

The impacts of governance on Environmental Pollution in some countries of Middle East and sub-Saharan Africa: The Evidence from panel Quantile Regression and Causality

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1 *The impacts of governance on Environmental Pollution in some countries of Middle East and sub-*
2 *Saharan Africa : The Evidence from panel Quantile Regression and Causality*

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8 *Abstract*

9 *In some countries of the Middle East and sub-Saharan Africa, it was studied the impacts of governance*
10 *and FDI on environmental pollution over the period of 1996–2018 by the Panel Quantile and Granger*
11 *causality methods. The countries were selected by considering two different measurements, EPI (2020)*
12 *and governance index (2020). Accordingly EPI(2020), these countries have low scores in terms of*
13 *environmental quality and in governance index(2020), they have bad governance scores because of*
14 *inefficient regulatory structures, government bureaucracy, weak law enforcement, etc. Panel Quantile*
15 *regression revealed the evidence of the long-run relation among the environmental pollution, the*
16 *governance and FDI. Accordingly Quantile regression results, governance has the greatest positive effect*
17 *on CO₂ emission. Both traditional and Dumitrescu-Hurlin (DH) causality methods found the evidence of*
18 *causality among governance and environmental pollution in the context of two parameters of governance,*
19 *as the evidences of unidirectional causal nexus from political governance and FDI to environmental*
20 *pollution and from economic governance, and FDI to environmental pollution.*
21

22 **Key Words:** *Governance, panel quantile regression panel causality test, environmental pollution,*
23

24 **1. Introduction**

25 Environmental pollution under the influence of dangerous pollutants such as CO₂, NO_x, and GHG
26 became a major threat across the worldwide. According to IEA(2019), CO₂ emissions through the world
27 rose 33.1 billion tons in 2018, which is about 145% above pre-industrial levels. (Dean, et al., 2018). The
28 reasons for the rise in CO₂ releases have been discussed in many papers accented the impacts of various
29 factors. Although in pursuit of Grossman and Krueger(1991) ¹., the impacts of industrialization on
30 environmental pollution were analyzed by many papers, a few papers accented the importance of
31 governance. Governance has impact both on economic growth and environmental pollution. A few
32 environmental economist discussed that governance has an important role on environmental pollution
33 (Danish et al. 2019). In the context of environmental damages, the government system and institution
34 quality affect environmental quality both directly and indirectly. Good governance helps to decrease the
35 level of pollution(e.g. Leonard, 1988; Shandra et al., 2008; Clapp and Dauvergne, 2005; Jorgenson, 2009)
36 and it contributes to the environmental improvement (Hassan et al. 2020) and regulation of emission level.

37 Nowadays, institutional quality and strong institution structure are needed as the basic tools (Liu et
38 al.;2020) to decrease pollution levels (Hosseini and Kaneko: 2013) through property rights, the effective
39 judicial system, etc.. And the faults in governance support corruption in the environmental arena

¹ They showed that the economic development tends to accelerate environmental pollution problems once a certain GDP per capita level is reached

40 (Leitao: 2016). So, escapes in rules would do it difficult for the realized of the rule that decreases
41 CO₂ releases (Abid: 2016; Liu et al:2020). Moreover, institutional quality in the frame of governance
42 can control the impacts of CO₂ releases increasing on the shadow economy and corruption (Goelet
43 al.: 2013).

44 FDI as another factor of environmental pollution can cause the important damages on
45 environmental, and it is affected by governance. The nexus between FDI, environmental and
46 sustainability was explored by Brundtland and WCED(1987). Some papers showed that energy
47 consumption under the influence of FDI inflows is significant reason of environmental pollution
48 in the frame of the PHH(Pollution Haven Hypothesis) that was developed by Copeland and
49 Taylor (1994). Bokpin(2017) showed that a great quantity of FDI inflows to less-developed
50 nations are ecologically inefficient and highly polluting manufacturing methods originating from
51 developed nations. In the recent years, some papers discuss that the less-developed countries live
52 a deepening foreigndebt, with governments incorporating exemptions into environmental
53 regulations planned to keep thenatural environment from activities in diverse sectors of the
54 economy (e.g. Leonard, 1988; Shandra et al., 2008, Jorgenson, 2009, Clapp and Dauvergne,
55 2005). Peres et al.(2018), Wang andChen (2014) and Li et al.,(2019) analysed the relation among
56 good governance, CO₂ releases and FDI. The impacts of FDI on the environmental damages of
57 host country are based upon the level of governance. Governance of the host country affects
58 behaviors and policies of transnational firms (Wang and Chen 2014). These firms put pressure to
59 corrupt policies of host countries to be positively affected by environmental regulations (Cole
60 andFredriksson 2009). Desbordes and Vauday (2007) signed that these firms provide regulatory
61 and substantial tax advantages. If it is explained briefly, FDI inflows have adverse effect on
62 environmental sustainability of less developed countries and the relation between environmental
63 sustainability and FDI is depend on the role of institutions and governance.

64 In this paper, the long-run relation and causal link among environmental pollution,
65 governance, FDI inflow, and real GDP for a sample of the countries consisting of Afghanistan,
66 Angola, Bangladesh, Benin, Cameroon, Congo Dem., Congo, Chad, Central African Rep,
67 Ethiopia, Ghana, Gambia, Eritrea, Iraq, Kenya, Lesotho, Madagascar, Mali, Mozambique,
68 Myanmar, Niger, Pakistan, Syria, Uganda, Zimbabwe by using Quantile panel regression, and
69 causality tests will be analysed. The countries were selected by depending on the Global
70 Environment Index (EPI:2020) and governance performance index (2020) of the countries. These
71 countries have low scores of environmental quality. And accordingly other index, the selected
72 countries are categorized by inefficient regulatory structures, government bureaucracy, and weak
73 law enforcement. Firstly, panel Quantile regression(PQR) method will be applied. PQR will give
74 the long-run estimations to determine accurate economic policy suggestions that cover the crucial
75 points in this paper. PQR is robust to heavy distributions and outliers. By employing PQR
76 method, the determinants of CO₂ releases through the conditional distribution will be found. This
77 method will permit to estimate the conditional heterogeneous covariance impacts of CO₂
78 releases. The results of PQR will be compared with one's of FMOLS and DOLS. Lastly,
79 causality test will determine the direction of causality that is very significant to determine
80 appropriate economic policy suggestions. If these methods give the same results, the results will
81 be considered as correct.

82 The design of this article was constructed in the following way. The literature section is given
83 in the following section. The third part presents the data and definitions of the variables.

84 Methodology is explained in the section four. The fifth section supplies the econometric results.
85 The discussion has taken place in the sixth part. The conclusions are exhibited in the last part.

86 2. Literature

87 Dryzek (1987) suggested radical decentralization on environmental degradation. Desai (1998) showed
88 that in developing countries, corruption contributes to environmental problems. Fredriksson and Svensson
89 (2003) showed that environmental policies are affected by corruption and political instability. And they
90 showed that governance and the levels of corruption have an adverse impact on the stringency of
91 environmental regulation, and that the impact can be positive at high levels. Fredriksson et al. (2004),
92 Pellegrini and Gerlagh (2006), Damania et al. (2003) found that corruption decreases the severity of
93 environmental regulations. Bhattarai and Hammig (2004) found the support for the EKC hypothesis in the
94 context of control variables of institutional factors and the rule of law. Fredriksson et al. (2005) found that
95 democracy encourages the administration to better characterize public preferences and that the
96 government can prefer a more strict environmental policy. Bernauer and Koubi (2009), Wilson and
97 Damania (2005), Yang et al. (2018) showed green parties' strength and regulatory systems have non-
98 negative effect on environmental quality. In EKC framework, Welsch (2004) tested the direct and
99 indirect impacts of corruption on environmental quality and determined that it hampers the application and
100 formation of environmental regulations. Cole (2007) found that corruption positively affects both CO₂ and
101 sulfur (SO₂) emissions for 94 countries in the period of 1987-2000. Dutt (2009) examined the relation
102 between the environment and income in the context of institution and governance. Gani (2012) who
103 examined the relationship between CO₂ releases and five dimensions of governance in 99 developing
104 countries found that good governance enables lower CO₂ releases. Halkos and Tzeremes (2013) found the
105 important the relationship between CO₂ emission and governance by non-parametric estimator. Halkos
106 et al. (2015), for U.K, Germany and France, and tested the impact of regional quality on environment.
107 They determined that high regional quality will not enable environmental effectiveness. Zhang et al.
108 (2016) tested the influence of corruption on CO₂ releases in APEC countries from 1992 to 2012 by Panel
109 quantile regression model. Their findings indicated that the impact is adverse and statistically significant.
110 Sarkodie and Adams (2018) showed that corruption control, better governance, and political institutional
111 quality could support to mitigate pollution in South Africa. Abid (2017), in EU countries, determined that
112 a higher institutional quality can decrease CO₂ releases, and that institutional quality is not significant in
113 the MEA countries. Danish et al. (2019), for BRICS countries, tested the importance of governance on
114 environmental damages. The results found the importance of governance. Liu et al. (2020), for five
115 countries that have high CO₂ emission countries, explored the relationship between governance, CO₂
116 releases, and real GDP in the context of the EKC from 1996 to 2017 by the panel data methods. They
117 showed that good governance is a way to test effective measures to protect and enhance
118 environmental quality.

119 If it is explored the literature of FDI in the context of governance, it is seen that some articles
120 concentrate on this subject. Good governance systems are very important to increase the attractiveness of
121 FDI (Lehnert et al., 2013; Gani, 2007). Peres et al. (2018), Nguyen (2015), Mengistu and Adhikary (2011),
122 Gani (2007), Globerman and Shapiro (2002) determined a positive correlation among FDI and good
123 governance. In less developed countries, it is accepted that FDI has detrimental impacts on the
124 environment in the frame of exhaustible resources (Solow, 1974; Stiglitz, 1974; Bokpin et al., 2015). A
125 few paper found that natural resources become the most important determinants of FDI flow to Africa.
126 Bokpin et al., (2017) accented that FDI flows towards Africa are related with natural resource
127 endowment and that they cause environmental degradation. Bokpin (2017) showed how FDI towards
128 Africa contributes to the environmental degradation to situate Africa's FDI flows over the period of 1990–
129 2013. The results determined that an rise in FDI inflows importantly rises environmental damages; and
130 affirmed that there are need of strong governance and quality institutions to have non-negative effects on
131 environmental sustainability of FDI. Omri and Hadj (2020), in 23 emerging countries over 1996–

132 2014, tests how good governance complements FDI to diminish CO emissions. They found that
 133 increasing governance quality have negative effects on carbon emissions and that both
 134 institutional and political governance decrease the level of CO₂ releases.

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3. Data and Definitions

138 In this study, annual data covering the period of 1996-2018 for the Afghanistan, Angola,
 139 Bangladesh, Benin, Cameroon, Congo Dem., Congo, Chad, Central African Rep, Ethiopia, Ghana,
 140 Gambia,, Eritrea, Iraq, Kenya, Lesotho, Madagascar, Mali, Mozambique, Myanmar, Niger, Pakistan,
 141 Syria, Uganda, Zimbabwe employed. The variables used in the analysis are environmental pollution
 142 (co), FDI inflow (fdi), real GDP (y), and *political governance(p) and government effectiveness (g)* as a
 143 measure of governance. Economic growth is represented by realGDP (y) in constant 2005 USD. Real
 144 GDP (USD), FDI, and CO₂ releases for the analyzed countries were obtained from the World Bank(WB).
 145 Two indicators as *economic governance (government effectiveness)* and *political governance (political*
 146 *stability)* were used. These variables were taken from the WGI (Worldwide Governance Indicators)
 147 database. It is expected a positive link between the reduction of CO₂ emissions and these categories of
 148 governance indicators (Costantini and Monni, 2008). And it was used logarithmic transformation for the
 149 selected variables and they were converted as log(variables_i)

150 In these countries, in the context of political governance and economic effectiveness regional
 151 differences and the ethnic disputes deserve important attention. Some of these countries suffer from an
 152 ethnic heterogeneity problem which is an important factor that causes to political instability². These
 153 countries have multi-ethnic structures to varying degrees. These problems strictly have the impacts on the
 154 economic and political development of the region.

155 In these countries, the level of environmental pollution is very high due to poor governance and other
 156 factors. Poor governance does not allow policy makers to adhere to strict environmental policies, and this
 157 is not enough to control corruption. Therefore, mismanagement creates more environmental pollution by
 158 resulting in higher CO2 emissions.

159 In Table 1, Global Environmental Index (EPI:2020) shows how far to establish the environmental
 160 policy goals of these countries.

161 **Table 1:** Scores of the countries

Countries	EPI(2020)*	10-Year Change	Countries	EPI(2020)	10-Year Change
Myanmar	25.1(179)	-1.2	Eritrea	30.4(156)	-3.7
Afghanistan	25.5(178)	5	Congo	30.8(152)	-1.5

² Political instability covers the increase in the effect of wars, civil wars, terror attacks, religious opposition, minorities, etc. Alesina et al. (1992), Tabellini and Alesina (1990), Alesina and Tabellini (1989, 1990), Ozler and Tabellini (1991), Cukierman et al. (1992), Gil-Alana and Barros (2010) discussed the economic inefficiencies of unstable political environment. But these papers did not analyze the environmental impacts. Political instability is generally experienced in developing countries in the World. According to GTI (2017), the number of political conflicts increased (almost doubled) in 2016. In 2006, SubSaharan Africa and Asia tracked by SubSaharan Africa had the highest growth in the number of conflicts. Since 2000, these countries have experienced many conflicts, wars, terror attacks, etc., which are accepted as sources of political instability. For example, Iraq- United States-led coalition War (2003- 2011), the conflict in Central African Republic Bush War (2004-07), the Niger Delta(2004-present), the Central African Republic conflict (2012–present), the Arab Spring (2010-12), Syrian civil war(2011-present) are a few of them. According to GTI (2018), Afghanistan experienced the highest amount of terrorism-connected deaths in 2017. In the same year, Iraq had the second-highest amount of deaths from terrorist attacks and the highest rate of rise in terrorism((IEP 2018); Bildirici and Gökmenoğlu:2020). Terrorist attacks, wars etc., increase environmental pollution as well as reducing the level of economic growth by damaging public and private capitals (Collier, et al. 2003); Bildirici and Gökmenoğlu(2020).

Cote d'Ivoire	25.8(176)	-8.5	Niger	30.8(152)	-8.1
Guinea	26.4(175)	-4.2	Pakistan	33.1(142)	6.1
Madagascar	26.5(174)	-6.6	Cameroon	33.6(139)	1.5
Chad	26.7(172)	-0.9	Mozambique	33.9(136)	5.3
Ghana	27.6(168)	-4.4	Ethiopia	34.4(134)	0.2
Gambia	27.9(166)	3.6	Kenya	34.7(132)	-
Lesotho	28(165)	-1	Uganda	35.6(127)	1.8
Bangladesh	29(162)	-0.1	Dem. Rep. Congo	36.4(125)	-0.4
Mali	29.4(160)	-3.3	Central African Rep	36.9(124)	-3.9
Angola	29.7(158)	5.3	Zimbabwe	37(123)	-7.3
Benin	30(157)	2.7	Iraq	39.5(106)	0.2

162 *EPI (2020) ranks 180 countries on 22 performance indicators. The numbers in parenthesis show rank
163 within 180 countries for EPI (2020). EPI(2020) did not determine value for Syria
164

165 According to EPI (2020), the countries in the African continent have low scores in terms of
166 environmental quality. Low scores show the need for domestic sustainability struggles.
167 Myanmar, Afghanistan, Cote d'Ivoire, Guinea and Madagascar are near the bottom of the rankings. These
168 countries have more serious environmental damages.
169

170 4. Econometric Methodology

171 The methodology was presented in two stages. Firstly, Quantile panel regression test was presented.
172 Secondly, panel causality tests were presented. And lastly, two different causality tests were supplied.
173

174 4.1. Panel quantile Method

175 The panelquantile regression that was suggested by Koenker and Basset(1978)has some advantages
176 over the OLS regression. Firstly, it can be obtained more *robust* the result from panel quantile
177 regression(PQR)(Bera et al.:2016). And it is unneeded to shape distributional assumptions by employing
178 PQR(Sherwood and Wang:2016). Furthermore, this technique can seizure the characteristics of the full
179 conditional distribution of the selected variables (Yu and Jones:1998; Chen et al.(2018). Koenker &
180 Bassett (1982) proposed that Quantile regression is useful in examining asymmetric features of variable
181 distributions (Chen and Lei: (2018)).

182 The conditional quantile of y_i given as follows

$$183 Q_{coi}(t | x_i) = x_i^T b_t \quad (1)$$

184 PQR is robust to heavy distributions and outliers. In this paper, the fixed effect PQR method was used:
185

$$186 Q_{yi}(t_k | a_i, x_{it}) = a_i + x_{it}^T b(t_k), \quad i = 1, \dots, N; t = 1, \dots, T \quad (2)$$

187 N is the number of observations, and t is the index of time. The parameter estimate is calculated as
188 follows
189

$$190 \min_{(\alpha, \beta)} \sum_{k=1}^K \sum_{t=1}^T \sum_{i=1}^N w_k \rho_{\tau_k}(y_{it} - \alpha_i - x_{it}^T \beta(\tau_k)) + \lambda \sum_i |\alpha_i| \quad i = 1, \dots, N; t = 1, \dots, T \quad (3)$$

191 To estimate the impacts of FDI(fdi), economic growth (y), political governance(p) and economic
192 governance(g) on CO2 emissions, it was used equally weighted quantiles $w_k = 1/K$ as Ang (2007) and
193

194 Chen and Lei: (2018)) and set $l = 1$ as Chen and Lei (2018). The conditional quantiles function is
 195 given as follows

$$Q_{coi}(\tau | \alpha_i, \xi_i, x_i) = \alpha_i + \xi_i + \beta_{1\tau}lg_{it} + \beta_{2\tau}lc_{it} + \beta_{3\tau}ly_{it} + \beta_{4\tau}lfdi_{it} + \beta_{5\tau}lp_{it}$$

196 co p fdi g y c (4)

197 **5. Empirical Results**

198
 199 In this paper, the empirical results were obtained in four steps:

- 200 1- The descriptive statistics and panel unit root tests were given.
- 201 2- Westerlund (2007) test determine cointegration result.
- 202 3- Panel Quantile regression, and DOLS and FMOLS tests suggested by Pedroni determined the long-
 203 run coefficients. DOLS and FMOLS tests were preferred to compare the results determined by
 204 quantile methods.
- 205 4- The direction of causal relation by traditional and Dumitrescu-Hurlin causality tests were
 206 determined.

207
 208 **Descriptive Statistics**

209 In Table 2, the results showed that while ‘co’ variable is positively skewed, “g”, “fdi”, “p”, and ‘y’
 210 variables are negatively skewed.

211 **Table 2. Statistics**

	co	g	fdi	p	y
Kurtosis	1.26	1.94	3.305	2.65	2.27
Jarque-Bera	3.06	2.03	2.789	3.01	3.007
Skewness	0.144	-0.78	-0.083	-0.12	-0.27

212
 213 **The Unit Root Tests**

214 Table 3 shows the findings determined by LLC, and IPS tests. The variables were found as an I(1).
 215

216 **Table 3. LLC and IPS Results**

	<i>LLChu</i>	<i>IPS</i>		<i>LLChu</i>	<i>IPS</i>	Decision
<i>y</i>	-1.87	-2.18	<i>dy</i>	-12.62	-15.83	I(1)
<i>p</i>	-1.65	0.805	<i>dp</i>	-6.96	-9.26	I(1)
<i>fdi</i>	-1.23	1.32	<i>dfdi</i>	-7.14	-8.032	I(1)
<i>co</i>	-1.63	-2.19	<i>dco</i>	-11.72	-13.46	I(1)
<i>g</i>	-1.86	-1.47	<i>dg</i>	-7.88	-10.018	I(1)

217
 218 After unit root tests, it was applied Westerlund (2007) test.
 219

220 **Table 4. The Cointegration Result**

G_t	- 3.117	G_a	- 12.641	P_t	- 13.921	P_a	- 11.729
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 222 For the selected variables, in small sample size, T=25, the results can exhibit the sensitivity to the
 223 selection of parameters as the kernel width and lag-lead lengths. Based on Persyn&Westerlund (2008),
 224 cross-sectional dependencies were taken into account. When a shorter kernel window is used, the H_0 of
 225 no cointegration was rejected by Westerlund test.
 226

227 **Long-run Coefficients**

228 Pedroni DOLS and FMOLS results estimated the long-run relation. The coefficients of governance,
 229 and FDI are statistically significant in all models and they have effects on environmental pollution.

230 In Table 5, according to our results, all variables have statistically significant impacts on
 231 environmental pollution. The estimations of the FMOLS model disclose that a 1% increase in political
 232 governance and government governance increases environmental pollution by 0.44% and 0.367
 233 respectively, and a 1% rise in FDI increases environmental pollution by 0.016%.

234 **Table 5. Quantile, and FMOLS and DOLS Results**

<i>Dependent Variable: co</i>							
	Pedroni DOLS and FMOLS		<i>Quantile</i>				
	<i>FMOLS</i>	<i>PDOLS</i>	<i>0.1</i>	<i>0.25</i>	<i>0.5</i>	<i>0.75</i>	<i>0.90</i>
<i>ly</i>	0.09 (2.93)	0.13 (2.4)	0.14 (13.4)	0.063 (2.61)	0.05 (2.75)	0.114 (7.10)	0.207 (3.63)
<i>lp</i>	0.44 (1.88)	0.404 (2.09)	0.136 (1.85)	0.13 (1.78)	0.143 (2.29)	0.328 (1.82)	0.822 (4.62)
<i>lg</i>	0.367 (2.83)	0.561 (1.99)	0.169 (1.91)	-0.011 (1.75)	0.061 (1.83)	0.23 (2.71)	0.738 (3.85)
<i>lfdi</i>	0.016 (1.94)	0.09 (1.93)	0.012 (1.758)	0.011 (2.02)	0.05 (2.55)	0.328 (4.25)	0.029 (2.94)

235
 236 Accordingly, the determined results by the panel quantile regression underlined several significant
 237 points. The important effects of FDI and governance on CO₂ emissions were seen. Furthermore, when
 238 compared with other variables, the political and government governance have the greatest positive effect
 239 on CO₂ emissions across quantiles. The influential intensity of political governance on CO₂ emissions
 240 changes from 0.13 to 0.822. According to results, good governance system supports environmental
 241 regulations and decreases CO₂ releases.

242 FDI cause increasing carbon releases, ranging from 0.011 to 0.328. FDI increase carbon emissions in
 243 these countries due to the old-fashioned the technologies and due to insufficient environmental laws and
 244 regulations.

245
 246 **Causality Results**

247 As the cointegration among the variables is determined, it is expected that through a feedback
 248 mechanism, a change in a variable has an influence on the other variables.

249
 250 **Table 6. Causality Results**

$\Delta fdi \rightarrow \Delta co$	$\Delta y \rightarrow \Delta co$	$\Delta g \rightarrow \Delta co$	$\Delta p \rightarrow \Delta co$	$\Delta fdi \rightarrow \Delta y$
$\Delta co \rightarrow \Delta fdi$	$\Delta co \rightarrow \Delta y$	$\Delta co \rightarrow \Delta g$	$\Delta co \rightarrow \Delta p$	$\Delta y \rightarrow \Delta fdi$
3.48	4.34	3.56	4.83	4.83
1.61	0.954	0.84	0.84	1.76
Causality Direction				
<i>fdi</i> → <i>co</i>	<i>y</i> → <i>co</i>	<i>g</i> → <i>co</i>	<i>p</i> → <i>co</i>	<i>y</i> → <i>fdi</i>
$\Delta fdi \rightarrow \Delta g$	$\Delta fdi \rightarrow \Delta p$	$\Delta g \rightarrow \Delta y$	$\Delta p \rightarrow \Delta y$	$\Delta p \rightarrow \Delta g$
$\Delta g \rightarrow \Delta fdi$	$\Delta p \rightarrow \Delta fdi$	$\Delta y \rightarrow \Delta g$	$\Delta y \rightarrow \Delta p$	$\Delta g \rightarrow \Delta p$
4.55	5.56	7.93	3.93	3.27
3.86	4.87	10.497	5.99	4.99

Causality Direction				
fdi↔g	p↔fdi	y↔g	y↔p	g↔p
↔ describe bidirectional causality, the sign → indicates the direction of causality				

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Table 7. Dumitrescu-Hurlin Test*

$\Delta fdi \rightarrow \Delta co$	$\Delta y \rightarrow \Delta co$	$\Delta g \rightarrow \Delta co$	$\Delta p \rightarrow \Delta co$	$\Delta fdi \rightarrow \Delta y$
$\Delta co \rightarrow \Delta fdi$	$\Delta co \rightarrow \Delta y$	$\Delta co \rightarrow \Delta g$	$\Delta co \rightarrow \Delta p$	$\Delta y \rightarrow \Delta fdi$
$W_{N,T}^{hnc}$				
3.99	4.54	3.68	6.093	4.944
1.77	0.81	1.75	1.135	0.964
Causality Direction				
fdi→co	y→co	g→co	p→co	y→fdi
$\Delta fdi \rightarrow \Delta g$	$\Delta fdi \rightarrow \Delta p$	$\Delta g \rightarrow \Delta y$	$\Delta p \rightarrow \Delta y$	$\Delta p \rightarrow \Delta g$
$\Delta g \rightarrow \Delta fdi$	$\Delta p \rightarrow \Delta fdi$	$\Delta y \rightarrow \Delta g$	$\Delta y \rightarrow \Delta p$	$\Delta g \rightarrow \Delta p$
$W_{N,T}^{hnc}$				
5.132	5.9356	5.65	5.36	5.35
6.129	0.0851	5.32	6.61	6.47
Causality Direction				
fdi↔g	p↔fdi	y↔g	y↔p	g↔p

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- Only $W_{N,T}^{hnc}$ results were exhibited but not $Z_{N,T}^{hnc}$

The results can be given as follows:

- 1- It was found that there is uni-directional causality running from economic governance to CO₂ release. More clearly, bad economic governance is a Granger cause of environmental pollution.
- 2- It was found that there is uni-directional causal link running from political governance to environmental pollution.
- 3- The uni-directional causality from FDI to CO₂ releases corrected the findings of the PHH. Production technology and insufficient environmental awareness are very important factors for increasing environmental pollution.
- 4- As approved by many papers, it was determined that there is uni-directional causality from Y to CO₂ releases.
- 5- It was found the evidence of two-way causality between political governance and Y, between political governance and economic governance, between political governance and FDI, and between economic governance and FDI.

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According to both traditional and Dumitrescu-Hurlin causality tests, there is uni-directional causal nexus from economic growth, political and economic governance, and FDI inflow to CO₂ emission.

274 7. Discussion

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Quantile regression results showed that economic and political governance have significant explanatory power on FDI inflow, CO₂ releases, and real GDP. The coefficients of economic and politic

279 governance, FDI and economic growth, are a positive signs in various quantiles (Table 6) . The
280 coefficients of government and politic governance in all the estimated models are positive and determine
281 that bad government governance and political governance lead to increasing CO2 emissions.

282 In these countries, since the evidence of uni-directional causality from bad economic governance to
283 CO₂ release and the evidence of uni-directional causality from political governance to environmental
284 pollution were determined, both the organizations and individuals are prevented from dealing with
285 environmental quality due to impacts of bad governance.

286 And FDI cause increasing carbon emissions in changing ranges from 0.011 to 0.328 percent.
287 Accordingly causality results, there is the evidence of uni-directional causality from FDI to CO₂ releases.
288 In these countries, the FDI inflows provide the important contribution to economic growth, but it leads to
289 an increase in environmental pollution. Rising pollution caused by FDI is not controllable upto some
290 extent, because these countries have the problems of economic development, and in these countries, FDI
291 is vital for economic development. But FDI increase carbon emissions in these countries due to the old-
292 fashioned the technologies and due to insufficient environmental laws and regulations. Because bad
293 governance is to prevent government policies for addressing environmental issues caused by FDI. In this
294 countries, there is bi-directional causality between FDI and governance. In these countries FDI is
295 sensitive bad governance, bad governance attracts FDI and FDI causes bad governance

296 On the other hand, the governments must apply incentive policies to attract high-tech firms to
297 further invest in their countries, and on the other hand, to limit the entry of polluting industries into the
298 country, they must have strict environmental regulations. The government policies should look after the
299 efficient and environmentally-friendly source consumption of FDIs. And lastly, governments must
300 embrace green policies to decrease pollution. As a results, good political and economic governance can
301 decrease environmental pollution. These countries have need to good governance because good
302 governance covers the protection of the environment and sustainable natural sources.

303 304 *Conclusions*

305
306 This paper tested the relation between governance and environmental pollution with additional two
307 variables such as real GDP, and FDI inflow in Afghanistan, Angola, Bangladesh, Benin, Cameroon,
308 Congo Dem., Congo, Chad, Central African Rep, Ethiopia, Ghana, Gambia,, Eritrea, Iraq, Kenya,
309 Lesotho, Madagascar, Mali, Mozambique, Myanmar, Niger, Pakistan, Syria, Uganda, Zimbabwe for the
310 period of 1996–2018 by utilizing panel tests. Panel cointegration test determined the presence of
311 cointegration among the selected variables. The panel Quantile regression, and FMOLS and DOLS
312 methods found the effects of government and political governance, and FDI on environmental pollution.
313 The coefficients of economic and politic governance in all the estimated models are positive and
314 determine that an increase in good economic governance and bad political governance will lead to
315 increasing CO₂ emissions. Both traditional and Dumitrescu-Hurlin causality approaches were employed
316 to determine the evidence of the causality between the analyzed variables. The results determined uni-
317 directional causality from governance, and FDI inflow to environmental pollution.

318 Despite unsustainable development, the policymakers do not have the opportunity to choose the
319 variables which have adverse effects on the environment. Bad governance is to prevent government
320 policies for addressing environmental issues. The political stability helps to control CO₂ emissions and, to
321 recover environmental quality. Decreasing CO₂ emissions with better political institution can be
322 provided, because stability is one of the most significant requirements of environmental quality.

323 As a result, unless the bad governance is solved, the policies executed on environmental sustainability
324 will not give the expected results.

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