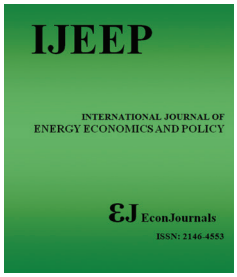

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The Ambivalent Role of Institutions in the CO_2 Emissions: The Case of Emerging Countries

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ABSTRACT

The CO_2 emission is a very urgent theme for emerging economies that are currently producing 60% of the global emissions. Because these countries generally have a high economic growth, they usually face with environmental issues. This article investigates the relationship between the economic activity, and more precisely economic integration (trade openness and FDI inflow), on CO_2 emissions by taking into consideration the potential role played by institutions. Through sys-GMM estimators, our analysis investigates a sample of 36 emerging economies on a period going from 2002 to 2015. Our major findings are the following: (1) The economic integration increases CO_2 emissions, supporting the "pollution-haven" hypothesis for emerging economies; (2) the improvement of institutional quality also increases CO_2 emissions via the increase of economic activities it generates; (3) more interestingly, the improvements of institutions can reduce the positive effect of FDI inflow and trade openness on CO_2 emissions. We will explain this observation through the lens of the well-known Environmental Kuznets curve suggesting that an improvement of institutional quality goes hand in hand with financial and trade openness of emerging economies if these countries want to fight against global warming in the long term.

Keywords: CO_2 Emissions, Economic Integration, Environment, Institutions
JEL Classifications: E02, F15, Q56

1. INTRODUCTION

Human activities definitely contributes to the global warming and climate change (Spangenberg, 2007). Therefore the relationship between economic activities and environment got much attention from economists and policy-makers during the last decades (Zakarya et al., 2015). The link between FDI, international trade, and environment have been largely investigated in the specialized literature (Ertugrul et al., 2016; Grossman and Krueger, 1991; Kahouli and Omri, 2017). Grossman and Krueger (1991) discussed the influences of trade openness and FDI on environment through their role on economic activities and their ability to bring new techniques of production (Haapanen and Tapio, 2016). In relation to this aspect, two perspectives can be evoked: (1) The "pollution-haven" hypothesis according to which developed countries use FDI as a way of escaping their environmental duties by developing polluting activities abroad (Zakarya et al., 2015); and (2) the "pollution-halo" hypothesis which states, on the other hand, that FDI inflow provides motivations and opportunities for host countries to develop new technologies decreasing the CO_2 emissions (Frankel and Rose, 2002; Wheeler, 2001).

The objective of this article is to investigate these two hypotheses in emerging countries in the light of the gradual improvement of institutional quality observed in these countries. Recent studies investigated the dynamic inter-relationships between economic growth, FDI, international trade and pollution by taking into consideration the variety of emitters' profile. Zakarya et al. (2015) analyzed the interactions that may exist between the total energy consumption, FDI, economic growth and CO_2 emissions in BRICS (Brazil, Russian, Indian, China and South Africa) countries indicating that FDI directly affects economic growth but does not have a short term influence on the CO_2 emissions in these countries. In the long term, FDI net inflows and the gross domestic product (GDP) are shown to be important factors for the increasing of CO_2 emissions. Ertugrul et al. (2016) analyzed the relationship between CO_2 emissions, trade openness, real income and energy consumption in the top ten CO_2 emitters among the

developing countries (Brazil, China, India, Indonesia, Malaysia, Mexico, South Africa, South Korea, Turkey, and Thailand) for a period from 1971 to 2011. They found that real income, energy consumption and trade openness are the major determinants of CO_2 emissions in the long run in all these countries.

Institutions can be defined as the society "rules of game" setting the constraints on human behaviors and therefore defining the room for economic activities (Marošević and Jurković, 2013; North, 1990). Institutional and regulatory framework of a country directly influences the way economic activities can (or not) impact the environment. Although this aspect looks obvious, the study of the inter-relationships between FDI inflow, trade openness and CO_2 emissions through the lens of institutional quality is still under-investigated in the specialized literature. This article aims at filling this gap by shedding the light on the importance of the combined effect of the trade, FDIs and the institutional quality on the pollution for the 36 highest CO_2 emitters among emerging economies and the world (Figure 1). Actually, emerging countries face with many changes and challenges in their fast-growing economies with increasing trade activities and growing FDI inflows. In this context, institutions can play an important role in the economic activities and CO_2 emissions. This article aims at investigating further this potential influence. The aim of this paper is to study to what extent institutions can contribute (or not) to the fight against global warming in a fast growing context observed in emerging countries.

This article is structured as follow. The next section presents a review of the literature devoted to institutions, FDI, trade and their impact on CO_2 emissions. The third section presents our methodology and data. Afterwards, the fourth section discusses our results while the fifth section ends this paper by proposing general recommendations for policy makers.

2. LITERATURE REVIEW

This section is structured into two sub-sections. We first review the literature dealing with the relationship between economic integration and CO_2 emissions. Afterwards, we present the existing studies that investigated the combined effect of FDI inflow, trade openness, and institutions on the CO_2 emissions.

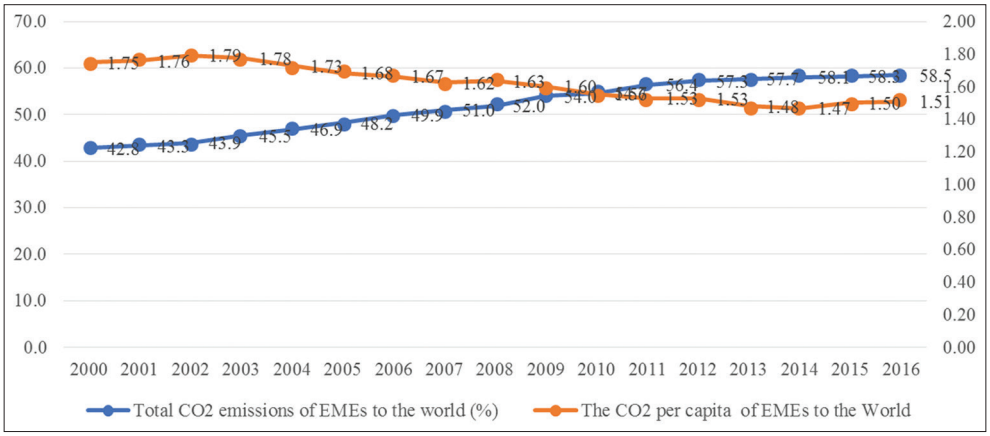
2.1. Economic Integration and CO_2 Emissions

The trade openness that can be roughly defined as the sum of exports plus imports in relation to GDP, is a key parameter in the CO_2 emissions. Because trade openness expands the scale of economic activities, it potentially increases the total pollution if the way of producing does not focus on green aspects. Trade openness might also affect the environment when a country excessively specializes in its competitive advantage without taking into consideration environmental issues. Paradoxically, trade openness also brings new techniques to the domestic production that, in contrast with the two effects evoked above, might help to reduce the CO_2 emissions. According to Grossman and Krueger (1991), the openness in trade activities (reduction of trade barriers) and capital activities (deregulation of capital control) can positively influence the economic environment by favoring the development of new techniques and by improving education and the existing mode of production. Furthermore, trade liberalization generates higher income levels which also increase the awareness of people about environment problems. Such situation usually increases the political pressures on policy-makers for a better environment. These debates are well documented in the existing literature (Ertugrul et al., 2016 for further information on this topic).

Naranpanawa (2011) emphasized the short-run relationship between trade openness and CO_2 emissions in Sri Lanka for the period going from 1960 to 2006 showing that there is no long-run relations or even causality between these variables. Fotros and Maaboudi (2011) found that trade openness has a significant positive impact on the CO_2 emissions in Iran for the period 1971-2006. Al-Mulali and Ozturk (2015) observed that trade openness (in combination with energy consumption, urbanization, and industrial development) increase environmental damage by emphasizing that the political stability can reduce this problem in the long run for 14 Middle East and North African countries. Shahzad et al. (2017) found that one percent increase in trade openness and financial development in Pakistan increases carbon emissions by 0.247% in the long-term.

In contrast with these works, other studies emphasized the positive effect of trade openness on environment. Hossain (2011) or Sebri and Ben-Salha (2014), for instance, studied the case of BRICS countries

Figure 1: The CO_2 emissions in 36 emerging economies versus the world

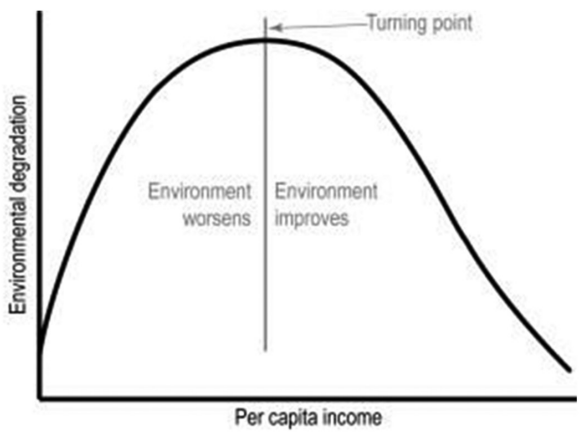


Source: Calculations from EDGAR's Global Fossil CO_2 emissions

for the period of 1971-2010 and they found a significant effect of trade openness on the promotion of renewable energy. These authors also showed that trade openness favored a 'green technologies' transfer helping BRICS countries to invest more in renewable energy. However, these studies can be nuanced by Le et al. (2016) who documented that a relatively lack of environmental regulation can be considered as a comparative advantage for pollution-intensive companies looking for a "pollution-haven" (to avoid paying costly pollution control expenditures in their country, Zakarya et al., 2015).

Regarding to FDI, Frankel and Romer (1999) noticed that the development and liberalization of financial markets may attract FDI and higher degrees of R&D investments. Such situation can then speed up the economic growth by influencing the dynamics of the environmental performance through two directions. On the one hand, a higher capital flow creates opportunities for host countries to use new technologies. This first potential effect is called the "pollution-halo" hypothesis claiming that FDI can contribute to reduce the CO_2 emissions (Birdsall and Wheeler, 1993; Frankel and Rose, 2002; Zarsky, 1999). On the other hand, a higher level of FDI may also contribute to the "pollution-haven" hypothesis according to which higher FDI inflows may impact negatively the environmental quality due to higher industrial activities they generate. Interestingly, studies on these two effects are still inconclusive. Pao and Tsai (2011) showed the existence of a "pollution-haven" effect combined with a "halo effect" in Brazil, China, India, and Russian Federation for the period 1980-2007. Kivyiro and Arminen (2014) found that FDI tends to increase CO_2 emissions in Kenya and Zimbabwe while the opposite effect has been observed in Democratic Republic of the Congo and South Africa. Frankel and Romer (1999) explained that the variety of results observed on the pollution-haven effect or the pollution-halo effect depends on the political pressures that people might put on the government in terms of environment quality. Shahbaz et al. (2017) found that trade openness improves environmental quality high income, middle and low income countries which contrasts with empirical results provided by other studies such as Le et al. (2016) who noticed that trade openness has a small effect on the environment in high-income countries, but a harmful effect in middle- and low-income countries.

These works echoes to the so-called Environmental Kuznets Curve according to which the income-environment degradation relationship takes the form of an inverted U-shape in the long term in line with the following illustration:



Environmental Kuznets curve for sulfur emissions. Source: Panayotou (1993).

This study will investigate the situation of emerging countries in a context of institutional improvement and see if the Kuznets curve can be supported for the period going from 2002 to 2015. It is worth mentioning that better institutions contribute to a higher economic growth and therefore to a higher income level that usually lead people to be more aware and exigent about policies to control pollution (Dal Bó and Rossi, 2007). The next section discusses the roles played by institutions in the CO_2 emissions.

2.2. Institutions and CO_2 Emissions

Roughly speaking, the improvement of institutional quality has a strong positive impact on economic activities especially in low income countries (Perera and Lee, 2013). In this context, institutions might stimulate CO_2 emissions (Herrera-Echeverri et al., 2014) through the higher economic activities that they generate. However, institutions may also reduce CO_2 emissions through regulation (Dal Bó and Rossi, 2007), economic growth (Dutta et al., 2013), improvement of resource allocations (Ebeke et al., 2015) or production (Carter and Olinto, 2003; Moenius and Berkowitz, 2004).

In emerging countries, the per capita income level is still relatively low explaining that governments usually face with political pressures to boost their economic growth rather than focusing on the environmental issues. In other words, institutions mainly favor the development of a context that sacrifices the environment quality for the sake of a high economic growth by focusing on "brown-sectors" (i.e. polluting ones). In the meanwhile, emerging countries' firms are usually less efficient in controlling CO_2 emissions in comparison to firms operating in advanced economies (Peters et al., 2012). In other words, the improvement of institutions may increase the economic growth and economic activities damaging the environment. On the other hand, as evoked earlier, institutions contribute to a higher economic growth and therefore to a higher income level that usually lead people to be more aware about green issues increasing then pressure for control pollution (Dal Bó and Rossi, 2007). In this case, the improvement of institutions can actually stimulate a more sustainable economic environment caring about the CO_2 emissions.

Institutions may also influence CO_2 emissions through regulation and the new techniques they can promote. An improvement of institutional quality therefore favors innovation and therefore the potential development of environment-friendly techniques (Hoekman et al., 2005; Silajdzic and Mehic, 2015). Furthermore, the gradual implementation of competitive competition in emerging countries might also lead to a higher efficiency and then fewer emissions (Andersson, 2018). This situation is especially true for countries close to their turning point of their Kuznets Curve (Bomberg and Super, 2009; Gil de Zúñiga et al., 2009). However, generally speaking, the improvement of institutions in developing countries usually focused more and more on the environment issues as the GDP per capita increases (Babiker, 2005, Ren et al., 2014a).

Herrera-Echeverri et al. (2014) showed that international trade appears to be more important in low-income countries with a higher institutional quality (easing therefore business activities, Zhang, 2016). In other words, a better institutional quality might attract more trade and investment activities. In this context, the combined effect of FDI, trade and institutions on CO_2 emissions is an important issue to investigate. We will focus on this point later in this study.

Kasman and Duman (2015) studied the causal relationships between CO_2 emissions, economic growth, trade openness and urbanization for a panel of new EU member and candidate countries over the period 1992-2010. Their results support the Kuznets Curve: The environment degradation increases as the income per capita increases until a turning point at which we observe an inverse relationship between the variables. This trend has also been identified by Omri et al. (2015) who observed this relationships between financial development, CO_2 emissions, trade and economic growth in 12 MENA countries over the period 1990-2011.

In the light of these inconclusive studies dealing with CO_2 emissions and the Kuznets Curve, investigating the potential role of institutions in this issue became crucial. The next section presents our methodology and data through which we examine this institutional influence on the CO_2 emissions in emerging countries.

3. METHODOLOGY AND DATA

3.1. Methodology

In line with existing studies (Farzin and Bond, 2006; Li and Reuveny, 2006; Tamazian and Rao, 2010) studying the economic determinants (income level, urbanization, financial development, energy use, trade openness, and FDI inflows) of pollution, we collected data related to these indicators for 36 emergent economies. We then integrate the institutional quality indicators in our model in order to estimate their role on the CO_2 emissions for the selected countries (Table 1).

This study aims at investigating the influence of institutions and their associations with economic integration (FDI and trade openness) on the CO_2 emissions in 36 emerging economies for the period 2002-2015. Precisely, our analysis estimates the following baseline model to determine this impact while controlling other drivers including urbanization, financial development, energy use and income level:

$$CO2_{it} = \beta_0 + \beta_1.Trade_{it} + \beta_2.FDI_{it} + \beta_3 INS_{it} + \beta_j.X_{it} + \varepsilon_{it} \quad (1)$$

in which: *i, t* are the country i at year t, respectively; CO_2 is the proxy for CO_2 emissions; the proxy for economic integration including trade openness (*Trade*) and FDI inflow (*FDI*); *INS* is the proxy for institutional quality (Government effectiveness (*Goeff*), Regulatory quality (*Requa*), Rule of Law (*Law*), Control of Corruption (*Concor*), Voice and Accountability (*Voice*), and Political stability (*Politic*)); *X* is a vector of vital control variables including urbanization (*Urban*), financial development (*FD*), energy use (*Energy*), income level (*LnGDP*), is coefficient; and ε is error term. The detail of each variable is summarized in the Table 2.

In this study, CO_2 is proxied by the logarithms of CO_2 per capita emissions by country (ton CO_2/capita/year) from Emissions Database for Global Atmospheric Research (EDGAR). Such methodological choice is supported by previous studies which used both SO_2 and CO_2 emissions to proxy pollution (Bernauer and Koubi, 2009). However, in this research, we focus on the CO_2 emissions as the major proxy for environmental quality (Hosseini and Kaneko, 2013; Merican, 2007; Zakarya et al., 2015) for three reasons:

1. CO_2 is considered to be the primary greenhouse gas responsible for global warming, its regulation has been an important inter-governmental issue (Haapanen and Tapio, 2016; Talukdar and Meisner, 2001);
2. The high correlation between the three pollutants (CO_2, NO, and SO_2) provides sufficient evidence to show that the use of CO_2 as a proxy to measure pollution levels is valid (Hoffmann et al., 2005);
3. The availability of data (CO_2 emissions) for the sample of emerging economies.

The institutional quality indicators are collected from Worldwide Governance Indicators (World Bank) and scaled from −2.5 to +2.5

Table 1: CO_2 emissions: Country list

America (7)	Ranking	Europe (10)	Ranking	Africa (4)	Ranking	Asia (15)	Ranking
Argentina	30	Bulgaria	60	Egypt	27	Bangladesh	48
Brazil	12	Czech Republic	37	Mauritius	139	China	1
Chile	44	Greece	50	Nigeria	43	India	3
Colombia	47	Hungary	59	South Africa	15	Indonesia	10
Mexico	13	Poland	20			Israel	51
Peru	55	Romania	46			Kuwait	39
Venezuela	32	Russian Federation	4			Malaysia	23
		Slovenia	93			Oman	42
		Turkey	16			Pakistan	31
		Ukraine	25			Philippines	36
						Qatar	40
						South Korea	9
						Thailand	22
						United Arab Emirates	28
						Vietnam	29

Ranking is the rank of CO_2 emissions in the world until 2017

Table 2: Definitions and sources of data

Variable	Definitions	Sources
Dependent variable		
CO2	Logarithm of CO_2 emissions in ton per capita	Calculation from EDGAR's Global Fossil CO2 Emissions
Control variables		
LnGDP	Logarithm of GDP per capita constant 2010 US$	Calculation from WDI
Energy	Logarithm of Energy use (kg of oil equivalent per capita)	Calculation from WDI
Urban	Urban population (% of total)	WDI
FD	Domestic credit to private sector (% of GDP)	WDI
Explanatory variables		
Trade	Trade (% of GDP)	WDI
FDI	Foreign direct investment, net inflows (% of GDP)	WDI
Goeff	The difference of Government effectiveness value with its means for each country	Calculation from WGI
Requa	The difference of Regulatory quality indicator value with its means for each country	Calculation from WGI
Law	The difference of Rule of Law indicator value with its means for each country	Calculation from WGI
Concor	The difference of Control of Corruption indicator value with its means for each country	Calculation from WGI
Voice	The difference of Voice and Accountability value with its means for each country	Calculation from WGI
Politic	The difference of Political Stability and Absence of Violence/Terrorism value with its means for each country	Calculation from WGI

GDP: Gross domestic product

for each indicator with the norm that greater value means the better institutional quality, then we calculate the mean of each indicator for each country to standardize their value with their mean value to approximate the changes in institutional quality. This process also allows us to reduce the heteroskedasticity and to normalize the sample.

The major methodological problems we faced with our sample refer to two aspects: (1) We use a sample collected on dynamic panel data with a lagged dependent variable and, (2) the relationships between some independent variables such as the human capital might have a mutual influence with the dependent variable. In this context, we selected a classical methodology to deal with unbalanced panel data: The system GMM estimator for the estimation process. This methodology, derived from Arellano and Bond (1991), Arellano and Bover (1995) (and extended by Blundell and Bond, 1998 and Blundell and Bond, 1998) can reduce the bias associated with the fixed effects in short panels. Furthermore, this methodology can also solve the problem of endogeneity in dynamic panel data. GMM is a recognized class of estimators appropriate for dynamic panel modelling containing lagged dependent variables (like ours) for which OLS estimators might be problematic (McLachlan and Peel, 2004).

3.2. Data

We use annual unbalanced panel data for 36 emerging economies (EMEs) in the period of 2002-2015. The descriptive statistics for individual countries, are presented in the Table 3 showing that the government effectiveness, regulatory quality, rule of law witnessed an improvement while the control of corruption, voice and accountability, and political stability rather exhibit a decreasing trend.

The Table 4 shows that the CO_2 emissions have a positive and strong correlation with *Trade* and five indicators of

Table 3: Data description

Variable	Obs.	Mean±SD	Min	Max
CO_2	504	1.46218±1.10485	−1.44026	4.01556
LnGDP	502	8.92562±1.11022	6.28273	11.19370
Energy	476	7.50064±0.95992	5.00885	9.99695
FD	502	56.68521±36.27007	0.18587	160.12480
Urban	504	64.97757±20.17776	24.75600	99.24400
Trade	502	80.03873±40.54415	21.12435	210.37380
FDI	502	3.18325±4.22568	−16.07110	50.74153
Goeff	504	0.17116±0.64807	−1.22676	1.50987
Requa	504	0.18343±0.69568	−1.88492	1.53851
Law	504	0.00029±0.72634	−2.03238	1.43314
Concor	504	−0.09297±0.69168	−1.49654	1.59227
Voice	504	−0.03392±0.77716	−1.74897	1.29252
Politic	504	−0.29042±0.96607	−2.81004	1.30258

Source: Author's calculation. SD: Standard deviation

institutional quality indicators (except *Voice* which is not significant). All control variables also show positive and strong correlations with CO_2 emissions. These results suggest, at first sight, a positive influence of the trade openness and institutions on the CO_2 emissions. However, a further statistical analysis is required to better understand the relationship between these indicators.

CO_2 emissions is a very important and timely topic in emerging economies because their contribution in the world CO_2 emissions raised from over 40% in 2002 to nearly 60% in 2016 with a rapid increased rate in the period 2000-2010 (Figure 1). More severely, the amount of CO_2 per capita in emerging economies is 1.75 times higher than the whole world meaning that economic activities in emerging economies generates more pollution than everywhere else (Figure 1). Interestingly, this ratio increased between 2001 and 2003; and then decreased after 2003 until 2015 indicating an improvement in the production of emerging economies.

Emerging economies have been evolving with an increasing economic development, constantly improving their income levels, and especially in the period of rapid globalization (with a short fall in 2009 due to the 2008 global financial crisis, Figure 2).

In this context, emerging economies became important hubs for FDI flows, especially before 2009. Data indicate that the CO_2 emissions in emerging economies increased with the raise of trade openness and FDI in the period 2002-2008 while the period of 2009-2016 shows a reduction of this trend in line with lower FDI inflow (decreasing therefore the trade openness). In the meanwhile, the institutional quality evolves in these emerging economies as the Figure 3 illustrates it by exhibiting a slightly downward general trend (implying a reduction of the institutional quality). Obviously, these changes in institutional quality are quite different among countries before and after the 2008 global financial crisis. We will discuss the implications of this trend in the following sections.

4. RESULTS AND DISCUSSION

The results of our estimations are presented in the Tables 5 and 6. AR(-2) and Hansen tests indicate the consistency of our sys-GMM estimations (Roodman, 2006; 2009). The negative impact of logarithms of GDP per capita (*LnGDP*) means that a higher income level in emerging economies refers to a lower level of CO_2 emissions in accordance with the Environmental Kuznets Curve (Ehrhardt-Martinez, et al., 2002; Dinda, 2004). Antonakakis et al., 2017). These results confirm that higher income levels countries face with more pressure (from population) for a better environmental quality reducing therefore the CO_2 emissions as indicated in the Table 5.

The significant positive influence of energy use on the CO_2 emissions is obvious and easy to understand since energy use is one of the most significant determinant of CO_2 emissions in emerging economies. This observation is in line with existing works on the topics (Al-Mulali and Ozturk, 2015; Ang, 2008; Sebri and Ben-Salha, 2014) emphasizing the difficult challenge that emerging countries are facing regarding the simultaneous improvement of economic growth and environment. In the same vein, a higher level of urbanization generates more CO_2 in emerging economies confirming the previous studies on the topic (Zang et al., 2017; Al-Mulali and Ozturk 2015).

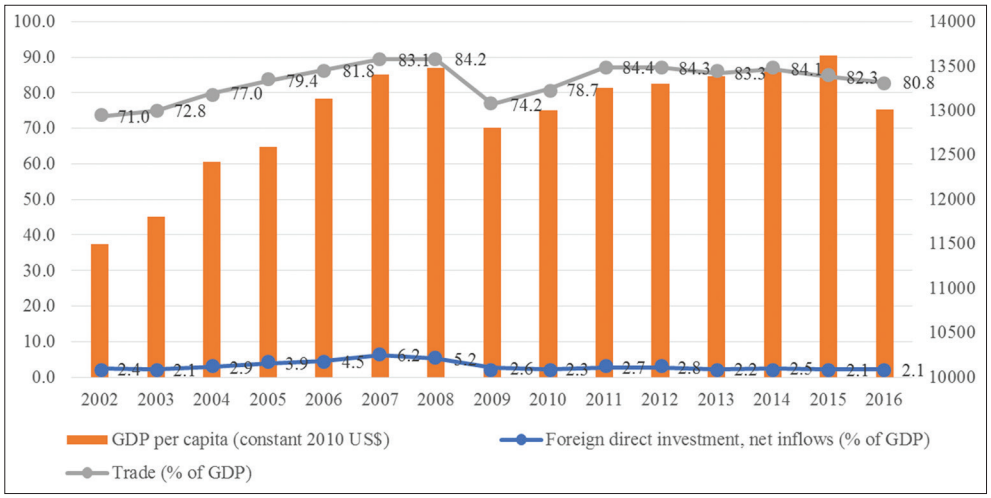
Our main explanatory variables including trade openness, FDI inflow and institutions show interesting findings. First, the insignificant positive effect of trade openness on CO_2 emissions

Table 4: Matrix correlation

	CO_2	LnGDP	Energy	FD	Urban	Trade	FDI	Goeff	Requa	Law	Concor	Voice	Politic
CO2	1.000												
LnGDP	0.862***	1.000											
Energy	0.975***	0.877***	1.000										
FD	0.272***	0.174***	0.232***	1.000									
Urban	0.686***	0.814***	0.700***	−0.005	1.000								
Trade	0.403***	0.290***	0.410***	0.355***	0.010	1.000							
FDI	0.052	0.022	0.058	0.013	0.048	0.207***	1.000						
Goeff	0.553***	0.652***	0.528***	0.498***	0.348***	0.515***	0.105**	1.000					
Requa	0.499***	0.644***	0.488***	0.360***	0.370***	0.416***	0.213***	0.882***	1.000				
Law	0.529***	0.638***	0.518***	0.422***	0.291***	0.470***	0.122***	0.912***	0.895***	1.000			
Concor	0.598***	0.737***	0.592***	0.338***	0.469***	0.407***	0.142***	0.892***	0.867***	0.911***	1.000		
Voice	0.063	0.285***	0.075	0.078*	0.185***	0.035	0.123***	0.498***	0.608***	0.561***	0.471***	1.000	
Politic	0.641***	0.618***	0.634***	0.273***	0.328***	0.575***	0.175***	0.651***	0.630***	0.714***	0.701***	0.349***	1.000

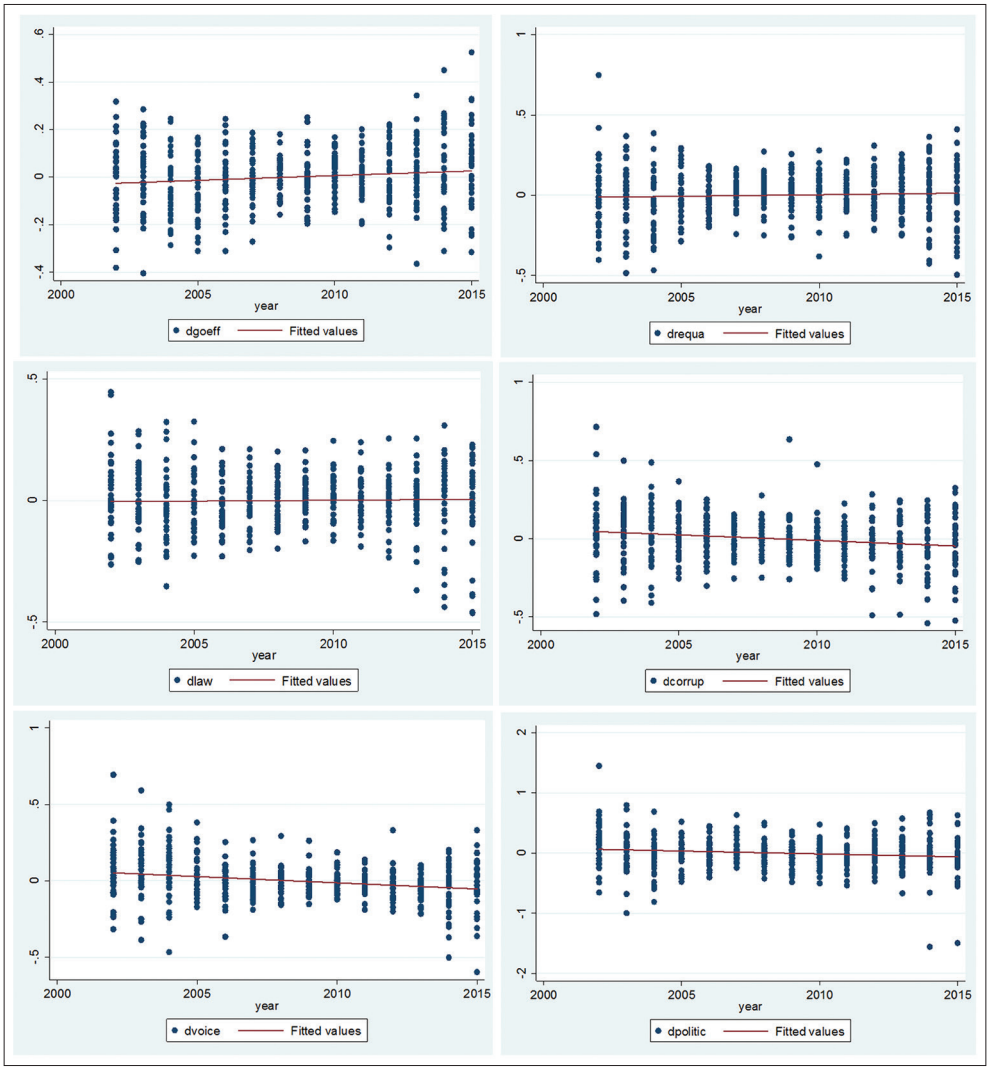
Source: Author's calculation. *. **. ***denote significant levels at 10%, 5%, 1% respectively

Figure 2: The economics in emerging economies



Source: World Development Indicators, World Bank

Figure 3: Changes in institutional quality comparing to its means in emerging economies



Source: Calculations from Worldwide Governance Indicators

suggests that trade openness might increase the CO_2 emissions in emerging countries and, thus, it should be considered as a driver of higher CO_2 emissions in for these economies. This result is also consistent with previous studies (Shahbaz et al., 2017; Fotros and Maaboudi, 2011). Second, the positive impact of FDI inflow on CO_2 emissions supports the existence of the "pollution-haven" hypothesis in emerging economies as previous studies have mentioned (Ren et al., 2014b). However, the insignificant level of this relationship also suggests that we should consider more factors interacting with trade and capital flow for explaining the dynamic of CO_2 emissions in emerging economies. We therefore integrate indicators describing the institutional environment (Pao and Tsai, 2011).

Interestingly, the all six institutional indicators have a positive influence on CO_2 emissions. This finding might be surprising since better institutions are used to promote environment and improve the awareness of population asking for better anti-pollution policies. We could therefore expect a reduction of the CO_2 emissions. However, this result can be explained under the light of scale effects of institutions on economic activities. First, better institutions have stronger positive impacts on economic activities in emerging economies where the existing institutional quality is quite low (Boubakri et al., 2015; Knack and Keefer, 1995; Perera and Lee, 2013; Young and Sheehan, 2014). In this context, the improvement of institutional quality has a stronger marginal positive effect on economic activities. Better institutions, in turn, exaggerate scale effect of economic activities on the CO_2 emissions. Second, emerging economies usually focus on economic institutional improvements that can boost their economy (Dong and Zhang, 2016; Driffield et al., 2013) rather than developing institutional policy promoting environmental improvement. This trade-off between economic growth and environmental quality is a classical challenge for leaders in emerging countries. Should institutions be ignored because they might favor economic activities (and then CO_2 emissions)? In an increasingly globalized world, in which trade openness and FDI are increasing important for emerging countries, we think that the previous question must be addressed in a careful way.

Our study proposes therefore a step further in the empirical investigation by associating the institutional quality indicators with

the trade openness and FDI inflow. The results are showed in the Table 6 hereafter, The combined effect of trade\FID inflow with institutional indicators on CO_2 emissions are negative indicating a very interesting implication for policy makers: Although the

Table 5: Economic integrations and CO2 emissions: Contributions from institutions

Dependent var:CO_2	Baseline model (1)	Economic integrations and CO_2 emissions: Contributions from institutions					
		Government effectiveness	Regulatory quality	Rule of Law	Control of Corruption	Voice and Accountability	Political stability
CO_2 (-1)	0.96749***	0.97462***	0.97416***	0.97206***	0.96907***	0.96611***	0.97061***
	[0.00523]	[0.00473]	[0.00566]	[0.00458]	[0.00456]	[0.00463]	[0.00526]
LnGDP	−0.02622***	−0.02085***	−0.02171***	−0.02203***	−0.02647***	−0.02819***	−0.02604***
	[0.00776]	[0.00581]	[0.00592]	[0.00608]	[0.00641]	[0.00617]	[0.00671]
Energy	0.03137***	0.02711***	0.02730***	0.02811***	0.03155***	0.03302***	0.03190***
	[0.00902]	[0.00667]	[0.00682]	[0.00705]	[0.00740]	[0.00681]	[0.00772]
Urban	0.00053**	0.00030*	0.00039**	0.00036**	0.00061***	0.00071***	0.00049***
	[0.00020]	[0.00017]	[0.00019]	[0.00017]	[0.00017]	[0.00018]	[0.00018]
FD	0.00018**	0.00013*	0.00014*	0.00014*	0.00016**	0.00018**	0.00015**
	[0.00007]	[0.00007]	[0.00007]	[0.00007]	[0.00007]	[0.00007]	[0.00007]
Trade	0.00001	0.00001	0.00005	0.00004	0.00009	0.00011	0.00007
	[0.00006]	[0.00007]	[0.00008]	[0.00007]	[0.00007]	[0.00007]	[0.00007]
FDI	0.00403**	0.00129	0.00022	0.00116	0.00013	0.00015	0.00050
	[0.00154]	[0.00110]	[0.00097]	[0.00109]	[0.00090]	[0.00097]	[0.00081]
INS		0.06061***	0.04461***	0.02759*	0.05003***	0.05283***	0.02792***
		[0.01454]	[0.01195]	[0.01554]	[0.00711]	[0.01157]	[0.00870]
N	404	404	404	404	404	404	404
Country (N)	36	36	36	36	36	36	36
No. of IVs	29	30	30	30	30	30	30
AR (2) test (P-value)	0.530	0.625	0.615	0.620	0.610	0.560	0.585
Hansen test (P-value)	0.120	0.146	0.124	0.117	0.123	0.227	0.166

Source: Author's calculation. *.**.***denote significant levels at 10%, 5%, 1% respectively. Standard error in []

Table 6: Economic integrations and CO_2 emissions: Contributions from institutions (associated effects)

Dependent var:CO_2	Economic integrations and CO_2 emissions: Contributions from institutions: Associated effects					
	Government effectiveness	Regulatory quality	Rule of Law	Control of Corruption	Voice and Accountability	Political stability
CO_2 (-1)	0.97378***	0.96995***	0.96945***	0.96931***	0.97160***	0.97431***
	[0.00505]	[0.00551]	[0.00543]	[0.00549]	[0.00521]	[0.00578]
LnGDP	−0.02338***	−0.02106***	−0.02394***	−0.02578***	−0.02302***	−0.01784***
	[0.00637]	[0.00733]	[0.00721]	[0.00717]	[0.00720]	[0.00562]
Energy	0.02856***	0.02411**	0.02989***	0.03058***	0.02618***	0.02377***
	[0.00804]	[0.00964]	[0.00857]	[0.00879]	[0.00905]	[0.00588]
Urban	0.00033**	0.00037*	0.00046	0.00049**	0.00049**	0.00015
	[0.00016]	[0.00019]	[0.00031]	[0.00023]	[0.00020]	[0.00019]
FD	0.00015**	0.00024***	0.00028***	0.00015**	0.00023***	0.00011
	[0.00006]	[0.00006]	[0.00009]	[0.00006]	[0.00005]	[0.00007]
Trade	0.00008	0.00018*	0.00002	0.00013	0.00009	0.00010
	[0.00013]	[0.00010]	[0.00010]	[0.00014]	[0.00012]	[0.00014]
FDI	0.00546	0.01007***	0.00162	0.00523	0.00672	0.00463
	[0.00572]	[0.00268]	[0.00203]	[0.00506]	[0.00466]	[0.00578]
INS	0.14066***	0.34834***	0.68242***	0.09362***	0.25529***	0.13796*
	[0.04396]	[0.08234]	[0.12586]	[0.02827]	[0.05545]	[0.08094]
INS*Trade	−0.00106**	−0.00202**	−0.00460***	−0.00023	−0.00177***	−0.00021
	[0.00042]	[0.00097]	[0.00093]	[0.00033]	[0.00061]	[0.00101]
INS*FDI	−0.01356	−0.16213***	−0.25182***	−0.02239***	−0.04729	−0.04454
	[0.01009]	[0.03220]	[0.05235]	[0.00653]	[0.02960]	[0.02640]
Trade*FDI	−0.00003	−0.00008***	−0.00003**	−0.00003	−0.00004	−0.00002
	[0.00004]	[0.00002]	[0.00001]	[0.00003]	[0.00003]	[0.00004]
INS*Trade*FDI	0.00016**	0.00117***	0.00184***	0.00014***	0.00033	0.00032
	[0.00008]	[0.00023]	[0.00037]	[0.00004]	[0.00023]	[0.00027]
N	404	404	404	404	404	404
Country (N)	36	36	36	36	36	36
No. of IVs	34	34	34	34	34	34
AR (2) test (P-value)	0.657	0.236	0.156	0.593	0.450	0.546
Hansen test (P-value)	0.158	0.130	0.575	0.137	0.190	0.137

Source: Author's calculation. *.**.***denote significant levels at 10%, 5%, 1% respectively. Standard error in []

improvement of institutional quality increases the CO_2 emissions (through the economic activities it generates), such improvement can actually reduce the positive effect of FDI inflow and trade openness on the CO_2 emissions. This particular observation is actually a key information for policy-makers because it suggests that governments have to undertake institutional reforms in parallel of the improvement of their economic situation (per capita income) if they want to fight against pollution in the long term.

5. CONCLUSION

Global warming and the deterioration of the environmental quality became as a worldwide concern over the past few decades (Spangenberg, 2007). The issue of CO_2 emissions is very urgent for emerging countries that are producing 60% of the global CO_2 emissions. Because these countries generally have a high economic growth, they usually face with environmental issues. This article investigates the relationship between the economic openness (trade openness and FDI inflow) and the CO_2 emissions by taking into consideration the potential role played by institutions. Through the system-GMM estimators, our study proposes new evidences on three aspects: (1) The financial and trade openness increase CO_2 emissions supporting therefore the "pollution-haven" hypothesis for emerging economies. Although these results might appear obvious (i.e. economic activities generate CO_2 emissions), they reject the "pollution halo effect" (i.e. emerging countries benefit from trade openness to produce less CO_2 emissions) partly supported by the existing literature. Our study contributes to these debates by rejecting this hypothesis. This is the first contribution of this article. The second important contribution refers to the observation that, although the improvement of institutional quality increases CO_2 emissions, this improvement also reduces the positive effect of FDI inflow and trade openness on CO_2 emissions. This result can be explained through the lens of the Kuznets Curve (supported by our empirical results –Tables 5 and 6) showing that emerging countries undertake institutional reforms that actually improve the economic context when the income per capita is low (generating therefore more economic activities and, therefore, more CO_2 emissions). However, as the income per capita increases, emerging countries gradually move towards institutional reforms that care more about environmental issue. In other words, data suggest that an improvement of institutional quality goes hand in hand with financial and trade openness of emerging economies if these countries want to contribute, in the long term, to the fight against global warming.

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