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INFORMAL SECTOR AND INTERNATIONAL CAPITAL MOVEMENT: NEW EVIDENCE FROM SOME PETROLEUM COUNTRIES

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Abstract. The main aim of this paper is to investigate the effect of the informal economy (IE) on foreign direct investment (FDI) in a sample of petroleum producing countries (Algeria, Norway, the Russian Federation, Saudi Arabia and United States) based on data covering the period of 1991–2018 and using the Non-linear Autoregressive Distribution Lag (NARDL) model. The NARDL model was built separately for each country in the study sample. The main finding of this study is the impact of IE size on FDI inflows in all of the countries in the study sample, even if they are all producing and exporting countries. The empirical results lead to distinguish between two sub-groups. The first sub-group consists of countries whose FDI inflows have been positively affected by positive and negative shocks in the IE. These countries are characterised by a high share of natural resources in their GDP. The second sub-group consists of countries whose inward FDI has been positively affected by negative shocks in the IE and negatively affected by the positive ones. The most common feature of this subgroup is the relative independence of economics from natural resources.

Keywords*: Informal economy (IE)*; *Foreign direct investment (FDI); Non-linear Autoregressive Distribution Lag (NARDL); International capital movement.*

JEL Classification: O17, E26, C22, F3, F21

INTRODUCTION

International capital movements began to rise significantly since the early 1980s, with the abandonment of the communist system by some communist countries, and the beginning of their entry into the market economy. The international institutions had accompanied these countries in their economic transition by providing the necessary mechanisms to achieve the capital. To address some economic, financial, and social issues, governments seek to attract international capital. According to the economists, international capital can provide jobs and income opportunities to people, thus increasing household consumption and the general demand. It can be a good way to transfer knowledge and technology (Osano & Koine 2016). The FDI is the most important aspect of capital movement; and it can be in two ways: inflow FDI and outflow FDI. Many definitions have been given to the FDI. The following definition has been provided by OECD (2019): "Foreign direct investment is a category of investment that reflects the

objective of establishing a lasting interest by a resident enterprise in one economy (direct investor) in an enterprise (direct investment enterprise) that is resident in an economy other than that of the direct investor". Imad (2002) defined FDI as follows, "FDI is the process whereby residents of one country (the source country) acquire ownership of assets for the purpose of controlling the production, distribution and other activities of a firm in another country (the host country)". The definition of FDI was also given by the World Trade Organization, which is "FDI occurs when an investor based in one country (the home country) acquires an asset in another country (the host country) with the intent to manage that asset". The simplest definition of FDI is "FDI is the establishment of a new business abroad" provided by Bradley (2005). Many influencing factors play an important role in attracting FDI, such as availability of natural ressorces. The researchers (Asiedu & Lien, 2011) proved that availability of natural resources in an economy was an attractive element to FDI. Human capital also has a positive nexus with the FDI and they reinforce each other (Kheng et al., 2016). Institutional quality also has a significant impact on FDI; thus, the high institutional quality leads to more incoming FDI Peres et al., 2018). In addition to institutional quality, the political stability is very important. Williams (2017) proved that the political instability reduced the FDI inflows. Infrastructure is another important factor in attracting FDI. Rehman et al. (2011) proved a powerful positive effect of infrastructure in attracting FDI, in the case of Pakistan. FDI is very sensible to economic freedom. Economic freedom is one of the critical requirements to attract FDI (Muslija, 2018). These are some influential factors controlling FDI. Although scholars have attached greater importance to studying FDI, studies dedicated to exploring the relationship between FDI and IE are not only few, but rare.T Thus, this subject needs more attention from researchers due to the ambiguous nature of IE.

Since the publishing of the ILO report 1972, the IE as a theme has taken a great attention by researchers, although of this attention the IE stayed keeping its ambiguous feature. The informal ecomomy size is about one third of global GDP, and sometimes its size records extraordinary levels as it happened in Bolivia, wherethe size of IE exceeded 70 % during the years 1992, 1993, 1994 and 2001, with an average of 62.28 % during the period of 1991–2015 (Medina & Schneider, 2018) . The IE gives an incom opportunities for about 70 % of the world work force (Loayza, 2016). The most common definition of IE was provided by ILO in the 15th International Conference of Labour Statisticians (ICLS), and which was adopted by a large part of scholars. The ICLS defines operating firms in the IE as follows: "private unincorporated enterprises that are unregistered or small in terms of the number of employed persons" (ILO, 2012). This definition is based on the identification of the informal firm to define the IE; another definition of the IE based on the definition of informal activities is as follows: "those economic activities and the income derived from them that circumvent or otherwise avoid government regulation, taxation or observation" (Feige, 1989). In the same context, the IE can be defined as "all currently unregistered economic activities that would contribute to the officially calculated (or observed) Gross National Product if observed" (Frey & Pommerehne, 1984). Many causes lead to the spread of the IE. The most known factor is tax burden. All studies published in this field come to

consensus that tax burden is the first influencer of IE size. The contribution of taxes and social security contribution to the IE size was estimated between 45 % and 52 %; and the contribution of intensity of regulation to the size of the IE size was estimated between 10 % and 15 % (Enste, 2018). Ruge (2010) proved that intensity of regulation is among the most important influencing factors in the size of IE, and the unemployment rate is associated with the size of IE. The unemployment and IE have positive relationship particularly in the long term (Lisi, 2015). The study of Berdiev (2018) shows that the economic freedom is an influencer of the size of the IE. In addition to previous factors, there are some other causes such as tax system complexity, lower deterrence, corruption, good governance, state subsidy, etc.

1. LITERATURE REVIEW

Despite the vast amount of research devoted to the study of FDI and its relationship with economic, social, and political phenomena such as economic growth (Osei & Kim, 2020; Awunyo-Vitor & Sackey, 2018; Apergis et al., 2008; Michael, 2018); financial policy (Davies et al., 2021; Desbordes & Wei, 2017; (Yao et al., 2021); unemployment and demographic changes (Sadikova et al., 2017; Schmerer, 2014; Alsan et al., 2006; Alfalih & Bel Hadj, 2020); governance and political institution (Kuvvet, 2021; Li et al. 2018; McCloud et al., 2018), only a few have studied the relationship between FDI and IE. Some studies that have dealt with the nexus between FDI and IE are discussed below.

The first study that dealt with the relationship between the FDI and shadow economy used panel data from 145 economies during the period of 1999–2005 (Nikopour et al., 2009). Using Generalized Method of Moments (GMM), the empirical results showed a significant positive effect of IE on FDI, and Granger causality test confirmed that IE caused FDI.

Based on the gravity theory which predicts bilateral trade flows based on the economic size of two countries, and with the purpose of examination of the link between FDI and IE in the OECD countries for the period of 1999–2007, using panel data from 34 OECD countries, the scholars Ali and Bohara (2017) used the Fully Generalized Least Square model (FGLS) and found a positive relationship between FDI and IE. They concluded that an increase in IE by 1 % in the host economy relative to the investor economy led to increasing the incoming FDI by 0.0571 %.

For the Asian case, the study used the ARDL model, and Error Correction Model (ECM) to find the relationship between FDI and IE, on the basis of data taken from 19 Asian countries during a period of 2002–2015 (Huynh et al., 2019). In contrast to previous studies, the researchers found a significant negative link between FDI and IE.

There was also research conducted to investigate the effect of IE on specified kind of FDI – Greenfield Investment and Mergers and Acquisitions (M&As) (Cuong et al., 2020). The study covered 158 economies all over the world, during the period from 2003 to 2018. The study concluded that IE had a negative effect on M&As and a positive effect on Greenfield Investment.

In their paper, Bayar et al. (2020) examined the impact of IE and human development on FDI in a sample of 11 post-communist economies, by using panel data covering the period from 1995 to 2015. The empirical study concluded that IE and human development were significant determinants to attract FDI, and the long-run analysis showed a negative effect of IE on FDI, but FDI was positively affected by human development.

2. ESTIMATION METHODOLOGY AND DATA

2.1. Methodology: The NARDL Co-integration Model Developed by Shin et al. (2014)

In order to investigate the effect of the IE on the FDI inflows in a sample of petroleum producing countries, NARDL model has been used in this study. The model allows examining the effects in the short and long run, as well as exploring a response of FDI inflows to positive and negative shocks of IE (Shin et al., 2014):

$$FDI_t = f\ (IE_t^+, IE_t^+, Growth_t, \varepsilon_t). \tag{1}$$

The empirical model is represented as follows:

$$\Delta FDI_t = c + \alpha_1\, IE_{t-1} + \alpha_2\, IE_{t-1}^+ + \alpha_3\, IE_{t-1}^- + \sum_{i=1}^{q} \eta_i\, \Delta IE_{t-i} + \sum_{i=1}^{q_1} \omega_1^+\, IE_{t-i}^+ + \sum_{i=1}^{q_1} \omega_1^-\, FDI_{t-i}^- + \alpha_4\, Growth_{t-1} + \varepsilon_t. \tag{2}$$

The positive and negative shocks of IE are calculated as follows:

$$\begin{cases} IE_t^+ = \sum_{j=1}^{t} \Delta IE_t^+ \ = \ \sum_{j=1}^{t} \max(\Delta IE_{\mathrm{j}}, 0) \\ IE_t^- = \sum_{j=1}^{t} \Delta IE_t^- \ = \ \sum_{j=1}^{t} \min(\Delta IE_{\mathrm{j}}, 0) \end{cases}, \tag{3}$$

where:

Δ represents the first differentiation;

FDI represents foreign direct investment inflow to the country as a percentage of official GDP;

IE represents the size of the informal economy in the country as a percentage of official GDP;

Growth represents the annual percentage growth rate.

2.2. Data Description

This paper aims at exploring the impact of IE on FDI inflows in a sample of petroleum producing countries, using data taken from three sources: FDI as a percentage of official GDP and growth rate were extracted from the World Bank web site (2021); the size of IE as percentage of official GDP was gathered from the studies (Medina & Schneider, 2018; Kahina & Saïd, 2020). The original time series were annual data, which were converted into quarterly data using EVIEWS 11 software.

When starting this study, the aim was to explore the effect of IE on FDI in OPEC countries plus the Russian Federation and the United States. Due to non-stationary variables related to most of these countries, the study was limited only to

countries whose variables were stationary. Thus, the counties unde investigation are Algeria, Norway, the Russian Federation, Saudi Arabia and the United States.

Table 1. Sources of Data

Variable	Description	Source
FDI	Foreign direct investment net inflows as a percentage of official GDP	World Bank https://databank.worldbank.org/home.aspx
IE	The size of informal economy as percentage of official GDP	All informal economy data except the data for Algeria from 2016 to 2018 were taken from (Medina & Schneider, 2018) Data on informal economy in Algeria from 2016 to 2018 were taken from Kahina & Saïd, 2020
Growth Rate	Annual percentage growth rate of GDP at market prices based on constant local currency	World Bank https://databank.worldbank.org/home.aspx

3. EMPIRICAL RESULTS AND DISCUSSION

3.1. Unit Root Test

Before the estimation of NARDL model, it is necessary to examine the stationary variables of the study. Using Eviews11 software, we examined the stationary variables using ADF test developed by Dickey & Fuller (1979), PP test developed by Phillips and Perron (1988), and KPSS test developed by Kwiatkowski et al. (1992). These tests showed that all variables were stationary at the level or at the first difference (view appendix). It means that variables meet the requirements for building NARDL model developed by Shin et al. (2014).

Based on the results of unit root test, and trying to investigate the long-run and the short-run relationships between FDI and IE, in our case we will rely on the NARDL model.

3.2. Diagnostics Tests

The strength of models were defined using some statistic tests, such as Breusch–Godfrey serial correlation LM test developed by Breusch & Pagan (1980) to test the serial correlation; ARCH test developed by Engle (1982), Jarque–Bera normality test (Jarque & Bera, 1987), and Ramsey RESET (Ramsey, 1969).

As shown in Table 2, F_{prob} and χ^2 are greater than 5 % in the case of Algeria and Saudi Arabia; F_{prob} and χ^2 are greater than 10 % in the case of Norway, the Russian Federation and the United States. It appears that models do not suffer from problems of serial correlation.

Table 2. Breusch–Godfrey Serial Correlation LM Tests

Country	F_{stat}	F_{prob}	$Obs * R^2$	x^2	Decision
Algeria	0.805	0.451	2.012	0.366	H_0 is accepted; there is no serial correlation at the 5 % level
Norway	0.135	0.873	0.423	0.809	H_0 is accepted; there is no serial correlation at the 10% level
The Russian Federation	1.632	0.206	5.475	0.647	H_0 is accepted; there is no serial correlation at the 10 % level
Saudi Arabia	4.145	0.0245	17.054	0.010	H_0 is accepted; there is no serial correlation at the 5 % level
The United States	1.320	0.273	3.489	0.175	H_0 is accepted; there is no serial correlation at the 10 % level

ARCH test clearly indicates that F_{prob} is greater than 10 % for all five models (see Table 3). It means the null hypothesis is rejected, thus demonstrating absence of conditional heteroscedasticity.

Table 3. Heteroskedasticity, ARCH Test

Country	F_{stat}	F_{prob}	$Obs * R^2$	x^2	Decision
Algeria	0.9479	0.3326	0.9579	0.3277	H_0 is accepted; there is long-run equilibrium relationship at the 10 % level
Norway	0.4829	0.4891	0.4914	0.4833	H_0 is accepted; there is long-run equilibrium relationship at the 10 % level
The Russian Federation	2.4174	0.1711	2.2786	0.1613	H_0 is accepted; there is long-run equilibrium relationship at the 10 % level
Saudi Arabia	3.4364	0.2354	2.8593	0.1956	H_0 is accepted; there is long-run equilibrium relationship at the 1 % level
The United States	0.4931	0.4834	0.5053	0.4779	H_0 is accepted; there is long-run equilibrium relationship at the 10 % level

Jarque–Bera test is used to examine whether the residuals are normally distributed. According to test results shown in Table 4, in the case of this study, *P*-value is greater than 1 % for all models, which means that in all equations the hypothesis H_0 of normal distribution of the residuals cannot be rejected.

Table 4. Jarque–Bera Test

Country	JB	Prob	Decision
Algeria	4.1889	0.021	H_0 is accepted; residuals are normally distributed at the 1 % level
Norway	3.2594	0.014	H_0 is accepted; residuals are normally distributed at the 1 % level
The Russian Federation	3.7381	0.041	H_0 is accepted; residuals are normally distributed at the 1 % level
Saudi Arabia	3.7921	0.038	H_0 is accepted; residuals are normally distributed at the 1 % level
The United States	2.7514	0.041	H_0 is accepted; residuals are normally distributed at the 1 % level

Table 5 shows the results of Ramsey REST test. It is clear that *P*-values of T_{stat} and F_{stat} are largely greater than 10 % for all models; the hypothesis H_0 which states that the model is correctly specified is acceptable for the five models.

Table 5. Ramsey RESET Test

Country	Statistic test	Value	DF	Prob	Decision
Algeria	T_{stat}	0.182	81	0.856	H_0 is rejected; there is long-run equilibrium relationship at the 10 % level
	F_{stat}	0.032	(1, 81)	0.856	
	Lkelihood ratio	0.041	1	0.838	
Norway	T_{stat}	0.258	57	0.798	H_0 is rejected; there is long-run equilibrium relationship at the 10 % level
	F_{stat}	0.066	(1, 57)	0.798	
	Lkelihood ratio	0.102	1	0.749	
The Russian Federation	T_{stat}	0.919	49	0.362	H_0 is rejected; there is long-run equilibrium relationship at the 10 % level
	F_{stat}	0.845	(1, 49)	0.362	
	Lkelihood ratio	1.470	1	0.225	
Saudi Arabia	T_{stat}	1.398	35	0.171	H_0 is rejected; there is long-run equilibrium relationship at the 10 % level
	F_{stat}	1.954	(1, 35)	0.171	
	Lkelihood ratio	4.727	1	0.030	
The United States	T_{stat}	0.901	68	0.011	H_0 is rejected; there is long-run equilibrium relationship at the 10 % level
	F_{stat}	0.895	(1, 68)	0.013	
	Lkelihood ratio	0.884	1	0.013	

3.3. The Bound Test for Nonlinearity

The empirical results of bounds test for co-integration revealed that the computed F_{stat} for the Algerian model was above the upper bounds at 10 % level; for Norway, the Russian Federation and the United States the computed F_{stat} fell

above the upper bounds at 5 % level; also, it is above the upper bounds in the models of Arabia Saudi. Based on results shown in Table 6, the null hypothesis H_0 of no-cointegration is rejected, which implies the existence of long-run relationships between FDI, IE and growth rate.

Table 6. The Bound Test for Nonlinearity

Country	Level of significance	F_{table}		F_{stat}	Decision
		I(0)	*I*(1)		
Algeria	10 %	2.37	3.20	3.49	H_0 is rejected; there is long-run equilibrium relationship at the 10 % level
	5 %	2.79	3.67		
	2.50 %	3.15	4.08		
	1 %	3.65	4.66		
Norway	10 %	2.37	3.20	4.03	H_0 is rejected; there is long-run equilibrium relationship at the 5 % level
	5 %	2.79	3.67		
	2.50 %	3.15	4.08		
	1 %	3.65	4.66		
The Russian Federation	10 %	2.37	3.20	3.89	H_0 is rejected; there is long-run equilibrium relationship at the 5 % level
	5 %	2.79	3.67		
	2.50 %	3.15	4.08		
	1 %	3.65	4.66		
Saudi Arabia	10 %	2.37	3.20	4.55	H_0 is rejected; there is long-run equilibrium relationship at the 5 % level
	5 %	2.79	3.67		
	2.50 %	3.15	4.08		
	1 %	3.65	4.66		
The United States	10 %	2.37	3.20	4.05	H_0 is rejected; there is long-run equilibrium relationship at the 5 % level
	5 %	2.79	3.67		
	2.50 %	3.15	4.08		
	1 %	3.65	4.66		

3.4. NARDL Models for Long-run and Short-run Analysis

Based on the diagnostic test and bounds test results reported in Tables 2–6, it can be said that the NARDL model is applicable in each case of the sample.

The empirical results reveal that for Algeria and Saudi Arabia, FDI inflows are positively affected by positive shocks of the IE, where an increase by one unit in the IE lead to an increase by 1.7 % and 67.9 % in the FDI inflows, respectively. The negative shocks also positively affect the FDI inflows. If the IE decreases by one unit, the FDI inflows will increase by 9.2 % and 102.1 %, respectively. The economic growth rate has a positive effect on the FDI inflows; thus, a change in the economic growth by one unit leads to a change in the FDI inflows by 1.2 % and 21.1 %, respectively.

Table 7. NARDL Models for Long-run Analysis

Country	Variable	Coefficient	T_{stat}	Prob
Algeria	*POS****	0.017	0.296280	0.04
	*IE_NEG***	0.092	0.625333	0.252
	*GR***	0.012	0.234778	0.037
	C	2.095	1.162453	0.074
	$FDI = 2.095 + 0.017\ IE^{+} + 0.092\ IE^{-} + 0.012\ Growth$			
Norway	*IE_POS**	−1.419	−3.810130	0
	*IE_NEG**	1.301	3.563975	0
	GR	0.729	1.380623	0.825
	C	−1.086	-0.494083	0.048
	$FDI = -1.056 - 1.419\ IE^{+} + 1.301\ IE^{-} + 0.729\ Growth$			
The Russian Federation	*IE_POS*	−0.444	−0.307762	0.055
	*IE_NEG****	0.011	0.017511	0.37
	*GR***	0.671	0.459377	0.074
	C	9.652	0.380752	0.169
	$FDI = 9.652 - 0.444\ IE^{+} + 0.011\ IE^{-} + 0.671\ Growth$			
Saudi Arabia	*IE_POS**	0.679	3.399254	0.765
	*IE_NEG**	1.021	3.404450	0.062
	*GR***	0.211	0.636277	0.04
	*C**	4.621	3.398849	0.683
	$FDI = 4.621 + 0.679\ IE^{+} + 1.021\ IE^{-} + 0.211\ Growth$			
The United States	*IE_POS*	−0.242	−0.416420	0.07
	*IE_NEG****	0.376	0.743559	0.64
	*GR****	0.422	0.904898	0.095
	*C****	−0.349	−0.170440	0.094
	$FDI = -0.348 - 0.242\ IE^{+} + 0.376\ IE^{-} + 0.422\ Growth$			

In case of Norway, the Russian Federation and the United States, FDI inflows are affected negatively by positive shocks of the IE size, and they are positively affected by the negative ones, where an increase in the size of IE by one unit leads to a decrease in FDI inflows by 141.9 %, 44.4 % and 24.2 %, respectively. When the IE size moves in the opposite direction, the FDI inflows will increase by 130.1 %, 1.1 % and 37.6 %, respectively. FDI inflows are positively affected by the economic growth rate in the case of Norway, the Russian Federation and the United States, where one unit of change in the economic growth rate leads to a change by 72.9 %, 21.1 % and 42.2 %, respectively.

Table 8. NARDL Models for Short-run Analysis

Country	Variable	Coefficient	Std.Error	T_{stat}	Prob
Algeria	D(FDI(-1))	0.614	0.089	6.883	0.000
	D(FDI(-2))	0.140	0.090	1.546	0.125
	D(IE_POS)	0.042	0.049	0.849	0.397
	D(IE_POS(-1))	0.098	0.051	1.896	0.060
	D(IE_NEG)	0.096	0.057	1.674	0.097
	CointEq(-1)*	−0.039	0.009	−4.149	0.000
Norway	D(FDI(-1))	0.416	0.108	3.843	0.000
	D(FDI(-2))	0.227	0.116	1.953	0.055
	D(IE_NEG)	0.536	0.335	1.600	0.114
	D(GR)	1.257	0.128	9.762	0.000
	D(GR(-1))	−0.462	0.200	−2.310	0.024
	CointEq(-1)*	−0.235	0.050	−4.646	0.000
The Russian Federation	D(FDI(-1))	0.860	0.081	10.53	0.000
	D(IE_POS)	0.352	0.049	7.123	0.000
	D(IE_POS(-1))	−0.299	0.057	−5.162	0.000
	D(IE_NEG)	−0.074	0.039	−1.917	0.060
	D(GR)	0.099	0.011	8.560	0.000
	CointEq(-1)*	−0.013	0.006	−2.200	0.032
Saudi Arabia	D(FDI(-1))	2.183	0.097	22.419	0.000
	D(FDI(-2))	1.915	0.244	9.840	0.000
	D(IE_POS)	0.005	0.000	7.250	0.000
	D(IE_POS(-1))	0.071	0.007	9.432	0.000
	D(IE_POS(-2))	0.067	0.007	8.910	0.000
	D(IE_NEG)	0.001	0.000	1.766	0.085
	D(IE_NEG(-1))	0.074	0.008	9.258	0.000
	D(IE_NEG(-2))	0.064	0.007	8.695	0.000
	D(GR)	0.161	0.020	7.788	0.000
	D(GR(-1))	0.291	0.048	6.003	0.000
	CointEq(-1)*	−0.010	0.001	−9.342	0.000
The United States	D(FDI(-1))	0.688	0.087	7.837	0.000
	D(FDI(-2))	0.107	0.082	1.299	0.198
	D(IE_POS)	0.405	0.124	3.264	0.001
	D(IE_POS(-1))	0.352	0.126	2.782	0.007
	D(IE_NEG)	−0.171	0.039	−4.365	0.000
	D(IE_NEG(-1))	0.152	0.044	3.453	0.000
	D(GR)	0.216	0.032	6.764	0.000
	D(GR(-1))	−0.155	0.038	−4.055	0.000
	CointEq(-1)*	−0.070	0.021	−3.295	0.001

The most interesting finding in the short-run analysis is that the FDI inflows response positively to FDI inflows lagged to two periods for the whole sample except the Russian Federation, where the FDI inflows response positively to FDI inflows lagged to just one period. FDI inflows are also affected by the positive shocks of the size of the IE lagged to one period in Algeria, the Russian Federation and the United States, and it is affected by the positive shocks lagged to two periods in the case of Saudi Arabia. The positive shocks of IE do not have an effect on FDI inflows in Norway in the short-run analysis. FDI inflows are affected by the negative IE shocks lagged to two periods in Saudi Arabia; they are affected by negative IE shocks lagged to just one period in the case of Algeria and the United States. In the case of Norway and the Russian Federation, they are affected just by instantaneous negative IE shocks. FDI inflows are affected by the economic growth rate lagged to just one period in the case of Norway, Saudi Arabia and the United States. In the case of the Russian Federation, they are affected just by instantaneous negative IE shocks; for Algeria the economic growth rate does not have an effect in the short-run analysis.

4. FURTHER DISCUSSIONS

The empirical results of long-run analysis allowed distinguishing between two subgroups of countries. The first subgroup consisted of countries where the FDI inflows took an upward trend, whatever the direction of the IE development. This subgroup consisted of Algeria and Saudi Arabia. The second subgroup was composed of countries where the FDI inflows were affected negatively by the positive shocks of the IE, and positively by the negative ones. It consisted of the following countries: Norway, the Russian Federation and the United states. The effects of IE varied from country to country inside each subgroup. Another important remark is that the FDI inflows were positively affected by the economic growth rate in all countries of the study sample.

It is surprising that the FDI inflow equation is an augmented equation in terms of both positive and negative shocks of the IE for Algeria and Saudi Arabia. These countries are depending on natural resources in their economies, and they are characterised by a high share of natural resources in their GDP, where Algeria and Saudi Arabia have enormous natural resources, especially hydrocarbons. The statistics shows that the hydrocarbons represented more than 90 % of Algerian exports in 2019 (UNCTAD, 2021), and natural resources rent as a percentage of GDP was 31.6 % and 19 % in Algeria in 2011 and 2018, respectively (World bank, 2021). Inward FDI in the oil and gas industry and related fields represented 63.8 % of global FDI inflows to Algeria in 2005 and it was 46.2 % in 2009 (NAID, 2021). The statistics of the World Bank indicates that natural resources represented 50.5 % and 29.5 % in Saudi Arabia's GDP in 2011 and 2018 respectively. The investment in the oil and gas industry represented more than 37 % of the global FDI inflows to Saudi Arabia in 2009 (SAGIA, 2010), and it was 22.45 % in 2004 and 64.3 % in 2005 (ESCWA, 2007). As it is known, the investment in the oil and gas industry is more sensitive to the change in oil and gas prices in the international markets than any other factors; this leads to considering the effect of IE on investment in this

sector as insignificant. Thus, FDI inflows are not affected by a change in the size of IE in economy featured by reliance on hydrocarbons. The augmented international demand on oil and gas in the period of 2004–2012, and a higher price of oil and gas during this period contributed to increasing international investments in the hydrocarbon sector in Algeria and Saudi Arabia. Regardless of the size of the IE in these countries, the multinational hydrocarbon companies have attempted to keep up the increasing global demand of hydrocarbons, and also to make bigger profits.

The inward FDI of the second subgroup (Norway, the Russian Federation and the United States) was affected negatively by positive shocks of the IE. It means that a higher size of IE leads to a lower inward FDI. The most common feature of this subgroup is the relative independence of these economies from natural resources, where natural resources rent did not exceed 2 % of the US GDP, 5 % of Norwegian GDP over the period of 1996–2019.

The international investment in the US economy exceeded 4363 billion USD, just 74 billion USD were destined to invest in activities related to the extraction and manufacture of natural resources which represented 1.69 % of global FDI inflows to US in 2018 (OII, 2019). The Russian economy received about 150 billion dollars as FDI in 2017; 72 % of this inward FDI was directed to economic activities other than those related to the extraction of natural resources. In the first quarter of 2020 (Q1-2020), the FDI inflows to the Russian Federation accounted for 40 billion USD and just 11.5 billion USD were destined to oil and gas sector, mining and quarrying, rubber and plastic idustry (Bank of Russia, 2021). The inward FDI of Norway was mainly directed to activities that were not related to mining, quarrying, oil and industry, just 22 % of global inward FDI was directed to those activities in 2018 (OECD.Stat, 2021).

The short-run analysis shows that the current FDI inflows are related to FDI inflows in the previous periods (between one and two lagged periods), and this finding is economically justified, because investment is usually a multi-year process.

Based on the results of the short-run and long-run analysis, it is obvious that the effect of IE size on inward FDI is dependent on its structure, and also it is dependent on the structure of the FDI inflows in the case of Norway, the Russian Federation and the United States, which are characterised by diversification of their economies and the relative independence from natural resources. Trend change of the IE leads to a change in the trend of FDI inflows, but in the case of Algeria and Saudi Arabia, the inward FDI is positively affected by both positive and negative shocks of the IE.

CONCLUSION AND POLICY IMPLICATIONS

The main aim of this paper has been to investigate the impact of IE on FDI inflows for a sample of countries producing and exporting hydrocarbons (Algeria, Norway, the Russian Federation, Saudi Arabia, and the United States) by exploring the effect of both positive and negative shocks of IE, using the NARDL methodology. The NARDL model was built for each country separately. The

empirical results show that in countries characterised by a high share of natural resources rents in GDP (Algeria and Saudi Arabia), the inward FDI is positively affected by positive and negative shocks of IE size, but in countries characterised by a low share of natural resources rents in GDP (Norway, the Russian Federation and the United States), the FDI inflows are negatively affected by positive shocks of IE size, and positively affected by negative shocks of the IE size. In the previous cases, the FDI inflows moved in the same trend with an economic growth rate.

It is good for Algeria and Saudi Arabia to attract more FDI inflows regardless of the size of IE, but it will be better if they maintain the same amount of attracted FDI associated with improvement of their economic freedom, and give more importance to reducingthe IE size. This can be done through:

- Liberating economic activity from restrictions;
- Ensuring more transparency in both governmental and political lives;
- Enactment of laws and regulations in order to give more protection for proprietary rights;
- Promoting investment in economic sectors out of those related to natural resources, such as tourism and new technologies;
- Exploiting hydrocarbon revenues in building new infrastructures and renovating the existing ones.

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