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Financial Development and Environmental Quality: Empirical Evidence for Morocco

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ABSTRACT

This paper explores the effects of financial development on environmental quality in Morocco using time series data over the period of 1980-2015 and ARDL modeling (autoregressive distributive lag model). Here, several variables representing financial development, economic growth, and energy consumption were explored. The model shows the existence of a link, though not statistically a significant one, between financial development and C02 emissions. This said, the government is highly in need to engage a development process that promotes a balance between the environmental, economic, and social dimensions.

Keywords: Financial Development, CO_2 Emissions, Environmental Performance, Autoregressive Distributed Lag Model
JEL Classifications: C32, Q43

1. INTRODUCTION

Today, global warming is a major challenge that faces humanity at the front line. This common consensus is a fact among scientists, public decision-makers, and the public opinion. To an extent, this consensus resides in the fact that human activities, in particular the production of goods and service activities, are responsible for this global warming through their emissions of green house gases (GHGs), in particular CO2. To wit, several empirical studies show that human activity i.e., the production of goods and services through consumption of fossil energies is the main source of CO2 emissions (Kraft and Kraft, 1978; Soytas and Sari, 2003; Lee and Chiang, 2008).

Importantly, the global economy continues to grow through the emergence of large economies (China and India in particular) in recent years as well as the wishes of their populations to adopt the living standards of the industrialized countries. Consequently, this would increase even more the global consumption of these polluting energies[1]. On the other side, the economic development and improving the quality of life are devoted to the production of goods and services, even though this case is not a question of opposing these two objectives: economic prosperity and environmental quality especially in the case of developing countries.

Some economists think that from a level of economic development, the growth of production activities favors the quality of the environment. It would be as if there was a reversed U-shaped relationship between income and pollution. This hypothesis is referred to as Environmental Kuznets curve (EKC), proposed by Grossman and Krueger (1995). The famous Kuznets curve is inspired by connecting economic development and inequality. In the early stages of economic development, the link between economic development and pollution is positive but from a level of income, the relationship is reversed (Stern [2004] and Carson

1 This is also the case of the countries of Eastern Europe. The report EBRD (2007) shows that the economies of these countries are more energy intensive than the countries of Western Europe.

[2010] for more details). Several works attempt, with more or less success, to confirm this intuition on the empirical plan; we could refer in this regard to Jebli et al. (2016) for OECD nations, Aldy (2005) for US states, Apergis and Ozturk (2015) for Asiane conomies, and Acaravci and Ozturk (2010) for European countries.

The conciliation of both of these goals would be achieved by reducing emissions without any reduction of levels of production activities but by putting in place an energy transition which consists of replacing the current economic model based on a massive use of fossil energies with another based on a gradual replacement of these energies by cleaner ones. At this level, we could plausibly as about the role the financial development plays in this debate on the relationship between economic development and CO2 emissions and the environment in general.

The financial development can affect the environment in several ways. The financial development and the investment credits increase the level of investment, the development of the industrial sector and the economic growth, and hence the demand for energy and rising GHG emissions (Sadorsky, 2010). In the same way, increasing the credits makes acquisition more accessible of the amenities by the households e.g. the home appliances, the automobiles, etc. (Karanfil, 2009).

On the other side, and under the assumption of the (EKC), the financial development through its participation in economic development and prosperity of individuals increases their demand for cleaner goods and contributes to the development of a greener business model. Similarly, the financial development favors the inflow of foreign investments that bring technological progress and cleaner production. It also promotes investment and innovation in cleaner technologies (Frankel and Rose, 2002).

Morocco is no exception in this debate. Its CO2 emissions totaled 6.6 million tonnes of CO2 (MtCO2) in 1971 and climbed without interruption to reach 53.1 MtCO2 in 2014. Among the developing countries, Morocco is the lowest of emitting green house gas (GHG)[2]. But although these emissions represent only 0.17% of global emissions and that its per capita ecological footprint remains below the world average, Morocco's ecological deficit has been growing since the mid-1970[3]s.

Understanding the impact of financial development on the quality of the environment then becomes crucial in a global context that concerns itself of these changes. Given the theoretically contradictory effects of financial development on CO2 emissions, only empirical work can be used to estimate the total effect. It is in this context that our paper is located. It is organized as follows: Section 2 presents a brief review of the literature on the relationship between financial and economic development on the one hand and the quality of the environment on the other. The third section discusses the data and methodology used in the study. Section 4 discusses the results with some economic policy implications.

2. REVIEW OF LITERATURE

The fundamental objective of economic development is to improve the general situation and the living conditions of the people. However, beyond the effects of improving the quality of life, the economic development can also come up with negative effects on the environment. Several empirical works try to verify the relationship between economic growth and environmental quality, for example, Shafik (1994), Jaeger et al. (1995), Horvath (1997), List and Gallet (1999), Stern and Common (2001), Friedl and Getzner (2003), Managi and Jena (2008), and Akbostanci et al. (2009).

The EKC literature mostly uses energy consumption as control variable. Thus, many researchers using financial development as an important determinant of environmental performance. Indeed, the most obvious reason to use financial development as an important determinant in this relationship is that the existence of a well-developed financial sector improves the efficiency of the allocation of capital which promotes economic growth, and thus affects the environmental quality as Frankel and Romer (1999) remark.

Tamazian et al. (2009) study empirically whether financial development affects carbon emissions for BRIC countries. They argue that developed capital markets help reduce financing costs and channel financial resources to purchase new equipment and finance new projects, which, in turn, create energy demand and affects CO2 emissions. Moreover, their analysis indicates that financial development supports effective technologies on the energy plan and therefore reduces carbon dioxide emissions. In the same context, Tamazian and Rao (2010) examine the association between financial development and environmental degradation by integrating institutional quality into carbon dioxide emission functions. They find that financial development improves environmental quality by reducing CO2 emissions in countries with strong institutions. Additional evidence is provided by Zhang and Lin (2010) who show that financial development encourages listed companies to use energy efficient technology, which in turn helps reducing carbon emissions.

Ozturk and Acaravci (2013) study the causal relationship between financial development, trade, economic growth, energy consumption and carbon missions in Turkey. Their results show that there is a long-term causal relationship between per capita energy consumption, real per capita income, square of real per capita income, openness and financial development, and per capita carbon emissions. Then, Shahbaz et al. (2013a) examine the causal links between economic growth, energy consumption, financial development, trade openness and CO2 emissions in Indonesia. They show, in turn, that economic growth and energy consumption increase CO2 emissions, while financial development and trade openness reduce it. The VECM causality analysis showed the feedback hypothesis between energy consumption and

2 In the case of Morocco, the GHG emissions excluding CO2 are very little documented. However, the available data lead to the conclusion that CO2 emissions have been the majority of GHGs emitted since 1990. In fact, they accounted for 74.3% of total GHG emissions in 2010 compared to 17.1% and 8.6% of GHG emissions. % for methane (CH4) and nitrous oxide (N2O).

3 Royal Institute of Strategic Studies (2017).

CO2 emissions. Economic growth and CO2 emissions are also interrelated, that is, bi-directional causality. Financial development causes CO2 emissions.

On the other hand, Al-Mulali et al. (2016) empirically study the link between financial development and carbon dioxide emissions for European countries; they show that financial development reduces the quality of the environment by increasing carbon dioxide emissions. Also, Abbasi and Riaz (2016) re-evaluate the association of financial development with carbon dioxide emissions by including foreign direct investment in the carbon dioxide emission equation.

Salahuddin et al. (2015) examine the relationship between carbon dioxide emissions, economic growth, electricity consumption and financial development in the Gulf Cooperation Council (GCC) countries using panel data for the period 1980-2012. The results suggest that electricity consumption and economic growth stimulate CO2 emissions in GCC countries while financial development reduces them.

They use total credit, domestic credit and market capitalization as indicators of financial development. Their results indicate that total credit is negatively associated with carbon dioxide emissions. More to that, Shahbaz et al. (2016) examined the asymmetric impact of financial development on the quality of the environment in Pakistan for the period from the first quarter of 1985 to the fourth quarter of 2014. They concluded that bank-based financial development is detrimental to the environment.

Recently, Nasreen et al. (2017) show that financial stability improves the quality of the environment, while economic growth, energy consumption and population density are detrimental to the quality of the environment in the long run in South Asian countries over the period 1980-2012. Then, Ali-Bekhet et al. (2017) study the causal relationships between carbon emissions, financial development, economic growth and energy consumption of the gulf cooperation council (GCC) countries from 1980 to 2011. The results suggest long-term and causal relationships between carbon emissions, financial development, gross domestic product (GDP) and energy consumption in all GCC countries.

Finally, we conclude that the work that has focused on the question of verifying the link between financial development and CO2 emissions has so far yielded mixed results. For more details, a summary of the studies on the financial development-CO2 emissions nexus is provided in Table 1.

3. MODEL CONSTRUCTION, METHODOLOGICALFRAMEWORK AND DATA

3.1. Model Construction

As we pointed out in the general introduction, the link between financial development (FD) and CO2 emissions involves energy consumption (EC) and the production of goods and services (Y). To assess the effects of financial development on environmental quality in Morocco in the long term from 1980 to 2015, the general form of this relationship is as follows:

$$CO2_t = f(EC_t, FD_t, Y_t) \quad (1)$$

The introduction of the logarithm makes the relation to estimate the following (2):

$$\log(CO2_t) = \beta_1 + \beta_2 \log(EC_t) + \beta_3 \log(FD_t) + \beta_4 \log(Y_t)) + \varepsilon_t \quad (2)$$

Where ln, $CO2_t$, FD_t EC_t, and Y_t represent natural log, $CO2$ emissions, financial development, energy consumption and economic growth. ε_t is the error term at time t.

3.2. Unit Root Tests

Before testing cointegration between variables, it is important to lead the unit root test to make sure that no variables are left unintegrated in order 2 I (2). This is essential because the ARDL procedure assumes that all the variables are integrated in order I (0) or I (1). If a variable is considered to be I (2), the calculated F statistics produced by Pesaran et al. (2001) cannot be valid anymore. In this regard, the most common and widely used test is the Augmented Dickey-Fuller (ADF) test(Dickey and Fuller, 1979; 1981). However, Phillips and Perron (1988) proposed a nonparametric correction of Dickey-Fuller (DF) statistics to account for heteroscedastic errors.

The Table 2 shows that not all variables are stationary in level. This leads to rejecting the hypothesis of stationarity for all series (in level). The application of the same test for the data expressed as a first difference leads to not rejecting, at the 1% threshold, the non-stationarity hypothesis for all the variables used. Also, it is possible to conclude that all the variables are integrated in order I (1). Moreover, since no series is integrated in order two I (2) or more, the use of ARDL modeling is justified.

3.3. ARDL Bounds Testing Approach to Cointegration

For the present study, we have opted for a different method which is that of the autoregressive distributed lag (ARDL) bounds testing approach to cointegration, introduced by Pesaran and Shin (1999) and developed by Pesaran et al. (2001). This choice is justified by several reasons. First, this test can be applied to non-stationary time series without the constraint of the same order of integration, unlike the other tests. In addition, endogeneity is not a problem with this method (Harris and Sollis, 2003).

$$\begin{aligned} \Delta LCO2_t &= \beta_0 + \sum_{i=1}^{p} \delta_i \Delta LCO2_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta LEC_{t-1} \\ &+ \sum_{i=1}^{p} \gamma_i \Delta GDP_{t-1} + \sum_{i=1}^{p} \omega_i \Delta LFD_{t-1} + \acute{A}_1 LCO2_{t-1} \\ &+ \acute{A}_2 LEC_{t-1} + \acute{A}_3 LGDP_{t-1} + \acute{A}_4 LFD_{t-1} + \cup_t \end{aligned}$$

Where β_0 is the drift component, and $\cup_t$ a white noise. The terms with the summation signs represent the error-correction model, while those with the coefficient ρ_t represent the long-term relationship.

The verification of the cointegration relation is carried out thanks to the "bounds test." The latter consists of conducting an F-test on the hypothesis $\rho_1 = \rho_2 = \rho_3 = \rho_4 = 0$ against the alternative hypothesis $\rho_1 \neq \rho_2 \neq \rho_3 \neq \rho_4 \neq 0$. The Statistic F, thus calculated,

Table 1: Summary of studies on financial development-emissions CO2

Authors	Time period	Methodology	Country	Result
Tamazian et al. (2009)	1992-2004	SRM	BRIC	FD improves EQ
Tamazian and Rao (2010)	1993-2004	GMM	24 transition economies	FD improves EQ
Jalil and Feridun (2011)	1953-2006	ARDL	China	FD improves EQ
Ozturk and Acaravci (2013)	1960-2007	ARDL, VECM	Turkey	FD Insignificant EQ
Shahbaz et al. (2013b)	1965-2008	ARDL, VECM	South Africa	FD improves EQ
Boutabba (2014)	1971-2008	ARDL, VECM	India	FD decreases EQ
Shahbaz et al. (2013)	1970-2012	ARDL, VECM	India	FD decreases EQ
Omri et al. (2015)	1990-2011	PSE	12 MENA	FD Insignificant EQ
Charfeddine and Khediri (2016)	1975-2012	ARDL, VECM	United Arab Emirates	FD decreases EQ
Javid and Sharif (2016)	1972-2013	ARDL, VECM	Pakistan	FD decreases EQ
Dogan and Turkekul (2016)	1960-2010	ARDL, VECM	United States	FD Insignificant EQ
Al-Mulali et al. (2016)	1990-2013	FMOLS, VECM	European Union	FD decreases EQ

FD: Financial development), EQ: Environmental quality, GMM: Generalized moments method, ARDL: Autoregressive distributed lag model, VAR: Vector auto-regression, VECM: Vector error correction granger causality, DOLS: Dynamic ordinary least square, FMOLS: Fullimodified ordinary least square, UAE: United Arab Emirates, EU: European Union, MENA: Middle East and North America

Table 2: Tests ADF de racine unitaire

Variables	C	C and T	WC and WT
Level			
$lnCO_{2t}$	−0.111	−3.282**	1.428
$lnDC_t$	−1.187	−2.172*	−2.930
$lnEC_t$	0.235	−3.287**	3.847**
$lnM2_t$	0.486	−2.369*	3.323*
$lnGDP_t$	0.945	−1.490	2.789
$lnlMt$	−2.705*	−2.710*	−2.059
First difference			
$\Delta lnCO2_t$	−6.899***	−6 785***	−4.828***
$\Delta lnDC_t$	−5.669***	−5.601***	−5.031***
$\Delta lnEC_t$	−6.611***	−6.41***	−4.571***
$\Delta lnM2_t$	−8.559***	−8.649***	−2.444***
$\Delta lnGDP_t$	−4.043***	−4.162***	−3.514***
$\Delta lnLM_t$	−7.174***	−7.130***	−7.285***

C: Constant, T: Trend, WC: Without constant, WT: Without trend, *.** and *** represent the rejection of the null hypothesis at the 1%, 5% and 10% levels, respectively. ADF: Augmented Dickey-Fuller

is compared with two critical thresholds: a lower band LB and a superior band SB, generated by Pesaran et al. (2001). If Statistic F is below the lower band, the null hypothesis of non-cointegration is not rejected, whereas if Statistics is above the upper band, then the null hypothesis is rejected, thus showing the existence of a cointegration relation between the variables. On the other hand, if the F statistic is located between the two terminals, the "Bounds Test" is said to be inconclusive.

In order to choose an optimal delay for each variable, the ARDL method estimates $(\rho+1)^k$ regressions, where: ρ is the maximum number of delays and k is the number of variables in the equation. The model can be chosen on the basis of the Akaike information criterion (AIC). The AIC allows you to select the maximum number of delays. After the selection of the ARDL model by the AIC, the long-term relationships can be estimated. Once these are established, the error correction model can then be estimated:

$$\Delta LCO2_t = \beta_0 + \sum_{i=1}^{p} \delta_i \Delta LCO2_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta LEC_{t-1} + \sum_{i=1}^{p} \gamma_i \Delta GDP_{t-1} + \sum_{i=1}^{p} \omega_i \Delta LFD_{t-1} + \mu ECM_{t-1} +$$

In summary, the application of the ARDL methodology for the analysis of cointegration requires the following steps:

1. Test stationarity of time series;
2. Select the optimal delay number;
3. Perform the Bound Test to establish the long-term relationship;
4. Estimate long-term and short-term coefficients;
5. Test the stability of the model through residue analysis and the CUSUM and CUSUMSQ technique (Brown et al., 1975).

3.4. Data Sources and Construction

The variable to explain (CO2) refers to the amount of (CO2), expressed in metric tons, emitted on average by a resident. Energy consumption (EC) is given by the amount of energy consumed per capita in kg of oil equivalent. The production of goods and services is approximated by real GDP per capita. The financial development is represented by several financial and banking variables as the bank credits, the liquidity and the number of stock market transactions. Table 3 presents the different variables and the source of the data.

4. EMPIRICAL RESULTS AND DISCUSSION

4.1. Cointegration Test

To avoid the risk of cointegration and to study the existence of a long-term relationship between the variables we conducted a cointegration test using the new ARDL boundary test procedure which comes back as a Fisher test of joint significance of the coefficients. Table 4 presents the value of the Fisher statistic and the theoretical values of the limits for thresholds of 1%, 5% and 10%.

The comparison of the Fisher statistic with the critical limit values allows us to reject the null hypothesis of absence of a long-term relationship and to conclude that there is a long-term relationship between economic growth, energy consumption, financial development and CO2 emissions. There is therefore a co-integration relationship between the variables (Table 4).

4.2. Long-term Estimation Results

The empirical results are presented in Table 6. These show that the coefficient of the CE variable is equal to 19.2784 and statistically insignificant, implying that a 1% increase in per capita energy consumption would result in a 19.27% increase in per capita CO2 emissions. The positive sign of this coefficient is consistent with

Table 3: Sources and measure of variables

Variable	Variable measure	Source
Y	Real GDP (per capita)	Minister of economy and finance
CO2	CO2 emissions (metric tons per capita)	World Bank
EC	Energy consumption (kg of oil equivalent per capita)	World Bank
DC	Domestic credit to the private sector	Bank Al-Maghrib
M2	Money and quasi money	Bank Al-Maghrib
LM	Liquidity of the stock market	Bank Al-Maghrib

GDP: Gross domestic product

Table 4: The results of ARDL cointegration test

Bounds testing to cointegration		
Estimated equation	$lnCO2_t$=f ($lnEC_t$, $lnFD_t$, $lnGDP_t$)	
Number of retard	2	
F-statistics (wald-statistics)	13.034	
Significance level	Lower bounds, I(0)	Upper bounds, I(1)
1%	3.41	4.68
5	2.62	3.79
10	2.26	3.35

ARDL: Autoregressive distributed lag model

Table 5: Long run results

Dependent variable=$lnCO2_t$				
Variable	Coefficient	Standard error	T-statistic	Probability
$lnEC_t$	19.278	212.003	0.090	0.935
$lnDC_t$	18.506	245.230	0.075	0.946
$LnM2_t$	−50.721	635.609	−0.079	0.943
$lnLM_t$	−13.324	170.114	−0.078	0.944
$lnGDP_t$	−1.708	21.143	−0.080	0.942
Constant	−49.864	473.862	−0.105	0.925

The long-term equation is: $lnCO2_t$=19.278400 $lnEC_t$+18.506851 $lnDC_t$−50.721540 $lnM2_t$−13.324513 $lnLM_t$−1.708742 $lnGDP_t$−49.864785 C

Table 6: Short run results

Dependent variable=$\Delta ln\ CO2_t$				
Variable	Coefficient	Standard error	T-statistic	Probability
$\Delta lnEC_t$	0.815054	0.139467	5.844071	0.0000
$\Delta lnDC_t$	0.070535	0.060534	1.165199	0.2538
$\Delta lnM2_t$	0.041582	0.141503	0.293863	0.7710
$\Delta lnLM_t$	−0.010235	0.020831	−0.491311	0.6270
$\Delta lnGDP_t$	−0.026080	0.022824	−1.142669	0.2629
ΔECM_{t-1}	−0.790288	0.121185	−6.521324	0.0000

Ang's work (2007, 2008, 2009). In addition, the negative sign of the coefficient of the GDP variable confirms the validity of the hypotheses of the EKC in the case of Morocco. The GDP per capita has a negative and statistically insignificant impact on CO2 emissions. It means that the level of CO2 emissions per capita increases first with GDP per capita, until it reaches its stabilization point, any increase in GDP per capita probably reduces per capita carbon emissions.

The coefficient of the variable CB is positive and equal to 18,5068 and statistically insignificant, implying that a 1% increase in bank credit per capita would result in an increase of 18,50% in CO2 emissions per capita. So we see that bank loans reduce the quality of the environment by increasing CO2 emissions. Our results comply with those of Al-Mulali et al. (2015). Indeed, the results of Al-Mulali (ibid) have shown that financial development reduces the quality of the environment by increasing CO2 emissions.

On the other hand, the coefficient of the variable TB is negative and equal to -13.32, which implies that the volume of transactions carried out on this financial market improves the environmental quality by reducing the CO2 emissions. Our results are consistent with those of Tamazian et al. (2009). Importantly, the results of Tamazian et al. (2009) have shown that developed capital markets help reduce financing costs and channel financial resources to purchase new equipment and finance new projects, which in turn creates energy demand and affects CO2 emissions. Regarding the level of financialization of the economy (M2), we found that the coefficient of the variable M2 is negative and equal to -50.7215 and is statistically insignificant, which implies that the level of financialization of the economy (M2) reduces CO2 emissions.

The long-term equation is:

$$\ln CO2_t = 19.278400\ lnEC_t + 18.506851\ lnDC_t - 50.721540\ lnM2_t - 13.324513\ lnLM_t - 1.708742\ lnGDPt - 49.864785C$$

4.3. Short-term Estimation Results

It can be seen that the short-term coefficients of the variables (EC, DC, M2) each have a positive and statistically insignificant sign. Indeed, this implies that the variables reduce the quality of the environment by increasing CO2 emissions in the short term but statistically insignificant. However, the coefficients of the variables (LM, GDP) each have a negative and statistically insignificant sign. Then the variables (LM, GDP) improve the environmental quality by reducing CO2 emissions in the short term.

Furthermore, we can see that the coefficient of the restoring force towards the equilibrium CointEq (−1) = −0.7902 is negative and significantly different from 0 at the threshold of 5%. There is therefore an error-correcting mechanism. The error correction model is validated. This coefficient, which expresses the degree to which the CO2 (CO2 emissions) variable will be recalled towards the long-term target, is estimated at −0.790 for our ARDL model, reflecting an adjustment to the relatively fast long-term target.

The negative sign on the error correction term confirms the expected convergence process in the long-term dynamics. In fact, 79% of last year's imbalances are corrected during the current year, suggesting a good speed of adjustment in the relationship process following a shock last year.

4.4. Validation Tests

After interpreting the results of this model, in this next step, we focus on verifying the three main hypotheses, namely: assumptions of error normality, heteroscedasticity test, autocorrelation error test and test stability of the coefficients of the model so that the model remains globally significant, for an overall relevance of the regression and not to fall into fallacious regressions. The results are shown in Table 7. It is found that the error distribution follows a normal distribution. Serial correlation does exist between error term and CO2 emissions. There is no autoregressive conditional heteroskedasticity and same inference is drawn about White heteroskedasticity.The model is well specified proved by Ramsey RESET test.

The last step of the ARDL estimation is to check the stability of the long and short term parameters of equation (2). CUSUM techniques based on the cumulative sum of recursive residues and CUSUMQ based on the cumulative sum of squares of recursive residues are applied (Figures 1 and 2 and Annux Figure 1).

Table 7: Statistical validation of the model used

Diagnostic tests		
R^2	0.8745	
Adjusted-R^2	0.6985	
Durbin-Watson	1.6421	
J-B normality test	1.223	(0.542)
Breusch-Godfrey LM test	0.190215	(0.827)
ARCH LM test	0.012	(0.911)
White heteroskedasticity test	0.548594	(0.4645)
Ramsey RESET	1.468479	(0.2432)

Values in () indicate probabilities

Figure 1: Plot of cumulative sum of recursive residuals

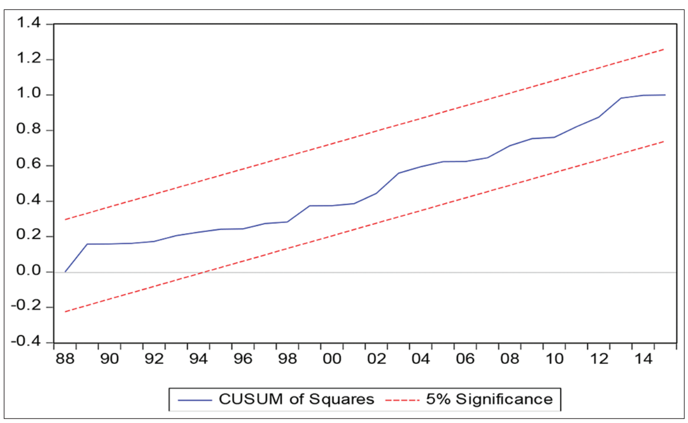
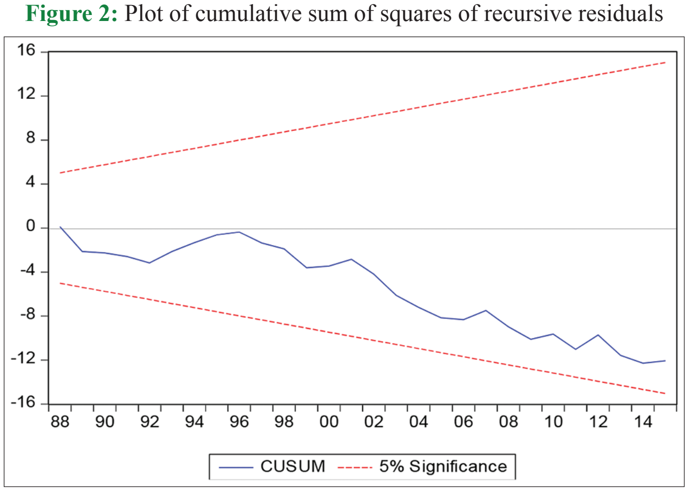


Figure 2: Plot of cumulative sum of squares of recursive residuals



The results show that the statistics graph of CUSUM and CUSUMQ remain inside the interval of the critical values at the 5% threshold, which implies that the coefficients of the model are stable.

The straight lines represent critical bounds at 5% significance level.

5. CONCLUSION AND POLICY IMPLICATIONS

This study examines the association between financial development and CO2 emissions by integrating energy consumption and economic growth as additional factors in the CO2 emission function. In this study, we applied the approach ARDL (autoregressive distributed lag model), in order to determine the effects of financial development on the environmental quality in Morocco for the period 1980-2015.

We found in this study that when measures the financial development of the banking market by the following variable: the domestic credit to private sector (DC), we arrive at a positive link and not a significant one between bank financial development and CO2 emissions. Indeed, bank loans reduce the quality of the environment by increasing the CO2 emissions but statistically insignificant. However, when measuring the financial development of the banking market by the following variable: the money and quasi money (M2), we come to a negative and insignificant link between the banking financial development and CO2 emissions. Proven right, we have found that the level of financialization of the economy (M2) reduces CO2 emissions. Secondly, when measuring the financial development of the stock market by the stock market transactions (LM), we arrive at a negative link between the financial development of the stock market and environmental quality. Indeed, the volume of transactions in this financial market improves environmental quality by reducing CO2 emissions.

Our results carry the following political implications:

The public authorities play an important role in aligning the Moroccan financial sector with sustainable development. Thereby, the Moroccan financial sector as a whole is called to finance and support the transition to a more sustainable economy. This is especially in relation to the projects of mitigation green house gas (GHG) emissions and to get involved more in the sensitization sure the environmental and social preoccupations. The Credit institutions and stakeholders at the level of the capital market, have a major role to play by offering sustainable financing products or "ecological" ones for sustainable development projects.

On the other side, the financial sector must adopt a device of environmental, social risk management and governance to identify risks and measure the impacts of projects financed by the environment. Then, as advisers, these financial institutions have a role of sensitizing and educating economic operators to environmental, social and sustainability concerns. They must be as exemplary as possible in this area by promoting the emergence of a genuine internal culture of environmental and social risks and by regularly communicating the actions undertaken in this domain.

Finally, the government should also encourage the banking sector to invest in the renewable energy sector. In this respect, the banking sector should allocate financial resources to R & D for eco-energy technologies.

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ANNEX

Figure 1: The time trends of the variables selected. (a) GDP per capita, (b) CO_2 emissions. (c) energy consumption, (d) money supply in the economy (M2), (e) bank credit, (f) liquidity of the stock market