Does institutional quality mitigate the effect of Foreign Direct Investment on environmental quality: Evidence of MENA countries

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Abstract

The purpose of this study is to examine the interaction effects of Foreign Direct investment and institutional quality on environmental degradation in 17 Middle East and North African (MENA). We use ordinary least squares (OLS), Fixed effects (FE) random effects (RE) and system generalized method of moments (GMM) for the period 1996–2018. Six dimensions of governance are used : control of corruption, a sound voice and accountability, rule of Law, regulatory Quality, Govenance effectiviness and Political Stability. First, our findings show that FDI increases CO2 emissions in the MENA countries. Second, the effect of FDI on environmental degradation can be ameliorated through the presence of good institutional quality. In fact, FDI accompagnied by good governance could reduce the adverse effects of co2 emissions in MENA countries. Therefore, MENA countries should implement efficiently good institutions that will help to reduce carbon dioxide emissions.

Keywords : FDI, CO2 emissions, institutional quality, GMM Panel, MENA countries.

1. Introduction

Foreign Direct Investment (FDI) as seen as an important factor for economic growth in developed and developing countries (Su and lu 2016). Indeed, FDI can have a positive effect on the productivities gain through the transfer of technology and know

how, the staff training, the introduction new process and mangerial skills (Bouchoucha and Yahyaoui (2019).However, the economic gains associated with increased FDI are offset by potential environmental costs, as FDI can increase environmental emissions (Cole et al., 2011). In particular, Omri, (2013), Farhani and shahbaz(2014) and Kahia et al. (2017)) showed that FDI have an adverse effects on the environmental degradation. Many countries have not paid an importance role to environmental policies. In fact, environmental degradation may have harmful effects on human life and especially on economic growth. According to Shahbaz et al.(2019), the volume of crude oil and gas and non oil fuels represent 39% in MENA countries.

The nexus between FDI and environmental degradation has been analyzed by many scolars that belong to the economic energy field in the past two decades. However, some studies such as Cole and Fredrikson (2009) and Muhammad et al. (2011) found that this relationship is ambiguous. The first argument is based on pollution haven hypothesis (PHH) in economic theory. PHH assumes that heavypolluting industries are attracted by countries with worse regulations on environment. In other words, migration of heavy industries increase pollution and degradate environmental quality in developing countries (Cole and Fredriksson (2009)). In contrast, the second argument is based on the pollution haloes hypothesis that assumes that foreign companies work under better management and advanced technologies that guarantee a clean environment in the host countries. Pollution haloes imply that trend in pollution due to FDI is not sustainable (Muhammad et al. (2011)).

The related past studies about the direct effect of FDI on environmental degradation can be subdivised into three research strands : In the first strand, some scholars consider that FDI can decrease the concentation of CO2 emissions in host countries (Tamazian and Rao(2010), Al- mulali and tang(2013), Zhu et al(2016), Shao(2018), Sung et al.(2018)). Recently, Paramati et al. (2017) find that FDI lead to reduce CO2 in developing economies in long run. Similarly, Liu et al. (2017) showed that FDI inflows can lead to decrease CO2 emissions, and they advocated the use of advanced clean technologies acquired through FDI.

Nevertheless, in the second strand, others studies consider FDI as a factor of increasing the carbon emissions in host countries (Jorgenson (2007), Wang(2012), Shahbaz et al.(2014), Kivyro and Arminen(2015), Jaing (2015), AliNasir et

al.(2019), Solarin et al.(2017). Moreover, Solarin et al. (2017) have shown that FDI contributes to an increase in CO2 emissions in Ghana. While in the third strand, others researches assume that FDI doesn't have any impact or insignificant effect on the carbone missions of host countries (Kentor and Grimes (2006), Perkin and Neumayer(2009)).

Others studies, such as Muhammad et al. (2011) tested the non-linear relationship between FDI and environmental pollution employing panel data of 110 developed and developing countries. The authors have concluded that the EKC is validated and FDI enhances the environmental pollution. Furthermore, Mert and Bôlük (2016) investigate the effect of foreign direct investment (FDI) and the potential of renewable energy consumption on carbon dioxide (CO2) emissions in 21 Kyoto countries. For this framework, Mert and Bôlük (2016) examine the validity of Environmental Kuznets Curve (EKC) hypothesis, employing panel cointegration analysis. The results suggest that FDI brings in clean technology and enhances the environmental standards. However, an inverted U-shaped relationship (EKC) was not supported by the estimated model for the 21 Kyoto countries.

More recently, Shahbaz et al. (2019) investigate the effect of FDI on CO2 emissions in MENA countries. They employed the GMM method to validate the existence of the pollution haven hypothesis (PHH). Their findings validated the existence of N - Shaped between FDI and CO2 emissions.

Compared to the above existing literature, our paper thus contributes in the two following ways: Despite the existence of an abundant literature covering FDI-CO2emissions, FDI- institutional quality, and institutional quality-CO2 emissions nexuses, (Xie et al.(2019), Shahbaz et al.(2019), Bouchoucha and benammou (2018), Sadi Ali et al .(2019)), to our best knowledge, seldom these variables have been taken together. Furthermore, To the best of our knowledge, none of the empirical studies focused on the interaction effect of FDI and institutional quality on CO2 emissions. For this reason, it is interesting to study in the first hand the direct effect of FDI on CO2 emissions. In the second hand, we examine the interaction effect of FDI and institutional quality on CO2 emissions in MENA countries. In other words, our study examine how different governance indicators moderate the relationship beween FDI and CO2 emissions in MENA countries.

The remainder of this paper is organized as follows : Section 2 provides the Main hypothesis, Econometric modeling, Data and Source. Section 3 presents the main results and interpretations. Finaly, we conclude our study with the presentation of conclusion and policy implications.

2. Main hypotheses, Econometric Modeling, Data and Source and methodolgy

2.1 Main hypotheses

We hypothesises that governance indicators might moderate the effect of FDI on CO2 emissions in MENA countries. Our hypothesis is inspired from the studies of Glanito and Islam (2014) and Gholipour and Farzanegan(2017). Thus, our main hypothesis is :

H1. An increase of FDI inflows Lead to increase or decrease in CO2 emissions in MENA region.

H2. The effect of FDI on CO2 emissions depend on quality of the governance

H2.1. higher levels of control of corruption improve the effectiviness of FDI in terms of reduction of CO2 emissions in MENA region.

H 2.2. higher levels of poltical stability improve the effectiviness of FDI in terms of reduction of CO2 emissions in MENA region.

H 2.3. higher levels of government effectiviness improve the effectiviness of FDI in terms of reduction of CO2 emissions in MENA region.

H 2.4. higher levels of rule of law improve the effectiviness of FDI in terms of reduction of CO2 emissions in MENA region.

H 2.5. higher levels of voice and accountability improve the effectiviness of FDI in terms of reduction CO2 emissions in MENA region.

H 2.6. higher levels of regulatory quality improve the effectiviness of FDI in terms of reduction of CO2 emissions in MEN A region.

2.2. Econometric Modeling

The objective of this study is to examine in the first hand the relationship between Foreign Direct Investment and environmental degradation in the MENA countries. Our sample consists of 17 MENA countries during the period from 1996 to 2018. In +order to investigate this relationship, we can use the econometric model which can be expressed as follows :

$$CO2_{it}=\alpha_1+\alpha_2 FDI_{it}+\alpha_3 X_{it}+\varepsilon_{it} \quad (1)$$

$$CO2_{it}=\alpha_i+\alpha_1 CO2_{it-1}+\alpha_2 FDI_{it}+\alpha_3 X_{it}+\varepsilon_{it} \quad (2)$$

Where CO2 is an indicator of deterioration in environmental quality which is measured by the CO2 emissions (metric tons per capita); FDI is Foreign Direct Investment expressed as a percentage of GDP ; X is a vector of the explanatory variables, it includes : GDP is the GDP growth (annual %) ; inf is the inflation which approximated by the consumer prices index (annual %) ; open is trade openess which approximated by the sum of export and import as share of GDP ; Enrol is the Gross enrollement ratio primary ; PE is the public expenditure ; urban is Urban population (% of total population) ; and ε_{it} is the error term.

In second hand, we access the indirect impact of FDI on the environmental degradation (CO2 emissions) through the institutional quality. To do this framework, we will introduce each time one of six dimensions of governance developed by the Kaufman and al. (2018) (Control of Corruption(CC), Voice and Accountability (VA), Rule of Law (RL), Regulatory Quality (RQ), Govenance effectiviness (GE) and Political Stability (PS)) and the interaction term between FDI and these indicators (FDI* CC, FDI* GE, FDI* VA, FDI*RL, FDI* PS, FDI* RQ). It should be noted that the six governance indicators ranging from -2.5 to 2.5. So, the model 2 can be written as follows:

$$CO2_{it}=\alpha_1+\alpha_2 FDI_{it}+\alpha_3 X_{it}+\alpha_4 Gov_{it}*FDI_{it}+\varepsilon_{it} \quad (3)$$

$$CO2_{it}=\alpha_i+\alpha_1 CO2_{it-1}+\alpha_2 FDI_{it}+\alpha_3 X_{it}+\alpha_4 Gov_{it}*FDI_{it}+\varepsilon_{it} \quad (4)$$

In equation 3, where (Gov*FDI) is the term of interaction between FDI and each dimensions of governance ((CC), (VA), (RL), (RQ), (GE) and (PS)); respectively. The coefficients (FDI*GOV) are the indirect effect of FDI on environmental degradation through different channels of governance. We applied in this study the

GMM Method that uses a set of instrumental variables in order to solve the endogeneity problem.

2.3. Data and Source

The study use panel data covering 1996-2018 on 17 Middle East and North Africa (MENA) namely: Algeria -Tunisia-libyia- Morocco- Saudi Arbia- Quatar –Iran- Oman- Bahrain- Jordan- Kuwait- Lebanon- Syrian Arab Republic- United Arab Emirates- Yemen- West Bank and Gaza- Iraq. All variables are obtained from World Development indicators (2018), except, the six indicators of governance which are extracted frome World Governance indicators (2018).The description and source of the variables are reported in table 1.

Table 1. Data description and Source

	Variables	**abbrievations**	**Source**
CO2 emissions	Environmental quality is measured by CO2 emissions (metric tons per capita)	**CO2**	WDI
FDI	Foreign Direct Investment expressed as a pourcentage of GDP	FDI	WDI
Gov	The variables of institutional quality (Control of corruption, Voice and Accountability, Political Stability, Rule of law,Government effectiviness and Regulatory Quality)	CC,VA , PS,RL,GE and RQ	WGI
GDP	GDP is measured by GDP growth	GDP	WDI
Inf	Inflation measured by the consumer prices index (annual %)	Inf	WDI
Open	Trade openess measured by the sum of exports and imports as share of pourcentage of GDP	Open	WDI
Enrol	Gross enrollement ratio primary	Enrol	WDI
PE	The public expenditure	PE	WDI
Urban	Urban population (% of total population)	Urban	WDI

2.4.Methodology

In order to examine the nexus between FDI, CO2 and institutional quality in MENA countries, we first test the link between FDI and CO2 (without interraction), and then we analyze the nexus between FDI and CO2 in the presence of institutional quality (with interraction). To do this goal, we use four estimation methods in our study. These were OLS, fixed effects (FE),

random effects (RE) and generalized method of moments (GMM). However, to select the most appropriate model, we use the Hausman specification test. Since OLS, fixed

effects (FE), random effects (RE) models do not take into account the endogeneity problem. Thus, the GMM in-system method solves the endogeneity bias. We use the two-step GMM which is more efficient than the one-step GMM (Arellano & Bond, 1991) because it accounts for endogenous regressors, measurement errors or omitted variable bias.Also, the system-GMM estimator consistency depends on whether lagged level variables are valid instruments in the regression by using additional assumptions.

3. Results and interpretations

3.1.1. Descriptives statistics and correlation Matrix

Before running to the regressions, we will perform the preliminary tests. Table 2 presents the differents descriptives statistics of all variables which describe our sample. On average the mean of CO2 emissions (metric ton per capita) is around 0.868. In fact, the highest value is observed in Quatar (2.076) in 2017, while the lowest value is recorded in West Bank and Gaza (-0.834) in 1997. In addition, the mean of foreign direct investment is around 0.362. Indeed, the highest value of FDI is obseved in kuwait (1.882) in 2017, However, the lowest of FDI is recorded in Morocco (-2.195) in 1999.

Moreover, on overage, the governance indicators are around the intervall [-.568, -.243], on average the highest value of governance is the control of corruption (-.243). In fact, the highest value of control of corruption is recorded in Quatar (1.567) in 2009, While, the lowest value of control of corruption is observed in Yemen (-1.663) in 2016. However, on average the poorest governance indicator is the political stability (-.568), Indeed, the maximum value of political stability is obtained for Quatar (1.223) in 2009, however, the minimum value is found for Iraq (-3.180) in 2004.

Table 3 shows covariance matrix results for the included variables. FDI inflows have a positive association with CO2 emissions, which means that an increase in FDI inflows will raise the volume of CO2 emissions. GDP and PE have a negative association, confirming that raising of GDP and public expenditure in a country can reduce the volume of CO2 emissions.

Table 2.Descriptives statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
CO2	368	.868	.614	-.834	2.076
FDI	322	.362	.798	-2.195	1.882
GDP	286	.639	.346	-.670	2.090
Inf	315	.576	.442	-1.242	1.726
Enrol	283	2.007	.0425	1.860	2.108
Urban	391	1.853	.121	1.384	2
PE	341	1.231	.141	.387	1.518
Open	354	1.763	.437	-1.570	2.579
CC	320	-.243	.738	-1.663	1.567
GE	320	-.264	.765	-2.244	1.509
PS	320	-.568	1.100	-3.180	1.223
RQ	320	-.353	.833	-2.278	1.120
RL	320	-.268	.759	-2.090	.958
VA	320	-1.057	.465	-2.050	.303

Table 3. Correlation Matrix

	CO2	FDI	GDP	inf	Enrol	urban	PE	open
CO2	1.0000							
FDI	0.2370	1.0000						
GDP	-0.0866	0.2773	1.0000					
inf	0.1181	-0.2354	-0.0681	1.0000				
Enrol	0.1347	0.0056	-0.1125	-0.0193	1.0000			
urban	0.5144	0.4915	0.1382	-0.0060	-0.3706	1.0000		
PE	-0.3647	0.2006	0.2680	-0.3172	-0.1995	0.2438	1.0000	
open	0.2609	0.7162	0.3050	-0.3778	-0.1532	0.6427	0.3356	1.0000

3.1.2 Impact of Foreign Direct Investment on environmental degradation

This study attempts to examine the relationship between foreign direct investment, environmental quality and governance quality for a sample of 17 Middle East and North African (MENA). In first hand of our analysis, we estimate from eq 1 the effect of the FDI on environmental quality using the OLS model, the fixed effect(FE) and the random effect(RE). To do this goal, we use the Hausman test in order to choose between the fixed effect and the random effect model. We start our analysis by

estimating our model using the OLS method. Then, We applied the Hausman test in order to determine which of the regressions (fixed effects or random effects) is the most appropriate. The Hausman test choose the fixed effect in all specifications.

The results show that the coefficients of our interest variables (FDI) have expected signs in all regressions (OLS, FE and RE). Hence, From columns 1-3, we report the results without the interaction term, the FDI has a positive and statistically significant effect on CO2 emissions. This implies that the increase in foreign direct investment increase the emissions of CO2 in MENA countries.

Table 4 The direct effect of FDI on environmental degradation

	OLS	FE	RE	GMM system
	(1)	(2)	(3)	(4)
Co2(t-1)				0.965
				(0.000)***
FDI	1.426	1.793	1.102	1. 460
	(0.083)*	(0.007)***	(0.021)**	(0.0 37)**
GDP	0.300	0.0208	-0.011	0.004
	(0.001)***	(0.060)*	(0.023)**	(0.749)
Inf	- 0.250	-0.118	-0.108	-0.040
	(0.009)***	(0.048)**	(0.079)*	(0.679)
Enrol	0.270	0.093	0.075	0.268
	(0.000)***	(0.027)**	(0.07)***	(0.017)**
PE	-0.644	0.108	0.114	-0.037
	(0.000)***	0.241	0.223	(0.247)
Open	0.079	0.011	0.018	0.115
	(0.002)***	0.603	0.426	(0.075)*
Urban	0.909	0.013	0.228	0.234
	(0.000)***	0.890	(0.011)**	(0.045)**
Const	-65.751	-.024	-13.358	-1.105
	(0.000)***	0.997	(0.070)*	(0.011)**
R2	0.75	0.54	0.40	
AR2 (p-value)				0.443
Hansen test(p-value)				0.904

Note. P value in parenthesis ***, ** and * indicate the significance level at 1%,
5% and 10% respectively.

In order to account for the heteroscedasticity and endogeneity issue, we apply in next part of this study the system-GMM proposed by Arellano and Bover (1995) and Blundell and Bond (1998). The system GMM is more efficient than the first difference GMM. The efficiency of the GMM estimator is based on the validity of the following assumptions: (i) the instruments are valid and (ii) the error terms are not autocorrelated. To test the validity of lagged variables as instruments, Blundell and Bond (1998) suggest the Hansen / Sargan overidentification tests. In our work, we use the Hansen test because it is effective in the presence of autocorrelation and heteroskedasticity problems (Neanidis and Varvarigos, 2009). Then,Table 4 reports the results of The estimation by GMM method in system.

Before runing the estimation, we will check the validity of the instruments. According to table 4, we find that the results of autocorrelation test accept the null hypothesis of no second-order autocorrelation as well as validity of the instruments. Regarding the over-identification test by Hansen (1982) does not reject the null hypothesis of the validity of the instruments.This implies that we accept the validity of instrument according to the Hansen test and the AR-autocorrelation test(2).

The empirical evidence in table 4 shows that the lagged CO2 variable is positive and statiscally significant at 1% level. This means that higher level of lagged of CO2 emissions send a positive signal to prospective foreign investors. This result is in line with finding of Abdouli and Hammami(2016).

According to Table 4, the coefficient of FDI is still positive and significant at the 5% level in GMM method. This implies that an increase of FDI inflows increase the CO2 emissions in MENA countries. A 1% increase of FDI leads to an increase of CO2 emissions by 0.060%. This assumption is supported by Cole and al(2011) and Sapkota and Bastola (2017).

For the control variables, we found that education has a significant positive impact on CO2 emissions per capita. A 1% increase of education raises the CO2 emissions by around 26%. This implies that education increases the quantity of CO2 emissions in the MENA countries. This result is in line with the findings of Farzin and Bond (2006). Moreover, it was found that the trade openness has a significant positive impact on CO2 emissions at a 5% level in MENA countries. This indicates that greater trade openness tends to increase the CO2 emissions per capita. A 1% increase

of trade raises the CO2 emissions by around 11%. This result is consistent with the finding of Jebli and Youssef(2015) and Kasman and Duman(2015).

In addition, the coefficient of Urbanization is positive and statistically significant at the 5% level. A 1% increase of urbanization raises the CO2 emissions by around 23%. This implies that higher level of urbanization is associated with the higher level of CO2 emissions. This implies that higher level of urbanization is associated with higher economic activity. Higher economic activity increases the demand for the energy-consuming products (cars, air conditioning, etc.) which can enhance CO2 emissions. This result is in line with the findings of Farzanegen and Markwardt (2018) and Yazidi and Dariani(2019).

3.1.3. Effect of the governance on the relationship between FDI and environmental degradation

In the second part of this study, we will examine the effect of Foreign Direct Investment on environmental degradation by introducing each time one of the six dimensions of governance indicators developed by Kaufman et al.(2018). We keep the same initial empirical specification, except that we introduce the interaction terms between the FDI and the governance indicators in eq 3 and 4. It should be noted that the introduction of six dimensions of governance into a single model can lead to fallacious results because there is a strong correlation between them (see Table A .1.1 in appendix). In other words, we include the interaction term between Foreign direct investment and the various dimensions of governance (GOV*FDI). In order to examine the effect of each dimension in promoting the effect of FDI on environmental quality, we will estimate the role of Control Corruption(CC), Government Effectiveness(GE), Voice and Accountability (VA), Rule and Law (RL), Political Stability(PS) and Regulatory Quality (RQ) in enhancing environmental quality.

Table 5.The indirect effect of FDI on environmental degradation through institutional quality

	OLS	FE	RE	OLS	FE	RE	OLS	FE	RE	OLS	FE	RE	OLS	FE	RE	OLS	FE	RE
	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
CC	-1.821	-5.185	-1.348															
	0.259	(0.000)***	(0.046)**															
GE				-5.552	-3.616	-0.375												
				(0.000)***	(0.018)**	0.792												
VA							-2.660	-1.839	-2.368									
							(0.077)*	(0.094)*	(0.035)**									
RL										-7.804	-4.247	-1.071						
										(0.000)***	(0.004)***	0.452						
PS													-3.846	-1.673	-0.241			
													(0.000)***	(0.053)**	0.766			
RQ																-6.069	-2.305	-1.435
																(0.000)***	(0.033)**	0.167
CC*FDI	0.544	0.362	0.313															
	(0.000)***	(0.051)**	(0.069)*															
GE*FDI				0.512	0.551	0.667												
				(0.040)**	(0.012)**	(0.062)*												
VA*FDI							0.192	0.509	0.294									
							(0.011)**	(0.048)**	(0.002)***									
RL *FDI										0.113	0.404	0.129						
										(0.09)*	(0.000)***	(0.000)***						
PS*FDI													0.716	0.289	0.416			
													(0.044)**	(0.054)*	(0.047)**			
RQ*FDI																0.048	0.872	0.704
																(0.000)***	(0.000)***	(0.000)***
FDI	0.057	0.082	0.073	0.124	0 .088	0.052	0.079	0.015	0.009	0.041	0.043	0.087	0.070	0.078	0.094	0.130	0.108	0.063

	(0.029)**	(0.030)**	(0.075)*	(0.020)**	(0.048)**	(0.032)**	(0.080)*	(0.049)**	(0.018)**	(0.077)*	0.545	0.323	0.627	0.268	0.214	0.384	0.143	0.494
GDP	0.057	0.017	0.024	0.390	0.014	0.017	0.365	-0.004	0.011	0.403	0.012	.036	0.328	0.003	0.007	0.375	0.011	0.041
	0.466	0.702	0.648	(0.000)***	0.755	0.741	(0.000)***	0.924	0.809	(0.000)***	0.795	0.514	(0.000)***	0.937	0.887	(0.000)***	0.811	0.474
Inf	-0.010	-0.081	-0.077	-0.182	-0.077	-0.084	-0.167	-0.123	-0.115	-0.111	-0.081	-0.041	-0.064	-0.082	-0.082	-0.098	-0.106	-0.087
	0.890	0.124	0.218	(0.051)*	0.176	0.180	0.181	(0.027)**	0.046	0.241	0.150	0.233	0.497	0.144	0.170	(0.000)***	(0.062)*	0.213
Enrol	0.264	0.044	0.047	0.296	0.090	0.065	0.325	0.081	0.234	0.380	0.058	0.079	0.275	0.084	0.050	0.362	0.081	0.092
	(0.000)***	0.277	0.312	(0.000)***	0.034	0.148	(0.000)***	(0.055)*	(0.032)**	(0.000)***	0.170	0.109	(0.000)***	0.055	0.262	(0.000)***	(0.050)*	(0.064)*
PE	-0.350	0.208	0.099	-0.444	0.067	0.054	-0.645	.067	-0.355	-0.583	0.081	0.015	-0.338	0.048	0.081	-0.614	0.045	-0.018
	(0.000)***	(0.028)**	0.350	(0.000)***	0.475	0.586	(0.000)***	(0.090)*	(0.095)*	(0.000)***	0.388	0.887	(0.004)***	0.611	0.413	0.000	0.632	0.864
Open	0.037	0.025	0.023	0.119	0.021	0.034	0.087	0.032	0.018	0.115	0.015	0.028	0.070	0.017	0.003	0.132	0.024	0.032
	(0.073)*	(0.029)**	(0.025)**	(0.000)***	(0.048)**	(0.047)**	(0.001)***	(0.012)**	(0.025)**	(0.000)***	(0.094)*	(0.034)**	(0.003)***	(0.068)*	(0.079)*	(0.000)***	(0.088)*	(0.086)*
Urban	0.615	0.044	0.432	0.837	0.081	0.363	0.912	0.031	0.242	0.763	0.061	0.505	0.806	0.013	0.299	0.825	-0.003	.555
	(0.000)***	0.631	(0.000)***	(0.000)***	0.410	(0.000)***	(0.000)***	0.756	(0.008)***	(0.000)***	0.530	(0.000)***	(0.000)***	0.890	(0.001)***	(0.000)***	0.972	(0.000)***
Const	-55.059	1.598	-25.534	-63.317	-3.875	-21.845	-69.577	2.383	-10.481	-64.855	0.343	-32.136	-64.905	1.915	16.948	-64.228	3.954	-36.167
	(0.000)***	0.821	(0.001)***	(0.000)***	0.611	(0.005)***	(0.000)***	0.752	0.167	(0.000)***	0.963	(0.000)***	(0.000)***	0.800	(0.023)**	(0.000)***	0.607	(0.000)***
R2	0.87	0.20	0.60	0.80	0.11	0.68	0.76	0.10	0.64	0.80	0.12	0.74	0.81	0.11	0.71	0.81	0.10	0.75

Note. P value in parenthesis ***, ** and * indicate the significance level at 1%, 5% and 10% respectively.

Eq 2 reports the interaction term results between FDI and each dimensions of governance. Table 5 reports the results of the panel data OLS, FE and RE regression models. As shown, all the coefficients have the expected signs in all the OLS, FE and RE estimated models. From Equation (3), it is shown that the interaction term between governance indicators and FDI (Gov*FDI) exerts a positive influence on CO2 emissions. This means that the differents indicators of governance can mitigate the effect of FDI on CO2 emissions. In other words, FDI reduce CO2 emissions after accounting the various dimensions of the governance.

The regression's results of GMM system are reported in the table 5 : the columns from 23 to 28 describe each time the various dimensions of the governance : the control of corruption, the effectiviness of government, the rule of law, the political stability, the regulatory quality and the voice and accountability ; respectively.

Table 6. The indirect effect of FDI on environmental degradation through institutional quality

	(23)	**(24)**	**(25)**	**(26)**	**(27)**	**(28)**
Co2t-1	0.209	0.828	0.996	0.942	1.005	0.868
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
CC	1.024					
	(0.082)*					
GE		0.0367				
		(0.422)				
VA			0.456			
			(0.146)			
RL				0.082		
				(0.000)***		
PS					0.0157	
					(0.204)	
RQ						0.936
						(0.093)
CC* FDI	1.029					
	(0.077)*					
GE*FDI		0.076				
		(0.086)*				
VA *FDI			1.160			

			(0.044)**			
RL*FDI				0.076		
				(0.088)**		
PS*FDI					0.096	
					(0.005)***	
RQ*FDI						1.072
						(0.083)*
FDI	-0.140	-0.080	-2.247	-0.141	-0.141	0.080
	(0.092)*	(0.259)	(0.047)**	(0.072)*	(0.004)***	(0.509)
GDP	0.008	0.001	-0.101	0.014	0.002	0.205
	(0.851)	(0.945)	(0.194)	(0.541)	(0.910)	(0.060)*
Inf	0.363	0.009	0.173	0.024	0.0509	0.091
	(0.130)	(0.796)	(0.268)	(0.387)	(0.147)	(0.375)
Enrol	1.517	0.468	1.045	0.453	0.613	-1.209
	(0.003)***	(0.222)	(0.628)	(0.089)*	(0.096)*	(0.303)
PE	-.977	-0.307	-0.049	-0.123	0.119	-2.943
	(0.050)*	(0.269)	(0.893)	(0.252)	(0.234)	(0.091)*
Open	1.169	0.165	0.590	0.154	0.457	4.402
	(0.136)	(0.434)	(0.385)	(0.305)	(0.033)**	(0.097)*
Urb	3.406	1.014	0.947	0.358	-0.583	6.026
	(0.040)	(0.442)	(0.321)	(0.115)	(0.365)	(0.083)*
Cons	-5.334	-2.610	-6.348	-1.631	-1.155	3.626
	(0.006)***	(0.285)	(0.352)	(0.012)**	(0.310)	(0.317)
AR2 (p-value)	0.388	0.246	0.271	0.174	0.118	0.396
Hansen test(p-value)	0.949	0.435	0.667	0.863	0.996	0.993

Note. P value in parenthesis ***, ** and * indicate the significance level at 1%, 5% and 10% respectively.

We noticed that after adding the term of interaction in eq 4, the coefficients of interaction terms between Foreign Direct Investment and governance indicators are still positive and significant in all regressions. We conclude that FDI can reduce the environmental degradation through the development of good quality of governance. In other words, better institutional quality can enhance the effectiveness of FDI in reducing CO2 emissions. In other words, all dimensions of governance are considered as an important factors to reduce environmental degradation (Abid, 2017).

4. Conclusion and Policy Implications

This research has investigated the interaction effects of Foreign Direct investment and institutional quality on environmental degradation in 17 Middle East and North African (MENA) for the period 1996-2018. Our estimation consists to estimate in the first hand the direct effect of Foreign Direct Investment on environmental quality. In the second hand, we investigate how the good governance measured by six dimensions of Kaufman et al. (2018) could be considered as a channel between Foreign Direct Investment (FDI) and environmental quality. In our analysis, we include each time one of six dimensions of governance developed by Kaufman et al (2018) (Control of corruption, Government effectiviness, Voice and accountability, Regulatory Quality, Political stability and Rule of law), in order to test the interaction between FDI and each dimension of governance.

In a first step, the empirical evidence shows that there is a positive relationship between FDI and environmental quality. In a second step, the effect of FDI on environmental degradation may be ameliorated through the good quality of governance. These results are robust, as we use different dimensions of governance. Our results reinforce the argument that great collaboration between FDI and strengh quality of institutions will be more effective to reduce the environmental degradation.

These findings imply that policy makers should develop and implent policy that incentivize Foreign Direct Investment to use green technologies that are more environmentally freindly in MENA countries. Likewise, government should develop and implement good institutional quality in order to reduce the harmful effects of FDI on CO2 emissions in MENA countries.

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Appendix A1

Table A.1.1. Correlation between the different indicators of governance

	CC	GE	PS	RQ	RL	VA
CC	1.000					
GE	0.996	1.000				
PS	0.985	0.986	1.000			
RQ	0.994	0.995	0.979	1.000		
RL	0.997	0.996	0.986	0.995	1.000	
VA	0.985	0.983	0.964	0.981	0.984	1.000