FDI as a contributing factor to economic growth in Burkina Faso: How true is this?

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FDI AS A CONTRIBUTING FACTOR TO ECONOMIC GROWTH IN BURKINA FASO: HOW TRUE IS THIS?

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ABSTRACT: Much emphasis has been placed on attracting FDI into Burkina Faso as a catalyst for improved economic growth within the economy. Against the lack of empirical evidence evaluating this claim, we use data collected from 1970 to 2017 to investigate the FDI-growth nexus for the country using the ARDL bounds cointegration analysis. Our empirical model is derived from endogenous growth theoretical framework in which FDI may have direct or spillover effects on economic growth via improved human capital development as well technological developments reflected in urbanization and improved export growth. Our findings fail to establish any direct or indirect effects of FDI on economic growth except for FDI's positive interaction with export-oriented growth, albeit being constrained to the short-run. Therefore, in summing up our recommendations, political reforms and the building of stronger economic ties with the international community in order to raise investor confidence, which has been historically problematic, should be at the top of the agenda for policymakers in Burkina Faso.

Keywords: Foreign direct investment; economic growth; Burkina Faso; West Africa; ARDL cointegration.

JEL Classification Code: C13; C32; C51; F21; O40.

1. Introduction

According to United Nations Conference on Trade and Development (UNCTAD, 2014), foreign direct investment (FDI) is a key force in the globalization process. Both developed and developing nations have been competing to attract inflows of FDI, considering its various positive spillover effect on a country's employment, economic growth and development. The official data on FDI was firstly reported by the United Nations Conference on Trade and Development in 1970, a year in which global FDI flows accounted for US$ 13.26 Billion. In 2007, just before the global financial crisis of 2008-2009, global foreign direct investment (FDI) flows amounted to a historical high of around $2 trillion, a sum equivalent to more than 16 percent of the world's gross fixed capital formation (GFCF) at the time (Dorneanet al., 2012). This marked the peak of a four year upward trend in FDI flows. Along with the subsequent worldwide collapse in real estate values, stock markets, consumer confidence, production, access to credit, and world trade, global FDI flows also began to fall by 16 per cent in 2008, and when worldwide output contracted in 2009 for the first time in sixty years, FDI declined a further 40 per cent. In 2010 FDI stagnated at just above US$1 trillion and subsequent to this period, the world witnessed an increase of global FDI flows, such that in 2015, it stood at US$ 1.76 Trillion (UNCTAD, 2016).

The last couple of decades have witnessed a significant shift in concentration of global capital and FDI flows from industrialized economics to developing countries, more notably Latin American and Asian countries. And despite FDI flows to developing countries taking a toll during the recent 2007-2008 financial crisis, the World Investment Report (2013) shows that developing countries accounted for a record of 52 percent of the global FDI inflows (World Investment Report, 2013). Despite the observed increase of global FDI inflows to developing countries, Africa has not been as fortunate in attracting FDI inflows when compared to other regions like Asia. Globally, the African and Asian continents accounted for about 9.6 percent and 6.4 percent, respectively, of FDI flows in1970. However, though Africa's share declined

to 4.6 percent in 2009, Asia recorded an increase of 27.5 percent in the same period (Mawugnon and Qiang, 2009).

Along the same vein, Asia has been the world's fastest growing continent over the last few decades whilst Africa is currently placed as the second fastest growing region globally. A bulk majority of Asia's economic success is attributed to the so-called Asian miracle, a term coined and popularized in a 1993 World Bank and mark report. At the nucleus of the Asian miracle were market forces primarily driven by cross-border trade, favourable financial flows as well as FDI's (Page, 1994). On the other hand, Africa's growth is largely dependent on exports of commodities, whose prices are vulnerable to exogenous shocks. In West Africa, growth remained stable at 6.7 percent in 2013 compared to 2012, mainly due to investment in minerals and oil sector (Tomi, 2015). However, sustainability of fiscal budgets faced by most governments in the continent are historically weak and reliance on monetary policy as a stabilizing tool has failed to address deeper socio-structural issues such as food security, unemployment, poverty and mortality. And even though attracting more FDI remains a desirable objective in developing countries, and despite the increase in private capital inflows, these resources have not had a meaningful impact on economic development in African countries (Ndikumana and Verick, 2008).

Our study particularly focuses on the role, if any, which FDI has on stimulating economic growth in Burkina Faso. Whilst a handful of studies have investigated the relationship for West African countries inclusive of Burkina Faso, no study, the best of our knowledge, has done so for Burkina Faso as aa country-specific case. This is worrisome since previous panel-based studies generalize their empirical findings for different countries with different economics structures and dynamics. Our study hence makes a unique contribution to the literature from this perspective. However, empirical estimates from country-specific studies are commonly criticized based on low asymptotic power due to short sample sizes. Therefore, we use the bounds approach to autoregressive distributive lag approach designed by Pesaran et al. (2001) which circumvents the problem of low power in small sample sizes. Considering that the longest available time series for Burkina Faso from the various statistically sources is annual

data stretching over a period of 1970 to 2017, the ARDL model is an excellent choice to use for our empirical analysis.

Against this background, the rest of the paper is organized as follows: Section 2 provides a general overview of the Burkina Faso economy; Section 3 presents the literature review; Section 4 outlines the empirical framework; Section 5 presents the empirical results whilst Section 6 provides the discussion of our findings of the study. The paper is then concluded in the section 7.

2. An overview of Burkina Faso

2.1 A political overview of Burkina Faso

Burkina Faso which was formerly called Upper Volta is a landlocked country in Western Africa which achieved independence from France in 1960, but the country spent many of its post-independence years under military rule with repeated coups during the 1970s and 1980s (Country Review, 2018). During the 1960s and early 1970s, Upper Volta received a large amount of financial aid from France. During this period, Upper Volta was suffering from a long-term drought, mainly in the north. The drought began in the late 1960s and continued into the 1970s. Upper Volta was also involved in a border dispute with Mali in 1974 over land containing mineral reserves. The dispute resolved in a national strike and demands for higher wages and a return to civilian rule.

President Sankara came in to power in 1984 and cultivated ties with Libya and Ghana whilst simultaneously adopting a policy of nonalignment with Western nations. Nevertheless, Sankara adopted a more liberal policy toward the opposition and increased the government's focus on economic development. While respected in Upper Volta, Sankara and his Marxist-Leninist administration were not well received by the United States which resulted in political disputes (Ndiaye and Xu, 2016). In a symbolic rejection of Upper Volta's colonial past, Sankara changed the country's name to Burkina Faso in August 1984. The new name Burkina Faso is a

combination of local languages and roughly translated as "the country of incorruptible men living in the land of their ancestors". President Sankara died in 1987 and was buried with his vision policy of nonalignment with Western nations.

President, Blaise Compaore, came to power in 1987 military coup that involved the assassination of then President Thomas Sankara and other officials and ruled Burkina Faso for 27 years until late 2014. Once Campaore was established with the power of the presidency, Compaore, unlike his predecessor Sankara began to attract foreign investment and expanded the private sector (Ndikumana and Verick, 2007). However, despite these positive developments, Burkina Faso has remained one of the poorest countries in the world with few natural resources and a weak industrial base (Engels, 2018). Almost 90 percent of the population is engaged in subsistence agriculture, which is vulnerable to periodic drought. Cotton is the most important agricultural crop and the main source of export earnings, and manufacturing is limited to cotton and food processing. International pressure along with difficult negotiations led to the development of a transitional plan aimed at returning Burkina Faso to self-governing order which was once facilitated by Sankara.

The election of Roch Marc Christian Kabore as president in late 2015 was the culmination of that process. Despite these disadvantages, Burkina Faso has achieved generally good macroeconomic performance in recent years, attributable to the implementation of economic reforms supported by the International Monetary Fund and the World Bank (Country Review, 2018). Currently, Burkina Faso has excellent relations with European, North African and Asian donors, which are all active development partners (Samoff, 2004). France continues to provide significant aid and support. U.S. trade with Burkina Faso is extremely limited, there is $220 million in U.S. exports and $600,000 in Burkina Faso exports to the U.S. annually in recent years, but investment possibilities exist, especially in the mining and the communications sector. Burkina Faso and the Millennium Challenge Corporation recently signed a $12 million Threshold Country Program to build schools and increase girls' enrolment rates (Country Review, 2018). Moreover, Burkina Faso currently scores a 4 on the foreign Investment Index

which shows that it is less attractive in terms of FDI, which is a disadvantage for many least developed countries.

2.2 Overview of FDI and economic growth (1970-2016)

Table 1 provides some basic statistics for GDP growth, FDI share in GDP and FDI growth for 5 sub-periods between 1970 and 2016 whereas Figure 1 presents the time series plots of the variables over the entire sample period of 1970-2016. As can be observed the lowest economic growth rates and the FDI growth figures occurred between the first two sub-periods dating over 1970-1990, with minimum GDP growth values (-1.78%) and FDI share in GDP (-0.092) occurring in 1984-1985. Following democratic transitions experienced in the early 1990's resulted in significantly improved economic growth performance with GDP growth rates experiencing an all-time high of over 11 percent in 1996 with FDI's growing significantly yet remaining relatively low in terms of wold standard/averages. Notably, FDI growth plummeted during the more recent global financial crisis of 2007-2008, reaching an extreme low of -4.66% in 2007, and yet following the Gold sector boom of 2010, FDI have experienced since gaining independence in the 1960's reaching growth levels of 0.95% in 2011 and over a 4% share in GDP in 2013.

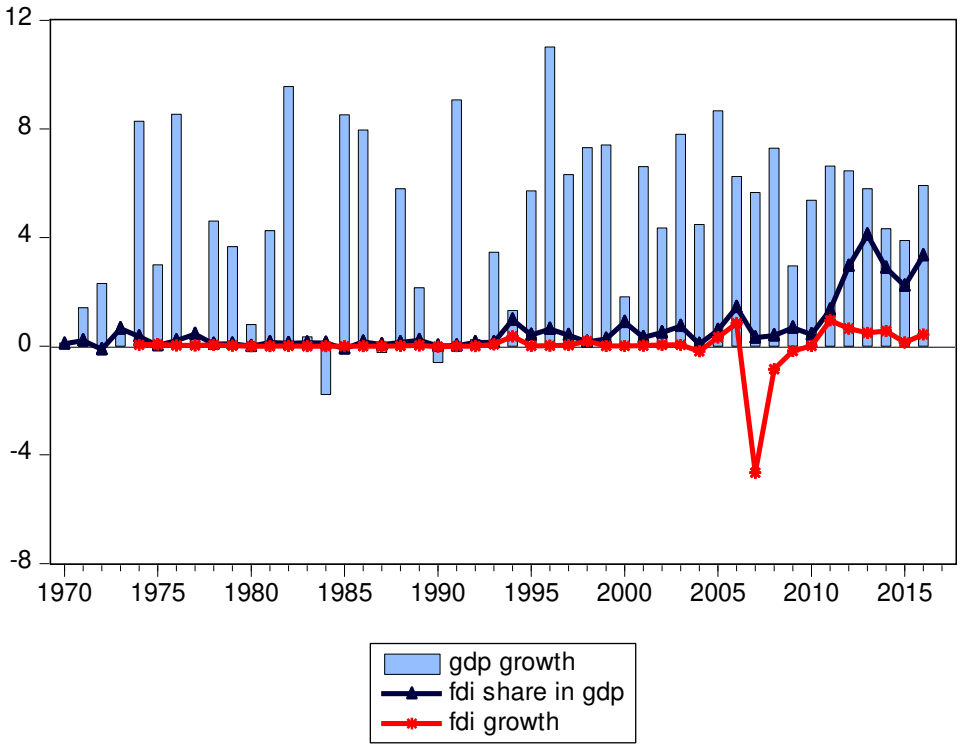
Table 1: Basic GDP growth and FDI statistics

	Time series variables		
	GDP	FDI	FDI_GDP
Panel A: Mean values			
1970-2016	4.588	-0.008	0.324
1970-1979	3.050	0.037	0.184
1980-1989	3.600	0.004	0.098
1990-1999	5.759	0.071	0.401
2000-2009	5.945	-0.457	0.548
2010-2016	5.502	0.537	2.806
Panel B: Maximum and minimum values			
Maximum	11.015 [1996]	0.953 [2011]	4.104 [2013]

Minimum	-1.779 [1984]	-4.656 [2007]	-0.092 [1985]

Note: Year associated with maximum and minimum values reported in brackets [].

Figure 1: GDP growth, FDI share in GDP and FDI growth in Burkina Faso



3. Literature Review

Empirical work on dynamic models of economic growth can be traced to seminal papers of Harrod (1939) and Domar (1946) which became more prominently branded as the neo-classical synthesis following later contributions of Nobel laurate Solow (1965).Whilst capital accumulation is defined as the engine of growth within such dynamic models, initially there was very little role for foreign capital flows in influencing long-term dynamic growth. This is because conventional neoclassical models are built on the foundation of constant returns to scale in the production function which results in increased capital accumulation producing diminishing returns to capital. Under the assumption of diminishing returns to capital, FDI is merely an injection of capital stock which can only affect the level of income, leaving the long-run growth unchanged (de Mello, 1997).

Eventually, endogenous growth model, as attributed to seminal contributions of Lucas (1988) and Romer (1986, 1987, 1990), took centre stage within the dynamic growth paradigm in which the key determinants of growth are endogenous to the model. These 'endogenous growth models' generally assume constant returns to scale for input factors with the level of technological progress being a form of investment spillover dependent upon a set of factors, such as tangible capital, human capital and research and development (Belloumi, 2014). Henceforth within endogenous growth models, long-run steady-state growth can be achieved if the marginal product of capital can be bounded away from the rate of time preference as the stock of foreign capital flows increases, such that the long-run growth rate positively depends on foreign capital (de Mello, 1999). Theoretically, some identified channels through which FDI can improve steady-state growth within endogenous models include increased capital accumulation in the recipient economy, include improved efficiency of locally owned host country firms via contract and demonstration effects, and their exposure to fierce competition, technological change, human capital augmentation and increased exports (Akinlo, 2005).

On the other hand, potential drawbacks of FDI on any economy's growth have also being identified in the literature. For instance, Hansen and Rand (2006) earlier highlighted the possibility of FDI Deteriorating of the Balance of Payments as profits are repatriated thus exerting adverse effects on competitiveness in domestic markets. Adams (2009) further concludes that for the case of developing and especially African countries, FDI can spur economic development only after some basic conditions are meet since the impact of FDI is constrained by an absorptive capacity in terms of availability of trained workers, basic infrastructure network and institutions as well as macroeconomic performance. Therefore, while FDI can potentially stimulate economic growth, these growth effects are only sustainable if FDI stimulates the utilization of domestic factors of production, especially by increasing employment and stimulating domestic public as well as private investment (Baharumshah and Almasaied, 2009).

Table 2 presents a summary of the empirical studies conducted on the FDI-growth nexus for Sub- Saharan African countries inclusive of Burkina Faso, the time frame of the studies, the

different methodologies used as well as the empirical findings of the different studies. In quickly screening through these studies, we can conveniently segregate these studies into three classifications. The first group consists of a majority of studies which find a positive relationship between FDI and economic growth (i.e. Seetanah and Khadaroo (2007), Sharma and Abekah (2008), Ndikumana and Verick (2009), Brambila-Macias and Massa (2010), Loots and Kabundi (2012) and Adams and Klobodu (2012)). The second group of studies are those which found an insignificant FDI-growth relationship for the data (i.e. Ndambendia and Njoupouognigni (2010), Seyoum et al. (2014), Tomi (2015)). There is the third cluster of studies which find a significant and inverse relationship between the two time series (i.e. Adams (2009) and Ndiaye and Xu (2016)). The general inconclusiveness of the aforementioned studies leaves the subject matter open to further deliberations. A natural development to the above literature would be to provide country-specific evidence for Burkina Faso.

Table 2: Summary of reviewed literature

Author	Period	Country	Method	Results
Lumbila (2005)	1980-2000	47 African countries	SUR-WLS	FDI positively and significantly affects economic growth except for panels with high inflation rates and high corruption levels.
Sharma and Abekah (2008)	1990-2003	47 African countries	POLS	FDI has a positive and significant effect on economic growth for the entire panel.
Ndikumana and Verick (2009)	1970-2004	38 SSA countries	Pesaran coefficient, POLS, FE.	FDI inflows are significantly and positively correlated with a range of determinants including GDP growth
Adams (2009)	1990-2003	42 African countries	POLS and FE	Significant and positive relationship between FDI and growth using OLS and insignificant using FE.
Brambila-Macias and Massa (2010)	1980-2008	45 African countries	DOLS	FDI has a positive and significant effect on economic growth for the entire panel.
Ndambendia and Njoupouognigni (2010)	1980-2007	36 SSA countries	PMG and FE	FDI has an insignificant effect on economic growth for all estimators.
Brambila-Macias and Massa (2010)	1980-2007	45 SSA countries	DOLS	FDI positively affects GDP for entire sample.
Loots and Kabundi (2012)	2000-2007	46 African countries	POLS and FE	Positive relationship between FDI and economic growth
Tekin (2012)	1970-2009	18 least developed countries	Panel bootstrap granger causality tests	Causality from economic growth for FDI in Burkina Faso but not vice versa.
Gui-Diby (2014)	1980-2009	50African countries	GMM	Significant negative relationship between FDI and economic between 1980-1999 and significant positive relationship between FDI and economic between 1995-2009.
Seyoum et al. (2015)	1970-2011	23 African countries	LA-VAR model	No causality between FDI and economic growth for Burkina Faso
Tomi (2015)	1970-2012	7 WAEMU countries	ARDL model	Insignificant relationship between FDI and economic growth

Ndiaye and Xu (2016)	1990-2012	7 WAEMU countries	POLS and FE	Regression results report a negative and significant relationship between FDI and GDP
Adams and Klobodu (2017)	1970-2014	5 SSA countries	ARDL	There is a positive and significant relationship between FDI and economic growth Burkina Faso

Notes: POLS – Panel ordinary least squares; LA-VAR – Lag augmented vector autoregressive model; ADRL – Autoregressive distributive lag model; PMG – Pooled Mean group; FE – Fixed effects, SUR-WLS – Seemingly Unrelated Regression weighted least squares; GMM – Generalized Method of Moments.

4. Empirical framework

The theoretical model used in this study draws heavily from the growth model specified in De Mello (1997), Bosworth and Collins (1999), Ramirez (2000) and Akinlo (2004). In the model FDI is incorporated as externality within the following production function:

$$Y_t = A_f \{(\lambda L), K_p, \Xi\} = A_f (H^z) = A_t (\lambda L)^{\alpha} K_p^{\beta}, \Xi^{1-\alpha-\beta}, \qquad \alpha + \beta < 1 \qquad (1)$$

Where Y_t is real output, A is the efficiency of production, K_p is domestic capital stock, L is labour input, λ is level of human capital, α is the private capital share, β is labour share and Ξ is the externality generated by increased FDI. Denoting K_f as the foreign capital flows as well as σ and γ as the marginal and intertemporal elasticities of substitution between private domestic and foreign capital, respectively, Ξ can be expressed as by the following Cobb-Douglas function:

$$\Xi = \{(\lambda L) K_p, K_f^{\sigma}\}^{\gamma} \qquad \sigma > 0, \gamma > 0 \qquad (2)$$

And substituting equation (2) into (1) produces:

$$Y_t = A_t (\lambda L)^{\alpha} K_p^{\beta} [\{(\lambda L) K_p, K_f^{\sigma}\}\gamma\}]^{1-\alpha-\beta} \qquad (3)$$

The factoring out of regression (3) results in:

$$Y_t = A_f \{(H^z L)^{\alpha + \gamma(1- \alpha - \beta)} K_p^{\beta + \gamma(1- \alpha - \beta)} K_f^{\sigma\gamma(1- \alpha - \beta)} \quad (4)$$

And in defining $\lambda = H^z$, with H denoting a measure of educational level and z is the returns to education relative to labour input, L, the general growth accounting equation which can be derived from equation (4) is given as:

$$Gy = g_A + z(\alpha + \gamma - \alpha\gamma - \beta\gamma)g_H + (\alpha + \gamma - \alpha\gamma - \beta\gamma)g_L + (\beta + \gamma - \alpha\gamma - \beta\gamma)g_{kp} + (\sigma\gamma - \alpha\sigma\gamma - \beta\sigma\gamma)g_{kp} \quad (5)$$

And in further log-linearizing equation (5), we obtain the following empirical regression:

$$y = \beta_0 + \beta_1 k_p + \beta_2 k_f + \beta_3 h + e_t \quad (6)$$

Where β_0 is a regression intercept, the lowercase letters represent the natural logarithmic transformations of the variables and e_t is a well-behaved disturbance term. De Mello (1997), Bosworth and Collins (1999), Ramirez (2000) and Akinlo (2004) have all argued for the baseline empirical regressions can be augmented with a vector X, which denotes a vector of control variables i.e.

$$y = \beta_0 + \beta_1 k_p + \beta_2 k_f + \beta_3 h + \beta_4 X + e_t \quad (7)$$

In alignment with Barro (1991), De Long and Summers (1991), Levine and Renelt (1992), Barro and Sala-i-Martin (1995) and Sala-i-Martin (1997) popular choices for the growth control variables as found in the literature include government size (Iamsiraroj and Ulubasoglu, 2015), inflation (Lumbila, 2005), financial deepening (Akinlo, 2004), urbanization (Alguacil et al., 2011), exports (Adams, 2009) and exchange rates (Li and Lui, 2004). Equation (7) can be estimated in a straightforward manner using OLS estimates (see Sharma and Abekah (2008), Ndikumana and Verick (2009) and Adams (2009)) or Johansen (1991) vector error correction

model (VECM) (see de Mello (1997, 1999), Akinlo (2005)). As mentioned before, our study relies on the ARDL model of Peseran et al. (2001) which has gained popularity over other contending cointegration models on the premise of i) allowing for modelling of time series variables whose integration properties are either I(0) or I(1) ii) the models suitability with small sample sizes and iii) the model providing unbiased estimates of the long-run model even when some of the estimated regressors are endogenous. The ARDL representation of the equation (7) can be reformulated as:

$$\Delta y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i}\, k_{p_{t-i}} + \sum_{i=1}^{p} \alpha_{2i}\, k_{f_{t-i}} + \sum_{i=1}^{p} \alpha_{3i}\, h_{t-i} + \sum_{i=1}^{p} \delta_{4i}\, X_{t-i} + \phi_{1i} k_{p_{t-i}} + \phi_{2i} k_{f_{t-i}} + \phi_{3i} h_{t-i} + \phi_{4i} X_{t-i} + + \xi_t \quad (8)$$

Where Δ is a first difference operator, δ_0 is the intercept term, the parameters $\alpha_1, \ldots, \alpha_4$ and $\phi_1, \ldots, \phi_4$ are the short-run and long-run elasticities, respectively, and ξ_t is a well-behaved error term. From equation (8), the bounds test for cointegration can be implemented straightforward by testing the null hypothesis of no cointegration (i.e. $\phi_1 = \phi_2 = \phi_3 = \phi_4 = \phi_5 = \phi_6 = 0$), which is tested against the alternative hypothesis of ARDL cointegration effects (i.e. $\phi_1 \neq \phi_2 \neq \phi_3 \neq \phi_4 \neq \phi_5 \neq \phi_6 \neq 0$). There cointegration test is evaluated via a F-statistic, of which the null hypothesis of ARDL cointegration effects are rejected if the computed F-statistic exceeds the upper critical bound and cannot be rejected if the F-statistics is less than the lower critical bound level. However, if the F-statistic falls between the upper and lower critical bound, then the cointegration tests are deemed as inconclusive. Once cointegration effects are validated, then the following unrestricted error correction model (UECM) representation of the ARDL regression (8) can be modelled as follows:

$$\Delta y_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i}\, k_{p_{t-i}} + \sum_{i=1}^{p} \alpha_{2i}\, k_{f_{t-i}} + \sum_{i=1}^{p} \alpha_{3i}\, h_{t-i} + \sum_{i=1}^{p} \alpha_{4i}\, X_{t-i} + + \eta\, ect_{t-i} + \xi_t \quad (9)$$

Where ect_{t-1} is the error correction term which measures the speed of adjustment of the series towards steady-state equilibrium in the face of disequilibrium. Pragmatically, the error correction term should be negative and statistically significant in order for the short-run dynamic effects to translate into meaningful long-run effects.

5. Data and empirical results

5.1 Empirical data

Deriving directly from theoretical model and its augmentation of control variables, our study makes use of 8 time series variables (i.e. GDP growth, FDI, domestic investment, secondary schooling, inflation, urbanization and exports). Table 3 provides details of the time series variables used in our empirical study and particularly shows their description, their coverage period as well as their source. Table 4 presents the correlation matrix of the time series and can be easily observed all variables are positively correlated with economic growth with the sole exception of inflation. We note that these preliminaries reported in Table 4 confine to standard growth theory.

Table 3: Description of time series variables

Symbol	Time series	Coverage Period	Source
y	Annual % growth rate of GDP at market prices	1970-2016	World Bank
k_p	Gross fixed capital formation as % of GDP	1970-2016	World Bank
k_f	Foreign direct investment, net inflows as % of GDP	1970-2016	World Bank
h	Secondary school enrolment (gross %)	1970-2016	World Bank
g	General government final consumption expenditure as % of GDP	1970-2016	World Bank
π	Inflation in consumer prices (annual %)	1970-2016	World Bank
u	Urban population as % of total population	1970-2016	World Bank

x	Exports of goods and services as % of GDP	1970-2016	World Bank

Note: All employed time series have been transformed into their natural logarithms for empirical purposes.

Table 4: correlation matrix

Time series	y	k_d	k_f	h	g	π	f	u	x
y	1								
k_d	0.35	1							
k_f	0.13	0.69	1						
h	0.24	0.70	0.79	1					
g	0.19	0.43	0.37	0.66	1				
π	-0.17	-0.04	-0.10	-0.28	-0.25	1			
f	0.12	0.42	0.61	0.69	0.37	-0.12	1		
u	0.28	0.64	0.69	0.97	0.78	-0.32	0.62	1	
x	0.14	0.71	0.85	0.86	0.50	-0.18	0.72	0.80	1

5.2 Unit root tests

Even though unit root testing is not a pre-condition for the implementation of the ARDL model, we take caution in ensuring that none of the time series is integrated of order higher than I(1). Table 4 presents the empirical results of the DF-GLS (Elliot et al. 1996) and the Ng-Perron (Ng and Perron, 1996, 2001) unit root tests performed on the first differences of the time series. We avoid the use of popular, conventional unit root testing procedures such as the ADF (i.e. Dickey and Fuller, 1979), PP (i.e. Philips and Perron, 1988) and KPSS (i.e. Kwiatkowski et al., 1992) since it is well acknowledged that these traditional testing procedures exhibit lower power in distinguishing between unit root processes and close-to-unit root behaviour and further suffer from unfavourable small sample size properties. The tests presented by Elliot et al. (1996) and Ng and Perron (1996, 2001) circumvent these criticisms and are based on local de-trending techniques which display good power properties in small samples. This latter point is relevant for each of our series which only consists of 37 observations.

To implement the aforementioned tests it is imperative to select an appropriate lag length for the 'autoregressive trunculation' which are included to soak up possible serial correlation in the errors of the testing regressions. Ng and Perron (1995, 2001) suggest the use of a modified Akaike Information criterion (MAIC) in determining the optimal lag. In our study,

we apply this principle by setting a maximum of 9 lags on the test regression and trim down until lag 0. Our optimal lag is selected as that which minimizes the MAIC values. Panel A of Table 5 reports the findings from these 'modified' tests performed with only a drift on our series whereas Panel B does so for the tests performed with both a drift and intercept. As can be observed from Table 5, there is overwhelming evidence rejecting the unit root hypothesis for the employed time series in their first differences which the exception of the results obtained from the DF-GLS test performed with a drift on GDP, urbanization and exports as well as the DF-GLS test performed with both a drift and trend on domestic investment and urbanization. Against this evidence, we proceed to model and estimate our empirical ARDL regressions.

Table 5: Unit root tests on the first differences of the time series

	DF-GLS	MZa	MZt	MSB	MPT
Panel A: drift					
y	0.91	-38.49***	-4.38***	0.11***	-38.49***
	[6]	[1]	[1]	[1]	[1]
k_d	-0.59***	-21.58***	-3.25***	0.15***	1.25***
	[8]	[0]	[0]	[0]	[0]
k_f	-10.26***	-34.48***	-4.15***	0.12***	0.72***
	[0]	[1]	[1]	[1]	[1]
h	-3.45	-14.16***	-2.66***	0.18**	1.73***
	[0]	[0]	[0]	[0]	[0]
g	-7.66***	-45.13***	-4.75***	0.11***	0.54***
	[0]	[1]	[1]	[1]	[1]
π	-14.39***	-26.40***	-3.63***	0.14***	0.93***
	[0]	[1]	[1]	[1]	[1]
f	-3.06***	-19.97***	-3.16***	0.16***	1.24***
	[2]	[0]	[0]	[0]	[0]
u	-0.88	-33.09***	-4.07***	0.12***	0.74***
	[2]	[1]	[1]	[1]	[1]
x	-1.18	-21.74***	-3.29***	0.15***	1.13***
	[6]	[0]	[0]	[0]	[0]
Panel B: drift and trend					
y	-12.13***	-44.85***	-4.73***	0.11***	2.05***
	[0]	[1]	[1]	[1]	[1]
k_d	-1.51	-21.70***	-3.29***	0.15**	4.20**
	[8]	[0]	[0]	[0]	[0]
k_f	-10.27***	-34.62***	-4.16***	0.12***	2.64***
	[0]	[1]	[1]	[1]	[1]
h	-4.34***	-16.28***	-2.85*	0.17*	5.63**
	[0]	[0]	[0]	[0]	[0]
g	-7.72***	-46.62***	-4.82***	0.10***	1.96***
	[0]	[1]	[1]	[1]	[1]
π	-14.42***	-26.64***	-3.65***	0.14***	3.42***
	[0]	[1]	[1]	[1]	[1]
f	-4.75***	-20.19***	-3.17***	0.16***	4.56***
	[0]	[0]	[0]	[0]	[0]
u	-3.86	-33.52***	-4.09***	0.12***	2.72***
	[0]	[1]	[1]	[1]	[1]
x	-6.08***	-21.88***	-3.30***	0.15***	4.20***
	[0]	[0]	[0]	[0]	[0]

Notes: "***', '**', '*' denote the 1%, 5% and 10% critical levels, respectively. Optimal lag length as determined by the modified AIC reported in [].

5.3 Cointegration tests

We begin our modelling process of the ARDL models by choosing the appropriate lag length for each estimated regressions. This is achieved by finding the ARDL regression which minimizes the Schwarz's criterion (SC). Note that we have a total of 7 estimated regressions, the first being the log-linear baseline growth model as represented in equation (6), the second to the sixth equations being the baseline model inclusive of one control variable and the last equation being the baseline model inclusive of all control variables. The optimal lag lengths for each obtained for each of our regressions is reported in second column of Table 5 and all regressions indicate an optimal lag length of 1 on the dependent variable and 0 lags being optimal for all intendent variables. This finding is plausible considering the short-sample of time series. The corresponding bounds test for cointegration for the ARDL regressions are reported in the third column of Table 6. As can be observed, all produced F-statistics exceed their respective 1 percent upper bound critical levels hence strongly rejecting the null hypothesis of no ARDL cointegration effects.

Table 6: Bounds test for cointegration tests

function	Equation No.	Lag selection	Test statistics	Critical values					
				10%		5%		1%	
				I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
$f(y\sim k_f, k_d, h)$	1	(1,0,0,0)	17.17***	2.72	3.77	3.23	4.35	4.29	5.61
$f(y\sim k_f, k_d, h, g)$	2	(1,0,0,0,0)	13.96***	2.45	3.52	2.86	4.01	3.74	5.06
$f(y\sim k_f, k_d, h, \pi)$	3	(1,0,0,0,0)	13.43***	2.45	3.52	2.86	4.01	3.74	5.06
$f(y\sim k_f, k_d, h, f)$	4	(1,0,0,0,0)	13.37***	2.45	3.52	2.86	4.01	3.74	5.06
$f(y\sim k_f, k_d, h, u)$	5	(1,0,0,0,0)	14.71***	2.45	3.52	2.86	4.01	3.74	5.06
$f(y\sim k_f, k_d, h, x)$	6	(1,0,0,0,0)	13.49***	2.45	3.52	2.86	4.01	3.74	5.06
$f(y\sim k_f, k_d, h, g, \pi, f, u, x)$	7	(1,0,0,0,0,0,0,0,0)	7.33***	1.95	3.06	2.22	3.39	2.79	4.10

Notes: "***', '**', '*' denote the 1%, 5% and 10% critical levels, respectively.

5.4 Regression results

Having confirmed bounds cointegration effects for our regressions, we now present the empirical estimates of our six empirical regressions in Table 7 whereas the associated diagnostic tests are found in Table 8. In referring to the long-run estimates reported in Panel A of Table 7, we find statistically significant coefficients on the investment variable across the six estimated regressions. This finding is evidently consistent with traditional growth theory which views capital accumulation as the engine of dynamic economic growth. However, in turning to our main growth determinant, the FDI variable, we observe negative and statistically significant coefficient estimates in equation (1), equation (2) and equation (5) whereas in the remaining regressions the FDI coefficient either produces a negative and insignificant estimates (i.e. equations (3), (4) and (7)) or a negative and insignificant estimates (i.e. equation (6)). Clearly, these latter results oppose those of conventional thinking and yet are in line with those previously presented by Ndambendia and Njoupouognigni (2010), Seyoum et al. (2014) and Tomi (2015), for similar West African data.

Other findings which are at odds with conventional growth theory include the insignificant coefficient estimates on the government expenditure variable (i.e. equation (2)), the inflation variable (i.e. equation (3)), the financial deepening variable (i.e. equation (4) as well as the urbanization variable (i.e. equation 5). We also observe insignificant coefficient estimates on the schooling time series in most regressions (i.e. equations (1), (2), (3), (4), (5), and (7)) except for equation 6, where the schooling variable produces the theoretically correct positive and statistically significant estimate. Note, that these findings are in line with those found in previous literature of Adams (2009) as well as Gui-Diby (2014). Encouragingly enough, we able to establish a positive and statistically significant coefficient estimate on the exports variable (i.e. equation (6) and (7)), which we note is in accordance with traditional growth theory as well as previous empirical evidence presented by Adams (2009), Seyoum et al. (2015) and Ndiaye and Xu (2016). We finally note that the short-run estimates reported in panel B of Table 6 seemingly mirror those of the long-run in Panel A in terms of the sign and significance of the coefficient estimates whereas all error correction terms, from equation (1)

to (7) produce a correct negative and statistically significant value implying equilibrium correction behaviour in the face of an exogenous shock to the series.

Table 7: Empirical regression estimates (dependent variable: y)

	1	2	3	4	5	6	7
Panel A: Long-run							
k_d	0.24*	0.24*	0.26*	0.25*	0.24*	0.27**	0.31**
	(0.06)	(0.09)	(0.05)	(0.07)	(0.08)	(0.02)	(0.03)
k_f	-0.72*	-0.91*	-0.72	-0.76	-0.97*	0.11	-0.09
	(0.09)	(0.09)	(0.11)	(0.18)	(0.07)	(0.82)	(0.87)
h	0.61	1.26	0.47	0.58	-1.02	1.03**	-0.87
	(0.16)	(0.26)	(0.38)	(0.26)	(0.66)	(0.01)	(0.78)
g		-0.11					-0.03
		(0.52)					(0.86)
π			-0.04				-0.03
			(0.50)				(0.48)
f				0.02			0.11
				(0.88)			(0.41)
u					0.25		0.29
					(0.48)		(0.45)
x						0.22*	0.32**
						(0.03)	(0.03)
Panel B: Short-run							
k_d	0.31*	0.31*	0.33*	0.31*	0.30*	0.36**	0.42**
	(0.05)	(0.08)	(0.04)	(0.07)	(0.08)	(0.01)	(0.03)
k_f	-0.91*	-1.15*	-0.89*	-0.97	-1.22*	0.15	-0.12
	(0.08)	(0.08)	(0.09)	(0.17)	(0.07)	(0.82)	(0.87)
h	0.77	1.58	0.59	0.73	-1.29	1.37**	-1.18
	(0.15)	(0.26)	(0.38)	(0.25)	(0.67)	(0.01)	(0.79)
g		-0.14					-0.04
		(0.52)					(0.86)
π			-0.05				-0.05
			(0.49)				(0.47)
f				0.02			0.15
				(0.88)			(0.40)
u					0.31		0.40
					(0.49)		(0.46)
x						0.29**	0.44*
						(0.03)	(0.03)
Ect(-1)	-1.26***	-1.25***	-1.25***	-1.26***	-1.26***	-1.33***	-1.36
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)***
R^2	0.23	0.24	0.24	0.23	0.24	0.28	0.34

Notes: '***', '**', '*' denote the 1%, 5% and 10% critical levels, respectively.

5.5 Sensitivity analysis

In this subsection of the paper, we present a sensitivity analysis with the following modifications being made to our original estimated regressions. Firstly, we employ a different measure of FDI, with the growth in FDI being used in place of FDI as a share in GDP. Secondly, we add a add a dummy variable corresponding to the global financial crisis period of 2007 to

2009, a period in which FDI growth was in negative figures for these three consecutive years. Thirdly, we add, a number of interactive terms within the estimated regression and these are intended to capture the interaction effects between i) fdi and domestic investment (equation (1)) ii) fdi and human capital (equation (2)) iii) fdi and government size (equation (3)) iv) fdi and financial deepening (equation (4)) v) fdi and urbanization (equation (5)) ii) fdi and exports (equation (6)). Lastly, we remove the inflation variable from all regressions as the inclusion of the time series in all regression fails to secure any significant ARDL cointegration effects.

The results of the sensitivity analysis presented in Table 8, indicate that all seven estimated regressions display significant cointegration effects between the time series as evidence from the F-statistics of the bounds tests reported in Panel A points to the null hypothesis of no cointegration null hypothesis being rejected at significance levels of at least 5 percent for equations (1) through (7). The long-run estimates reported in Panel B produce familiar positive and significant estimates on the investment variable (equations (1) – (7)) and export variables (equations (6) – (7)). We also establish two statistically significant estimates for the schooling variable, one positive (equation (6)) and the other negative (equation (7)), hence rendering the evidence as inconclusive. Moreover, the dummy variable only produces the expected negative and statistically significant estimate in regression (7), thus providing evidence on the adverse effects of the 2009 global financial collapse on the Burkina Faso economy. The remainder of the long-run coefficients (i.e. interactive terms, government size, financial deepening) are all statistically insignificant across all estimated regressions. Concerning the short-run estimates reported in Panel C, the only exceptional finding from our previous estimates is the positive and statically significant estimate on the on the interactive term between fdi and exports (i.e. equation (7)), a finding which is more in lieu with conventional theory.

Table 8: Sensitivity estimates (dependent variable: y)

	1	2	3	4	5	6	7
Panel A: Bounds test ARDL specification	(1,0,0,0,0,0)	(1,0,0,0,0,0)	(1,0,0,0,0,0)	(1,0,0,0,0,0)	(1,0,0,0,0,0)	(1,0,0,0,0,0)	(1,0,0,0,0,0)
F-statistic	9.49***	9.92***	8.40***	8.66***	8.57***	8.97***	4.34**
Panel B: Long-run							
k_d	0.28*	0.25*	0.24*	0.25*	0.29**	0.34***	0.53***
	(0.06)	(0.06)	(0.08)	(0.07)	(0.01)	(0.00)	(0.00)
k_f	-0.16	-0.52	1.34	-0.42	-2.96	-2.04	0.01
	(0.95	(0.80)	(0.77)	(0.79)	(0.20)	(0.32)	(0.98)
h	0.06	0.08	0.07	0.07	-0.35***	0.29***	-0.34
	(0.40)	(0.29)	(0.46)	(0.39)	(0.00)	(0.00)	(0.28)
g			0.04				-0.16
			(0.68)				(0.19)
f				0.04			0.13
				(0.74)			(0.25)
u					0.42***		0.70*
					(0.00)		(0.04)
x						0.49***	0.72**
						(0.00)	(0.01)
Dum	-0.38	-0.48	-0.43	-0.41	-0.35	-2.56***	-1.82
	(0.63)	(0.56)	(0.66)	(0.61)	(0.58)	(0.00)	(0.10)
fdi × k_d	-0.03						-0.40**
	(0.76)						(0.01)
fdi × h		-0.02					-0.37
		(0.81)					(0.32)
fdi × g			-0.11				-0.05
			(0.62)				(0.65)
fdi × f				-0.03			-0.09
				(0.72)			(0.43)
fdi × u					0.10		0.40
					(0.21)		(0.15)
fdi × x						0.07	0.61
						(0.35)	(0.10)
Panel C: Short-run							
k_d	0.31*	0.30*	0.27	0.35*	0.36**	0.40**	0.59***
	(0.08)	(0.07)	(0.12)	(0.04)	(0.03)	(0.01)	(0.00)
k_f	-0.49	-2.09	0.07	-3.17	-5.07*	-4.12*	-11.06
	(0.87)	(0.31)	(0.98)	(0.19)	(0.09)	(0.05)	(0.16)
h	0.03	-0.06	-0.01	-0.15	-0.62	0.46	0.96
	(0.94)	(0.89)	(0.97)	(0.75)	(0.40)	(0.28)	(0.34)
g			0.19				0.19
			(0.49)				(0.53)
f				0.03			-0.02
				(0.92)			(0.96)
u					0.84		-0.37
					(0.54)		(0.81)
x						0.97***	1.38***
						(0.00)	(0.00)
fdi × k_d	-0.02						0.41*
	(0.88)						(0.05)
fdi × h		0.06					-1.75**
		(0.54)					(0.02)
fdi × g			-0.05				-0.20
			(0.83)				(0.58)
fdi × f				0.12			0.32
				(0.34)			(0.27)
fdi × u					0.18		1.35*
					(0.15)		(0.06)
fdi × x						0.19*	1.27***
						(0.06)	(0.00)

Dum	1.49	1.18	1.22	1.28	0.61	-2.65	-2.76
	(0.51)	(0.59)	(0.58)	(0.56)	(0.77)	(0.23)	(0.23)
Ect(-1)	-1.34***	-1.32***	-1.35***	-1.32***	-1.32***	-1.39***	-1.62***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
R^2	0.21	0.21	0.22	0.22	0.29	0.32	0.51

Notes: "***', '**', '*' denote the 1%, 5% and 10% critical levels, respectively.

5.6 Diagnostic tests and stability analysis

In order to validate the estimates presented in the previous sub-section, we apply a battery of diagnostic tests to ensure that the residuals conform to the classical regression assumptions. These diagnostics include tests for normality in regression residuals, tests for serial correlation in regression errors, tests for heteroscedasticity between the errors and the regressand variables, tests for correct functional form as well as CUSUM and CUSUM of squares plots for stability of estimated regressions. The results of these test performed on our original regressions are reported in Panel A of Table 9 and indicate that all regressions conform to the classical regressions assumptions. The same can be concluded for the sensitivity analysis estimates as presented in Panel B of Table 9 with the sole exception of regression (3), in which both CUSUM and CUSUM of squares plots indicate instability of the regression at a 5 percent critical level.

Table 9: Residual diagnostics and stability analysis

Panel A: Original regressions							
Equation	1	2	3	4	5	6	7
Norm	0.53	0.32	0.40	0.15	0.23	0.29	0.49
	(0.77)	(0.85)	(0.82)	(0.93)	(0.89)	(0.87)	(0.78)
SC	0.14	1.16	1.71	1.65	1.39	1.84	2.18
	(0.87)	(0.35)	(0.16)	(0.17)	(0.26)	(0.18)	(0.13)
Het.	0.86	0.70	0.75	0.28	1.22	1.58	1.48
	(0.47)	(0.41)	(0.39)	(0.60)	(0.32)	(0.18)	(0.21)
FF	0.95	0.02	0.25	0.42	0.15	0.70	0.52
	(0.35)	(0.98)	(0.80)	(0.68)	(0.898)	(0.49)	(0.61)
CUSUM	S	S	S	S	S	S	S
CUSUMSQ	S	S	S	S	S	S	S
Panel B: Sensitivity regressions							
Equation	1	2	3	4	5	6	7
Norm	0.88	0.76	0.68	0.04	1.39	0.76	2.13
	(0.64)	(0.68)	(0.71)	(0.98)	(0.50)	(0.68)	(0.35)
SC	0.53	0.77	1.09	0.79	0.02	0.60	1.14
	(0.78)	(0.60)	(0.39)	(0.60)	(0.96)	(0.75)	(0.34)
Het.	0.81	0.71	0.73	0.74	0.61	0.74	0.51
	(0.37)	(0.41)	(0.40)	(0.40)	(0.74)	(0.40)	(0.91)

FF	0.54	0.71	0.36	0.42	0.11	0.57	1.59
	(0.60)	(0.49)	(0.72)	(0.68)	(0.91)	(0.58)	(0.12)
CUSUM	S	S	U	S	S	S	S
CUSUMSQ	S	S	U	S	S	S	S

Notes: S – stable and U – unstable

6. Discussion of results

Our empirical results obtained in the previous section presents a number of interesting phenomenon concerning the Burkina Faso. Starting with the findings from the control variables used the multivariate regressions, the common finding of a a positive investment-growth, a positive urbanization-growth as well as a positive trade-growth relationship are consistent with traditional economic theory which view domestic investment as the engine of growth (Solow; 1965; Swan 1965; Rommer 1988), urbanization as an indicator of infrastructure in communication and transportation (Barro and Salai-i-Martin, 1995; Salai-i-Martin, 1997) and trade as the 'newer' engine of growth which must exploited by developing and emerging economies to induce catch-up effects (Riedel, 1988). However, given the current global environment of falling and unstable world prices, futures income expected from exports may be undermined which may further worsen the current economic woes faced by Burkina Faso economy.

Empirical findings which are at odds with conventional economic theory include that of an insignificant government size-economic growth relationship which is contradictory to Wagner's hypothesis of a positive relationship between the variables. However, Adam and Klobodu (2017) have established similar negative government size-growth relationships for previous FDI-growth studies for West African countries. Notably the nonlinear dynamics of the government size-growth relationship, as advocated by Barro (1990), Armey (1995), Rahn and Fox (1996) and Scully (1995) may explain this phenomenon as the economy may have crossed the threshold at which government spending is useful to economic prosperity. Other aspects such as corruption and inefficient use of government funds may contribute to this finding of government size being insignificant for economic growth (Armantier and Boly, 2013).

The insignificant relationship found between inflation and economic growth is reminiscent of the 'superneutrality hypothesis of money' in which monetary policy action can only affect nominal variables such as inflation and money supply without influencing real variable such as capital accumulation and economic growth (Sidrauski, 1967). Henceforth, the country's affiliation with the West African, Economic and Monetary Union (WAEMU) which ensure a financial stable environment, cannot solely guarantee an environment conducive for economic growth. Other unconventional findings include insignificant effects of school attainment and financial deepening towards the growth of the economy and these are opposing to existing theoretical and empirical propositions (Schumpter 1912; Barro (1991); De Long and Summers (1991); Levine and Renelt (1992)). We attribute this irregularities to deeper socio-structural imbalances existing within the Burkina Faso economy.

In the same vein, the insignificant relationship found between our primary growth explanatory variable, FDI, and economic growth, is contrary to the traditional economy belief and its low impact may be attributed to its historic low share in GDP. In turn, low FDI levels may be attributed to low investor confidence in Burkina Faso amidst her legacy of severe political instability which is easily observable from the number of coups experienced by the country over the last couple of decades. The positive and significant interaction between FDI and exports in promoting short-run economic growth, reflects the importance in which the available external financial inflows contribute towards enhancing export-oriented growth for products such as cotton and cereals. Nevertheless, the spillover effects of FDI towards technological infrastructure, as it's interaction with urbanization, as well as enhanced human development, as reflected with FDI's interaction with schooling attainment, are virtually non-existent over both the short and long-run. Moreover, that lack of interaction between FDI and government size may also indicate the inefficiency of fiscal structure and expenditure towards infrastructure projects conducive for attracting FDI. Altogether, we believe that our results resonate from the country's legacy of political instability and resulting low investor's confidence and willingness to invest in the economy.

7. Conclusion

The main objective of the study was to examine the short-run and long-run cointegration relationship between FDI and Economic growth in Burkina Faso using time series spanning between 1970 and 2016 applied to the ARDL model of Peseran et al. (2001). Our estimate empirical model is directly derived from endogenous growth setting in which FDI may exert direct as well as indirect, spillover effects on steady-state growth via human capital development, enhanced domestic investment, increased government spending mainly in infrastructure as well as through technology advancements reflected in higher urbanization and export production. Whilst we are unable to find any significant effects of FDI on growth over the long-run, we are, however, able to establish positive interactive effects of FDI on export size towards economic growth over the short-run.

The general lack of a finding of significant effects of FDI on long-run economic growth in Burkina Faso reflects the historically low share of FDI in economic growth caused by previous policies of nonalignment with western countries. Another contributing factor to these findings is the lack of investor confidence due to decades of political instability reflecting in the numerous coups in Burkina Faso. And in considering the advent of the most recent coup attempts and terrorist bombings in 2015, the confidence of potential foreign investors is most likely to be further dampened. Domestic authorities should thus be primarily concerned with implementing policies and socio-economic strategies aimed at enhancing a politically stable environment as a means of securing international confidence in the country.

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