Financial Development and Economic Growth Impact on the Environmental Degradation in Lebanon

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ABSTRACT

The study aims to examine the influence of financial development and economic growth on environmental degradation in Lebanon. Several theoretical and empirical studies on the relationship between the financial development and economic growth on carbon emissions showed conflicting findings. This research focus on studying the impact of both the financial development and economic growth on environmental degradation in Lebanon. The findings indicate that financial development and economic growth both have significant and positive impact on the carbon dioxide emissions using some control variables like fossil energy consumption, trade openness and urbanization. Also, the results showed a significant impact for the control variables on carbon emissions. This suggests crucial implications for policy-makers. The study recommends that the policy makers in Lebanon should push the financial institutions to invest more in green and friendly environment projects which will lead to minimize the carbon dioxide emissions.

Keywords: Financial Development, Economic Growth, Carbon Emission, Environmental Degradation
JEL Classifications: 016, 044, Q43 G00, Q50

1. INTRODUCTION

This study investigates the impact of economic growth and financial development on environmental degradation in Lebanon. Few previous studies focused on the link between the financial development, economic growth and environmental degradation. In studying Sub-Saharan African countries, Onanuga (2017) found that financial development impact on carbon emissions varied between low and upper middle and high-income countries. The study enables Lebanese policy maker to develop economic policies and direct the financial development in order to reduces the environmental degradation.

Due to the significant and rapid environmental degradation conditions worldwide, environmental quality became a major concern for the developed as well for developing economics policy makers (Lohnert and Geist, 2018; Ramuhulu and Chiranga, 2018). Some studies showed an important relationship between economic growth and environmental degradation (Tang and Tan, 2014;

He et al., 2019). In this context, some recent and limited studies suggest that financial advancement is also an essential element that could affect the environmental degradation (Samaila et al., 2018). In this regard, some studies reported positive relationship between financial development and environmental degradation (Sadorsky, 2010; Çoban and Topcu, 2013; Rasiah et al., 2018; Tsaurai, 2019) other studies reported negative impact for financial development on environmental degradation (Tamazian and Rao, 2010; Phong, 2019).

Recent empirical studies observed that carbon dioxide as the determinate of the environmental degradation has an effective impact on the economic growth (Taher, 2019). Most recently, a debate between academicians and environmentalists on the impact of financial development on environmental degradation gained high importance although it's not clearly conclusive.

The theoretical views in the aspect of the relationship between the financial development and carbon dioxide emission have

taken different diversions, some studies agreed on the negative influence for the financial development on the carbon dioxide emissions, others showed positive influence, others should no influences. Based on these divergent views, more studies need to be done in this field to better clarify this relationship. More precisely, empirical studies in the Middle East region and mainly in Lebanon has so far been ignored. Accordingly, paper investigates the influence of financial development and economic growth on carbon emissions in Lebanon.

Therefore, the study aims to investigate the influence of financial development and economic growth on the carbon dioxide emissions on Lebanon. Because of the several pollical and security in stability since the beginning of the Lebanese civil war in 1975 beside the pour infrastructure especially the electricity could be the main reason for the slow economic growth. In contrast, the Lebanese banks always played the key role in pushing the economy. While, the environmental degradation is considered nowadays a major concern for the Lebanese authorities with approximate annual increase of 2% in carbon dioxide emissions.

This paper is divided into five sections as follows: Section 2 show some theoretical review on the influence of financial development and economic growth on carbon emissions, section 3 shows an overview about the financial development, economic growth and carbon dioxide emissions in Lebanon. Section 4 is research methodology (econometric model specification, data analysis, robustness tests, results discussion and findings). Section 5 is the conclusion.

2. LITERATURE REVIEW

The economic growth, financial development and environmental degradation relationship has been the center of research for several researchers in recent economic and environmental literature (Khan et al., 2018; Taher, 2019). Theoretically and empirically proved that the impact of financial development on economic growth is not reach a unified conclusion.

In most of the recent studies, no unified conclusions for the type and sign of the relationship between the financial development, economic growth and environmental degradation. Some of these researches studied the relationship between the financial advancements and ecological deterioration with Tamazian and Rao (2010) using data of twenty-four emerging nations taking carbon emission as the proxy for measuring environmental deterioration. The study showed a significant and negative impact for the financial development on environmental degradation. In the same vein, a study on the Chinese economy investigating the relationship between financial advancements and ecological deterioration from period of 1953 to 2006 by Jalil and Feridun (2011) also taking carbon dioxide emission as proxy of the environmental degradation. Th study showed a significant and negative impact for the financial advancement on ecological degradation. However, a study by Çoban and Topcu (2013) examined the relationship between financial development and energy dependence for several European countries for the period of 1990 to 2011. The study showed a significant but positive impact for financial advancement on energy consumption. Similarly, a study for Malaysian economy for the financial advancement, economic growth and energy dependence from the period of 1971 to 2008 by the Islam et al. (2013). They found a significant relationship and positive impact for the financial advancements and economic growth.

In another study, this time for Turkish economy studying the relationship financial advancements and energy utilization with ecological deterioration from the period of 1960 to 2007 by the Ozturk and Acaravci (2013) also using carbon dioxide emissions as proxy for measuring the environmental deterioration. A study for the impact of climat change on the economic growth for the period of 1990 and 2015 applied in the Lebanese economy by Taher (2019). The study results reported significant relationship and negative impact of climate change using carbon dioxide emission on economic growth. Also with Taher (2018), a study for the impact of fossil and renewable energy impact on the economic growth in Lebanon for the period of 1990 and 2012 showed a significant and positive impact for fossil energy on economic growth with negative impact for the renewable energy on economic growth. In the same vein, a study for the Indian economy for the long-run equilibrium between financial development, economic growth, CO_2 emissions, energy consumption, and trade openness by Boutabba (2014). The study found causal relationships between all tested variables which reflect that financial development and energy use increased CO_2 emissions.

Similarly, in a panel study using data for some emergent economies by Saidi and Mbarek (2017) the period of 1990-2013 examining the relationship between financial advancements and environmental deterioration also using carbon dioxide emissions as proxy for measuring the ecological deterioration. The study showed a significant relationship and negative impact of financial advancements with carbon emission. In contrast, a study for by Shahzad et al. (2017) examining the relationship between the financial advancements and ecological deterioration also using the carbon dioxide emissions as proxy for environmental deterioration for the Pakistani economy. The results reported significant and positive impact of financial advancement on ecological degradation. In the same vein, Salahuddin et al. (2018) studied the Turkish economy from the period of 1980 to 2013 examined the relationship between financial development, production advancement, energy utilization, and ecological deterioration for the Turkish economy over the period of 1980 and 2013. The study results showed the significant relationship and positive impact between financial advancements, energy utilization, output advancement and with carbon emission. In the other side, some studied showed no relationship between economic growth and financial development. Mainly with Achy in 2005, he found that there is no significant impact for financial development on economic growth for five southern Mediterranean countries for the period of 1970-1999. Also, Ben Naceur and Omran in 2008 found no significant impact for the financial development on economic growth for seven southern Mediterranean countries over the period of 1979-2005.

In a recent study by Charfeddine and Kahia (2019) examining the impact financial advancement and renewable energy on economic advancement for MENA countries over the period between 1980

and 2015. The results of this panel study affirmed that both financial development and renewable energy are weakly significant to both environmental degradation and economic development. To sum up, the relationship between economic growth, financial development and environmental deteriorations had been varied and not unified in the literature. The current study seeks to unpack the intricacies of the impact of economic growth and financial development on carbon emissions in Lebanon.

3. FINANCIAL DEVELOPMENT, ECONOMIC GROWTH AND ENVIROMENTAL DEGRADATION IN LEBANON

The Lebanese as an emergent unstable economy is considered as the center f the Middle East with highly developed financial and mainly banking system. Due to the several pollical and security in stability since the beginning of the Lebanese civil war in 1975 beside the pour infrastructure especially the electricity could be the main reason for the slow economic growth. In contrast, the Lebanese banks always played the key role in pushing the economy. While, the environmental degradation is considered nowadays a major concern for the Lebanese authorities with approximate annual increase of 2% in carbon dioxide emissions.

Despite the slow growth of the Lebanese economy as shown in Figure 1, the financial development and mainly indexed with the credit to privet sector showed a remarkable increase mainly between 2008 and 2010 with 20% growth above the average of 6% in 2005 and 2007 this had also a positive impact on the Lebanese economy. A study done by Saad (2014) on the Lebanese economy over the period over 1972 and 2015 for the relationship between economic growth and the financial development. The study showed a positive relationship in the shot run but not significant results in the long run. However, the impact of economic growth and the financial development on the Lebanese environmental degradation had not been empirically studied. Noting that Lebanon lately is significant increase in carbon dioxide emissions as basic indicator for the environmental degradation. Fossil CO_2 emissions in Lebanon were 21,863,288 tons yearly change +1.95% global share 0.06% in 2016. Ranking of the country (Lebanon) at the global level is (from the highest to the lowest data) 65 over 188 (Figure 1).

Figure 1: Financial development, economic growth and CO_2 emissions in Lebanon (1988-2018)
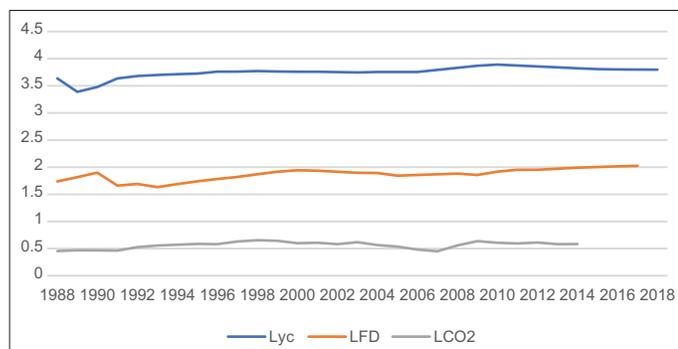
Source: Author calculation based on WDI World Bank WDI (2019)

4. METHODOLOGY

This paper employs data from 1988 to 2018 for analyzing the impacts of financial development and economic growth on environmental degradation in Lebanon data used was limited to its availability. All the data extracted from World Bank indicators were converted into natural log mainly to address the problem of outliers and since data are not normally distributed (World Bank, 2019). The financial development measurement was used as the domestic credit to the private sector as a ratio of GDP, the economic growth was used as GDP per capita, and CO_2 emissions (metric tons per capita) is a proxy of environmental degradation. There are 6 variables used in this study: CO_2 emissions, financial development, GDP per capita, fossil energy consumption, trad openness and urbanization. All variables are transformed into natural logarithmic series, according to Shahbaz et al. (2016), Dar and Asif (2018), when all variables are transformed to natural logarithm, the log-linear regression equation can smooth out the dynamics of time-series and produce reliable estimations. In testing the viability of the research model, multilinear regression equation is used based on time series ordinary least squares method. Starting with baseline estimation regression followed by robustness test to check the stationarity and fitness of the model. For this purpose, we refer to the ARMAX and the least absolut deviation estimates tests. Following the existing literature on the financial development and economic growth impact on environmental degradation, the model design is as follow:

$$LCO_{2t} = \beta_0 + \beta_1(LYC_t) + \beta_2(LFD_t) + \beta_3(LFEC_t) + \beta_4(LTO_t) + \beta_5(LURB_t) + \varepsilon \quad (1)$$

According to the above model equation, β_1-β_5 are considered as the regression coefficients for each independent variable while β_0 is a constant variable and ε is the error term. CO_2 signifies the carbon dioxide emission, which is calculated as carbon dioxide emissions measured in metric tons per capita; Yc specifies the real economic growth is calculated as GDP per capita is measured in constant 2010 US\$; FD signifies the financial development is calculated as domestic credit to private sector as % of GDP; FEC is the fossil energy consumption as the proxy for energy consumption is calculated as the fossil fuel energy consumption as % of total energy consumption; URB is the urban population share of the

Table 1: OLS, using observations 1989-2014 (T = 26)

Dependent variable: l_CO$_2$				
	Coefficient	**SE**	**t-ratio**	**P-value**
Constant	3.90064	13.7753	0.2832	0.7800
l_FD	0.271421	0.122248	2.220	0.0381**
l_Yc	0.413850	0.175327	2.360	0.0285**
l_FFC	5.07859	1.43727	3.533	0.0021***
l_TO	−0.172765	0.0577194	−2.993	0.0072***
l_Urb	−6.66532	3.19001	−2.089	0.0497**
Mean dependent var.	1.307857	SD dependent var.		0.135645
Sum squared resid.	0.086955	SE of regression		0.065937
R-squared	0.810964	Adjusted R-squared		0.763704
F (5, 20)	17.15994	P-value (F)		1.25e-06
Log-likelihood	37.21362	Akaike criterion		−62.42725
Schwarz criterion	−54.87867	Hannan-Quinn		−60.25353
Rho	0.164512	Durbin-Watson		1.491994

***,** and *denote significance at 1%, 5% and 10% levels; Source: Author calculation based on WDI (2019)

Table 2: ARMAX, using observations 1989-2014 (T=26)

Dependent variable: l_CO$_2$; standard errors based on Hessian			
	Coefficient	**SE**	**Z**	**P-value**
Constant	3.39652	11.8022	0.2878	0.7735
Phi_1	−0.140658	0.356378	−0.3947	0.6931
Theta_1	0.553392	0.242616	2.281	0.0226**
l_FD	0.243045	0.104527	2.325	0.0201**
l_Yc	0.363682	0.163897	2.219	0.0265**
l_FFC	4.29462	1.24891	3.439	0.0006***
l_TO	−0.197202	0.0613011	−3.217	0.0013***
l_Urb	−5.60262	3.02123	−1.854	0.0637*
Mean dependent var.	1.307857	SD dependent var.		0.135645
Mean of innovations	−0.000480	SD of innovations		0.054353
Log-likelihood	38.71438	Akaike criterion		−59.42877
Schwarz criterion	−48.10590	Hannan-Quinn		−56.16819
	Real	**Imaginary**	**Modulus**	**Frequency**
AR				
Root 1	−7.1095	0.0000	7.1095	0.5000
MA				
Root 1	−1.8070	0.0000	1.8070	0.5000

***,** and * denote significance at 1%, 5% and 10% levels; Source: Author calculation based on WDI 2019

total population (%). Noting that all test variables are used in natural logarithm. The data used as annual records and collected mainly from the world development indicator over the period of 1988-2018. The main research hypothesize are as follow:

H$_1$: The variability of the environmental degradation is positively relayed on the variability of the financial development and economic growth.

H$_2$: The test control variables are statistically significant on the environmental degradation.

5. DATA ESTIMATION AND INTERPRETATION

According to the model equation one, we regress the logged carbon dioxide emissions as the dependent variable on the logged real Lebanese GDP per capita and the logged domestic credit to private sector as proxy for the financial development, logged fossil energy consumption, and logged urbanization. The multilinear regression equation used time series ordinary least squares method as shown in Table 1.

6. RESULTS AND DISCUSSION

According to the OLS approach, the financial development using proxy the domestic credit to private sector had a significant positive effect on carbon emissions. The results support Xing et al.'s (2017) argument that more credit availed to the consumers enable them to buy energy consuming machinery and automobiles. Also, the GDP per capita as proxy for the economic growth showed a significant and positive impact on carbon emissions. This research is supported by Aye and Edoja's (2017) study indicating that economic growth increased is associated with larger manufacturing scale activities which needs to consume more energy and thus more carbon dioxide emissions.

Continuing with control variables, the test result shows that the fossil energy consumption had significant and positive impact on

Table 3: LAD, using observations 1989-2014 (T=26)

Dependent variable: l_CO$_2$			
	Coefficient	**Std. Error**	**t-ratio**	**P-value**
l_FD	0.274990	0.156784	1.754	0.0940*
l_Yc	0.438610	0.210600	2.083	0.0497**
l_FFC	6.18358	2.47225	2.501	0.0207**
l_TO	−0.154544	0.101314	−1.525	0.1421
l_Urb	−6.99057	2.67235	−2.616	0.0161**
Median dependent var.	1.340811	SD dependent var.		0.135645
Sum absolute resid.	1.117810	Sum squared resid		0.096435
Log-likelihood	37.79302	Akaike criterion		−65.58604
Schwarz criterion	−59.29556	Hannan-Quinn		−63.77461

***,** and *denote significance at 1%, 5% and 10% levels; Source: Author calculation based on WDI 2019

the carbon dioxide emissions is affirmed with Ozturk and Acaravci (2013) study that reported a significant relationship and positive impact of energy utilization on ecological degradation. Also, the test results with respect to trade openness and urbanization show that they are statistically significant at 1% and 5% with negative impact on the carbon dioxide emissions is affirmed with Kasman and Duman (2015). These findings are shown in Table 1.

6.1. Robustness Check Running ARMAX and LAD

To the test the stationarity for the regression model, robustness tests are applied through ARMAX and least absolut deviation methods. The results illustrate the baseline regression estimation stationarity with respect to financial development, economic growth and the remaining control variables with affirm their robustness (Tables 2 and 3). In testing the model stationarity based on the Auto regression AR and moving average MA polynomial, we run the ARMA autoregressive–moving-average (ARMA). Whereas, the first part which is the auto regression AR take the role of regressing the model variables by their own values. However, the second part of the ARMA is the moving average MA check the error term considering them as linear combination of error terms that occur in contemporaneously and at different periods.

According to the results in Table 2, The AR root is >1 and MA root is >1 in absolute value thus the model is stationary. The ARMAX results show very similar significant results to the ones on regressed model variable coefficients. Using Least absolute deviation LAD as another method in testing the stationarity for the regressed model, the results shows a good fit for the model. In addition, the results in Table 3 show very similar significant results to the ones on regressed model variable coefficients.

7. CONCLUSION AND DISCUSSION

It is clear from both theoretical and empirical sides that the impact of economic growth and financial development on environmental degradation is still a contentious issue which is yet to be resolved in literature. In order to fill in this gap, this study investigated the impact of financial development and economic growth on carbon emissions in Lebanon taking fossil energy consumption, trade openness and urbanization as control variable. The results confirm a significant impact for the financial advancement, fossil energy consumption, economic growth, and carbon dioxide emission in Lebanon. The result further suggested that financial advancement, fossil energy consumption, and economic growth have a positive and significant impact on carbon emission in Lebanon. While, the trade openness and urbanization have significant but negative impact on the environmental degradation in Lebanon. The study recommends that the government needs to direct the financial institutions and mainly the banks towards encouraging the green and sustainable investment and renewable energy utilization, which ultimately reduce the carbon dioxide emissions increase in Lebanon. Crucial implications can be recommended for Lebanon, mainly the governments should encourage and support green investment projects. Simply the private and public financial authorities in Lebanon should work to foster the project that lead to minimize the environmental degradation off course with the international institutions support. The Lebanese policy makers should encourage the trade openness and direct it towards more environment friendly goods and services. For Lebanon to ensure environmentally sustainable development green urbanization concept should be fostered in order to minimize the environmental degradation.

In the other hand, this vison should be accompanied with several reform steps mainly in institutions, corruptions, and final legal systems so as to foster financial development and economic growth, which contributes to treat the environmental degradation in Lebanon. The study therefore encourages Lebanese policy makers to implement credit policies that ensures that the loans availed by the financial sector to the domestic firms are used towards acquiring environmental friendly machinery and equipment that reduces carbon emissions. The limitation of this article entails inadequate data in Lebanon. More research should be done in this field and mainly in emergent economies, also expanding the study to global level is a worthy attempt in future studies.

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