Received 15 May 2019
Revised 10 June 2019
Accepted 24 June 2019

Does agricultural sector foreign direct investment promote economic growth of Pakistan? Evidence from cointegration and causality analysis

Abbas Ali Chandio
College of Economics, Sichuan Agricultural University, Chengdu, China, and
Amir Ali Mirani and Rashid Usman Shar
College of Management, Sichuan Agricultural University, Chengdu, China

Abstract

Purpose – The purpose of this paper is to examine the linkage between agricultural sector foreign direct investment (FDI) and economic growth in Pakistan over the period from 1991 to 2013.
Design/methodology/approach – In this study, the stationary analysis is performed by using Phillips–Perron and Dickey–Fuller generalized least squares unit root tests and Johansen cointegration technique to determine the long-run linkage among the studied variables. The robustness of long-run linkage is checked by employing autoregressive distributed lag (ARDL) approach, dynamic ordinary least squares (DOLS), fully modified ordinary least square method (FMOLS) and the canonical cointegration regression (CCR). The causal linkage between the selected variables is investigated by the VECM Granger causality test.
Findings – The results of the Johansen cointegration test confirmed a cointegrating association between the variables. In addition, the results of the ARDL, DOLS, FMOLS and CCR showed that agricultural sector FDI has a strong positive significant effect on economic growth in long run. Moreover, the findings of the present empirical study revealed that there exists bidirectional Granger causality between the agricultural sector FDI and economic growth in both short run and long run.
Originality/value – The present empirical study filled the literature gap of applying the Granger causality based on error-correction model to examine this relevant issue for Pakistan.

Keywords Pakistan, FDI, Economic growth, Cointegration, Granger causality
Paper type Research paper

1. Introduction

There are many factors that play a vital role in capital formation and economic growth. These factors may vary from country to state in terms of geographical, geological, technological progress, political and institutional structures. This study investigates the causal linkage between foreign direct investment (FDI) in the agricultural sector and economic growth in Pakistan over the period of 1991–2013. FDI inflows have been playing an important role in the development of developing countries. Over the past few decades, developing economies have been recipients of increased FDI inflows around the world. However, these developing economies, such as South, East and South-East Asian countries need more capital inflows in order to boost up their economic growth (Wang and Wang, 2015). Based on certain factors, including the existence of well-developed basic infrastructure, the availability of advanced technology, the expansion of export markets and the growth of employment rates have been assessed the economic growth of developing countries. FDI brings more extra benefits, for instance, management skills and technological know-how (Broude, 2010; Djokoto *et al.*, 2014; Latief and Lefen, 2018; Lipsey, 2000; Meyer and Sinani, 2009). As a result, many developing economies are taking steps to increase FDI inflows. For foreign investors, developing countries offer profitable income-generating opportunities; for developing countries themselves, FDI is an

World Journal of Science, Technology and Sustainable Development
Vol. 16 No. 4, 2019
pp. 196-207

2042-5945
DOI 10.1108/WJSTSD-05-2019-0025

important source of foreign financial inflows (Arita, 2013; Awunyovitor and Sackey, 2018; Kumari and Sharma, 2017). Presently, Pakistan has been receiving FDI from several countries around the world, including the USA, China, Saudi Arabia, the United Arab Emirates, Japan, Norway, the UK and Switzerland. The main economic sectors for FDI are the power and energy sector, construction, textiles, trade, financial business and agriculture (Bano *et al.*, 2019; Latief and Lefen, 2019). As stated by World Bank (2018), in Pakistan, the average value of FDI from 1970 to 2017 was 0.76 percent with a minimum of −0.6 percent in 1973 and maximum of 3.67 percent in 2007. It is extensively supposed that FDI plays a significant role to recreation in national growth strategies and is seen as the contraption for exploiting, sustaining resources and capacity competitiveness through the doctrine of economic liberalization. Often developing nations, including Pakistan, are experiencing the issue of saving-investment gap; thus, the FDI is influencing the mechanism of economic growth by filling the disparity, improving economic efficiency, transferring advanced technology, creating employment and increasing competition in market places especially in the agriculture sector (Azam and Khattack, 2009; Chaudhuri and Banerjee, 2010; Mottaleb and Kalirajan, 2010; Suleman, 2009). FDI has not been in a suitable position in Pakistan from the last three years, even though regular investments from China, because an advanced intensity of saving and investment is not good to increase the percentage of capital development and national saving at the preferred level (Longami and Razim, 2001). After peaking at $5.4bn in the fiscal year 2007–2008, FDI inflows to Pakistan remained relatively low, reaching $2.8bn in 2017, at the same time, at the end of 2017, FDI's total stock stood at $43bn (14.1 percent of GDP). FDI inflows fell 19 percent to $1.31bn in the first half of the fiscal year 2018–2019 (July–December 2018) compared to $1.63bn in the same period last year (SBP, 2018). Pakistan's potential investment attractiveness is lower than the neighboring country India but equals to Sri Lanka and Bangladesh; the attractiveness of Pakistan improves, albeit very slowly against the backdrop of a challenging security environment, shortages of electricity, a burden of some investment and climate conditions (SBP, 2018). According to the report of World Bank (2007) around 75 percent of the world's poor people live in rural areas and are directly and indirectly involved in agriculture-related activities; these economic sectors have suffered neglect and underinvestment over the last few decades with only 4 percent of official development assistance going to the agricultural sector in developing countries. In Pakistan, the agricultural sector plays a major role in the economy. The role of FDI in the agriculture sector is therefore crucial for economic development since the economic development in developing countries like Pakistan is dependent on agricultural performance. The agriculture sector in Pakistan is the main source of livelihood for almost 70 percent of the rural population. The agriculture sector is considered as the backbone of Pakistan economy and it has a rich contribution to increasing the economy (Ullah *et al.*, 2012). Therefore, the main aim of the present study is to examine the causal association between FDI in the agricultural sector (FDIA) and economic development. The present paper contributes to the existing literature as follows: the stationarity of the variables has been checked by applying the Phillips–Perron (PP) and Dickey–Fuller generalized least squares (DF-GLS) unit root tests; it is based on annual data over the period from1991 to 2013; it checks robustness by employing the Johansen cointegration procedure; and it uses the Granger causality based on the error-correction model (ECM) to inspect the short-run and long-run linkages between FDIA and economic growth. The rest of the paper is arranged as follows: the existing relevant literature is exhibited in Section 2. Methodology framework presents Granger causality approach, cointegration technique and related test approach in Section 3. Data sources and main findings are discussed in Section 4. The conclusion and policy implications have been presented in the final section.

2. Literature review

In the past, numerous empirical research works have been done in several regions of the world to inspect the nexus between FDI and economic development with deferent

econometric techniques. Hypothetically, it is broadly supposed that FDI has promoted growth and development, whereas for the total economy level, an indication of the impact of FDI on economic growth is mixed. An empirical study conducted by Ahmad *et al.* (2019) inspected the effects of FDI inflows on poverty reduction in the ASEAN and SAARC countries over the period of 1990 to 2014. For estimation, several econometric techniques including descriptive statistics, correlation matrix, the variance inflation factor, Granger causality test and the two stages least squares (2SLS) have been used in the study. The findings of the study revealed that FDI net inflows have a positive and significant interconnection with poverty reduction in Asia, but it exhibits significant differences between South Asia and South-east Asia. In addition, the outcomes showed that FDI has a bigger influence on welfare in SAARC economies than in ASEAN economies. The study of Epaphra (2016) has investigated the sectoral economic effect of FDI in Tanzania by using the ECM approach. The time series data have been used in this paper over the period of 1970–2015. The findings of the study indicated that FDI has a positive and significant influence on manufacturing, construction, transportation, storage and communications sectors while FDI has a negative effect on agricultural output. An investigation conducted by Awunyovitor and Sackey (2018) examined the association among FDI to Ghana's agricultural sector and economic performance over the period from 1975 to 2017. This study used various techniques to analyze the data such as unit root tests, Granger causality approach and the ECM model. The findings showed a positive and significant association between FDI flow to the agricultural sector and economic performance and volume of trade. Research conducted by Gubak and Samuel (2015) examined the effects of Chinese trade and investment in the agricultural sector of Nigeria. The conclusion reveals that the segment which previously conquered the economy particularly as a basis of income quickly provided a way to crude oil. Compared to other sectors Chinese investment and trade in the agricultural sector of Nigeria are quite low and have not attentive much in the development of the sector in Nigeria. Ullah *et al.* (2012) studied the role of FDI on the growth of various sectors including agriculture and industrial sectors of Pakistan economy for the time period 1979–2009 by applying the 2SLS performance for estimation. They pointed out that the FDI has a negative significant influence on the agricultural output while FDI has a positive influence on the industrial sector. As concerns time-series studies, Ali and Hussain (2017) used the correlation and multiple regression analysis techniques to evaluate the effects of FDI on economic development, the case study of Pakistan for the period of 1991–2015. The multiple regression analysis results show that FDI has a positive influence on economic development in Pakistan. While Msuya (2007) inspected the effects of FDI on agricultural productivity and poverty decline in Tanzania, the author concludes that FDI consumes an optimistic effect on agricultural output particularly to smallholders who are connected in combined producer arrangements. Iddrisu *et al.* (2015) examined the influence of FDI on agricultural output in Ghana by applying yearly time series data from the period of 1980–2013, unit root tests, Johansen cointegration approach and autoregressive distributed lag (ARDL)–VECM method for estimation. Outcomes of the empirical study revealed that FDI has a negative influence on the output of the agricultural sector in the long run while in the short-run estimation, FDI has an optimistic connotation. Furthermore, in the long run, it was found that exchange rate has negative effects on the output of the agricultural sector and occupation frankness has an optimistic and momentous impact on the output of the agricultural sector. Meanwhile, Mohamed *et al.* (2017) examined the long-run fundamental association among FDI, internal speculation and economic growth by applying the annual time series data from 1970 to 2008. The study used several techniques such as VECM, instinct response role and modification disintegration, and the consequences of trajectory inaccuracy alteration modeling (VECM) suggest a long-run bilateral causality among domestic investment and economic growth while there is no evidence of causality among

FDI and economic growth in Malaysia. With regard to annual time series data analyses, Oloyede (2014) inspected the influence of FDI on agricultural sector development by applying Granger causality approach. He used time series data from 1981 to 2012. He pointed out that FDI has a positive and momentous influence on agricultural sector development in both long run and the short run, whereas political unpredictability unfavorably affects agricultural investment in the long-run in Nigeria. Furthermore, Behname (2012) tested the impression of FDI on economic performance in Southern Asia by using the random-effects model. The study used data covering the period of 1977–2009. The findings revealed that FDI has a positive and statistically significant impact on economic performance, and the study variables (for instance, capital formation, economic infrastructure and human capital) have a positive influence on economic growth while inflation, population and technology gap have an undesirable inspiration on the economic growth. In an another study, Hansen and Rand (2006) conducted research to investigate the Granger causal associations among FDI and GDP in an example of 31 emergent nations concealing three continents over the time 1970–2000. The results revealed a bi-directional interconnection among the FDI-to-GDP ratio and the level of GDP. Moreover, FDI has an effect on GDP; however, GDP has no long-run impact on the FDI-to-GDP ratio and the level of GDP. A study was conducted by Djokoto (2012) to investigate the linkage among exterior provide agricultural clientele and FDI influxes into the agricultural segment of Ghana by using annual data from 1961 to 2008. He used the vector autoregressive model for estimation and revealed that the constants concerning FDI and exports, however, destructive, were not statistically substantial. There was a response concerning significances and FDI in the long run. Further, findings showed that exports caused FDI but not the contrary. With regard to studies on the case of Pakistan, Azam and Khattack (2009) inspected the trend of FDI in Pakistan by using the secondary data for the period ranging from 1971 to 2005. They concluded that for FDI in Pakistan, the more suitable areas are the energy sector, mining sector, IT and telecommunication, manufacturing sector and value-added textiles. Slimane *et al.* (2016) examined the influence of FDI on food security for 55 developing economies in a panel framework for the period ranging from 1995 to 2009, and results revealed that sectoral FDI has different effects on food security. Furthermore, the results showed that agricultural sector FDI increases food security while the secondary and tertiary sector FDI increases food insecurity. Furthermore, agricultural FDI can assist to increase agricultural terrestrial and labor efficiency which concluded better farmers' training and formal instruction, adoption of improved farming practices and skills, timely access to primarily agricultural inputs and modern agricultural technologies that increase crop productivity (Gunasekera *et al.*, 2015).

3. Methodology

3.1 Granger causality approach and stationarity analysis

Granger (1969) proposed the first effort to check the direction of causation. The Granger causality approach is appropriate and it is a very common method for identifying any situation where there is a causal linkage among two study variables. This procedure is satisfactory and straightforward for small sample size (Geweke *et al.*, 1983). According to the Granger causality technique, a time series (X)) is said to Granger cause another time series (Y) if the forecast inaccuracy of the present series Y decreases by using the past value of X and the previous Y value. In order to perform a Granger causality procedure, it is important for a series of variables to remain stable. Thus, following Engle and Granger (1987), the present empirical study is primarily to check the unit roots of said X and Y to check the stability of each variable. This is achieved by employing the PP (Phillips and Perron, 1988) and DF-GLS (Elliott *et al.*, 1992) unit root tests. If the series is found to be non-stationary, the first difference must be used, and then a causal exam should be used to difference data.

3.2 Cointegration technique

In the long run, the conception of cointegration can be well defined as a methodical collaborative flow between two or more variables. Engle and Granger (1987) reported that if both X and Y are non-stationary, one would assume the linear combination of X and Y to be an indiscriminate walk. Though these two variables might consume a specific amalgamation of them $Z = X - bY$ is a stationary property. Therefore, if such land rules real, then we can say that X and Y are cointegrated. If both X and Y variables are non-stationary and cointegrated, then any standard Granger causal inference is incorrect, and a wide-ranging causal test built on the ECM should be used (Engle and Granger, 1987). On the other hand, if both X and Y are non-stationary and the linear combination of two variables sequences is non-immobile, the normal Granger causality test (Toda and Phillips, 1993) should be used. Consequently, it is very important to check the cointegration characteristics of a series of agricultural FDI and economic development, earlier the Granger causality method is carried out. When two sequences are combined in a similar order, one can continue to check the existence of cointegration. Johansson cointegration approach is applied for this purpose (Johansen and Juselius, 2009).

3.3 Error-correction model (ECM)

In the process of ECM, X Granger causes Y if the evaluation coefficient of the X lag value or the assessment coefficient of the lag worth of the error item since the same-integral regression is important. Likewise, Y Granger causes X, if the estimation coefficient of Y hysteresis value or the estimation coefficient of the lag value of the error item from the co-association regression is statistically momentous. This technique exactly accepts for a causative link concerning two or more study variables that arise since a symmetry association, hence describing the long-term equilibrium association that perseveres after a short-term modification. If the series are non-stationary, but the series become stationary after the first difference, and co-integrated, the ECMs of the Granger causality approach can be indicated appropriately as follows:

$$\Delta Y_t = \psi_1 + \sum_{i=1}^{P_{11}} \psi_{11} i \Delta Y_t - i + \sum_{i=1}^{P_{12}} \psi_{12} i \Delta X_t - i + \phi_1 \varepsilon_t - 1 + u_{1t}, \quad (1)$$

$$\Delta X_t = \psi_2 + \sum_{i=1}^{P_{21}} \psi_{21} i \Delta X_t - i + \sum_{i=1}^{P_{22}} \psi_{22} i \Delta Y_t - i + \phi_2 \varepsilon_t - 1 + u_{2t}, \quad (2)$$

where Δ represents the variance operative, P denotes the numbers of lags; ψs are parameters of the model to be assessed; u_ts are the serially uncorrelated error terms; Y_t and X_t represent the natural logarithms of economic development and agricultural foreign direct investment; and ε_{t-1} denotes the error-correction term (ECT), which is obtained from the long-run co-integration association, $Y = \lambda_0 + \lambda_1 X_t + \varepsilon_t$, where λs are the parameters to be assessed and ε_t stands for is the error term.

4. Data sources and empirical results

To examine whether there is a causal association between FDIA and economic growth in Pakistan, data concealing the period 1991–2013 were used. The data on FDI in the agricultural sector are obtained from the Food and Agriculture Organization of United Nations (FAO, 2013) while data on GDP per capita are collected from a database of World Development Indicators (WDI, 2016). The FDIA (constant 2005 US$) and GDP per capita (constant 2010 US$) are rummage-sale as a representation for economic growth. The trend of GDP per capita and FDIA from 1993 to 2013 is shown in Figure 1, and both selected study variables take logarithmic form.

4.1 Results of stationarity and cointegration test

In order to test the stationary of the data, the present study used the PP (Phillips and Perron, 1988) and DF-GLS (Elliott *et al.*, 1992) unit root tests. Table I reports the estimated outcomes of the stationary test. First, this test is employed at the level of FDIA and GDP variables, then on their first difference. Outcomes of Table I display that all the study variables, FDIA and GDP, are showing stationary and are integrated of order one; this means that the series of variables may show a valid long-run association.

The computed consequences of the J-J co-integration approach for the two study variables such as FDIA and GDP are indicated in Table II which exhibit that the hypothesis is null of the nonexistence of the co-integrating nexus ($R = 0$) and can be rejected at the significance level of the 5 percent, and that the null hypothesis of the presence of at most one co-integrating nexus ($R \leqslant 1$) also can be rejected at a significance level of the 5 percent. This means that there are more than two co-integrating equations at the significance level of the 5 percent. Evidence in the present empirical paper states that the integrated study variables have a characteristic co-association propensity over the long run. Therefore, the present empirical study concluded that FDIA and GDP are co integrated. That is, there is a long-run linkage between FDIA and economic growth (GDP) for the case of Pakistan. The present study further applied four estimators including the ARDL technique, which is suggested by

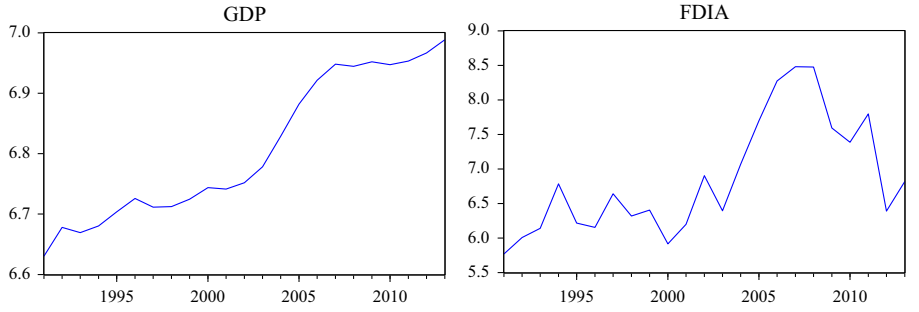

Figure 1. Natural logarithmic transformed plots of the selected variables

Test	At level Variable	*t*-statistics	Variable	First difference *t*-statistics	Order of integration
PP	FDIA	−1.816407 [1]	ΔFDIA	−5.367509 [0]***	I (1)
	GDP	−1.740432 [2]	ΔGDP	−3.307778 [1]**	I (1)
DF-GLS	FDIA	−2.043050 [0]	ΔFDIA	−5.641622 [0]***	I (1)
	GDP	−2.717743 [1]	ΔGDP	−2.930930 [4]*	I (1)

Notes: The number within parentheses are the best possible delay lengths determined with help of AIC well-defined in Pantula *et al.* (1994). *,**,***Indicate the rejection of the null hypothesis at 10, 5 and 1 percent levels of significance, respectively

Table I. Results of unit root tests

Null hypotheses	Likelihood ratio test statistic	*p*-values
The number of co-integrating equation is zero ($R = 0$)	23.44722*	0.0026
The number of co-integrating equation is at most one ($R \leqslant 1$)	7.111298*	0.0077

Notes: Trace test shows two co-integrating eqn(s) at the 0.05 level. *Indicates rejection of the hypothesis at the 0.05 percent significance level

Table II. Johansen co-integration test results

Pesaran *et al.* (2001); Phillips and Hansen (1990) also proposed the fully modified ordinary least square method (FMOLS) procedure; Stock and Watson (1993) proposed the dynamic ordinary least squares (DOLS) method; and the Park (1992) suggested the canonical cointegration regression (CCR) procedure to test the robustness of our long-run outcomes. Table III displays the outcomes of long-run ARDL, FMOLS, DOLS and CCR estimations. In the form of long run, this research found that FDIA has a highly strong significant and positive impact on economic growth. It is concluded that FDIA is a key factor to boost up economic growth in Pakistan. The empirical results of the study are consistent with the findings of previous studies (Akinwale, 2018; Awunyovitor and Sackey, 2018; Djokoto, 2012; Khan and Khan, 2011; Rashid *et al.*, 2016); however, they are contradicted with the findings of Epaphra (2016), Epaphra and Mwakalasya (2017) and Ullah *et al.* (2012). The log-run tests have successfully passed the sensitivity analysis against serial correlation (χ^2SERIAL) and autoregressive conditional heteroskedasticity (χ^2ARCH). The errors are normally distributed (χ^2NORMAL) and the Ramsey regression equation specification error test (χ^2RAMSEY) confirms a well-specified model. This study also applied CUSUM and CUSUMSQ techniques to check the constancy of the extensive-term constraints. If the conspiracies of both stability techniques sit inside 5 percent precarious boundaries, the hypothesis that "the regression calculation is appropriately definite can be accepted" (Brown *et al.*, 1975). The outcomes of stability tests are within the precarious boundaries (Figures 2 and 3). Hence, the model is correctly specified and stable over the period.

4.2 Results of ECM and Granger causality tests

The present empirical paper has been employed the ECM to explore both short-run and long-run causation. In the ECM, the first variance of the apiece endogenous variable (FDIA and GDP) in the period lag of the co-integrating equation was regressed and the first difference of endogenous variable was lagged in the system as shown in Equations (1) and (2). The lag lengths, P_{11}, P_{12}, P_{21} and P_{22}, in both (Equations (1) and (2)) have been chosen by employing Akaike information criterion described by Pantula *et al.* (1994). The estimated outcomes of the tests on causality are reported in Table IV. The study also used a significance level at 10 percent for causality tests. It is evidence of positive short run and strong causal linkage running from FDIA to economic growth. The positive sign of their linkages implies that an increase in one will lead to an increase of the other. Moreover, reverse short-run causality also exits, that is, there is bidirectional short-run Granger causality FDIA and economic growth. The estimated coefficients of the ECT are found to be statistically significant at 1 and 5 percent and negative in both Equations (1) and (2), which shows that bidirectional long-run Granger causality between FDIA and economic growth exists.

	ARDL		FMOLS		DOLS		CCR	
Variable	Coefficient	Prob. value	Coefficient	Prob. value	Coefficient	Prob. value	Coefficient	Prob. value
FDIA	0.1452	0.0004	0.1291	0.0000	0.1362	0.0000	0.1264	0.0000
Constant	5.7250	0.0000	5.9297	0.0000	5.8721	0.0000	5.9486	0.0000
Diagnostic test *F*-statistic prob. value								
χ^2NORMAL	0.8291	0.6606						
χ^2SERIAL	0.5268	0.3300						
χ^2ARCH	0.5268	0.4778						
χ^2RAMSEY	2.0946	0.1715						

Table III.
Long-run dynamics

Notes: χ^2NORMAL test for normality, the χ^2SERIAL test is conducted for LM serial correlation test, χ^2ARCH test is applied for autoregressive conditional heteroskedasticity; the χ^2RAMSEY test is used for Ramsey RESE test

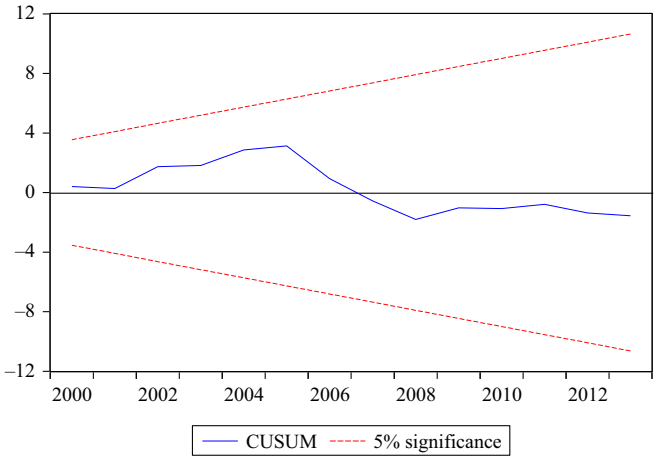

Figure 2.
The plot of CUSUM

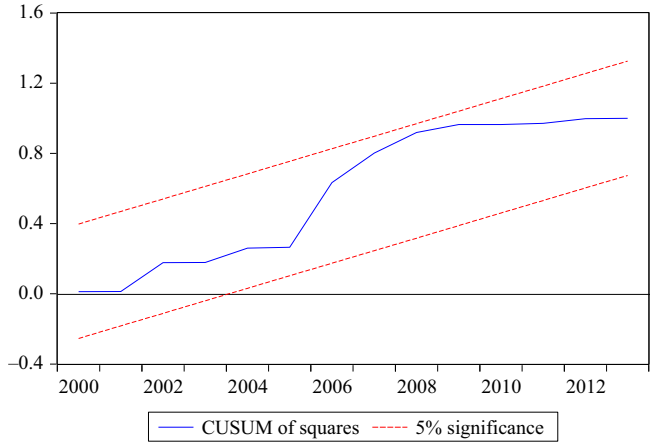

Figure 3.
The plot of CUSUM of squares

4.3 Variance decomposition analysis

Table V reports the outcomes of the variance decomposition of economic growth and FDIA. The outcomes show that FDIA contributes to the major variation in economic growth. In several periods, for instance, 3, 8 and 10 FDIA accounts for 3.60, 8.17 and 11.27 percent variations in economic growth in Pakistan, respectively.

5. Conclusion and policy implications

The FDI inflows play a vital role in boosting up the economic development, raising the technological level of a country, creating new jobs opportunities and providing an external resource of capital in developing countries. The present empirical paper has investigated the causal relationship among FDIA and economic growth in Pakistan over the period of 1991–2013. The present empirical study has conducted several essential econometric techniques including PP and DF-GLS unit root tests, Johansen cointegration, ARDL, DOLS, FMOLS, CCR and VECM specified Granger causality approaches to understanding the source and direction of a possible causal association among FDIA and economic growth. The Johansen cointegration technique outcomes establish the existence of a long-run

equilibrium linkage between FDIA and GDP series. The estimates of long-run based on the ARDL, DOLS, FMOLS and CCR show that FDIA has a strong positive significant impact on economic growth in Pakistan. While based on VECM Granger causality approach outcomes display that there is bidirectional short-run causality between FDIA and economic growth, bidirectional long-run causality among economic growth and FDIA. The study findings clearly exhibit FDIA; it could be regarded as a leading factor in the economy both in the short term and in the long term. Therefore, the present empirical study recommended that policies and incentives for foreign investment, as well as the institutional structure of farmers, should be encouraged to play a vital role in increasing investment in the agriculture sector. In addition, it is also important that public policies should focus on FDI inflows to the agriculture sector, as it promoted growth across the country. Impact of industrial sector FDI on economic performance should be investigated in future studies by using ARDL approach since the current study considered agricultural sector FDI.

Table IV.
Results of granger causality approach based on the error-correction models

	Source of causation		
		Short run	Long run
Null hypotheses	ΔFDIA *F*-values	ΔGDP	ε_{t-1} *t*-values
Foreign direct investment in the agricultural sector does not cause economic growth	4.7185* (0.0945)		−0.1422*** (0.0174)
Economic growth does not cause foreign direct investment in the agricultural sector		26.0886*** (0.0000)	−0.2206** (0.0239)

Notes: *,**,***Significant at 10, 5 and 1 percent levels, respectively

Table V.
Results of variance decomposition test

Period	SE	GDP	FDIA
Variance decomposition of GDP			
1	0.013608	100.0000	0.000000
2	0.022231	98.75969	1.240311
3	0.027641	96.39069	3.609313
4	0.030366	96.95713	3.042868
5	0.031550	97.04584	2.954163
6	0.031633	96.63806	3.361935
7	0.032283	94.75547	5.244530
8	0.033568	91.82209	8.177907
9	0.034838	89.99439	10.00561
10	0.035677	88.72902	11.27098
Variance decomposition of FDIA			
1	0.388998	3.027065	96.97293
2	0.415871	6.004969	93.99503
3	0.521719	33.42985	66.57015
4	0.582659	29.59824	70.40176
5	0.603358	27.99674	72.00326
6	0.609874	29.07733	70.92267
7	0.642943	34.57315	65.42685
8	0.710389	45.56526	54.43474
9	0.760603	52.46368	47.53632
10	0.794583	56.00115	43.99885

Notes: SE, standard error; GDP, gross domestic product; FDIA, foreign direct investment in the agricultural sector

References

Ahmad, F., Draz, M.U., Su, L., Ozturk, I., Rauf, A. and Ali, S. (2019), "Impact of FDI inflows on poverty reduction in the ASEAN and SAARC economies", *Sustainability*, Vol. 11 No. 9, pp. 1-24.

Akinwale, S.O. (2018), "Foreign direct investment inflow and agricultural sector productivity in Nigeria", *IOSR Journal of Economics and Finance (IOSR-JEF)*, Vol. 9 No. 4, pp. 12-29.

Ali, N. and Hussain, H. (2017), "Impact of foreign direct investment on the economic growth of Pakistan", *American Journal of Economics*, Vol. 7, pp. 163-170.

Arita, S. (2013), "Do emerging multinational enterprises possess South-South FDI advantages?", *International Journal of Emerging Markets*, Vol. 8 No. 4, pp. 329-353.

Awunyovitor, D. and Sackey, R.A. (2018), "Agricultural sector foreign direct investment and economic growth in Ghana", *Journal of Innovation and Entrepreneurship*, Vol. 7 No. 1, pp. 1-15.

Azam, M. and Khattack, N.-u.-R. (2009), "Trend of foreign direct investment in Pakistan (1971–2005)", *Journal of Managerial Sciences*, Vol. III No. 1, pp. 166-178.

Bano, S., Zhao, Y., Ahmad, A., Wang, S. and Liu, Y. (2019), "Why did FDI inflows of Pakistan decline? From the perspective of terrorism, energy shortage, financial instability, and political instability", *Emerging Markets Finance and Trade*, Vol. 55 No. 1, pp. 90-104.

Behname, M. (2012), "Foreign direct investment and economic growth: evidence from Southern Asia", *Atlantic Review of Economics*, Vol. 2, pp. 33-47.

Broude, T. (2010), "The white man's burden: why the west's efforts to aid the rest have done so much ill and so little good. By William Easterly", *Economic Record*, Vol. 85, pp. 488-490.

Brown, R.L., Durbin, J. and Evans, J.M. (1975), "Techniques for testing the constancy of regression relationships over time", *Journal of the Royal Statistical Society Series B-Methodological*, Vol. 37 No. 2, pp. 149-192.

Chaudhuri, S. and Banerjee, D. (2010), "FDI in agricultural land, welfare and unemployment in a developing economy", *Research in Economics*, Vol. 64 No. 4, pp. 229-239.

Djokoto, J.G. (2012), "Does causal relationships exist between external trade and foreign direct investment flow to agriculture in Ghana", *International Journal of Biometrics*, Vol. 7, p. 179.

Djokoto, J.G., Srofenyoh, F. and Gidiglo, K. (2014), "Domestic and foreign direct investment in Ghanaian agriculture", *Agricultural Finance Review*, Vol. 74, pp. 427-440.

Elliott, G., Rothenberg, T.J. and Stock, J.H. (1992), "Efficient tests for an autoregressive unit root", *Econometrica*, Vol. 64 No. 4, pp. 813-836.

Engle, R.F. and Granger, C.W.J. (1987), "Co-integration and error correction: representation, estimation, and testing", *Econometrica*, Vol. 55 No. 2, pp. 251-276.

Epaphra, M. (2016), "Foreign direct investment and sectoral performance in Tanzania", *Journal of Economics and Political Economy*, Vol. 3 No. 4, pp. 670-719.

Epaphra, M. and Mwakalasya, A. (2017), "Analysis of foreign direct investment, agricultural sector and economic growth in Tanzania", *Modern Economy*, Vol. 8 No. 1, pp. 111-140.

FAO (2013), "Food and agriculture organization of the United Nations", available at: www.fao.org/home/en/ (accessed April 2, 2019).

Geweke, J., Meese, R.A. and Dent, W. (1983), "Comparing alternative tests of causality in temporal systems: analytic results and experimental evidence", *Journal of Econometrics*, Vol. 21 No. 2, pp. 161-194.

Granger, C.W.J. (1969), "Investigating causal relations by econometric models and cross-spectral methods", *Econometrica*, Vol. 37 No. 3, pp. 424-438.

Gubak, H.D. and Samuel, M. (2015), "Chinese trade and investment in Nigeria's agricultural sector: a critical analysis".

Gunasekera, D., Cai, Y. and Newth, D. (2015), "Effects of foreign direct investment in African agriculture", *China Agricultural Economic Review*, Vol. 7 No. 2, pp. 167-184.

Hansen, H. and Rand, J. (2006), "On the causal links between FDI and growth in developing countries", *The World Economy*, Vol. 29 No. 1, pp. 21-41.

Iddrisu, A., Immurana, M. and Halidu, B.O. (2015), "The impact of foreign direct investment (FDI) on the performance of the agricultural sector in Ghana", *The International Journal of Academic Research in Business and Social Sciences*, Vol. 5 No. 7, pp. 240-259.

Johansen, S. and Juselius, K. (2009), "Maximum likelihood estimation and inference on cointegration-with applications to the demand for money", *Oxford Bulletin of Economics and Statistics*, Vol. 52 No. 2, pp. 169-210.

Khan, M.A. and Khan, S.A. (2011), "Foreign direct investment and economic growth in Pakistan: a sectoral analysis", working papers and research reports.

Kumari, R. and Sharma, A.K. (2017), "Determinants of foreign direct investment in developing countries: a panel data study", *International Journal of Emerging Markets*, Vol. 12 No. 4, pp. 658-682.

Latief, R. and Lefen, L. (2018), "The effect of exchange rate volatility on international trade and foreign direct investment (FDI) in developing countries along 'one belt and one road' ", *International Journal of Financial Studies*, Vol. 6 No. 4, pp. 161-194.

Latief, R. and Lefen, L. (2019), "Foreign direct investment in the power and energy sector, energy consumption, and economic growth: empirical evidence from Pakistan", *Sustainability*, Vol. 11 No. 1, pp. 1-21.

Lipsey, R.E. (2000), "Interpreting developed countries' foreign direct investment", *National Bureau of Economic Research*, pp. 285-325.

Longami, P. and Razim, A. (2001), "How beneficial is FDI for developing countries?", *Finance and Development*, Vol. 30 No. 2, pp. 1-6.

Meyer, K.E. and Sinani, E. (2009), "When and where does foreign direct investment generate positive spillovers? A meta-analysis", *Journal of International Business Studies*, Vol. 40 No. 7, pp. 1075-1094.

Mohamed, M.R., Singh, K.S.J. and Liew, C.-Y. (2017), "Impact of foreign direct investment & domestic investment on economic growth of Malaysia", *Malaysian Journal of Economic Studies*, Vol. 50 No. 1, pp. 21-35.

Mottaleb, K.A. and Kalirajan, K. (2010), "Determinants of foreign direct investment in developing countries: a comparative analysis", *Margin: The Journal of Applied Economic Research*, Vol. 4 No. 4, pp. 369-404.

Msuya, E. (2007), *The Impact of Foreign Direct Investment on Agricultural Productivity and Poverty Reduction in Tanzania*, University Library of Munich.

Oloyede, B.B. (2014), "Impact of foreign direct investment on agricultural sector development in Nigeria (1981–2012)", *Kuwait Chapter of Arabian Journal of Business and Management Review*, Vol. 33 No. 2571, pp. 1-11.

Pantula, S.G., Gonzalezfarias, G. and Fuller, W.A. (1994), "A comparison of unit-root test criteria", *Journal of Business & Economic Statistics*, Vol. 12 No. 4, pp. 449-459.

Park, J.Y. (1992), "Canonical cointegrating regressions", *Econometrica*, Vol. 60, pp. 119-143.

Pesaran, M.H., Shin, Y. and Smith, R.J. (2001), "Bounds testing approaches to the analysis of level relationships", *Journal of Applied Econometrics*, Vol. 16 No. 3, pp. 289-326.

Phillips, P.C.B. and Hansen, B.E. (1990), "Statistical inference in instrumental variables regression with I(1) processes", *The Review of Economic Studies*, Vol. 57 No. 1, pp. 99-125.

Phillips, P.C.B. and Perron, P. (1988), "Testing for a unit root in time series regression", *Biometrika*, Vol. 75 No. 2, pp. 335-346.

Rashid, I.M.A., Bakar, N.A.A. and Razak, N.A.A. (2016), "Determinants of foreign direct investment (FDI) in agriculture sector based on selected high-income developing economies in OIC countries: an empirical study on the provincial panel data by using stata, 2003–2012", *Procedia Economics & Finance*, Vol. 4 No. 9, pp. 477-481.

SBP (2018), *Foreign Investment in Pakistan-by Country*, State Bank of Pakistan, Karachi.

Slimane, M.B., Huchetbourdon, M. and Zitouna, H. (2016), "The role of sectoral FDI in promoting agricultural production and improving food security", *International Economics*, Vol. 145, pp. 50-65.

Stock, J.H. and Watson, M.W. (1993), "A simple estimator of cointegrating vectors in higher order integrated systems", *Econometrica*, Vol. 61 No. 4, pp. 783-820.

Suleman, A. (2009), "Fostering FDI in the agriculture sector", *The Pakistan Development Review*, Vol. 48 No. 4, pp. 821-838.

Toda, H.Y. and Phillips, P.C.B. (1993), "Vector autoregressions and causality", *Econometrica*, Vol. 61, pp. 1367-1393.

Ullah, A., Khan, M.U., Ali, S. and Hussain, S.W. (2012), "Foreign direct investment and sectoral growth of Pakistan economy: evidence from agricultural and industrial sector (1979 to 2009)", *African Journal of Business Management*, Vol. 6 No. 26, pp. 7816-7822.

Wang, J. and Wang, X. (2015), "Benefits of foreign ownership: evidence from foreign direct investment in China", *Journal of International Economics*, Vol. 97 No. 2, pp. 325-338.

WDI (2016), *World Development Indicators*, World Bank, Washington, DC.

World Bank (2007), "World Bank, world development report 2008", Agriculture for development. Washington, DC.

World Bank (2018), "Investment and new industrial policies", UNCTAD/WIR/2018, June 6.

Corresponding author
Abbas Ali Chandio can be contacted at: alichandio@sicau.edu.cn