Üçüncü Sektör Sosyal Ekonomi Dergisi
Third Sector Social Economic Review
56(3) 2021, 2132-2146
doi: 10.15659/3.sektor-sosyal-ekonomi.21.09.1651

Araştırma Makalesi

The Effect of Urbanization and Economic Growth on the Environment in the Emerging Markets

Yükselen Piyasalarda Kentleşme ve Ekonomik Büyümenin Çevre Üzerine Etkisi

Serap ÜRÜT SAYGIN
Dr. Öğr. Üyesi, Aksaray Üniversitesi, İİBF Maliye Bölümü, Aksaray
serap_urut@hotmail.com
https://orcid.org/0000-0002-5098-375X

Makale Gönderme Tarihi	Revizyon Tarihi	Kabul Tarihi
09.07.2021	13.09.2021	15.09.2021

Öz

Bu çalışmada seçili yükselen piyasa ekonomilerinde (Arjantin, Brezilya, Çin, Hindistan, Endonezya, Meksika, Polonya, Rusya, G. Afrika ve Türkiye) kentleşme ve ekonomik büyümenin çevre üzerindeki etkisinin tespit edilmesi amaçlanmıştır. 1990-2016 yıllarını ele alan çalışmada panel eşbütünleşme analizi yapılmıştır. Sonrasında ise panel genişletilmiş ortalama grup (AMG) tahmincisinden faydalanılarak uzun dönem katsayılar tahminlenmiştir. Analiz sonucunda hem ekonomik büyüme hem de kentleşme ile karbon emisyon hacmi arasında doğru yönlü bir ilişki olduğu sonucuna ulaşılmıştır. Bu da ekonomideki büyümenin ve artan kentleşmenin çevre açısından olumsuz bir etki yarattığını ortaya koymaktadır. Panel AMG tahmincisine göre, ekonomik büyümedeki 1 birimlik artış karbon emisyon miktarını 0.73 birim arttırmaktadır. Bunun yanı sıra kentleşmenin çevre üzerindeki etkisinin ise daha baskın olduğu saptanmıştır. Analiz sonucunda kentleşme düzeyindeki 1 birimlik artışın karbon emisyonlarını 1.16 birim arttırdığı belirlenmiştir.

Anahtar Kelimeler: *Kentleşme, Ekonomik Büyüme, CO_2 emisyonları*

Abstract

The present study aims to determine the effect of urbanization and economic growth in selected emerging market economies (Argentina, Brazil, China, India, Indonesia, Mexico, Poland, Russia, S. Africa and Turkey) on the environment. The study covers the years from 1990 to 2016 and includes a panel cointegration analysis. After that, the long-term predictions were estimated with the panel augmented mean group (AMG) estimator. As a result of the analysis, it was found that there is a positive relation of both economic growth and urbanization with the volume of carbon emissions. This reveals that economic growth and increasing urbanization have a negative effect on the environment. According to the panel AMG estimator, an increase of 1 unit in economic growth increases the amount of carbon emissions by 0.73 unit. In addition, it was determined that the effect of urbanization on the environment is more dominant. As a result of the analysis, it was determined that an increase of 1 unit in the level of urbanization increased carbon emissions by 1.16 units.

Keywords: *Urbanization, Economic Growth, CO_2 emissions*

1. Introduction

The efforts of countries to increase goods and service production in line with their basic goals of economic growth have some consequences. One of these consequences is the emergence of environmental problems that have global reflections. Climate change and global warming come

Önerilen Atıf /Suggested Citation
Ürüt Saygın, S. 2021 The Effect of Urbanization and Economic Growth on the Environment in the Emerging Markets, *Üçüncü Sektör Sosyal Ekonomi Dergisi,* 56(3), 2132-2146.

to the fore among these environmental problems that threaten human life. One of the most important causes of global warming and climate change is the carbon dioxide (CO_2) emission. According to the reports of the National Aeronautics and Space Administration (NASA), CO_2 emissions were at the limit of 30 ppm (parts per million) for centuries. However, the level of CO_2 emissions was rising steadily since the 1950s. The latest level was around 400 ppm (Afridi, 2019: 29978). There are many factors affecting the change in the volume of CO_2 emissions. Expressed as population growth, economic growth, technological change and urbanization, these factors, together with the necessity of daily life and the production process, cause an increase in energy consumption, thus an increase in the volume of CO_2 emissions (Kılıç et al., 2020: 183; Niu and Lekse, 2017: 3).

The effects of economic activities on the environment were ignored in the world economy until the 1970s. The economic targets were the main point of focus. For this reason, ignoring the effects of further growth on the environment led to an increase in environmental pollution (Balı and Yaylı, 2019: 304). The economic growth-environment relation is generally explained in the literature by the Environmental Kuznets Curve (EKC). The EKC hypothesis proposes an inverted U-shaped relation between economic growth and environmental degradation. This hypothesis suggests that the growth rate is low at the beginning of economic growth and environmental degradation will increase at this stage. It claims that when a certain growth level is reached in the later stage of economic growth, environmental degradation will also decrease together with both structural and technological developments (Destek, 2018: 269). Some effects stand out among the main factors behind the first increasing and then decreasing trend of EKC. These effects are expressed as scale effect, technological effect and structural effect. In addition, income elasticity regarding the demand for quality environment, foreign trade, expansion of technology, international organizations, globalization, strict environmental regulations, increase in environmental awareness and education level are also expressed as other factors (Topallı, 2016: 430).

The shift of the population from rural to urban together with industrialization made the urbanization phenomenon an important economic and social indicator. According to the World Bank data (2021), the urban population in the emerging market economies under examination reached 2 billion people from a total of 960 million people in the period from 1990 to 2016. Urbanization can affect both physical spaces and human behaviour. Rapid urbanization creates many problems including infrastructure, communication, migration, transportation, education and health. Urbanization has recently a high rate of increase in countries and has an important influence on the environmental degradation. In terms of environmental impacts, the housing demand increases with urbanization and agricultural lands are negatively affected by this condition in order to meet this increase. In addition, the increase in the use of vehicles after urbanization which causes air pollution is another negative factor. The generation of more waste after urbanization also draws attention among environmental degradation (Şahin and Gökdemir, 2019: 188-189).

Table 1 shows the changes in indicators related to carbon emission level, urbanization and economic growth in selected emerging market economies. Upon examining the Table 1, it can be stated that the amount of carbon emissions in selected countries generally increased from 1990 to 2016. Among these countries, a significant decrease is seen in Russia. However, it should be added that it would be more convenient to evaluate the data after the collapse of the Soviet Union in 1991 rather than the 1990 data of Russia. Looking at these data, it can be said that Russia's carbon emission amount was 13.9 in 1993 and 10.6 in 2000 (World Bank, 2021). Considering the change in the urban population, significant increases are remarkable in many countries. Especially China and India take the lead in urban population growth. The increase in job opportunities and maximization of health and education conditions with industrialization can be listed as the main reasons behind the transition to from rural areas to cities (Gürdal et al., 2020: 138). When it is

analyzed in terms of economic growth, it should be emphasized that very important growth figures were achieved in these countries.

Table 1. CO_2, Urbanization and Economic Growth Indicators of Selected Emerging Market Economies

	CO_2 (metric ton per person)		Urban Population (million people)		Per Capita Income (2010 constant prices-$)	
	1990	**2016**	**1990**	**2016**	**1990**	**2016**
Brazil	1.40	2.24	110	177	7984	10966
Mexico	3.79	3.94	59	98	7791	10183
Poland	9.67	7.88	23	22	5947	15076
South Africa	8.51	8.48	19	36	6060	7477
Turkey	2.71	4.67	31	59	6774	14153
Argentina	3.44	4.62	28	39	6246	10239
China	2.15	7.18	300	782	729	6908
India	0.71	1.82	223	439	581	1876
Indonesia	0.82	2.15	55	141	1708	3968
Russian Federation	24.40	12.00	108	107	9571	11356

Source: World Bank Data Base https://databank.worldbank.org/source/world-development-indicators (15.04.2021).

The main objective of this study is to examine the relations between urbanization, economic growth and the environment, which have attracted attention in recent studies on the environment. In this context, the effect of urbanization and economic growth on the environment in emerging market economies for the period 1990-2016 was empirically analyzed in the study. In line with the results obtained as a result of the analysis, the relation between urbanization, economic growth and the environment was evaluated and policy recommendations were made. No study was found in the literature for selected emerging market economies. Therefore, it is expected that the study will contribute to the literature. A literature review on the subject was included in the continuation of the introductory part of the study. Then, the data set and model of the study were introduced. The last stage was dedicated to methodology and empirical findings. Finally, the study was completed with conclusions and policy recommendations.

2. Literature Review

Considering the effects of human activities on the environment, there was a significant increase in the number of academic studies on the subject. In particular, the examination of the relations between urbanization, economic growth, energy and carbon emissions is frequently found in the literature. In these studies, different results are encountered according to the country or country group under examination. However, it is seen that many studies concluded that factors such as urbanization and economic growth cause environmental degradation.

Sadorsky (2014), studying the effect of urbanization on carbon emissions for emerging economies, found that there is a positive correlation between the level of welfare, the amount of population and the increase in energy intensity and the level of carbon emissions.

Azam and Khan (2016) analyzed the relation between urbanization and environmental degradation for 4 countries in the region of the South Asian Regional Cooperation Association (SAARC). In the study using the time series data from 1982-2013, a positive correlation was found between urbanization and environmental degradation for Sri Lanka.

Liu et al. (2016) empirically examined the relations between urbanization, economic growth and CO_2 emissions in their study for the period from 1997 to 2010 in China. In the study, it was concluded that urbanization, economic growth and CO_2 emissions are integrated in the long term. In addition, a bidirectional causality relation was determined between the variables.

Examining the effect of urbanization on carbon emissions for 141 countries for the period from 1961 to 2011, Zhang et al. (2017) found that there is an inverted U-shaped relation between urbanization and carbon emissions.

Bozkurt and Okumuş (2017) tested the Environmental Kuznets Hypothesis for 33 developed countries by considering the period from 1980 to 2013. The results of the study which included the panel cointegration test and panel FMOLS analysis revealed that the EKC hypothesis is not valid for developed countries. In addition, it was concluded that there is a U-shaped relation between economic growth and CO_2 emissions.

Bakırtaş and Akpolat (2018) studied the relation between energy consumption, urbanization and economic growth in emerging economies. Dimitrescu-Hurlin causality test was used in the study covering the period from 1971 to 2014. As a result of the analysis, a bidirectional causality relation was determined between the variables.

Destek (2018) tested the validity of EKC)hypothesis for Turkey. The study included ARDL bound test and VECM Granger causality analysis for the period from 1990 to 2014. In the study, it was revealed that the EKC hypothesis is valid for Turkey. In addition, it was determined that the increase in the level of urbanization accelerates environmental degradation in Turkey.

Wang et al. (2018) analyzed the relation between urbanization, economic growth, energy consumption and CO_2 emissions for countries with different income levels and determined the existence of a long-term relation between the variables. The study covered the period from 1980 to 2011 and found causality relations at different income levels. As a result of the analysis, it was determined that the income levels and the stage of development of the countries are important in the policies they will implement to reduce CO_2 emissions.

Şahin and Gökdemir (2019) investigated the effect of urbanization on the environmental quality for the period from 1995 to 2016 in Turkey. In the study, it was concluded that urbanization has a significant effect on greenhouse gas emissions.

Yıldız (2019) analyzed the causal relation between CO_2 emissions, energy consumption, economic growth and urbanization for E7 countries. The analysis was performed by panel Granger causality test covering the years from 1992 to 2014. According to the results of the analysis, a unidirectional causality relation was determined on a panel basis from urbanization to CO_2 emissions, from energy consumption to urbanization and from economic growth to urbanization.

Afridi et al. (2019) examined the effect of income per capita, trade openness, urbanization and energy consumption on CO_2 emissions. Countries in the SAARC were taken into account in the study. Panel data analysis techniques were used in the study, using the annual data between 1980 and 2016. The results of that analysis show CO_2 emissions were affected negatively by trade openness and positively by urbanization and energy consumption. As a result of the analysis, it was also concluded that there is a bidirectional causality relation between the variables.

Ali et al. (2019) examined the effect of urbanization on CO_2 emissions for Pakistan. The study analized the years from 1972 to 2014 using ARDL bound test and VECM causality analysis. There is a cointegration relation between the variables in the study which determined that urbanization increases carbon emissions. In addition, a causal relation from urbanization to carbon emissions was determined.

Bayraktutan and Alancıoğlu (2019) analyzed the relation between urbanization and growth for BRICS-T countries based on the period from 1990 to 2017. The study included a panel causality analysis and determined a unidirectional relation from growth to urbanization.

Altıntaş (2020) examined the effects of urbanization and economic growth on the environmental degradation in the case of Turkey. ARDL bound test and Granger causality analysis were used in the study covering the period from 1960 to 2014. As a result of the study, it was determined that urbanization increases environmental degradation. It was also determined that the economic growth variable had first an increasing and then a decreasing effect on the environmental degradation. This situation reveals the validity of the EKC for Turkey.

Kılıç et al. (2020) analyzed the effect of urbanization and industrialization on CO_2 emissions for Turkey with the ARDL bound test approach. The period of the study is between 1960 and 2014. The results of that analysis show that urbanization and industrialization cause environmental pollution by increasing the amount of CO_2 emissions.

Odugbesan and Rjoub (2020) analyzed in their study the relation between economic growth, energy consumption, CO_2 emissions and urbanization in MINT countries. The study used data from 1993 to 2017 and the analysis was carried out with the ARDL bound test approach. As a result of the analysis, it was determined that there is a long-term causality relation between the variables under examination in MINT countries. In the study, it was suggested to adopt policies to prevent CO_2 emissions in a way that will not impair economic growth and urbanization.

Adebayo et al. (2020) analyzed in their study the determinants of CO_2 emissions particularly for MINT countries. The ARDL approach was used in the study covering the years from 1980 to 2018. As a result of the analysis, a positive relation of CO_2 emissions was determined with energy use and urbanization. While no significant relation was found between economic growth and CO_2 emissions, a negative relation was found between trade and CO_2 emissions.

Anwar et al. (2020) examined the effect of economic growth and urbanization on CO_2 emissions for Far Eastern countries. The study covered the period from 1980 to 2017. The findings confirmed that the variables including urbanization, economic growth and trade openness have a significant effect on CO_2 emissions in selected countries.

Bashir et al. (2021) examined the relation between urbanization, economic growth, energy consumption and CO_2 emissions in Indonesia. The data used in the study covered the period from 1985 to 2017. As a result of the analysis, it was concluded that urbanization and energy consumption increase carbon emissions in the short term.

Aslan et al. (2021) examined the relation between urbanization and air pollution for Turkey. The study covered the period from 1960 to 2015 using the dynamic ARDL method. The findings confirmed that both urbanization and economic growth increase carbon emissions.

3. Data Set and Model

Examining the economic developments and their consequences from different aspects is among the topics of interest in the literature. At this point, the effects of urbanization and economic growth on the environment draw attention. Addressing the issue in terms of emerging markets that have come to the fore in recent times is considered to be a contribution of this study to the literature. In the study, 10 countries of emerging markets (Argentina, Brazil, China, India, Indonesia, Mexico, Poland, Russia, S. Africa and Turkey) were included in the analysis. Table 2 includes information on the variables used in the study.

Table 2. Data Set

Variables	Symbols	Source
CO_2 emissions (metric tons per capita)	lnCO_2	World Bank
GDP Per Capita (2010 constant prices)	lnGDP	World Bank
Urbanization (Urban Population)	lnU	World Bank

In the study, the amount of carbon (CO_2) emission was taken to represent the environmental variable. GDP per capita (at constant prices of 2010) was used to represent economic growth and urban population was used to represent urbanization. Since the data on the amount of CO_2 in the study could be accessed until 2016, the period of the study was determined to be 1990-2016. The data on the variables included in the analysis were obtained from the Internet database of the World Bank (https://databank.worldbank.org/source/world-development-indicators). All variables used in the study were included in the model by taking their logarithms. In the study, the panel data model given in Equation 1 was established to determine the relations between urbanization (lnU), economic growth (lnGDP) and CO_2 emissions (lnCO_2). Econometric model analysis was performed using the package programs Stata 15 and Eviews 9.

$$\mathbf{lnCO_{2\,it}} = \propto_0 + \propto_1 \boldsymbol{lnGDP_{it}} + \propto_2 \boldsymbol{lnU_{it}} + \boldsymbol{\varepsilon_{it}} \quad \textbf{(1)}$$

In Equation 1, α_0 is the constant coefficient, α_1 and α_2 are the slope coefficients, and ε is the error term. Here *t* represents time and *i* represents country.

4. Methodology

Firstly, the cross-section dependency test of the model was performed in the study which discussed the relations between urbanization, economic growth and the environment. There are different tests for the determination of cross-section dependence (CSD) in the literature. The *Breusch-Pagan (1980) LM (BP_{LM}) test*, which can be used in the case of T>N, was used in the study to examine the cross-sectional dependence. The basic hypothesis in the BP_{LM} (1980) test is that there is no cross-section dependency. The BPLM (1980) test statistic is given in Equation 2:

$$\boldsymbol{LM_{BP}} = \boldsymbol{T} \sum_{\boldsymbol{i=1}}^{\boldsymbol{N-1}} \sum_{\boldsymbol{j=i+1}}^{\boldsymbol{N}} \boldsymbol{\hat{\rho}_{ij}^2} \quad \textbf{(2)}$$

In Equation 2, the correlation coefficient between $\hat{\rho}_{ij}^2$ and the remains of the units i. and j is expressed (Yerdelen Tatoğlu, 2018: 227).

In the second stage of the analysis, the homogeneity of the model was determined. At this stage, delta ($\tilde{\Delta}$) and deviation corrected delta ($\tilde{\Delta}_{adj}$) tests developed by Pesaran and Yamagata (2008) were used. In the delta tests, the basic hypothesis is expressed as "*the slope coefficients are homogeneous*". If the basic hypothesis is rejected, it turns out that the model is not homogeneous and tests that take this into account should be used.

Two different delta tests presented in the determination of homogeneity are shown in Equations 3 and 4 (Pesaran and Yamagata, 2008: 54-55):

$$\tilde{\Delta} = \sqrt{\boldsymbol{N}} \left(\frac{\boldsymbol{N^{-1}}\, \tilde{\boldsymbol{S}} - \boldsymbol{k}}{\sqrt{\boldsymbol{2k}}} \right) \quad \textbf{(3)}$$

$$\tilde{\Delta}_{\boldsymbol{adj}} = \sqrt{\boldsymbol{N}} \left(\frac{\boldsymbol{N^{-1}}\, \tilde{\boldsymbol{S}} - \boldsymbol{E}\,(\tilde{\boldsymbol{Z}}_{\boldsymbol{it}})}{\sqrt{\boldsymbol{Var}}\,(\tilde{\boldsymbol{Z}}_{\boldsymbol{it}})} \right) \quad \textbf{(4)}$$

In Equations 3 and 4, *N* refers to the number of cross-sections, *S* refers to the Swamy test statistic, and *k* refers to the number of explanatory variables.

In the study, the Pesaran CIPS panel unit root test, which takes CSD into account, was used while performing the stability analysis of the variables. In the Pesaran panel unit root test, the delayed

cross-sectional means of the *Augmented Dickey-Fuller (ADF)* regression are taken into account. The basic CADF regression based on delayed cross-sectional means is expressed by an equation as follows:

$$\Delta y_{it} = \propto_i + b_i y_{i,t-1} + c_i \bar{y}_{t-1} + d_i \Delta \bar{y}_t + \varepsilon_{it} \quad (5)$$

After estimating the CADF regression in Equation 5, the averages of the t statistics of the delayed variables in the equation are calculated with the formula in Equation 6 to reach the CIPS statistics, and it is accepted that the combined asymptotic limit of the CIPS statistics is not standard (Yerdelen Tatoğlu, 2018: 85).

$$CIPS = \frac{1}{N} \sum_{i=1}^{N} CADF_i \quad (6)$$

In the next stage of the study, the existence of a long-term relation between the variables was tested with the Westerlund (2007) cointegration test. Westerlund (2007) suggests testing the long-term relation with four error-correction–based panel cointegration tests. Two of these tests (G_t and G_a) refer to group mean statistics and the other two refer to panel statistics (P_t and P_a). These tests reveal the long-term relation between variables by deciding whether each unit has its own error correction. The basic hypothesis of the test is "*There is no error correction*". The rejection of this hypothesis reveals the existence of a cointegration relation between the variables (Yerdelen Tatoğlu, 2018: 200-201). Under CSD, the Westerlund (2007) panel cointegration test needs to be obtained by the resistant bootstrap process.

In the last stage of the analysis, the long-term coefficients related to the model were estimated. At this stage, the augmented mean group (AMG) estimator, which takes CSD into account and heterogeneity, was used. This estimator was proposed by Bond and Eberhardt (2009) and Eberhardt and Teal (2010). In the AMG estimator, the error correction model is tested in the first stage with the first difference method by adding T-1 pieces of time dummy variables. Then, these estimates are added to the error correction model established for each unit. At the last stage, the AMG estimator for all units is reached with the Pesaran and Smith GO approach by taking the average on the basis of units (Yerdelen Tatoğlu, 2018: 303).

5. Findings

It is necessary to determine whether the variables include CSD or not in order to be able to decide the unit root test to be used in determining the stationarity of the variables in the study. Since T>N in the study, the situation regarding CSD was determined with the BP_{LM} test, which is recommended to be used in this situation. The results of the test are presented in Table 3.

Table 3. Breusch-Pagan (1980) LM Test Results

Variables	Test Statistics	Prob
lnCO_2	498.8334	0.0000***
lnGDP	992.5117	0.0000***
lnU	1035.590	0.0000***
Panel	151.6	0.0000***

Note:***%1 level is significant.

When Table 3 is examined, it is seen that the variables of lnCO_2, lnGDP and lnU have CSD. The main hypothesis suggesting that there is no CSD was rejected at the 1% significance level. In addition, the presence of CSD was also found with the BP_{LM} test for the model. Therefore, as a result of the acceptance of CSD in the series and throughout the model, it was concluded that unit root analyzes should be performed with tests that take this situation into account.

In the study, delta tests were used to determine whether the model was homogeneous. Table 4 presents the results of the delta tests.

Table 4. Homogeneity Test

Test	Test Statistics	Prob.
Delta Tilde	15.328	0.0000***
Delta Tilde adj.	16.607	0.0000***

Note: ***%1 level is significant.

The results obtained from Table 4 show that the model rejects the basic hypothesis that the slope coefficients are homogeneous. This situation revealed that the model is heterogeneous and this should be taken into account when determining the estimators.

Table 5. Pesaran CIPS Unit Root Test

	Constant		***Constant+trend***	
	Statistics	**Critical Value**	**Statistics**	**Critical Value**
lnCO_2	-2.529**	10%	-2.420	10%
lnGDP	-1.750	-2.21	-1.898	-2.73
lnU	-0.589		-1.968	
Δ lnCO_2	-4.443***	5%	-4.557***	5%
Δ lnGDP	-3.506***	-2.33	-3.677***	-2.86
Δ lnU	-3.005***	1%	-3.049**	1%
		-2.57		-3.1

Note: ***%1 and **%5 indicates the level of significance.

Pesaran CIPS panel unit root test, which is one of the leading tests in the presence of CSD, was used in the processing of the unit root tests of the variables used in the study. When Table 5 is examined, it is seen that the basic hypothesis, no unit root hypothesis, is rejected for the other variables except for the lnCO_2 variable in the fixed model. Therefore, it can be stated that the lnGDP and lnU series include a unit root. In the fixed trend model, it is seen that the basic hypothesis cannot be rejected for all variables. When the first difference of the variables is taken, it is concluded that they become stationary according to both fixed model and fixed trend model. After this stage, it will be possible to proceed to the stage of determining the cointegration relation between the variables. In the cointegration test, the bootstrap values of the Westerlund cointegration test recommended in the case of CSD were taken into account. The cointegration test results are given in Table 6.

Table 6. Westerlund Cointegration Test

Statistics	**Value**	**Z- Value**	**Prob**	**Bootstrapt Prob**
Gt	-3.471	-4.930	0.000	0.000*
Ga	-12.505	-1.704	0.044	0.000*
Pt	-12.554	-6.911	0.000	0.010*
Pa	-12.672	-3.850	0.000	0.000*

Note: *Bootstrap probability values were obtained with a Bootsrap value of 100. Latency and antecedent levels were taken as 1.*

The results obtained from Table 6 show that cointegration tests showing both group and panel statistics reject the main hypothesis of "*no cointegration*". This means that there is a significant relation between the variables in the long term. As a result of the determination that the variables are cointegrated, the stage of determining the coefficients of this relation was started. Due to the detection of CSD and heterogeneity in the tests performed on the model and variables, the long-term coefficients were estimated with the augmented mean group (AMG) estimator providing reliable results under these conditions, and the results are presented in Table 7.

Table 7. Panel AMG Estimation Results

$\mathbf{lnCO_{2\,it}} = \propto_0 + \propto_1 \boldsymbol{lnGDP_{it}} + \propto_2 \boldsymbol{lnU_{it}} + \boldsymbol{\varepsilon_{it}}$

Countries	lnGDP		lnU	
	Coefficient	*t-statistics*	*Coefficient*	*t-statistics*
Argentina	0.4978	0.000***	2.1854	0.000***
Brazil	0.6359	0.018**	1.8552	0.000***
China	1.7809	0.000***	-2.0481	0.005***
India	0.8578	0.000***	0.76793	0.059*
Indonesia	0.4113	0.047**	1.1668	0.000***
Mexico	1.1052	0.000***	0.9451	0.000***
Poland	0.3660	0.000***	-1.3794	0.081*
Russian Federation	0.9408	0.000***	5.7646	0.000***
South Africa	0.3821	0.057*	0.9162	0.000***
Turkey	0.3676	0.002***	1.5121	0.000***
Panel	0.7345	0.000***	1.1686	0.079*

Note: *** %1, **%5 and *%10 indicates the level of significance.

Upon examining the results obtained from Table 7 from the perspective of the panel, a positive relation of carbon emission volume is remarkable with both economic growth and urbanization. These results show that economic growth and increasing urbanization have an increasing effect on the environmental degradation. This is as expected in the literature. According to the panel AMG estimator, an increase of 1 unit in lnGDP across the panel increases $lnCO_2$ by 0.73 unit. When the panel AMG estimation results were analyzed in terms of the relation between urbanization and the environment, a positive and statistically significant relation was found throughout the panel. In selected emerging market economies, carbon emissions increase by 1.16 units as the level of urbanization increases by 1 unit. Again, this shows that urbanization is at the expense of environmental degradation.

When the results are analyzed on the basis of countries, it is seen that both economic growth and urbanization variables include statistically significant results. When the results in Table 7 are evaluated in terms of the economic growth variable, it is seen that China is the country where this variable has the most impact on carbon emissions. A 1-unit increase in China's lnGDP increases carbon emissions by 1.78 units. The country that follows this country most closely is Mexico with a coefficient of 1.1. The countries with the lowest environmental impact of the increase in economic growth were determined to be Turkey, South Africa and Poland. In the aforementioned countries, 1 unit increase in lnGDP increases $lnCO_2$ by about 0.36 unit. Upon evaluating the effect of urbanization on carbon emissions on a country basis, it is concluded that there is a positive relation except for China and Poland. Especially Russia and Argentina are seen to be the countries where this effect is felt more. When an evaluation is made for Turkey, an increase in carbon emission volume is found as a result of urbanization. 1 unit increase in urbanization in Turkey

increases carbon emissions by 1.5 units. India and S. Africa were found to be the countries with the lowest impact of urbanization on the environment. Within the framework of these results, it is revealed that the relation between these indicators and the environment should be taken into consideration while determining the policies related to economic growth and urbanization processes. Therefore, the implementation of environmentally friendly policies gains importance in this context.

6. Conclusion

A structural change began in the economy with the accelerated industrialization process after the World War II. Migration from rural areas to urban areas increased together with the transition from agriculture to industry and thus the phenomenon of urbanization became more prominent. In addition, the acceleration of technological developments also played an important role in product diversification, and there was the emergence of different products that increase energy consumption in particular. In addition to this, important steps were recorded in the economic growth processes of the countries. These developments can cause a chain effect. Namely, urbanization and economic growth took place with the increase in production. Changes in these factors created backlashes the environment in the process. With the rapid urbanization and the rise of the production process, the use of energy intensified leading to an increase in carbon emissions i.e. environmental degradation that caused problems such as climate changes and global warming.

In the present study, the effects of urbanization and economic growth on the environment in selected emerging market economies were analyzed. Panel cointegration analysis was carried out in the study, covering the period from 1990 to 2016. In the study, stationarity analysis was performed after cross-section dependency and homogeneity tests were conducted. Afterwards, the panel AMG estimator was used for the analysis of the Westerlund panel cointegration test and the long-term coefficients. With the Westerlund cointegration test, it was concluded that there is a long-term relation between the variables. The results of the panel AMG estimator which was conducted to reveal the effect of this long-term relation demonstrated that both urbanization and economic growth increased carbon emissions in selected emerging market economies. Throughout the panel, 1 unit increase in urbanization increases carbon emissions by 1.1 units. A 1-unit increase in economic growth increases carbon emissions by 0.7 unit. On the basis of countries, the effect of urbanization on carbon emissions was found to be positive, except for China and Poland. The effect of economic growth on carbon emissions was determined to be positive in all countries included in the analysis. Findings are parallel to the results of studies in the literature such as Afridi et al. (2019), Ali et al. (2019), Altintas (2020) and Anwar et al. (2020).

When the results of the analysis were evaluated in general, it was found that there is a significant relation of environment with urbanization and economic growth. Increasing sensitivity to the environment we live in is essential in supporting the measures to be taken in this regard. Policy makers should avoid inefficient and environmentally detrimental policies by considering the plans related to urbanization and production process. In other words, it can be stated that policy makers should give priority to the determination of policies to support production with environmentally friendly technologies. In meeting the energy need, which is an important point in the production and consumption process, the necessary importance should be attached to alternative energy sources with high sensitivity to carbon emissions. The urbanization process, on the other hand, should be positioned in a planned and environmentally friendly manner.

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Research Article

The Effect of Urbanization and Economic Growth on the Environment in the Emerging Markets

Yükselen Piyasalarda Kentleşme ve Ekonomik Büyümenin Çevre Üzerine Etkisi

Serap ÜRÜT SAYGIN

Dr. Öğr. Üyesi, Aksaray Üniversitesi, İİBF Maliye Bölümü, Aksaray

serap_urut@hotmail.com

https://orcid.org/0000-0002-5098-375X

Genişletilmiş Özet

Giriş

Ülkelerin temel hedefi olan ekonomik büyüme amaçları doğrultusunda mal ve hizmet üretimini arttırma çabalarının bazı sonuçları ile karşı karşıya kalınmaktadır. Bu sonuçlardan bir tanesi küresel düzeyde yansıması bulunan çevresel sorunlarının ortaya çıkışıdır. İnsanoğlunun yaşamını tehdit altına alan bu çevresel sorunlar arasında iklim değişiklikleri ve küresel ısınma ön plana çıkmaktadır. Bu sorunların en önemli nedenlerinden birisi ise karbondioksit (CO_2) emisyonudur. Ulusal Havacılık ve Uzay Yönetimi (NASA)'nin raporlarına göre, yüzyıllardır CO_2 emisyonları 30 ppm (milyonda parça) sınırında idi. Ancak 1950'li yıllardan bu yana CO_2 emisyonlarının seviyesi giderek yükselmektedir. En son geldiği seviye ise 400 ppm düzeylerindedir (Afridi, 2019: 29978). CO_2 emisyon hacminin değişmesine etki eden birçok faktör bulunmaktadır. Nüfus artışı, ekonomik büyüme, teknolojik değişim ve kentleşme biçiminde ifade edilen bu faktörler gerek günlük yaşantı gerekse de üretim sürecinin gerekliliği ile birlikte enerji tüketiminin artmasına dolayısıyla CO_2 emisyon hacminin yükselmesine neden olmaktadırlar (Kılıç vd., 2020: 183; Niu ve Lekse, 2017: 3).

İnsan faaliyetlerinin çevreye olan etkilerinin dikkate alınması ile birlikte konu ile ilgili akademik çalışmaların sayısında da önemli artışlar söz konusudur. Özellikle kentleşme, ekonomik büyüme, enerji ve karbon emisyonları arasındaki ilişkilerin incelenmesine literatürde sıklıkla rastlanmaktadır. Bu çalışmalarda incelenen ülke veya ülke grubuna göre farklı sonuçlar ile karşılaşılmaktadır. Ancak birçok çalışmada kentleşme ve ekonomik büyüme gibi faktörlerin çevresel bozulmalara yol açtığı sonucuna ulaşıldığı görülmektedir. Çevre, ekonomik büyüme ve kentleşme üzerine literatürdeki çalışmalara Sadorsky (2014); Azam ve Khan (2016); Liu vd. (2016); Zhang vd. (2017); Bozkurt ve Okumuş (2017); Bakırtaş ve Akpolat (2018); Destek (2018); Wang vd. (2018); Şahin ve Gökdemir (2019); Yıldız (2019); Afridi vd. (2019); Ali vd. (2019); Bayraktutan ve Alancıoğlu (2019); Altıntaş (2020); Kılıç vd. (2020); Odugbesan ve Rjoub (2020); Adebayo vd. (2020); Anwar vd. (2020); Bashir vd. (2021) ve Aslan vd. (2021)'nin çalışmaları örnek gösterilebilir.

Son dönemde çevre üzerine yapılan çalışmalarda dikkat çeken kentleşme, ekonomik büyüme ve çevre arasındaki ilişkilerin incelenmesi bu çalışmanın temel hedefidir. Bu çalışmada seçili yükselen piyasa ekonomilerinde 1990-2016 dönemi için kentleşme ve ekonomik büyümenin çevreye olan etkisi ampirik olarak analiz edilmiştir. Analiz neticesinde elde edilen sonuçlar doğrultusunda kentleşme, ekonomik büyüme ve çevre ilişkisinin değerlendirilmesi yapılmış ve

politika önerileri getirilmiştir. Literatürde seçili yükselen piyasa ekonomileri için herhangi bir çalışmaya rastlanmamıştır. Bu nedenle çalışmanın literatüre katkı sağlaması beklenmektedir.

Metodoloji ve Bulgular

Çalışmada çevre değişkenini temsilen karbon (CO_2) emisyon miktarı alınmıştır. Ekonomik büyümeyi temsilen kişi başına düşen GSYH (2010 sabit fiyatlarla) ve kentleşmeyi temsilen ise kent nüfusu kullanılmıştır. Çalışmada CO_2 miktarına ilişkin veriler 2016 yılına kadar erişilebildiği için çalışmanın dönemi 1990-2016 olarak belirlenmiştir. Çalışmada kullanılan verilere Dünya Bankası'nın internet sitesinden ulaşılmıştır. Çalışmada kullanılan tüm değişkenler logaritmaları alınarak modele dâhil edilmiştir. Çalışmada kentleşme (lnU), ekonomik büyüme (lnGDP) ve CO_2 emisyonu ($lnCO_2$) arasındaki ilişkilerin tespiti için Denklem 1'de verilen panel veri modeli kurulmuştur. Ekonometrik model analizi, Stata 15 ve Eviews 9 paket programları kullanılarak yapılmıştır.

$$\mathbf{lnCO_{2\,it}} = \propto_0 + \propto_1 \boldsymbol{lnGDP_{it}} + \propto_2 \boldsymbol{lnU_{it}} + \boldsymbol{\varepsilon_{it}} \qquad \textbf{(1)}$$

Kentleşme, ekonomik büyüme ve çevre arasındaki ilişkilerin ele alındığı çalışmada ilk olarak modele ilişkin yatay kesit bağımlılık testi yapılmıştır. Çalışmada yatay kesit bağımlılığını inceleme için T>N durumunda kullanılabilen Breusch-Pagan (1980) LM (BP_{LM}) testi kullanılmıştır. Analizin ikinci aşamasında modele ilişkin homojenlik durumu tespit edilmiştir. Bu aşamada Pesaran ve Yamagata (2008) tarafından geliştirilen delta ($\tilde{\Delta}$) ve sapması düzeltilmiş delta ($\tilde{\Delta}_{adj}$) testlerinden faydalanılmıştır. Çalışmada değişkenlere ilişkin durağanlık analizi yapılırken YKB'yi göz önünde bulunduran Pesaran CIPS panel birim kök testi kullanılmıştır. Çalışmanın bir sonraki aşamasında Westerlund (2007) eşbütünleşme testi ile değişkenler arasında uzun dönemde bir ilişkinin var olup olmadığı test edilmiştir. Analizin son aşamasında ise modelle ilgili uzun dönem katsayıların tahminlenmesi gerçekleştirilmiştir. Bu aşamada YKB ve heterojenliği dikkate alan genişletilmiş ortalama grup (AMG) tahmincisi kullanılmıştır.

Çalışmada kullanılan yatay kesit bağımlılığı ve homojenlik test sonuçlarına göre modelde yatay kesit bağımlılığı ve heterojenlik tespit edilmiştir. Çalışmada kullanılan değişkenlere ait birim kök testlerinin işletilmesinde YKB'nin varlığında ön plana çıkan testlerden Pesaran CIPS panel birim kök testi kullanılmıştır. Test sonucunda değişkenlerin birinci farkında durağanlaştığı sonucuna varılmıştır. Bu aşamadan sonra değişkenler arasında eşbütünleşme ilişkisinin tespit edilmesi aşamasına geçilmiştir. Eşbütünleşme testinde YKB durumunda önerilen Westerlund eşbütünleşme testinin bootsrap değerleri göz önünde bulundurulmuştur. Test sonucunda değişkenelr arasında eşbütünleşme ilişkisi olduğu belirlenmiştir. Değişkenlerin eşbütünleşik olmalarının belirlenmesi sonucunda bu ilişkinin katsayılarının saptanması aşamasına geçilmiştir. Model ve değişkenler ile ilgili yapılan testlerde YKB ve heterojenliğin tespit edilmesi nedeniyle bu koşullarda güvenilir sonuçlar veren genişletilmiş ortalama grup (AMG) yöntemi ile katsayıları tahminlenmiştir.

Panel AMG tahmincinden elde edilen sonuçlar panel açısından değerlendirildiğinde hem ekonomik büyüme hem de kentleşme ile karbon emisyon hacmi arasında doğru yönlü bir ilişkinin olduğu sonucuna ulaşılmıştır. Bu sonuçlar ekonomideki büyümenin ve artan kentleşmenin çevre açısından tahribatı arttırıcı bir etki yarattığını göstermektedir. Bu durum literatürde beklenildiği şekildedir. Panel AMG tahmincisine göre, panel genelinde lnGDP'deki 1 birimlik artış $lnCO_2$'yi 0.73 birim arttırmaktadır. Panel AMG tahmin sonuçları kentleşme ile çevre açısındaki ilişki bakımından incelendiğinde de panel genelinde doğru yönlü bir ilişki olduğu bulgusu elde edilmiştir. Seçili yükselen piyasa ekonomilerinde kentleşme düzeyi 1 birim arttıkça karbon emisyonları 1.16 birim artmaktadır. Yine bu durumda kentleşmenin çevresel bozulmalar pahasına olduğunu göstermektedir.

Sonuç

Bu çalışmada seçili yükselen piyasa ekonomilerinde kentleşme ve ekonomik büyümenin çevreye olan etkisi analiz edilmiştir. 1990-2016 döneminin ele alındığı çalışmada panel eşbütünleşme

analizi yapılmıştır. Çalışmada YKB ve homojenlik testleri sonrasında durağanlık analizi gerçekleştirilmiştir. Ayrıca Westerlund panel eşbütünleşme testi ve uzun dönem katsayılarının analizi için panel AMG tahmincisi kullanılmıştır. Westerlund eşbütünleşme testi ile değişkenler arasında uzun dönemli ilişkinin olduğu saptanmıştır. Bu uzun dönemli ilişkinin etkisini ortaya koyabilmek amacıyla gerçekleştirilen panel AMG tahmincisinin sonuçları da seçili yükselen piyasa ekonomilerinde hem kentleşmenin hem de ekonomik büyümenin karbon emisyonlarını arttırdığı yönünde tespit edilmiştir. Panel genelinde kentleşmedeki 1 birimlik artış karbon emisyonlarını 1.1 birim arttırmaktadır. Ekonomik büyümedeki 1 birimlik artış ise karbon emisyonlarını 0.7 birim arttırmaktadır. Ülkeler bazında bakıldığında ise kentleşmenin karbon emisyonları üzerindeki etkisi Çin ve Polonya hariç pozitif yönlü olarak saptanmıştır. Ekonomik büyümenin karbon emisyonlarına etkisi ise analize dâhil olan tüm ülkelerde pozitif yönlü olarak tespit edilmiştir. Elde edilen bulgular Afridi vd. (2019), Ali vd. (2019), Altıntaş (2020) ve Anwar vd. (2020) gibi literatürdeki çalışma sonuçları ile paralellik göstermektedir.

Analiz sonuçları genel olarak değerlendirildiğinde kentleşme ve ekonomik büyüme ile çevre arasında önemli bir ilişkinin olduğu bulgusu elde edilmiştir. Yaşadığımız çevreye olan duyarlılığın artması bu konuda alınacak önlemlerin desteklenmesi noktasında önem arz etmektedir. Politika yapıcıların kentleşme ve üretim süreci ile ilgili planlamaları gözeterek verimsiz ve çevre açısından olumsuzluklar oluşturacak politikalardan kaçınması gerekmektedir. Diğer bir deyişle, politika yapıcıların çevreye duyarlı teknolojilerle üretimin yapılmasını destekleyici biçimde politikalar belirlenmesini ön plana almaları gerektiği ifade edilebilir. Üretim ve tüketim sürecinde önemli bir noktada yer alan enerji ihtiyacının karşılanmasında ise karbon emisyonlarına duyarlılığı yüksek alternatif enerji kaynaklarına gereken önem atfedilmelidir. Kentleşme süreci ise planlı ve çevre dostu olacak bir şekilde konumlandırılmalıdır.