A 0.9151% increase in economic growth is fostered by a 1% increase in capital if all else is same. This empirical evidence is consistent with Shahbaz (2012), who reports that capital contributes to economic growth by stimulating economic activity. The relationship between labour and economic growth is statistically significant, which implies that labour, like financial development, natural resources and capital, also plays an important role in expediting economic growth. A 1% increase in labour increases economic growth by 0.3016% by keeping other things constant. The effect of the dummy variable the Economic Reform Protection Act is positive and significant at the 1% level. This reveals that the implementation of the Economic Reform Protection Act (1992), in which investment laws were relaxed to boost investment activities in the country positively affected economic growth.

We include the squared term of financial development into production function to examine if the relationship between financial development and economic growth is inverted-U shaped. The empirical results are reported in Table 5. We note that linear and squared terms of financial development have positive and negative impacts on economic growth, respectively. This reveals that economic growth is positively impacted by financial development initially, but after meeting a threshold level of financial development, economic growth starts declining. Our empirical results indicate the presence of an inverted-U shaped relationship between financial development and economic growth. It shows the importance and proper monitoring of financial resources when allocating productive ventures to stimulate economic growth process. It is beneficial to maintain allocation of financial resources before the threshold point. This relationship is termed as Financial Kuznets curve (FKC). This empirical finding corroborates empirical results reported by Samarghandi et al. (2015) and Moosa (2016), who note that too much finance retards economic growth. On the contrary, Hung (2009) reports the asymmetric relationship between financial development and economic growth. Similarly, the relationship between natural

resources and economic growth is inverted-U shaped, which implies that economic growth is initially positive, but it starts to decline after the threshold level of natural resources per capita. This inverted-U relationship between natural resources and economic growth is consistent with Mehrara (2009), who reports that in oil-exporting countries, natural resources exert a positive effect on economic growth, but after the threshold level, natural resources are negatively linked to economic growth. The model has passed all of the diagnostic and stability tests and does not have any issues with normality, serial correlation, autoregressive conditional heteroskedasticity, white heteroskedasticity, and specification. Brown et al. (1975) suggest that the parameter stability can be examined with a CUSUM and CUSUMsq analysis. The CUSUM and CUSUMsq analysis indicates the stability of long-run parameters (Figure 2).

Table-5: Long Run Analysis

Dependent Variable: lnY_t				
Variable	Coefficient	*t*-Statistic	Coefficient	*t*-Statistic
Constant	-2.5530	-11.5764	-2.6178	-9.8226
lnF_t	0.4733*	5.3305	0.8248*	4.6623
lnF_t^2	….	….	-0.2818*	-4.3669
lnR_t	0.4547*	3.3837	0.3212*	3.9378
lnR_t^2	….	….	-0.0892*	-3.1434
lnK_t	0.9151*	18.7897	0.7378*	12.753
lnL_t	0.3016*	16.615	0.2745*	11.3937
D_{1992}	0.0384*	8.6515	-0.0376**	6.3840
R^2	0.9336		0.9429	
$Adj-R^2$	0.9321		0.9410	
F-Statistic	6.2998*		6.8710*	
Stability Analysis				
Test	F-Statistic	p. Value	F-Statistic	p. Value
χ^2_{normal}	1.0696	0.5618	1.1953	0.5507
χ^2_{serial}	1.0714	0.4676	0.9078	0.5514
χ^2_{ARCH}	1.4057	0.1206	1.0500	0.2215
χ^2_{Hetero}	1.2468	0.7606	1.5464	0.1915
χ^2_{Remsay}	1.7424	0.1108	1.4210	0.1818
CUSUM	Stable		Stable	
CUSUMsq	Stable		Stable	

Table 6 reports empirical results of the short run analysis. We find that financial development declines economic growth insignificantly. The relationship between natural resources and economic growth is negative, but it is statistically insignificant. Capital is positive and

significantly linked with economic growth at the 1% level of significance. This shows that capital boosts economic activity and hence, economic growth is increased. Labour and economic growth are positively linked at the 1% level of significance, which implies that labour is also an important factor of domestic production that leads economic growth. The dummy variable has a positive and significant impact on economic growth; i.e., the Economic Reform Protection Act (1992) affects economic growth positively. The estimate of ECM_{t-1} is negative (-0.0345) and significant at a 1% level, which corroborates the long-run relationship between financial development and economic growth, including other determinants of economic growth. The ECM_{t-1} estimate shows that the production function moves to a long-run equilibrium path with a 3.45% speed of adjustment from the short-run path toward the long-run path. It will take approximately 7 years to reach the long-run equilibrium path.

Table-6: Short Run Analysis

Dependent Variable: lnY_t			
Variable	Coefficient	T-statistic	P-value
Constant	0.0185	11.088	0.0000
lnF_t	-0.0242	-0.4299	0.6678
lnR_t	-0.0201	-0.5797	0.5629
lnK_t	0.0788	3.5233	0.0005
lnL_t	0.2266	3.2868	0.0012
D_{1979}	0.0156	4.4033	0.0000
ECM_{t-1}	-0.0345	3.5901	0.0004
R^2	0.4903		
$Adj - R^2$	0.4625		
F-Statistic	6.8572*		
Stability Analysis			
Test	F-Statistic	P. Value	
χ^2_{normal}	1.1606	0.5548	
χ^2_{serial}	1.7014	0.3076	
χ^2_{ARCH}	1.4501	0.1146	
χ^2_{Hetero}	1.4862	0.5667	
χ^2_{Remsay}	1.2724	0.1218	
CUSUM	Stable		
CUSUMsq	Stable		

Furthermore, the short-run model has also passed the diagnostic tests. The results show the absence of non-normality in the model. No evidence is found showing a serial correlation in the short-run model. There is the absence of autoregressive conditional heteroskedasticity, and the

variance is homoskedastic. The specification of the short-run model is well designed. The results of the CUSUM and CUSUMsq analysis confirm the stability of the short-run parameters at a 5% significance level (Figure-3).

Figure-1: CUSUM

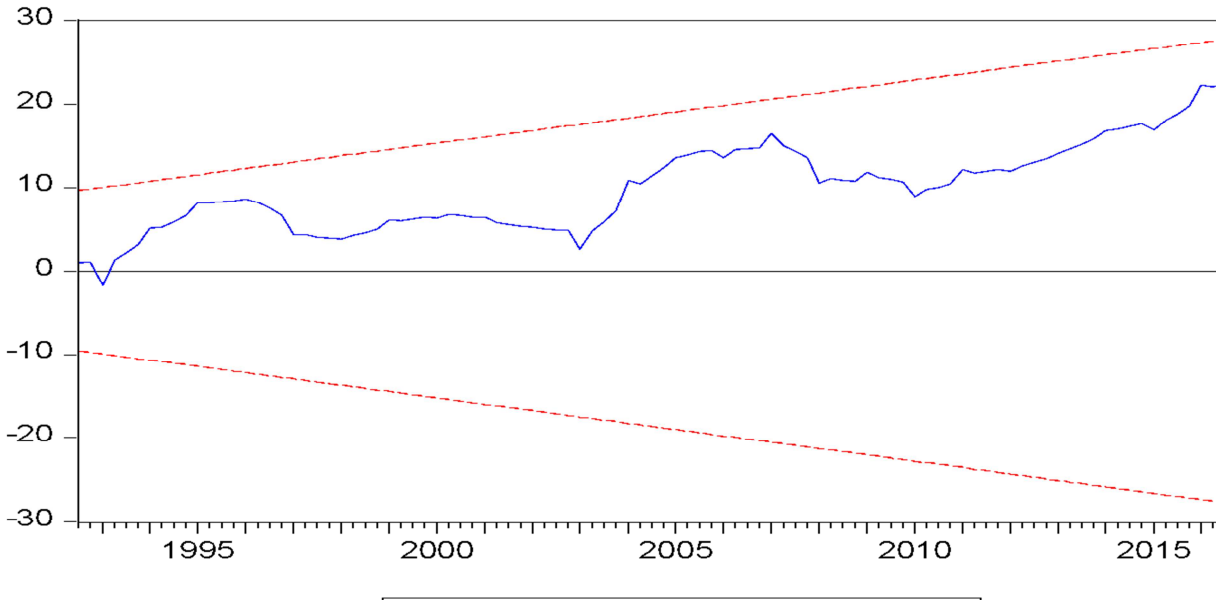
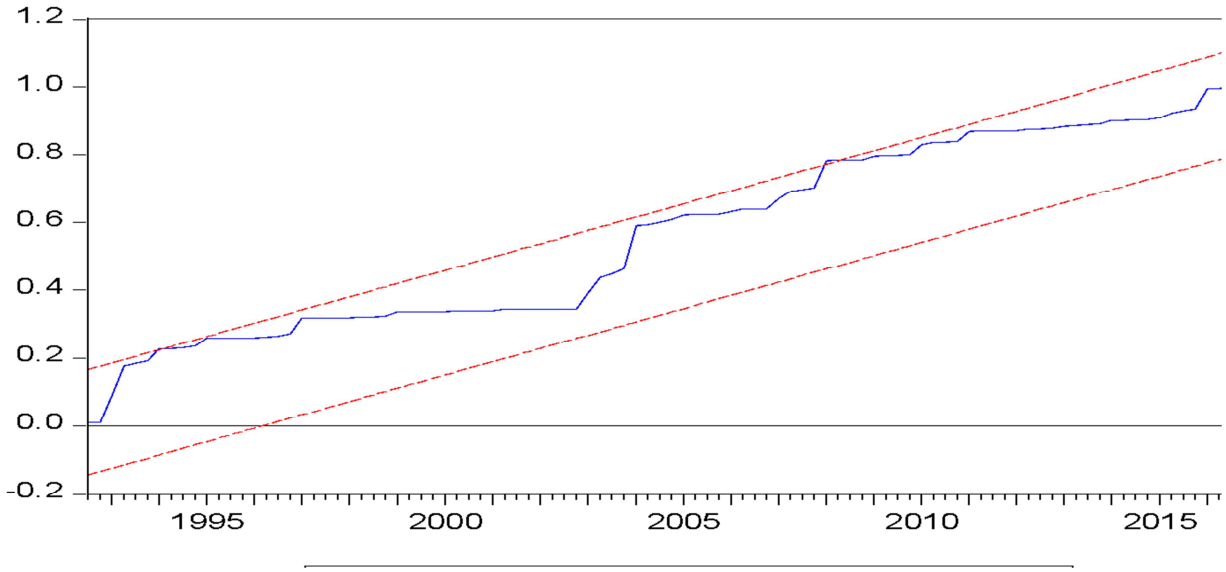


Figure-4: CUSUM of Squares



The direction of a causal relationship between the variables is tested by applying the VECM Granger causality approach. Table 7 presents these results. In the long run, we find that financial development causes economic growth (validating the supply-side hypothesis), and economic growth causes financial development (confirming the demand-side hypothesis) in the Granger sense. This shows the presence of a feedback effect between financial development and economic growth, which means that both variables are interdependent. These findings are consistent with Shahbaz and Rahman (2012, 2014a) who reported that financial development and economic growth are complementary. However, Shahbaz (2012) found that a demand-side effect exists, which reveals that financial development is the cause of economic growth, and Anwer et al. (2011) and Ali et al. (2014) propose that economic growth is the cause of financial development (i.e., the supply-side effect). Similarly, Shaheen et al. (2011) validate the presence of a neutral effect between financial development and economic growth. (i.e., financial development does not Granger-cause economic growth, and economic growth does not Granger-cause financial development). A feedback effect exists between natural resources and economic growth, revealing that natural resources cause economic growth, and economic growth Granger-causes natural resources development. We note that natural resources and economic growth are complementary. This empirical finding is consistent with Satti et al. (2014) and Ahmed et al. (2016), who report the presence of bidirectional causality between natural resources and economic growth in Venezuela and Iran, respectively. Capital causes economic growth, and

economic growth Granger-causes increased capital. This empirical result is similar to Satti et al. (2014) and Ahmed et al. (2016), who find that capital and economic growth are complementary. A unidirectional causal relationship exists from labour to economic growth and financial development. Natural resources and capital are Granger causes of labour.

Table-7: VECM Granger Causality Analysis

Variables	**Short Run Causality**						
	ΔlnY_t	ΔlnF_t	ΔlnR_t	ΔlnK_t	ΔlnL_t	ECM_{t-1}	**Break Year**
ΔlnY_t	….	1.7819 [0.1869]	0.0718 [0.9309]	3.6709** [0.0382]	4.5609** [0.0420]	-0.0993** [-2.3370]	$1992Q_{II}$
ΔlnF_t	0.1234 [0.8843]	….	0.3600 [0.7008]	0.5823 [0.5652]	1.8064 [0.1829]	-0.2325*** [-1.9848]	$1995Q_{I}$
ΔlnR_t	0.1347 [0.8547]	0.0469 [0.9542]	….	1.6461 [0.2109]	0.3624 [0.6992]	-0.5988* [-2.9851]	$2004Q_{I}$
ΔlnK_t	3.0170*** [0.0651]	2.1964 [0.1300]	0.4879 [0.6190]	….	0.1479 [0.8632]	-0.6331* [-3.3869]	$1996Q_{I}$
ΔlnL_t	5.0276** [0.0454]	0.6109 [0.5503]	2.2048 [0.1291]	0.1868 [0.8306]	….	-0.0229 [-1.5648]	$1985Q_{I}$
	Long-and-Short Run Joint Causality						
ΔlnY_t	….	19.3151 [0.0000]*	13.3060 [0.0000]*	11.3168 [0.0000]*	12.3006 [0.0000]*	….	$1992Q_{II}$
ΔlnF_t	5.5585 [0.0322]**	….	5.2448 [0.0285]**	9.5010 [0.0000]*	5.1852 [0.0287]**	….	$1995Q_{I}$
ΔlnR_t	9.9080 [0.0000]	10.0005 [0.0000]*	….	9.8709 [0.0001]*	10.0009 [0.0000]*	….	$2004Q_{I}$
ΔlnK_t	6.7931 [0.0175]**	9.0104 [0.0009]*	10.0017 [0.0000]*	….	6.7755 [0.0176]**	….	$1996Q_{I}$
ΔlnL_t	….	….	….	….	….	….	$1985Q_{I}$
Note: * and ** indicate the significance at 1% and 5% levels, respectively.							

In the short run, a neutral effect exists between financial development and economic growth (i.e., no causal relationship). Natural resources do not cause economic growth nor does economic growth cause natural resource development. A feedback effect exists between capital and economic growth. Labour causes economic growth, and economic growth causes labour, i.e. bidirectional causality. The results of long-run and short-run joint causality confirm the short-run and long-run causal relationship between economic growth and its determinants.

5. Concluding Remarks and Policy Implications

This study investigates the relationship between financial development and economic growth using the production function from 1972–2017. We have incorporated natural resources, capital, and labour as additional determinants of domestic production. The empirical results authenticate the presence of cointegration amid financial development, natural resources, capital, labour, and economic growth. In addition, financial development augments economic growth. The impact of natural resources on economic growth is positive, and the relationship between labour and economic growth is also positive and significant. The implementation of the Economic Reform Protection Act (1992) adds to economic growth. The empirical evidence by a causality test reveals a bidirectional causality between financial development and economic growth. Natural resources lead to economic growth and economic growth Granger-causes natural resources. A feedback effect is found between capital and economic growth. Natural resource abundance Granger-causes labour. A unidirectional causal relationship is found running from labour to economic growth, financial development, natural resources, and capital.

In the context of policy implications, financial development has a positive impact on economic growth. This suggests there should be more financial reforms for achieving sustainable economic development. Our analysis notes that financial development and economic growth are interdependent (i.e., financial system development and economic growth rely on each other). In such a situation, improving a financial system by introducing new financial reforms will have a positive impact on investment activities, which boosts economic growth. The rise in investment activities and income per capita will further increase the demand for financial services, and financial development would be further increased. This suggests an easy monetary implementation, not only for enhancing investment activities, but also for utilizing financial resources to augment domestic production, and hence, economic growth.

In such a situation, natural resources also positively affect economic growth. Natural resource revenue can be used further to boost capitalisation. In doing so, the financial sector can allocate natural resource revenue to productive investment ventures to enhance domestic production. Capital and labour not only play a direct role in domestic production but also indirectly contribute to economic growth by extracting natural resources. Furthermore, natural resources

revenue can be used to improve technical skills of labour by increasing vocational education, which would enhance domestic production, and hence, positively affect economic growth.

References

Acemoglu, D. 2008. *Introduction to Modern Economic Growth.* Princeton: Princeton University Press.

Adu, G., G. Marbuah, and J. T. Mensah. 2013. "Financial development and economic growth in Ghana: Does the measure of financial development matter?" *Review of Development Finance*, 3 (4): 192-203.

Adams, D., Ullah, S., Akhtar, P., Adams, K. and Saidi, S. (2018). "The role of country-level institutional factors in escaping the natural resource curse: Insights from Ghana." Resources Policy, forthcoming.

Ahmed, K., M. K. Mahalik, and M. Shahbaz. 2016. Dynamics between economic growth, labour, capital and natural resource abundance in Iran: An application of the combined cointegration approach." *Resources Policy* 49: 213-221.

Ali, S., H. Waqas, M. Asghar, Q. Mustafa, and R. A. Kalroo. 2014. "Analysis of financial development and economic growth in Pakistan." *Journal of Basic and Applied Scientific Research* 4 (5): 122-130.

Al-Yousif, Y. K. 2002. "Financial development and economic growth: another look at the evidence from developing countries." *Review of Finance and Economics* 11 (2): 131-150.

Anwar, S., G. Shabir, and Z. Hussain. 2011. "Relationship between financial sector development and sustainable economic development: Time series analysis from Pakistan." *International Journal of Economics and Finance* 3 (1): 262-270.

Arezki, R., and F. van der Ploeg. 2011. "Do natural resources depress income per capita?" Review of Development Economics 15 (3): 504–521.

Arin, K. P. and E. Braunfels. 2018. "The resource curse revisited: A Bayesian model averaging approach." *Energy Economics* 70: 170-178.

Ascher, W. 1999. "Why Governments Waste Natural Resources: Policy Failure in Developing Countries." Baltimore: Johns Hopkins University Press.

Badeeb, R. A. and H. H. Lean. 2017a. "The evolution of the natural resource curse thesis: A critical literature survey." *Resources Policy* 51: 123-134.

Badeeb, R. A. and H. H. Lean. 2017b. “Natural resources, financial development and sectoral value added in a resource based economy.” Robustness in Econometrics. 401-417.

Badeeb, R. A., H. H. Lean, and R. Smyth. 2016. “Oil curse and finance–growth nexus in Malaysia: The role of investment.” *Energy Economics* 57: 154–165.

Bierens, H. J. 1997. “Nonparametric Cointegration Analysis.” *Journal of Econometrics* 77: 379-404.

Brown, R.L., J. Durbin, and J. M. Ewans. 1975. “Techniques for testing the constancy of regression relations over time.” *Journal of Royal Statistical Society* 37 (2): 149-172.

Brunnschweiler, C. N. 2008. “Cursing the blessings? Natural resource abundance, institutions, and economic growth.” *World Development* 36 (3): 399–419.

Davies, R. B. 1977. “Hypothesis testing when a nuisance parameter is present only under the alternative.” *Biometrika* 64: 247-254.

Dickey, D. A and W. A. Fuller. 1981. “Likelihood ratio statistics for autoregressive time series with a unit root.” *Econometrica* 49 (4): 1057-1072.

Gallant, A., and G. Souza. 1991. “On the asymptotic normality of Fourier flexible form estimates.” *Journal of Econometrics* 50: 329-353.

Gantman, E. R. and P. M. Dabos. 2012. “A fragile link? A new empirical analysis of the relationship between financial development and economic growth.” *Oxford Development Studies* 40: 517-532.

Goh, S. K., J. Y. Yong, C. C. Lau, and T. C. Tang. 2017. “Bootstrap ARDL on energy-growth relationship for 22 OECD countries.” *Applied Economics Letters* 24: 1464-1467.

Humphreys, M., S. Jeffrey, and J. Stiglitz. 2007. “Escaping the Resource Curse.” Columbia University Press: New York.

Hung, F-S. 2009. “Explaining the nonlinear effects of financial development on economic growth.” *Journal of Economics* 97: 41-65.

Husain, F. and T. Mahmood. 2001. “The stock market and the economy in Pakistan.” *The Pakistan Development Review*, 40 (4): 107-114.

Hye, Q. M. A. and I. Dolgopolova. 2011. “Economics, finance and development in China: Johansen-Juselius cointegration approach.” *Chinese Management Studies* 5: 311-324.

Jalil, A. and M. Feridun. 2011. “Impact of financial development on economic growth: empirical evidence from Pakistan.” *Journal of the Asia Pacific Economy* 16 (1): 71-80.

Kandil, M., M. Shahbaz, M. K. Mahalik, and D. K. Nguyen. 2017. “The drivers of economic growth in China and India: globalization or financial development?” *International Journal of Development Issues* 16: 54-84.

Karima, S. and H. Ken. 2008. “Evidence on growth and financial development using principal components.” *Applied Financial Economics* 18 (19): 1549-1560.

Khan, M. A. and A. Qayyum. 2007. “Trade, financial and growth nexus in Pakistan. *Economic Analysis Working Papers* 6 (14): 1-24.

Khan, M. A., A. Qayyum, and S. A. Sheikh. 2005. “Financial development and economic growth: The case of Pakistan.” *The Pakistan Development Review* 44 (4): 819-837.

Khan, M.A. 2008. “Financial development and economic growth in Pakistan: evidence based on Autoregressive Distributed Lag (ARDL) approach.” *South Asia Economic Journal* 9 (2): 375-391.

Kim, D., and P. Perron. 2009. “Unit root tests allowing for a break in the trend function at an unknown time under both the null and alternative hypotheses.” *Journal of Econometrics* 148: 1-13.

King, R. G. and R. Levine. 1993. “Finance and growth: Schumpeter might be right.” *Quarterly Journal of Economics* 108: 717–738.

Koitsiwe, K. and T. Adachi. 2015. “Relationship between mining revenue, government consumption, exchange rate and economic growth in Botswana.” *Contaduríay Administración* 60: 133-148.

Law, S. H. and M. Moradbeigi. 2017. “Financial Development and Oil Resource Abundance - Growth Relations: Evidence from Panel Data.” *Environmental Science and Pollution Research* 24: 22458-22475.

Law, S. H. and N. Singh. 2014. “Does too much finance harm economic growth?” *Journal of Banking and Finance* 41 (3): 36-44.

Lawrence, I. A., M. O. Moni, and D. E. Eikhomun. 2014. “Development of financial system and economic growth: empirical evidence from Nigeria.” *European Journal of Business and Management* 6 (30): 137-152.

Lee, H. Y., L. A. Ricci, and R. Rigobon. 2004. “Once again, is openness good for growth?” *Journal of Development Economics* 75 (2): 451-472.

Levine, R. 1997. “Financial development and economic growth: Views and agenda.” *Journal of Economic Literature* 35 (2): 688-726.

Levine, R. 2005. *Finance and growth: theory and evidence*. In P. Aghion, and S. Durlauf (Eds), handbook of economic growth, 865-934. North Holland.

Leybourne, S., P. Newbold, and D. Vougas. 1998. “Unit roots and smooth transitions.” *Journal of Time Series Analysis* 19: 83–97.

Liang, Q. and T. Jian-Zhou. 2010. “Financial development and economic growth: Evidence from China.” *China Economic Review* 17 (4): 395-411.

Mankiw, N.G., D. Romer, and D.N. Weil. 1992. “A contribution to the empirics of economic growth.” *Quarterly Journal of Economics* 107 (5): 407-437.

Masih, M. A. A. and M. Haider. 2009. “Causality between financial development and economic growth: An application of vector error correction and variance decomposition methods to Saudi Arabia.” *Applied Economics* 41: 1691-1699.

McKinnon, R. 1973. “Money and Capital in Economics Development”, Brookings Institution, Washington, DC.

McNown, R., C. Y. Sam, and S. K. Goh. 2018. “Bootstrapping the autoregressive distributed lag test for cointegration.” *Applied Economics* 50: 1509-1521.

Mehrara, M. 2009. “Reconsidering the resource curse in oil-exporting countries.” *Energy Policy* 37: 1165-1169.

Moosa, I. 2016. “International evidence on the financial Kuznets curve.” School of Economics, Finance and Marketing, RMIT University, Melbourne, Australia.

Moshiri, S. and S. Hayati. 2017. “Natural Resources, Institutions Quality, and Economic Growth; A Cross-Country Analysis.” *Iranian Economic Review* 21: 661-693.

Narayan, P. K. and S. Narayan. 2013. “The short run relationship between the financial systems and economic growth: new evidence from regional panels.” *International Review of Financial Analysis* 29 (9): 70-78.

Nasir, M. A. Ahmad, M. Ahmad, F. Wu, J. (2015). “Financial and economic stability as ‘two sides of a coin’: Non-crisis regime evidence from the UK based on VECM.” Journal of Financial Economic Policy, 7(4), 327-353.

Nieuwerburgh, S. V., F. Buelens, and L. Cuyvers. 2006. “Stock market development and economic growth in Belgium.” *Explorations in Economic History* 43 (1): 13-38.

Ng, S., and P. Perron. 2001. “Lag length selection and the construction of unit root test with good size and power.” *Econometrica* 69 (6): 1519-54.

Obstfeld, M. 1994. “Risk-taking, global diversification, and growth.” *American Economic Review* 84 (5): 1310–1329.

Obstfeld, M. 1994. “The logic of currency crises.” *Cahiers Economiques et Monetaires* 43: 189-213.

Pesaran, M. H. and Y. Shin. 1999. “An autoregressive distributed lag modelling approach to cointegration analysis.” Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium, Strom, S. (ed.) Cambridge University Press.

Pesaran, M. H., Y. Shin, and R. Smith. 2001. “Bounds Testing Approaches to the Analysis of Level Relationships.” *Journal of Applied Econometrics* 16 (3): 289-326.

Philippot, L-M. 2010. “Natural Resources and Economic Development in Transition Economies.” PRES de Clermont Université (CERDI-CNRS, Université d’Auvergne), France.

Phillips, P. and P. Perron. 1988. “Testing for a unit root in time series regression.” *Biometrica* 75 (2): 335-346.

Polat, A., M. Shahbaz, I. Rehman, and S. L. Satti. 2015. “Revisiting linkages between financial development, trade openness and economic growth in South Africa: fresh evidence from combined cointegration test.” *Quality and Quantity* 49 (2): 785-803.

Pradhan, R. P., S. Bahmani, and M. U. Kiran. 2014. **“**The dynamics of insurance sector development, banking sector development, and economic growth: Evidence from G-20 countries.” *Global Economics and Management Review* 19: 73-96.

Quixina, Y. and A. Almeida. 2014. “Financial development and economic growth in a natural resource based economy: Evidence from Angola.” FEP-UP, School of Economics and Management, University of Porto, Portugal.

Rajan, R. G. and L. Zingales. 2003. “The great reversals: The politics of financial development in the Twentieth century.” *Journal of Financial Economics* 69 (1): 5-50.

Rostow, W. W. 1960. “The Stages of Economic Growth: A Non-Communist Manifesto.” Cambridge: Cambridge University Press. p. 10.

Rustamov, B. and C. Adaoglu. 2018. “Oil production cost, financial development, and economic growth in Russia,” *Energy Sources, Part B: Economics, Planning, and Policy* 13 (6): 301-309.

Rutland, P. 2008. “Russia as an energy superpower.” *New Political Economy* 13: 203-210.

Sachs, J. D. 2007. “How to handle the macroeconomics of oil wealth.” In: Humphreys, M., Sachs, J., Stiglitz, J. (Eds.), Chapter 7 in Escaping the Resource Curse. Columbia University Press, NY, 173–193.

Sachs, J. D. and M. W. Andrew. 1997. “Natural resource abundance and economic growth.” Center for International Development and Harvard Institute for International Development, November.

Samargandi, N., J. Fidrmuc, and S. Ghosh. 2015. “Is the relationship between financial development and economic growth monotonic? Evidence from a sample of middle-income countries.” *World Development* 68: 66-81.

Satti, S. L., A. Farooq, N. Loganathan, and M. Shahbaz 2014. “Empirical evidence on the resource curse hypothesis in oil abundant economy.” *Economic Modelling* 42: 421-429.

Schumpeter, J. 1912. *The theory of economic development*. Cambridge, MA: Harvard University Press.

Shahbaz, M. 2012. “Does trade openness affect long run growth? Cointegration, causality and forecast error variance decomposition tests for Pakistan.” *Economic Modelling* 29 (6): 2325-2339.

Shahbaz, M. and Rahman, M. M. (2012). The dynamic of financial development, imports, foreign direct investment and economic growth: Cointegration and causality analysis in Pakistan. *Global Business Review*, 13 (2), 201-219.

Shahbaz, M. and Rahman, M. M. (2014). Exports, financial development and economic growth in Pakistan. *International Journal of Development Issues*, 13 (2), 155 –170.

Shahbaz, M., Ahmad, K. and Chaudhary, A. R. (2008a). Economic growth and its determinants in Pakistan. *The Pakistan Development Review*, 47 (4), 471-486.

Shahbaz, M., Ahmed, N. and Ali, L. (2008b). Stock market development and economic growth: ARDL causality in Pakistan. *International Research Journal of Finance and Economics*, 14 (2), 182-195.

Shahbaz, M., F. Islam, and M. S. Butt. 2016. “Finance–growth–energy nexus and the role of agriculture and modern sectors: Evidence from ARDL bounds test approach to cointegration in Pakistan.” *Global Business Review* 17: 1037-1059.

Shahbaz, M., M. Naeem, M. Ahad, and I. Tahir. 2018a. “Is natural resource abundance a stimulus for financial development in the USA?” *Resources Policy* 55: 223-232.

Shahbaz, M., T. Omay, and D. Roubaud. 2018b. “The Sharp and Smooth Breaks Unit Root Testing of Renewable Energy Consumption: The Way Forward.” Journal of Energy and Development, 44(1), forthcoming.

Shahbaz, M., I. Rehman, and A. T. Muzaffar. 2015. “Re-visiting financial development and economic growth nexus: The role of capitalization in Bangladesh.” *South African Journal of Economics*, forthcoming.

Shaheen, S., M. S. Awan, M. Waqas, and M. M. Aslam. 2011. “Financial development, international trade and economic growth: Empirical evidence from Pakistan.” *Romanian Journal of Fiscal Policy* 2 (2): 11-19.

Shan, J. and Q. Jianhong. 2006. “Does Financial Development Lead Economic Growth? The Case of China.” *Annals of Economics and Finance* 1 (1): 231-250.

Shaw, E. 1973. “Financial Deepening in Economic Development”, Oxford University press.

Solow, R. M. 1956. “A Contribution to the Theory of Economic Growth.” *Quarterly Journal of Economics* 70 (1): 65-94.

Tinoco-Zermeno, M. A., F. Venegas-Martinez, and V. H. Torres-Preciado. 2014. “Growth, bank credit, and inflation in Mexico: evidence from an ARDL-bounds testing approach.” *Latin American Economic Review* 23 (8): 1-22.

Toda, H. Y. and K. Yamamoto. 1995. “Statistical inference in Vector Autoregressions with possibly integrated processes.” *Journal of Econometrics* 66: 225-250.

Tyavambiza, T. and D. Nyangara. 2015. “Financial and monetary reforms and the finance-growth relationship in Zimbabwe.” *International Journal of Economic and Financial Issues* 5: 590-601.

Uddin, G. S., B. Sjö, and M. Shahbaz. 2013. “The causal nexus between financial development and economic growth in Kenya.” *Economic Modelling* 35: 701-707.

Viner, J. 1952. “America’s aims and the progress of underdeveloped countries.” In: Hoselitz, B.F. (Ed.), The Progress of Underdeveloped Areas. University of Chicago Press, Chicago, 175–202.

Zagozina, M. 2014. “The Resource Curse Paradox: natural resources and economic development in the former Soviet countries.” Department of Forest Sciences, University of Helsinki, Finland.