

# FDI and Economic Growth: Revisiting the Role of Energy Consumption and Financial Development

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## Abstract

**Purpose:** Foreign direct investment (FDI) is one of the driving forces highlighted in the literature that have a significant impact on economic growth, although its significance in the context of Yemen is relatively unclear. Hence, the aim of this study is to investigate the cointegration and short run relationship between FDI and its determinants especially energy consumption and financial development in Yemen.

**Design/methodology/approach:** This study utilises a semi-annual time series data from 1990 to 2014. The Autoregressive Distributed Lag (ARDL) method was used to explore the cointegration of FDI with its determinants in Yemen.

**Findings:** The results showed that the cointegration relationship between FDI, energy consumption, real GDP growth, financial development, exchange rates, exports and inflation rates has been upheld in Yemen, with a significant positive effect of energy consumption and economic growth on FDI. In contrast, financial development was shown to have a significant but negative long run relationship with FDI.

**Research limitations/implications:** The lack of data availability for Yemen has led to the exclusion of some of the critical variables that could have contributed significantly to the results of the study i.e. interest rate and gross debt.

**Practical implications:** The proposed methodology might be a valuable practical tool for policy makers in Yemen or business stakeholder through their decision process to invest in this country in the future.

**Originality/value:** Currently, no studies yet done in Yemen that analyse the cointegration between FDI with energy consumption and financial development. The findings from this study can optimistically leading to a more detailed conclusion and contributing to the literature in the field of FDI.

**Keywords:** Foreign direct investment; economic growth; energy consumption; financial development; ARDL

## Introduction

Foreign direct investment (FDI) inflows provide the host countries with many economic benefits, such as an increased in foreign exchange, technology transfer, employment growth, balance of payments

improvement and much more (Musibah et al., 2015). FDI is a form of investment in which the ownership of a business in one country is controlled by a separate entity or organisation that is based in another country. FDI is also associated to other economic variables such as the exchange rate, inflation, financial development, energy consumption, and economic growth. FDI inflows promote technological progress by integrating international capital, technology transfer, management skills and human capital growth into a more dynamic market environment, which in turn promotes higher productivity levels (Singhania and Gupta, 2011; Asiedu, 2002; Caves, 1996; Dunning, 1993). More significantly, FDI plays a substantial role in improving the economic development, particularly in developing countries with limited resources and lack of capital investments.

Most countries have changed their liberalisation policies in recent years to attract foreign investment by reducing their restrictive trade policies (Goswami and Haider, 2014). Evidently, FDI generates the much-needed resources, develops management abilities, implements innovative marketing strategies, and offers access to up-to-date technologies as well as contacts around the world. These reforms are needed to achieve global strategic objectives while reacting to market opportunities through the Multinational Enterprises (MNEs) investment in foreign countries.

To date, there are many barriers to the economic growth in Yemen. The political instability in this country is an ongoing conflict that took place as a result of the dispute between the Saudi-led coalition that supports the internationally recognised government of Yemen and the Iran-backed Houthi movement. In addition, since 2014, Yemen has been highly dependent on oil supplies as its principal source of revenue. Consequently, any reduction in oil revenues due to growing geopolitical tensions in this country would trigger a macroeconomic imbalance. For example, a negative effect on oil prices greatly affected the country's revenue through energy exports in 2014 as earnings from oil and gas sector accounted for around 25% of GDP and 65% of national income. A decline in oil exports would thus adversely affect this country's economic output.

The World Bank has estimated oil output would no longer contribute any revenue to the economic income of Yemen by 2017. The Yemeni government is thus faced with the possibility of an economic tragedy and will be forced to take urgent and critical measures to avoid this. Furthermore, Yemen also currently faces many socioeconomic challenges such as a rise in poverty, rapid population growth and growing unemployment levels. Thus, these problems involve structural changes in government policies to help the Yemen economy cope with potential economic effects.

FDI is considered to be one of the most effective investment tools to support economic growth in a region. Consequently, successive Yemeni governments have mobilised the resources of the nation to develop, construct and expand the economic facilities in order to promote and create a competitive economic environment in Yemen (Almsafir et al., 2011). These initiatives were explicitly planned to draw FDI from other neighbouring Arab countries, as well as foreign capital inflows from international countries.

FDI inflows to Yemen's GDP remained below 5 per cent until 2015 (World Bank, 2017), after which a surge was reported. But economic growth remained low despite the rise in FDI over that time. Hence, the low economic growth situation in Yemen requires an evaluation from the perspective of FDI inflows, in relation to other relevant macroeconomic variables. Moreover, it is widely believed that for an economy to diversify from crude natural resources, FDI is necessary as it acts as a moderating factor, in relation to other economic variables such as exchange rates, inflation, financial development, and domestic energy consumption.

On the other hand, there are very limited study measuring the effect of FDI and its determinants in Yemen as this country is listed under the least developing country and very limited data available for this country. For example, many literatures on FDI and its determinations studies was done in Gulf countries such as by Al Rashid and Al-Shammari, (2017) and Mishrif and Balushi (2017) and amongst others, Yemen has been excluded from those researches.

Only one study investigated the impact of foreign investment in Yemen that was done by Musibah et al. (2015). They discovered that the political stability plays a significant role among other determinants of foreign investment in Yemen. In addition, exchange rate and gross national income nexus are influenced by the level of political system stability of Yemen. Thus, the present study, taking into account this limitation and several variables, such as energy consumption, exchange rate, inflation, trade openness and financial development, will be examined in order to produce a more comprehensive study in Yemen.

Therefore, the aim of this study is to investigate the relationship between FDI and its determinants, namely energy consumption, exchange rate, inflation, trade openness and financial growth, using a robust approach that integrates both long run and short run models within the same framework. The findings of this study are hoped to contribute to a better understanding of the relationship between FDI and its determinants in Yemen.

The organization of this study can be divided into a few sections. Section 1 is the introduction part. Section 2 describes the past literatures. Section 3 explains the research methodology. Section 4 discusses the findings and Section 5 is the conclusion.

## **Literature Review**

### ***Linkage between FDI and economic growth***

In principle, FDI has been shown to successfully improve host countries' economic growth through technology transfer and diffusion (Dimelis and Sophia, 2005), positive spillover effects and increase in labour productivity (Lee, 2013; Girma, 2005). FDI also facilitates the creation of an international networking system that allows national goods to be transported across the borders. To date, various effects and government policies regarding FDI have been investigated in several studies (Völlmecke et al., 2016; Wang and Wu, 2016).

Meanwhile, over the last two decades, FDI has become increasingly vital to economic development in many developing countries (Khan and Mehboob, 2014). Freckleton et al. (2012) argued that FDI can foster economic growth and this can be driven by the assimilative potential of the country, which depends on factors such as the quality of the labor force and the infrastructure, the development of financial sectors and innovation through technology advancement. In addition, the initial scholars namely Barro and Sala-i-Martin (1995), Grossman and Helpman (1994) and Hermes and Lensink (2003), have verified that FDI plays a pivotal role in revolutionising the host countries' economies, especially in developing countries.

Gunby et al. (2017) performed a meta-analysis that measured the relationship between FDI and economic growth in China. Their findings suggested that FDI had a significant, positive impact on China's economic growth. However, their finding showed the effect of FDI on Chinese economic growth is much smaller than expected. Shi (2015) studied the underlying relationship between the FDI and the economic development in the province of Gansu in China, using data from 1986 to 2010. This study failed to show FDI have any causality with economic growth. Thus, it showed that some studies had exaggerated the positive influence of the FDI on economic development.

Additionally, Alshehry (2015) assessed the relationship between FDI and economic growth in Saudi Arabia using data from 1970 to 2012. The results indicated the existence of a causality between FDI inflows, domestic capital spending, economic growth, and trade openness suggested that FDI inflows supported both Saudi Arabia's short and long-term economic growth.

#### ***Linkages between FDI and energy consumption***

The relationship between energy use and FDI was also scrutinized by several researchers. Amri (2016) for example, observed the relationship between energy consumption, FDI inflows and production in 75 countries from 1990 to 2010 that included developed and developing countries. The results of this study showed a bi-directional correlation in developed countries between primary energy, renewable energy use and FDI. Nevertheless, from international inflows to primary energy and renewable energy consumption a uni-directional connection was observed in all countries.

Dinh and Shih-Mo (2014) assessed the relationship between energy use, FDI and economic growth in Vietnam between 1980 to 2010. The results of the co-integration and Granger causality test showed a dynamic relationship between CO<sub>2</sub> emissions, energy usage, FDI and economic development. Similarly, Hamdi et al. (2014) investigated the relationship between electricity use, FDI, resources, labour and economic growth for the Kingdom of Bahrain from 1980 to 2010 and demonstrated the presence of a long-term relationship between all variables. Meanwhile, Zhu et al. (2016) highlighted the effect of FDI and energy use on carbon emissions in five countries of the Association of South East Asian Nations (ASEAN-5) made up of Indonesia, Malaysia, the Philippines, Singapore and Thailand. The authors used a panel quantile regression model in this study which accounted for non-observed individual heterogeneity and distributional heterogeneity, in which energy consumption was shown to increase carbon emissions, with the strongest impact occurring at a higher quantile.

#### ***Linkages between FDI and financial development***

To a certain degree, the creation of an internal financial structure determines the extent to which domestic companies would be able to pursue their investment plans that would required external financial support from banks or stock markets. Moreover, the financial sector's growth also affects the efficiency of the financial resources allocated for investment. The relationship between FDI inflows and financial development has been the subject of recent empirical studies, indicating that a stable financial sector attracts foreign investors to invest while encouraging sustainable projects that will ultimately lead to economic growth (Bekhet and Al-Smadi, 2015). The long-term and short-term relationships between FDI inflows and financial development have been developed by this study using different types of time series model.

A similar research was performed by Rjoub et al. (2017) using a panel data analysis for sub-Saharan African countries from 1995 to 2013, in which a positive relationship was found between market size (a financial development indicator) and FDI.

The interactions between foreign capital inflows, which include FDI inflows, foreign equity investments, and financial growth in Central and Eastern European countries from 1996 to 2015, were explored in another study by Bayar and Gavriletea (2018). The study showed that in the short term there has been a uni-directional causality from financial growth to FDI inflows. Likewise, Fauzel (2016) used a panel vector autoregressive model (PVAR) to investigate the relationship between FDI and financial growth in small island economies, in which both endogeneity and dynamism were assessed from 1990 to 2013. It was noted that

FDI in the small island economies could potentially become a significant tool for developing the financial markets.

### ***Linkages between FDI and real exchange rate***

Theoretically, the influence of the exchange rate on FDI is uncertain and relies primarily on foreign investors' provision. A depreciation of the exchange rate of the host country would result in lower local asset prices and production costs, which will in turn generate higher FDI inflows. In addition, corporations are reluctant to invest in countries with weaker currencies because they are valuable to exchange rate threats. On the other hand, because of a lack of exchange supply, an increase in the exchange rate could inadvertently lead to a rise in FDI inflows. Previous research on the effect of exchange rates on FDI inflows, however, has shown mixed outcomes. Liu et al. (2017) investigated the effect of the exchange rate on China's FDI, using the GMM approach to evaluate panel data for 34 developing Asian countries from 2003 to 2013. Results have shown that China's FDI had a significant positive association with exchange rate among developing Asian countries. However, in the long run, the rise in the exchange rate did not constitute a vital incentive among developing Asian countries for Chinese FDI. Furthermore, Khandare (2016) studied the effect of the exchange rate on FDI in India and China by using the regression analysis. A positive correlation between FDI and the Indian exchange rate exists in this analysis, while a negative correlation was observed for China.

While many studies have shown the causality between the exchange rate and FDI, some researchers have not, however, identified significant associations between these factors. For example, Boahen and Evans (2014) used a VAR model to study the impact of the exchange rate on FDI in Ghana, and demonstrated that the relationship between these factors was statistically insignificant. Similarly, in Ghana, Emmanue and Luther (2014) conducted a causality analysis of the FDI and exchange rate volatility and found no significant relationship. A panel data analysis of 56 developed and developing countries from 1995 through 2012 (country and industry level) was employed in a separate study by Deseatnicov and Akiba (2016). The study's main findings indicated that the exchange rate and political risks in developing countries are less likely to be tolerated by Japanese Multinational Companies (MNCs). In developed countries, however, they were willing to tolerate these risks provided the initial stability level was greater than their essential needs.

### ***Linkages between FDI and inflation***

As regards the relationship between inflation and FDI, Rahman (2015) looked at the relationship between FDI and its impact on selected macroeconomic indicators in Bangladesh from 1999 to 2013, such as the gross domestic product, inflation rate and trade balance. The results showed a strong positive correlation between FDI and inflation rate, showing that FDI was associated with an increase in inflation rate. As mentioned above, high inflation rates were thought to reduce people's purchasing power and, therefore, to be responsible for economic stagnation.

On the other hand, Bekhet and Al-Smadi (2015) suggested that an increase in the inflation rate in Jordan, as expressed by the CPI, would result in a decrease in inward FDI in the host country. Meanwhile, Valli and Masih (2014) looked at the relationship between inflation levels in South Africa by using a time series data analysis on annual datasets from 1970 to 2012. The results showed that there was an inverse long-term association between inflation levels and South African FDI inflows. Consequently, an increase in the level of inflation was thought to have a negative effect on South Africa's amount of FDI inflows.

### ***Linkages between FDI and trade openness***

It is widely understood that the openness of trade in a country contributes to trade liberalisation. For example, when a nation opens its markets to foreign trade, trade barriers such as tariffs and rations are often reduced. This increases the specialisation and division of labour, and results in not only the enhancement of export capability and productivity but economic development as well.

Tampakoudis et al. (2017) studied the impact of some determinants on FDI inflows to middle-income countries using panel data analysis and found a major effect of trade openness, GDP and population growth on FDI inflows.

By using the Generalized Moment Method (GMM) study from 1972 to 2010, Zakaria et al. (2014) also assessed the effect of trade openness on FDI in Pakistan and found a strong positive correlation between trade openness and FDI. Likewise, Demirhan and Masca (2008) studied the determinants of FDI in 38 developing countries from 2000 to 2004 and demonstrated that trade openness had a positive and important relationship with FDI, indicating the willingness of countries to consider foreign investment. A further research by Mangir et al. (2012) found a two-way causality between trade openness and FDI in Poland as opposed to the one-way causality observed in Turkey.

### **Methodology**

In this research, time series analysis and semi-annual time series data were used for the period between 1990 and 2014. The data was collected from the World Bank and the Yemen Central Bank database.

### ***Theoretical framework and model specification***

There are distinct theories in international trade that illuminate the root and importance of FDI and how it relates to macroeconomic results. There were also some attempts by economists to provide general explanations on the activities of international companies due to the increasing focus on evaluating the importance of FDI in the 1970s; and mainly concentrated on the subject of the theory of internalisation (Dunning, 1993).

In addition, internalisation (location) has been recognised by Vernon (1979), Dunning (1980, 1988, 1998), Cleeve et al. (2015) and Nardali (2017) as a way for countries to benefit from both comparative and absolute cost advantages for economic growth and development.

On the other hand, Dunning (1995) originated the Dunning eclectic paradigm method, also known as the paradigm of ownership, place, and internalisation (OLI), which was also derived from Dunning's frustration with the existing theory of international production and the absence of a systematic model to apply it to either trade or other modes of transfer of resources, as well as to justify it. This theory helps to understand why businesses chose to participate in FDI, and to highlight the various ways of foreign production and the selection of an acceptable one.

Meanwhile, in response to the dynamics of investment in the era of globalisation, research on the theoretical context and empirical study on the relationship between FDIs and their determinants has received considerable attention. Tsai (1994) and Dees (1998) were among the first researchers to investigate FDI and its determinants, and they discovered that market size and labour costs played an important role in attracting FDI. Hasli et al. (2016) analysed by applying (OLS) Regression Analysis from 1980 to 2011, the effect of macroeconomic characteristics and country-specific factors on FDI of the following three countries: China, Singapore, and Malaysia. The study found that the inflow of FDI was influenced by unemployment, infrastructure, financial capital, and stock market results. Meanwhile, by using a panel data study for fifteen (15) middle-income countries, Tampakoudis et al. (2017)

examined the impacts of several determinants on middle-income countries' FDI inflows. The findings highlighted the importance of trade openness, GDP and population growth on inward FDIs.

For the modelling of relationships between FDI and its determinants the proposed equation is represented in Equation 1.

$$\Delta LI_t = \alpha_i + \beta_1 LY_t + \beta_2 LE_t + \beta_3 LEX_t + \beta_4 LO_t + \beta_5 LF_t + \beta_6 P_t + \varepsilon_t \quad (1)$$

where

*LI*: natural log of foreign direct investment

*LY*: natural log of gross domestic products

*LE*: natural log of energy consumption

*LX*: natural log of exchange rate

*LO*: natural log of trade openness

*LF*: natural log of financial development

*LP*: natural log of inflation

The variables were converted to natural logs to calculate the elasticity of the independent variables into dependent variables for the relationship model to be meaningful and consistent. This approach was also important for proving the stationary mechanism and reducing problems with heteroscedasticity and autocorrelation (Narayan and Smyth, 2005).

The ARDLs model for the relationship between FDI and its determinants is expressed in equation (2).

$$\begin{aligned} \Delta LI_t &= \alpha_1 + \beta_{11} \Delta LI_{t-j} + \beta_{12} \Delta LY_{t-j} + \beta_{13} \Delta LE_{t-j} + \beta_{14} \Delta LX_{t-j} \\ &+ \beta_{15} \Delta LO_{t-j} + \beta_{16} \Delta LF_{t-j} + \beta_{17} \Delta LP_{t-j} + \lambda_{11} LI_{t-1} + \lambda_{12} LY_{t-1} \\ &+ \lambda_{13} LE_{t-1} + \lambda_{14} LX_{t-1} + \lambda_{15} LO_{t-1} + \lambda_{16} LF_{t-1} + \lambda_{17} LP_{t-1} + \varepsilon_{1t} \end{aligned} \quad (2)$$

The hypothesis for co-integration is as follows:

$\lambda_{11} = \lambda_{12} = \lambda_{13} = \lambda_{14} = \lambda_{15} = \lambda_{16} = \lambda_{17} = 0$ , which implies no co-integration between FDI and its determinants.

$\lambda_{11} \neq \lambda_{12} \neq \lambda_{13} \neq \lambda_{14} \neq \lambda_{15} \neq \lambda_{16} \neq \lambda_{17} \neq 0$ , which implies the existence of co-integration between FDI and its determinants.

### **Bounds testing**

The ARDL model bound testing methodology by Pesaran et al. (2001) was used in this analysis to examine the long and short run relationships between FDI and its determinants in Yemen. Compared to other forms of co-integration methods, the ARDL method has many advantages (Johansen and Juselius, 1990). More significantly, when applied to a small dataset, such as the data used in this analysis, the ARDL approach provides a robust result. Regardless of the underlying regressors in the model that are either strictly I(0), I(1) or jointly co-integrated, the bounds test can also be used. In addition, the ARDL approach can be used to evaluate the existence of the short and long run relationships between the independent variables and the dependent variable simultaneously.

The bound test is based primarily on the F-statistic joint, whereby the asymptotic distribution does not comply with the null hypothesis that there is no co-integration. In this method, by estimating the equations with ordinary least squares (OLS), the first step was to obtain the F-statistic, followed by comparing the F-statistic values with the essential values tabulated by Pesaran et al. (2001) (Odhiambo, 2009). The upper bound critical values in the table indicate that the variables are integrated at first order (first difference), while the lower bound critical values assume that the variables are integrated at I(0). If the computed F-statistic is smaller than the lower bound critical value, it implies that there is no long run relationship between the variables. In addition, the findings are considered inconclusive if the computed F-statistic falls between the lower and upper bound critical values (Pesaran et al., 2001).

## Findings

### *Descriptive statistics*

Table 1 displays the results of the descriptive statistical analysis of the variables using the time series data, covering the maximum, minimum, standard deviation, mean and median values of all the variables. Meanwhile, the correlation matrix values shown in Table 2 show the strength of the relationships based on the partial Pearson correlation between the variables. On the basis of these values, only the exchange rate (LX) and the inflation rate (LP) with a value of 0.899 were closely related. The correlation matrix also showed that real GDP growth (LY) was positively associated with FDI (LI). On the other hand, there was a negative association between energy consumption (LE), financial growth (LF) and exports (LO) with FDI (LI), while the exchange rate (LX) and inflation (LP) showed a positive relationship with FDI (LI). It should be noted that the rationale for performing a correlation matrix was to evaluate the highly correlated variables amongst the independent variables to avoid serial correlation issues.

Table 1: Descriptive statistics

<i>Variables</i>	<i>Mean</i>	<i>Median</i>	<i>Standard deviation</i>	<i>Minimum</i>	<i>Maximum</i>
LY <sub>t</sub>	6.616948	6.604729	4.130676	6.487608	6.742031
LI <sub>t</sub>	0.215111	-1.51413	1.581038	-1.631199	2.822569
LF <sub>t</sub>	1.715598	1.675226	0.09531	1.10194	1.96851
LO <sub>t</sub>	8.354178	8.17037	8.042748	6.414278	9.287301
LX <sub>t</sub>	4.936558	5.148366	4.35863	2.48574	5.391762
LE <sub>t</sub>	4.250778	4.266335	2.03862	4.065431	4.481533
LP <sub>t</sub>	3.965753	3.705245	3.712108	1.345472	4.98203

Table 2: Correlation matrix

	<i>LI</i>	<i>LE</i>	<i>LX</i>	<i>LO</i>	<i>LF</i>	<i>LY</i>	<i>LP</i>
LI	1.000000						
LE	-0.600203	1.000000					
LX	0.303937	-0.727273	1.000000				
LO	-0.223608	0.835137	-0.565357	1.000000			
LF	-0.580174	-0.111703	0.307710	-0.319019	1.000000		
LY	0.154010	-0.425272	-0.139322	-0.546201	-0.034765	1.000000	
LP	0.460913	-0.768832	0.899424	-0.519310	0.271424	-0.209996	1.000000

### Stationarity analysis

A unit root test was first performed in this analysis to verify the variables' stationarity. This move was to ensure that the variables under consideration were stationary at the maximum value of the first difference I(1), as variables that were stationary at second difference were not considered as a suitable fit for the ARDL model (Pesaran et al . , 2001). A new method was also proposed by Pesaran (2001), in which the variables integrated at different levels were regressed in order to determine the stationarity of the data, either at level I(0) or at first difference I(1). To check the stationarity of the variables, two stationarity test methods, known as the Augmented Dickey-Fuller (ADF) and the Philips Peron (PP) tests, were used. As shown in Table 3, the tests showed that all the variables for both, constant and constant with trend, were stationary at first difference I(1). The ARDL method was employed on the basis of these values to estimate the long-term relationship between the variables of interest. In addition, the results in Table 3 showed that inflation (LP) was not stationary for ADF at level I(0) and first difference I(1), while stationary inflation (LP) was indicated by the PP test at the first difference.

### Co-integration analysis

The ARDL boundary test results shown in Table 4 indicate that the variables in the model were co-integrated at the significance level of 1 percent, suggesting co-integration between the FDI (LI) and its determinants. As the F-calculated value was larger than the critical F value, the variables were deemed to be co-integrated. The F-statistic value (9.0353) that was higher than the values of both the lower I(0) and the upper I(1) boundaries proposed by Narayan (2005) with 1 percent critical values of 3.656 and 5.331, respectively, validated this relationship. The presence of co-integration between FDIs and their determinants (financial growth, per capita real GDP, energy consumption, amount of exports, exchange rate and inflation) in Yemen indicates that the global relationship between FDI inflows (LIs) and independent variables has been established and the estimation of long-run coefficients can be derived.

Table 3: Unit root test results

<i>Variables</i>	<i>Constant</i>	<i>Constant with trend</i>	<i>Constant</i>	<i>Constant with trend</i>
<i>Level</i>	<i>ADF</i>		<i>PP</i>	
$LI_t$	-2.9819	-3.2100	-3.1079**	-3.0676
$LE_t$	-1.0023	-2.8270	-1.6083	-3.1022
$LX_t$	-3.6480**	-1.7602	-1.7454	-1.1169
$LO_t$	-1.1178	-3.5155*	-1.1039	-2.8462
$LD_t$	-1.6556	-2.3606	-1.6556	-2.4311
$LY_t$	-1.6752	-0.8665	-1.6883	-0.8665
$LP_t$	-1.7109	-2.9039	-4.8709***	-2.6470
<i>First difference</i>	<i>ADF</i>		<i>PP</i>	
$\Delta LI_t$	-4.9543***	-5.6386***	-6.7954***	6.7230***
$\Delta LE_t$	-7.7684***	-7.7357***	-10.1014***	-9.7775***
$\Delta LX_t$	-9.7048***	-6.3707***	-7.4972***	-7.7420***
$\Delta LO_t$	-7.2259***	-7.2085***	-7.2254***	-7.2032***
$\Delta LF_t$	-6.7843***	-6.7102***	-6.7987***	-6.7761***
$\Delta LY_t$	-6.7986***	-7.1074***	-6.7987***	7.1092***
$\Delta LP_t$	-1.7146	-2.2777	-9.8618***	11.3181***

\*\*\* indicates significance level at 1%.

Table 4: Results of co-integration among the variables (F-bounds testing with intercept)

Models	Critical bounds				Decision
	F-stat	Sig	Lower	Upper	
LI (LI/LE, LX, LO, LF, LY, LP)	9.03***	1%	3.65	5.33	Co-integration

The critical values were obtained from Table 3: Unrestricted intercept with no trend by Narayan (2005).

Significance levels are denoted as follows: \*\*\* (1%) and \* (10%).

### Long run and short run estimates

The long-run relationship between FDI (LI) and its determinants in Yemen is represented in Table 5. The coefficients for the FDI model (LI) showed at a 1 percent significance level, the long-term movement was positive and significant for energy consumption (LE), suggesting that a 1 percent rise in energy consumption (LE) in Yemen would result in a corresponding 2.02 percent increase in FDI inflow. This observation has also been demonstrated to be consistent with the theoretical provision and our initial assumption that fuel consumption will be needed for production activities in the country. Therefore, as economic activities continue to flourish in Yemen, this situation creates a conducive environment for the inflow of further investment from within and outside the region. Similarly, this outcome was also in line with the recent findings of Leitão (2015), Doytch and Narayan (2016), and Mavikela and Khobai (2018), in which these studies confirmed the presence of a long-term relation between energy consumption (LE) and inflows of FDI (LI).

Table 5: Long run and short run estimates of the selected ARDL model

Dependent variable: LFDI [ARDL (1,2,0,0,2,0,0) selected based on SBC (1)]		
Variable	Short run coefficients	Long run coefficients
Constant	-29.4	-40.7
LY <sub>t-1</sub>	2.38 (1.70)*	3.30 (1.76)*
LF <sub>t-1</sub>	-1.60 (2.65)**	-2.22 (-2.41)**
LE <sub>t</sub>	1.53 (1.30)	
LE <sub>t-1</sub>	-2.64 (-2.64)**	2.02 (2.92)***
LX <sub>t</sub>	-1.01 (-3.35)***	
LX <sub>t-1</sub>	-1.27 (-3.35)***	-0.19 (-0.88)
LO <sub>t-1</sub>	0.26 (0.79)	0.36 (0.78)
LP <sub>t-1</sub>	-0.48 (-1.55)	-0.67 (-1.45)
ECT <sub>t-1</sub>	-0.723	
Diagnostic tests		
Serial correlation $\chi^2$ (2)	0.29	
Functional form $\chi^2$ (1)	0.211	
Normality $\chi^2$ (2)	0.45	
Heteroscedasticity $\chi^2$ (1)	0.73	
Dubbin-Watson	1.50	

\*, \*\* and \*\*\* indicate significance levels at 10%, 5% and 1% respectively.

In comparison, at a 5 percent significance level, the financial development (LF) association was stated to be negative. However, this finding was not unexpected due to the security situation in Yemen in recent years, in which it was perceived that the provision of loans by

commercial banks to the private sector was very risky. Nonetheless, as the security situation gradually improves over time, economic activity will resume and, maybe, financial-sector commercial banks will be able to provide private investment loans because of the lower adverse effects.

The results also showed that the relationship between GDP growth (LY) was positive and significant at the 10 percent level, in which Mishrif and Balushi (2017) recorded a similar observation for Oman. The positive GDP (LY) coefficient indicates that a related rise in the inflow of FDI (LI) would also occur as economic activity in the country increases.

The findings in Table 5 also explain the short-run model showing the relationship between FDI inflows (LI) at various levels of significance and all the independent variables examined in this analysis. Specifically, four out of the six independent variables were shown to have significant relationship with FDI (LI), where GDP growth (LY) showed a positive relationship with FDI at 10 percent significance level. Energy consumption (LE), financial growth (LF), and exchange rate (LE), on the other hand, showed negative relationships with FDI (LI) and significant at 1%. In addition, the coefficient of the error correction term was negative (-0.72) and significant at 1%, thereby indicating that the speed of adjustment from short run disequilibrium to long run equilibrium was 72%.

According to Narayan (2005), the error correction term denotes the rate of change at which a dependent variable returns to equilibrium. The existence of stable long-run equilibrium relationships between variables is therefore suggested by higher levels of relevance in the term of error correction.

As shown in Table 5, diagnostic tests have also been conducted to ensure the model's performance and reliability. The results showed that all four measures with the following results were passed by the model:

- serial correlation test (0.29)
- normality test (0.45)
- functional form test (0.211)
- heteroskedasticity test (0.73)

### **Discussion and Conclusion**

The empiric analysis provides conclusive evidence on the long-term model, which implies that energy consumption has had a significant positive impact on FDI in Yemen, while financial development has had a negative and significant impact on FDI. In addition, GDP growth also had a positive influence on FDI, as the findings were in line with the study's expectations, as energy consumption and GDP growth contributed to higher FDI inflows in Yemen. Negative findings, however, show that the inflows of FDI into Yemen are discouraged by a rigid financial development structure. The findings of the FDI model also showed that the exchange had no major effects.

It should be noted that the financial system has a negative effect on FDI in Yemen and, thus, efforts should be made to boost the growth of the domestic financial system for mutual benefit. Financial growth is the driver for both FDI and economic growth and development. Therefore, an enhanced financial system would certainly make greater use of FDI and accelerate economic growth (Alfaro et al., 2004).

It is important to understand its effect on FDI inflows in relation to energy consumption. The results of this study and other studies have shown that strict environmental regulations can enhance energy efficiency and usage, thereby absorbing FDI inflows. This main finding indicates that, in addition to the use of productive energy resources in development, environmental initiatives should be introduced to minimise energy waste.

The positive effect on real per capita GDP observed in this study indicates that improving the domestic financial system is a major prerequisite for the positive impact of FDI on economic development.

However, it is important to note that the results of this study are also in line with the reforms implemented since the 1990s by the Yemeni government. Yemen has embarked on a series of reforms aimed at stabilizing the economy and increasing foreign investment after the unification of North and South Yemen in 1990. The reforms include the implementation of the general sales tax (GST) and the elimination of domestic subsidies for petroleum and food. To date, the IMF has also been helping to stimulate economic activities by implementing indirect monetary policy tools, such as open market operations, rediscount facilities and reserve criteria. Nevertheless, additional reforms to draw investors to Yemen are expected to be extremely important to help change the country's economic status.

In a nutshell, the effects of energy consumption, real GDP growth, financial development, exchange rates, exports and inflation rates on FDI in Yemen were investigated in this study using the ARDL bound testing approach. The results have shown that energy consumption and economic growth have a significant positive effect on FDI.

In comparison, in the long run, financial growth showed a substantial but negative relationship with FDI. It is clear that Yemen's FDI inflow has been adversely affected by the financial system and therefore needs to be systematically checked. Efforts to boost the development of the domestic financial system should be carried out for the good of the economy. Financial growth is a driver for FDI, promoting economic growth and development in turn. Therefore, to take advantage of FDI more efficiently and thus boost economic growth, an improved financial system is needed. However, the Yemeni financial system is quite inadequate, especially in terms of growing the inflow of FDI. Thus, for a vigorous FDI inflow to the economy, it is important to strengthen the current financial development mechanism through the money and capital markets. These findings are of paramount importance to policymakers in Yemen, particularly during this difficult period in which various strategies to promote FDI inflows are needed to have a positive impact on the economy of the country.

In addition, in order to gain a true understanding of financial development based on related economic theories, future research involving more countries is recommended to support the findings of this study on the financial system in Yemen, which is thought to be relatively poor and underdeveloped. In addition, future studies are needed to confirm the negative relationship found in this study between financial development and FDI. It is suggested that other time series methods such as the completely updated OLS (FMOLS) and dynamic OLS (DOLS) can also be used by future researchers to validate the results of this analysis.

In terms of methodology, it would be useful to try to use a panel of data analysis of other types and processes to make further evidence possible, especially in the case of studies on least developed countries or developing countries which, unfortunately, have not been given by this particular study. It would therefore be useful to analyse the relationship between the FDI and its determinants via the Panel Analysis Process of the Research Methodology in order to find the most robust estimation technique. More attention should be given in future studies to the use of interaction variables for the formal check on multi-collinearity between inflation and trade.

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