Journal of the Knowledge Economy
https://doi.org/10.1007/s13132-022-01015-9

Assessment of Foreign Direct Investment-Led Growth Argument in South Africa Amidst Urbanization and Industrialization: Evidence from Innovation Accounting Tests

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Received: 29 October 2021 / Accepted: 18 March 2022
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Abstract
The objective of this study is to investigate the FDI-led growth hypothesis for the case of South Africa for the period between 1970 and 2017. The preliminary analysis of unit root test using traditional methods shows a different order of integration, which necessitates the use of autoregressive distributive lag (ARDL) methodology. Additionally, the current study also leverages on the innovative accounting techniques which comprised of impulse response function and forecast error variance decomposition (FEVD), which are employed to explore the responsiveness of the variables on each other. Our study results show that FDI inflow exerts a very strong positive impact on economic growth, thus validating the FDI-induced growth nexus in the South African economy. Furthermore, causality results show a one-way link running only from FDI inflow to economic growth and a unidirectional connection from urbanization to FDI inflow. The implication is that only urbanization matters in attracting FDI inflow to South Africa. These outcomes suggest that there is a need for the government administrators to develop urban centers through improving infrastructure facilities and the provision of industrial zones as a way of expanding both the ready market and the absorptive capacity of the country.

Keywords Foreign direct investment · Economic growth · Industrialization · Urbanization · Trade openness · Innovative accounting; South Africa

JEL Classification C22 · F43 · F3 · O14

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Published online: 28 March 2022

Introduction

It is an established fact that nations interact with each other for mutual benefits, which include FDI inflow. FDI inflow consists of many components including the transfer of technology and human capital development. In recent years, FDI across economies recorded drastic increase than the rate at which trade openness progresses (Mehrara et al., 2014). The implication is that FDI inflow is an emerging issue as well as a key factor in promoting the course of economic expansion. However, despite the abundance of empirical evidence, there is no consensus with regard to the potency of FDI inflow in the recipient countries. For instance, Ahmad et al. (2021b) asserts that FDI inflow affect economic growth through CO_2 emission. Rehman et al. (2021) submit that FDI inflow affects economic growth negatively. Wu (2021) examined the impact of FDI inflow in the Yangtze River Economic Belt and found that FDI inflow is a promoter of economic growth in the region. Baiashvili and Gattini (2020) found an inverted U-shaped relationship between the income levels of countries and the extent to which FDI impacts growth. Moving from low- to middle-income countries, the effect becomes larger. On the other hand, it diminishes when transitioning to high-income countries. It was also found that absorptive capacity plays a role in channeling FDI effects. Within country income groups, those with better-developed institutions relative to their peers benefit more from FDI in terms of growth. The study lends support to the theory that FDI inflow is a promoter of economic growth, which corroborates with previous studies (Kalai & Zghidi, 2019 and Sokhanvar, 2019). The studies of Sokhanvar (2019) and Lee (2013) maintained that FDI promotes economic expansion through the improvement of capital formation in the host economy, validating the claim of Mehic et al. (2013). These studies supported the dynamic drive of FDI inflow in the investment economies. Conversely, FDI inflow is also viewed as an agent that promotes underdevelopment, particularly in emerging economies as asserted by dependency theory. For instance, Zandile and Phiri (2019) posited that FDI inflow is a factor that undermined economic development in the case of Burkina Faso. Claassen et al. (2011) and Carike et al. (2012) asserted that the agricultural sector, market opportunity, and oil sector influence the FDI flowing from China to Africa. This contradicts the FDI-led growth nexus, stressing that FDI inflow leads to the repatriation of resources through the transfer of profit to the investor's home country.

In South Africa (SA) in particular, FDI inflow into the country experienced a drastic increase after 1995, which remained consistent throughout the period under investigation. In 2011, FDI flowing into Southern Africa increased by 25%, where South Africa received the largest share comparatively (UNCTAD, 2012). In 2010, FDI inflow stood at $1.23-billion with a sharp increase to m$5.81-billion in 2011, which placed South Africa as the second largest recipient in Africa behind Nigeria. Statistically, SA achieved 13.6% (31.8% of its national GDP) of the total inflow into Sub-Saharan Africa. Most recently in 2018, the FDI inflow to Sub-Saharan Africa rose by 13% to US$32 billion, out of which South Africa received US$5.3 billion compared to US$2.0 billion in 2017 (UNCTAD, 2018).

Various empirical studies have failed to establish a consensus with regard to evidence of the FDI-induced expansion nexus in the context of South Africa See (Khobai et al., 2017; Sunde, 2017; Tshepo, 2014). For example, some researchers (See Nunnenkamp & Spatz, 2003; Singh & Jun, 1999; Işik, 2015; Işik et al., 2017) studied the developing economies and asserted that industrialization drives FDI inflow to the host economy. However, in other studies (see Guimaraes et al., 2000; Nielsen et al., 2017), it was posited that urban centers with improved infrastructure could attract potential foreign investors into the host country. Thus, this study is different from the majority of the previous studies as it seeks to investigate the above claims by incorporating industrialization and urbanization as additional variables to augment the previous models and avoid the misspecification bias problem. Industrialization and urbanization are deliberately included in the new model to ascertain whether or not urbanization and industrialization drive FDI inflow into South Africa through a causality test. In essence, the main purpose of this study is to ascertain if urbanization and industrialization could concurrently Granger cause FDI inflow into South Africa. Secondly, this study seeks to investigate the extent to which this unprecedented FDI inflow promotes economic growth. The choice of South Africa is based on the fact that the country has experienced a massive inflow of FDI in recent years. Statistics indicate that South Africa has overtaken Nigeria as the largest recipient of FDI inflow to the continent (UNCTAD, 2020). Also, South Africa is the second largest industrialized economy in Africa and the 38th globally. This has attracted the attention of the research world, thereby prompting this study. The importance of this study is hanged on the fact that no study has model the relationship between FDI inflow and economic growth in an augmented form by incorporating urbanization and industrialization for the South Africa.

The rest of the study includes an empirical review presented in "Review of Empirical Literature" section which, is followed by the data and method in "Methodological Sequence and Data" section. Next is the theoretical framework, results and interpretation in "Empirical Findings" section and finally, "Conclusion and Recommendations" section presents the conclusion and recommendation.

Theoretical Literature

MacDougall-Kemp Hypothesis, one of the foremost theories of capital inflows, was developed by MacDougall (1958) and subsequently expounded by Kemp (1964). The hypothesis is based on a two-country model; one the investing country and the other the host country; the price of capital being equal to its marginal productivity; the free movement of capital from a country of surplus to a country of deficit, which leads to a situation where the marginal productivity of capital tends towards equilibrium between the two countries. This leads to improvement in efficiency in the use of resources that culminate in an increase in welfare. Although output in the investing country may decrease as a result of capital outflow which the invested capital represents, national income does not fall as long as return on investment covers the gap, which is equivalent to the product of marginal productivity of capital and the amount of foreign investment. In this way, as long as income from foreign investment exceeds the loss of output, the investing country stands in good stead, as

it enjoys more national income than when it retains its capital. The host country also experiences an increase in national income as a result of an increase in the quantum of investment occasioned by the inflows.

Review of Empirical Literature

The contention over the potency of FDI inflow and its impact on economic expansion is without concluding remark. The results of various studies have supported the FDI-led growth nexus, while it has been rejected by others. For instance, Wu (2021) examined the impact of FDI inflow in the Yangtze River Economic Belt and found that it is a promoter of economic growth in the region. According to Ali and Jameel (2021); Burlea-Schiopoiu et al. (2021); and Muhammad et al. (2021), foreign direct investment (FDI inflow) is a key promoter of economic growth in the respective recipient economies. Sokhanvar and Jenkins (2021) subscribed to the ongoing argument on the nexus between FDI inflow and economic growth. The study found a positive and strong connection between FDI inflow and economic growth in Estonia. In a related study, Qureshi et al. (2021) found a bidirectional linkage between FDI inflow and economic growth in both the developing and developed economies. Halizam et al. (2021) examine the relationship between FDI inflow and economic growth in Malaysia. The result shows that FDI inflow is a key determinant of economic growth in the country. Opeyemi (2020) employed regression analysis in his study, and the outcomes showed that FDI has a positive impact on economic growth in all the five countries under review. Baiashvili and Gattini (2020) found an inverted U-shaped relationship between countries' income levels and the size of FDI's impact on growth. Moving from low- to middle-income countries, the effect becomes larger. On the other hand, it diminishes when transitioning to high-income countries. It was also found that absorptive capacity plays a key role in channeling FDI effects. Bilas (2020) examined the relationship between FDI inflow and growth rate of GDP in Croatia. The findings revealed that FDI inflow does not assert a positive significant impact on the growth rate of GDP. Secondly, there was no evidence of a causal relationship between the variables. Okwu et al. (2020) examined the impact of FDI inflow on the 30 leading economies in the world. The outcomes revealed that FDI inflow exerts a positive and significant impact on economic growth in these economies. Goh et al. (2020) found evidence of an asymmetric relationship between FDI inflow and economic growth. Additional findings showed that attracting more FDI inflow is critical to the growth of GDP in the Asian economies. Opeyemi (2020) investigated the interaction between FDI inflow and economic growth. The results from the two-system generalized method of moments revealed an ambiguous effect of FDI on economic growth, although for the most part, higher FDI is associated with higher growth. Thus, the precise effect of FDI on economic growth is conditioned on the model specification. Interestingly, we observe that financial sector dampens the positive effect of FDI on economic growth. Also, the works of Sarkodie and Strezov (2019), Pradhan et al. (2019), Kalai and Zghidi (2019), and Sokhanvar (2019) provided significant evidence of the FDI-induced growth nexus. Borensztein et al. (1998) studied the said nexus and found that the full potential of FDI inflow

can be achieved when the host economy reaches a minimum threshold of absorptive capacity. Sunde (2017) found similar results for SA and concluded that FDI inflow drives economic acceleration. Ciobanu et al. (2020) examined the impact of FDI on economic growth in Central and Eastern European countries using panel data. The results proved that FDI inflow is promoter of economic growth in the region. Nguyen (2020) investigated the influence of FDI inflow on economic growth in South Asia and found that the impacts of FDI in the region are indeed influenced by the sectoral composition of FDI. Osunkwo (2020) examined the impact of FDI inflow on economic growth in Nigeria between 1980 and 2018. The results showed that about 80% of the variation in GDP in Nigeria could be explained by FDI inflow and employment level as indicated by the R^2 of 0.80. The outcomes further suggested that FDI inflow exerted a positive and significant impact on economic growth within the period under review. Similarly, Tshepo (2014) carried out research work on the subject matter and discovered that the interaction connecting FDI inflow with economic expansion is positive and strong. For the Romanian economy, Nistor (2014) found evidence of the FDI-induced growth nexus as well as a co-movement between the series. Almfraji and Almsafir (2014) reviewed a significant number of relevant extant studies and discovered that on average, FDI inflow positively influences economic acceleration, as supported by the work of Omri and Kahoulib (2013). Omri and Kahoulib (2013) studied the FDI-induced growth nexus among the World Bank income clusters of 65 countries. The outcomes validated the said nexus. Additionally, Adams (2009) studied the impact of FDI inflow and found a long-run positive influence of FDI inflow, complementing the work of Srinivasan et al. (2011). Srinivasan et al. (2011) examined the said nexus and found a feedback interaction between the series in the SAARC region, with the exception of India. Lee (2013) investigated the effect of FDI inflow on the host economy and found that FDI inflow promotes economic growth in the G20 economies, which concretized the study of Abdouli and Hammami (2017). Flora and Agrawal (2014) examined the causality flow between FDI inflow and economic expansion and found a feedback linkage, validating the research of Pandya and Sisombat (2017). Furthermore, in the MENA region, Abdouli and Hammami (2017) empirically investigated the topic and concluded that the efficacy of FDI inflow on economic expansion is country-based. Mehic et al. (2013) concluded that FDI inflow influences economic acceleration in Australia. Carike et al. (2012) and Claassen et al. (2011) posited that economic growth and FDI drive each other. Alguacil et al. (2011) submitted that the potential of FDI inflow could be better exploited by an open economy than its restricted counterparts. Lee (2013) submitted that FDI outflows asserts a positive impact on economic acceleration in Japan. Herzer (2008) subscribed to the positive influence of FDI inflow in the USA and Germany. Studies (See Herzer & Nunnenkamp, 2013; Herzer, 2008) posit that both inflow and outflow FDI promote income equality in a distance future for the European economies.

On the contrary, the dynamics of FDI inflow is contended by several studies. For instance, Ahmad et al. (2021b) assert that FDI inflow affects economic growth through CO2 emission. According to Rehman et al. (2021), FDI inflow exerts strong negative impact on economic growth. The study of Zangoei et al. (2021) found that FDI inflow does not exerts any impact on economic growth. Goh et al. (2017) investigated the said interaction and found that on average, FDI is not an inducer

of economic expansion in the Asian economies, as supported by the wok of Mah (2010). Mah (2010) examined the case of China and found similar outcomes, stressing that the effect of FDI inflow on economic expansion remains uncertain, corroborating the work of Khobai et al. (2017). The study failed to establish the positive influence of FDI inflow on economic prosperity. This argument aligns with the work of Zandile and Phiri (2019). Stancık (2007) concluded that FDI inflow exerts an adverse influence on the local firms of the host economy.

Methodological Sequence and Data

This study seeks to re-examine the FDI-induced growth nexus by extracting annual time–frequency data from the WDI (2018) for the period between 1970 and 2017 and applying econometric techniques. The incorporated variables include TO, trade-openness as a fraction of GDP; RGDP, economic expansion; FDI, foreign-direct-investment; INDTR, industrialization represented by industrial output; and URB, urbanization represented by population of urban centers. The natural log values of all the variables were obtained for the purpose of measuring the growth effect.

Model Specification

The functional model designed to achieve the objective of this study incorporates extra variables (industrialization and urbanization) to augment the attempts made by previous studies (Jibir et al., 2018). Thus, the current model consists of FDI, TO, URB, and INDTR as the independent variables, which explain the transformation in GDP as the targeted variable.

The operational model for the econometric procedures is stated as follows;

$$RDGP = f(FDI, TO, INDTR, URB) \tag{1}$$

$$lnGDP_t = \alpha_0 + \alpha_1 lnFDI_t + \alpha_2 lnTO_t + \beta_3 lnINDTR_t + \alpha_4 lnURB_t + \varepsilon_t \tag{2}$$

where lnGDP, lnFDI, lnTO, lnINDTR, and lnURB are natural log values of the series, respectively, ε_t = White Noise, and α_i = parameter for examination.

3:2 Stationarity Tests

The main reason why annual time series data are subjected to stationarity tests is because they are primarily non-stationary at level (Gujarati et al., 2007). Thus, this study begins the econometric procedures by conducting unit root tests to confirm the series' highest level of integration in order to avoid obtaining misleading results and spurious regression normally caused by the wrong choice of method. The traditional unit root test method (ADF & PP) was adopted and complemented by the confirmatory test of KPSS developed by Kwiatowski et al. (1992) for stationarity tests.

Table 1 Summary statistic

	lnRGDP	lnFDI	lnTO	lnINDTR	lnURB
Mean	26.274	−0.680	3.950	25.170	4.011
Median	26.241	−0.591	3.940	25.121	4.022
Maximum	26.773	1.780	4.281	25.401	4.180
Minimum	25.640	−5.990	3.622	24.910	3.861
Std. Dev	0.344	1.581	0.152	0.160	0.100
Skewness	−0.122	−1.340	−0.201	0.060	−0.051
Kurtosis	1.904	5.251	2.530	1.771	1.640
Jarque–Bera	2.053	20.020	0.631	2.442	3.011
Probability	0.350	0.001	0.721	0.293	0.220

Note: Author's Computation

$$\Delta y_t = \beta_1 + \beta_2 + \delta y_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta y_{t-i} + \varepsilon_t \tag{3}$$

Additionally, the Zivot-Andrews stationarity test was also carried out to check for structural break(s), although space does not permit us to include the equation here.

ARDL Bounds Cointegration Test

The autoregressive distribution lag (ARDL) method developed by Pesaran et al. (2001) is adopted mainly to address two issues: as an alternative for the traditional approach and for testing for evidence of future co-movement between the series. It is considered to be superior to the traditional method in the sense that it accounts for both short and long-run interactions between the variables. The method is more flexible and allows for the incorporation of a mixed order of integration, whether it is I(1)/I(0) or otherwise.

Empirical Findings

Preliminary Analysis

Table 1 presents the summary statistics, where GDP demonstrated a high average comparatively, while all series are inversely biased except for INDTR. The Jarque–Bera test results proved that the series exhibit normal distribution apart from FDI inflow. The Pearson coefficient correlation (see Table 2) revealed positive and significant links between the variables with a stronger connection between INDTR and GDP. A weak link flows between FDI inflow and GDP, while Fig. 1 indicates the trend or drift of the series under investigation. Table 3 presents the outcome from the ADF, PP, and KPSS stationarity tests, which confirmed different orders of stationarity between the series. For instance, the ADF test indicated that at level,

Table 2 Results of correlation analysis

Observations	lnRGDP	lnFDI	lnTO	lnINDTR	lnURB
lnRGDP	1.000				
lnFDI	0.341**	1.000			
lnTO	0.624***	0.54***	1.000		
lnINDTR	0.981***	0.352**	0.697***	1.000	
lnURB	0.978***	0.375***	0.574**	0.935***	1.000

Author computation

, and * denote statistical rejection level at 5%, and 10% levels respectively

FDI and URB achieved stationarity while all other variables turn out to be stationary at first difference. The PP test proved that only FDI achieved stationarity at level, while other variables became stationary after first differencing. The outcomes from the KPSS test proved that only TO and INDTR achieved stationarity at difference while others failed to establish stability (Table 4). To account for the structural break, this study adopted the Zivot-Andrews (2002) stationarity test, which validates the outcomes from the traditional method as recorded above.[1] The functional

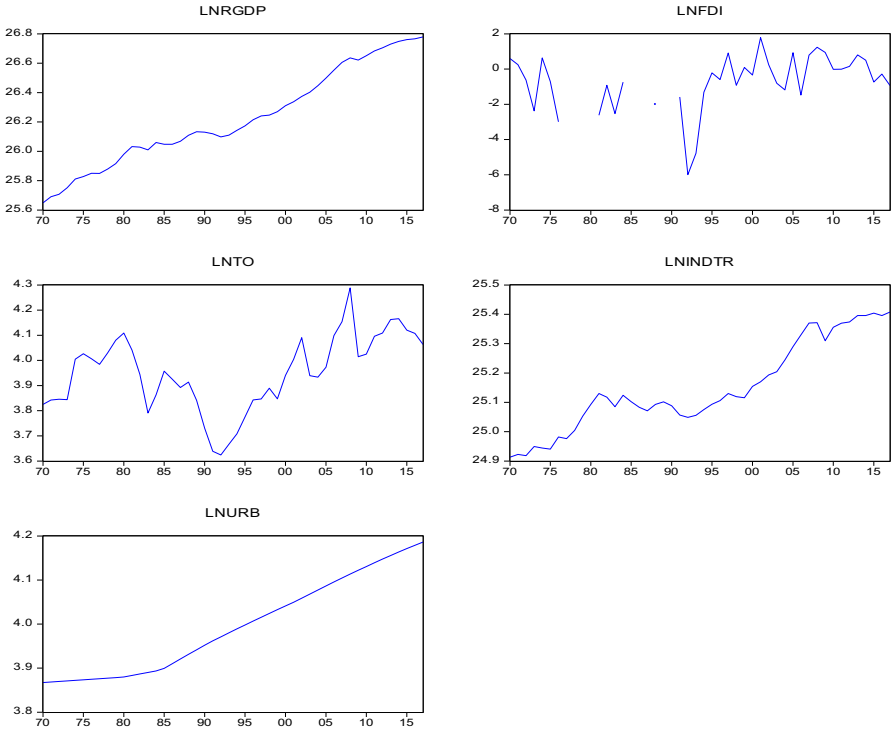


Fig. 1 Visual of series under investigation

[1] For the want of space, the results of ZA unit root test can be made available upon request.

Table 3 Unit root test results

Statistics (Level)	lnGDP	lnFDI	lnTO	lnINDTR	lnURB
τ_T (ADF)	−1.951	−3.870**	−2.037	−1.557	−3.750***
τ_μ (ADF)	−0.320	−3.579**	−1.890	−0.350	−0.212
τ (ADF)	3.422	−3.285***	0.363	2.964	1.990
τ_T (PP)	−1.641	−3.753**	−2.020	−1.762	−3.440
τ_μ (PP)	−0.482	−3.482**	−1.858	−0.398	2.191
τ (PP)	7.630	−3.071***	0.490	2.801	6.360
τ_T (KPSS)	0.140*	0.146*	0.157**	0.132*	0.192**
τ_μ (KPSS)	0.890***	0.436*	0.314	0.819***	0.881***
Statistics (FirstDifferc)	lnGDP	lnFDI	lnTO	lnINDTR	lnURB
τ_T (ADF)	−4.702***	−8.061***	−6.090***	−5.859***	−0.850
τ_μ (ADF)	−4.760***	−8.178***	−6.162***	−5.922***	−1.881
τ (ADF)	−2.973***	−8.305***	−6.212***	−5.176***	−0.170
τ_T (PP)	−4.520***	−8.424***	−6.218***	−5.863***	−0.850
τ_μ (PP)	−4.592***	−8.577***	−6.324***	−5.925***	−1.661
τ (PP)	−2.827***	−8.688***	−6.316***	−5.234***	0.040
τ_T (KPSS)	0.148**	0.267***	0.100	0.084	0.180**
τ_μ (KPSS)	0.140	0.219	0.099	0.093	0.546**

*, **, and *** denote rejection of the null hypothesis at the 1%, 5%, and 10% levels

Table 4 ARDL outputs indicating short-long run interaction between the series

Variables	Coefficient	SE	t-statistic	*P* value
Short run				
lnFDI	0.0032*	0.0017	1.8904	0.0691
lnTO	0.0573**	0.0241	2.3836	0.0242
lnINDTR	0.6108***	0.0718	8.5016	0.0001
LNURB	0.0039	0.1225	0.0322	0.9742
D1994	−0.0111	0.0114	−0.9766	0.3371
D2008	0.0027	0.0059	0.4577	0.6507
ECT	−0.4554***	0.0964	−4.7219	0.0001
Long run				
lnFDI	0.0061*	0.0032	1.8592	0.0731
lnTO	0.1260***	0.0431	2.8730	0.0070
lnINDTR	0.7341***	0.1312	5.5820	0.0001
lnURB	0.0081	0.2681	0.0321	0.9741
D1994	−0.0240	0.0230	−1.0491	0.3030
D2008	0.0051	0.0121	0.4720	0.6402

Author's Computation

Table 5 Model verification and validation

Tests	F-stat	*P* Value
χ^2 NORMAL	1.191	0.550
χ^2 SERIAL	0.001	0.961
χ^2 WHITE	1.100	0.390
χ^2 RAMSEY	2.101	0.161

Source: Author computation 2018

model was subjected to a diagnostic test as presented in Table 5, which indicates that the model is pure, and Table 6 validates the existence of cointegration in the fitted model. The findings further revealed that the distribution of the model is normal with no traceable problems of serial correlation or heteroscedasticity. Similarly, the Ramsey reset test revealed that the model is well specified, while the plots of the CUSUM and CUSUMsq statistic tests proved to be properly fitted into the critical bounds indicating that the model is fit for policy direction, as supported by Joshua and Bekun (2020) (Fig. 2).

Discussions

This section presents the discussion of empirical results. We set off with the baseline regression as reported in Table 4. Table 4 presents the outcomes from the short-run and long-run interactions between the series. The findings showed a significant positive impact of FDI inflow on economic growth, validating the FDI-led growth nexus as supported by the work of Sarkodie and Strezov (2019), Pradhan et al. (2019), Kalai and Zghidi (2019), and Sokhanvar (2019). Specifically, a 1% change in FDI inflow accounts for changes of about 0.0032% and 0.0069% in GPD for both the short run and long run. Trade openness exerts a strong positive and significant impact on economic growth. A 0.057% and 0.1261% transformations in GDP are caused by a 1% change in trade openness in the short run and long run. Similarly, the results revealed that a 1% change in industrialization will generate a positive transformations of 0.6108% and 0.7349% in economic growth in the

Table 6 ARDL cointegration test

Test statistic	Figure	K
F-statistic	4.0410	4
Critical figure bounds		
Significance	I(0) Bounds	I(1) Bounds
10%	2.68	3.53
5%	3.05	3.97
2.5%	3.4	4.36
1%	3.81	4.49

Source: Author compilation, 2018

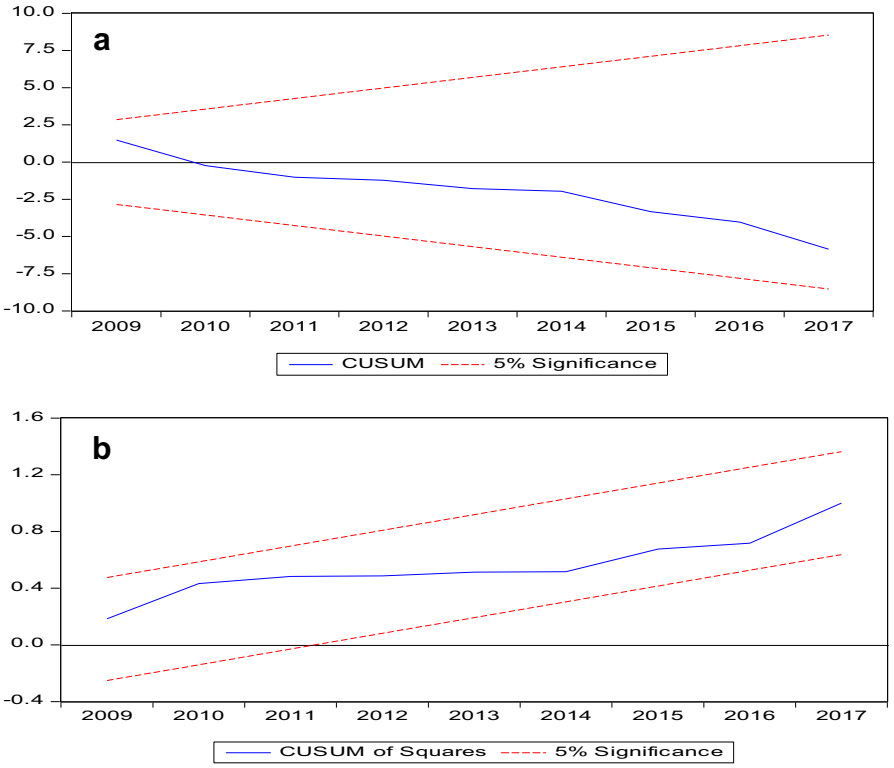


Fig. 2 **a** Plot of cumulative sum of recursive residuals. **b** Plot of cumulative sum of squares of recursive residual

short and long term. This is not unexpected based on the fact that South Africa is the second largest most industrialized economy in Africa and 38th at the global level (WDI, 2018). The findings furthermore revealed a positive but weak influence of urbanization on economic growth by 0.039% and 0.0087% proportions in the short and long term. Urbanization exhibits a positive and weak influence on economic advancement. Thus, A 1% change in urban development will cause a 0.004% and 0.009% improvement in GDP in both terms. The results show that the structural break of 1994, which is associated with the advent of democracy as revealed by the Zivot-Andrew stationarity test, exhibits a negative but weak impact on economic growth by 0.0111% and 0.0244% for the both terms. The transition to democracy was accompanied by an unfavorable political struggle and struggle for the freedom of the black race who appeared to have been marginalized over decades, thereby resulting in an economic slowdown. In addition, the financial shock experienced across the globe in 2008 might be the cause of the structural break of the same year. This caused a negative but negligible effect on the emerging economies like South Africa for two reasons; firstly, in the same year (2008), there was a commodity price boom across the globe which cushioned/overshadowed the effect

Table 7 Granger block exogeneity results

Excluded	Chi-sq	df	Prob
Dependent variable: RGDP			
LNFDI	2.082	2	0.353
LNTO	11.258	2	0.003
LNINDTR	1.871	2	0.392
LNURB	0.0252	2	0.987
All	15.802	8	0.045
Dependent variable: LNFDI			
LNGDP	5.554	2	0.062
LNTO	2.064	2	0.356
LNINDTR	1.452	2	0.483
LNURB	6.376	2	0.041
All	11.580	8	0.170
Dependent variable: LNTO			
LNFDI	1.520	2	0.467
LNGDP	2.025	2	0.363
LNINDTR	4.228	2	0.121
LNURB	5.026	2	0.081
All	23.277	8	0.003
Dependent variable: LNINDTR			
LNFDI	0.947	2	0.622
LNGDP	2.418	2	0.298
LNTO	6.678	2	0.035
LNURB	0.707	2	0.702
All	9.597	8	0.294
Dependent variable: LNURB			
LNFDI	2.772	2	0.250
LNGDP	5.914	2	0.052
LNTO	2.365	2	0.306
LNINDTR	3.549	2	0.169
All	7.834	8	0.449

Author's Computation

of the financial shock. Secondly, most of the emerging economies including South Africa primarily trade on commodities. Thus, the change in commodity prices caused a positive transformation in economic expansion by 0.0027% and 0.0059% in both terms. The ECT indicated in Table 7, which represents the speed of adjustment, shows that short-run disturbances between the variables will be corrected in the long run with a speed of 45%.

The results of the causality test are presented in Table 7. The findings show a unidirectional link from GDP to FDI inflow, validating the study of Tshepo (2014) for South Africa. This implies that economic expansion is a predictor of

FDI inflow into the South African economy. A non-feedback causal link running from trade openness to GDP is revealed proving that the former is a predictor of the latter, contradicting the work of Rani and Kumar (2019). This implies that economic openness could predict the trend of FDI inflow into South Africa. A one-way causal effect was found running from URB to FDI, which suggests that FDI inflow to South Africa is dependent in part on urban development, validating the claims made by Nielsen et al. (2017) and Guimaraes et al. (2000). Furthermore, a unidirectional link was found running from URB to TO, which implies that the development of urban centers could play a key role in attracting FDI inflow. A one-way causal effect was found running from trade openness to industrialization, suggesting that openness is a predictor of industrial development. The results show a unidirectional link running from GDP to urbanization, implying that economic expansion is a driver of urban development. This finding nullifies the position of Nunnenkamp and Spatz (2003) and Singh and Jun (1999) implying that industrialization is not a predictor of FDI inflow in the context of the South African economy.

Subsequently, this study proceeds by exploring the responsiveness of the current study variables on each other with the innovative accounting test to verify the long and short run dynamics using the impulse response function and forecast error variance decomposition (FEVD). Table 8 and Fig. 3 disclose the innovative analysis of the impulse response function and forecast error variance decomposition for the study variable under review. Table 8 presents the analysis of FEVD using 10 periods ahead of sample horizon over the study period. More specifically, the error variance decomposition of GDP due to its own innovative shock is 2.11%. Except GDP growth's own shock, foreign direct investment, urbanization, and industrialization all contributed sustainably to the FEVD where urbanization is the largest contributor to the forecast error variance decomposition (FEVD) of the emissions of GDP with 2.15%. Additionally, the second largest contributor to GDP decomposition is industrialization with a FEVD of 2.11%, while foreign direct investment exhibits the lowest contribution to the variance decomposition. In the same vein, other indicators examined showed significant contribution to GDP across the time horizon as established by the baseline ARDL regression.

Furthermore, Lütkepohl and Schlaak (2018) highlighted the impulse response function (IRF) analysis that forms the second half of the innovative tests, which outlined the reaction of the dependent variable, in our study case economic growth (GDP), to its external shock from the independent variables, in our case (FDI, URB, TO, INDTR). Figure 3 shows the IRF results, where the response of GDP to its own standard deviation shock is positive over FEVD. Similarly, the reaction of industrialization to a standard deviation shock to GDP is also positive, thus suggesting that industrialization as well as urbanization cause economic growth to increase over the initial forecast horizon and subsequently maintain a relatively fixed level over time. This result agrees with the positive nexus outlined by the baseline regression of the ARDL, validating both urbanization- and industrialization-induced growth for the case of South Africa. This is insightful for government administrators regarding the need to improve strategies on urban infrastructure.

Table 8 Error forecast variance decomposition

Response of GDP:				
Period	GDP	FDI	INDTR	URB
1	4.98E+09	0.000000	0.000000	0.000000
2	6.30E+09	–1.19E+09	2.07E+08	–1.08E+08
3	6.31E+09	–1.68E+09	1.12E+09	–86,368,402
4	5.72E+09	–1.78E+09	1.64E+09	16,521,211
5	4.98E+09	–1.73E+09	1.90E+09	2.09E+08
6	4.23E+09	–1.60E+09	1.99E+09	4.84E+08
7	3.54E+09	–1.45E+09	1.99E+09	8.30E+08
8	2.94E+09	–1.29E+09	1.95E+09	1.23E+09
9	2.46E+09	–1.15E+09	1.90E+09	1.68E+09
10	2.11E+09	–1.04E+09	1.88E+09	2.15E+09
Response of FDI:				
Period	GDP	FDI	INDTR	URB
1	–0.120419	0.995100	0.000000	0.000000
2	0.194491	–0.076006	–0.056263	–0.018252
3	0.080428	–0.140016	0.188308	0.010889
4	–0.063761	–0.050848	0.138758	0.026872
5	–0.111539	–0.005504	0.081073	0.043467
6	–0.121453	0.011861	0.041652	0.059395
7	–0.116007	0.019569	0.019314	0.073737
8	–0.101970	0.021836	0.008264	0.085791
9	–0.082714	0.020119	0.005322	0.095316
10	–0.061029	0.015733	0.007974	0.102301
Response of INDTR:				
Period	GDP	FDI	INDTR	URB
1	1.89E+09	–1.71E+08	9.39E+08	0.000000
2	1.97E+09	–6.46E+08	6.86E+08	–1.18E+08
3	1.73E+09	–6.46E+08	7.96E+08	–1.68E+08
4	1.40E+09	–5.61E+08	7.34E+08	–1.93E+08
5	1.10E+09	–4.70E+08	6.46E+08	–1.88E+08
6	8.38E+08	–3.83E+08	5.45E+08	–1.57E+08
7	6.13E+08	–3.03E+08	4.46E+08	–1.05E+08
8	4.32E+08	–2.33E+08	3.59E+08	–38,003,423
9	2.93E+08	–1.75E+08	2.87E+08	40,678,385
10	1.94E+08	–1.32E+08	2.34E+08	1.27E+08
Response of URB:				
Period	GDP	FDI	INDTR	URB
1	–0.000349	–0.003289	-0.000396	0.041893
2	0.000485	–0.005877	0.007682	0.083487
3	0.006461	–0.008067	0.019785	0.124012
4	0.018391	–0.012691	0.035196	0.162934
5	0.034851	–0.019561	0.053790	0.199930

Table 8 (continued)

Response of GDP:				
Period	GDP	FDI	INDTR	URB
6	0.054281	–0.028023	0.074772	0.234767
7	0.075466	–0.037543	0.097340	0.267317
8	0.097440	–0.047690	0.120780	0.297534
9	0.119440	–0.058106	0.144486	0.325438
10	0.140887	–0.068501	0.167957	0.351095
Cholesky Ordering: GDP FDI INDTR URB				

Implications of the Findings

The findings of this study indicate that FDI inflow into South Africa is a key determinant of economic growth as supported by the empirical work of Li and Liu (2005) and Kumar and Pradhan (2002). This aligns with the assertion of modernization theory, which suggests that globalization involving the inflow of advanced technology and human capital development from high concentration (developed nations) to low concentration (developing economies) is responsible for structural and economic change in the future. The implication is that South Africa's quest to achieve sustainable economic growth (SDG-8) is directly connected to external resources from the developed world. The South African government and relevant stakeholders should

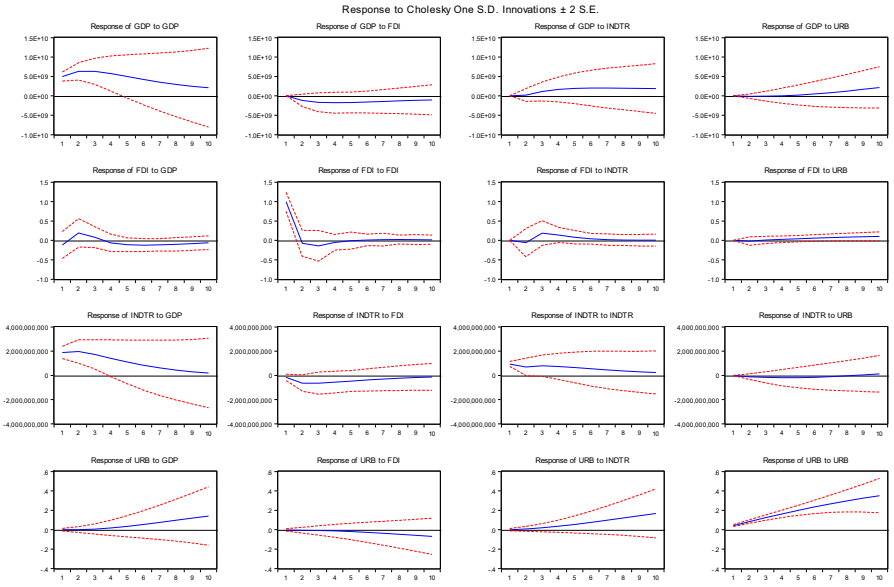


Fig. 3 Impulse response analysis

collectively make efforts towards attracting this indispensable resource to complement its domestic counterpart in an attempt to achieve the established macroeconomic goal of development.

Conclusion and Recommendations

The primary aim of this study is to examine FDI-induced growth nexus for South Africa by incorporating urbanization and industrialization as controlled variables to form an augmented model perspective. The confirmation of the FDI-led growth nexus from this study implies that FDI inflow and its previous dynamic spillover effect is a driver of economic growth in South Africa. Trade openness exhibits a significant influence on economic advancement, validating the trade-induced growth nexus as supported by empirical evidence from previous studies (see Matlanyane & Harmse, 2002; Thurlow, 2007) for South Africa. Industrialization asserts the largest impact on economic expansion relative to other variables in the model through the magnitude of its coefficient. Contrary to our initial expectations, urbanization exhibits a non-significant positive influence on economic expansion. Likewise, the findings of this study imply that the tenet of modernization theory is applicable to the economy of South Africa. This is in contrast to dependency theory which claimed to be applicable to the developing economies, as supported by empirical studies such as Stancık (2007) and Zandile and Phiri (2019). This is informative for policymakers in terms of future policy direction and improvement. Thus, there is a significant need for strong and functional economic systems and planning resulting in a peaceful political and economic environment couple with investment incentives such as tax breaks and free licenses for operation as a way of attracting more foreign investment into the economy. Infant industry protection policies are not relevant for South Africa as this will mitigate against the inflow of FDI. Instead, as observed, the inflow of FDI is key to transforming the local industry into maturity and competency.

Furthermore, economic openness is not an option for South Africa in its quest to attract foreign resource that will help generate the desired economic growth. The government must give serious priority to pursuing industrialization policies such as infrastructural development, siting of massive functional industrial zones. The results also indicate that only urbanization acts as a predictor of FDI inflow, supporting the works of (Guimaraes et al., 2000; Nielsen et al., 2017). This calls for the attention of the government to develop urban centers by improving its infrastructure facilities as a way of expanding the country's absorptive capacity. Achieving this will boost the confidence of foreign investors who wish to do business in South Africa. However, there is need for government administrators in South Africa to insulate the economy from externalities that might impede FDI influx such as pandemic attack like COVID-19 in recent times that limited free flow of persons, good, and services and in turn affect economic growth from the perspective of FDI-inflow like greenfield (Ahmad et al., 2021a, b).

The present study explored the FDI-growth nexus while controlling for urbanization and industrialization for the case of South Africa a very fast emerging economy

which has received less documentation in the extant literature. Hence, our study suggests future studies on this topical discourse by considering more demographic indicators like population, age disparity, and more on the FDI economic growth relationship. Future studies can also account for the role of pollutants like CO_2 emission to investigate the pollution haven hypothesis or pollution hallo hypothesis through the channel of FDI influx. Furthermore, future studies can explore the theme using disaggregated data and controlling for structural break(s). This extension of the literature can stretch to other emerging blocs like BRICS, MENA, and even SSA.

Acknowledgements Author gratitude is extended to the prospective editor(s) and reviewers that will/have spared time to guide toward a successful publication. The authors of this article also assures that they follow the springer publishing procedures and agree to publish it as any form of access article confirming to subscribe access standards and licensing.

Funding I hereby declare that there is no form of funding received for this study.

Availability of Data and Materials The data for this present study are sourced from structured questionnaire appended to this submission.

Declarations

Ethical Approval Authors mentioned in the manuscript have agreed for authorship read and approved the manuscript, and given consent for submission and subsequent publication of the manuscript.

Consent to Participate Note Applicable.

Consent to Publish Applicable.

Competing Interests The authors declare no competing conflicts.

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