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Validity of Environmental and Financial Kuznets Curve: The Case of Turkey
Çevresel ve Finansal Kuznets Eğrisinin Geçerliliği: Türkiye Örneği

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ABSTRACT

This study examined the distribution of income and economic growth relationship Kuznets (1955) in environmental Kuznets hypothesis is valid in Turkey for the period 1990-2017 was investigated. Also for the 2002-2017 period and Jonanovic Greenwood (1990) revealed that in order to examine the relationship between financial development and income distribution inequalities examined with financial Kuznets hypothesis validity for Turkey was investigated. In the study, the validity of the hypotheses was examined by ADF unit root test and Bayer and Hanck (2012) cointegration tests. According to the analysis findings, the Environmental Kuznets Curve in the examined period in Turkey were found to be valid, but Financial Kuznets Curve has not been found to be valid for Turkey's economy.

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ÖZET

Bu çalışmada gelir dağılımı ve ekonomik büyüme ilişkisini inceleyen Kuznets (1955)'in Çevresel Kuznets Hipotezi'nin 1990-2017 dönemi için Türkiye'de geçerliliğinin incelenmesi yanısıra 2002-2017 dönemi için Greenwood ve Jonanovic (1990)'ın, finansal gelişme ve gelir dağılımı adaletsizliği ilişkisini incelediği Finansal Kuznets Hipotezi'nin Türkiye için geçerliliğinin ADF birim kök testi ve Bayer ve Hanck (2012) eşbütünleşme testleri ile analiz edilmesi ve hipotezlerin geçerliliği incelenmektedir. Analiz bulgularına göre, Türkiye'de incelenen dönemde Çevresel Kuznets eğrisi geçerli olduğu ancak Finansal Kuznets Eğrisi'nin Türkiye ekonomisi için geçerli olmadığı bulunmuştur.

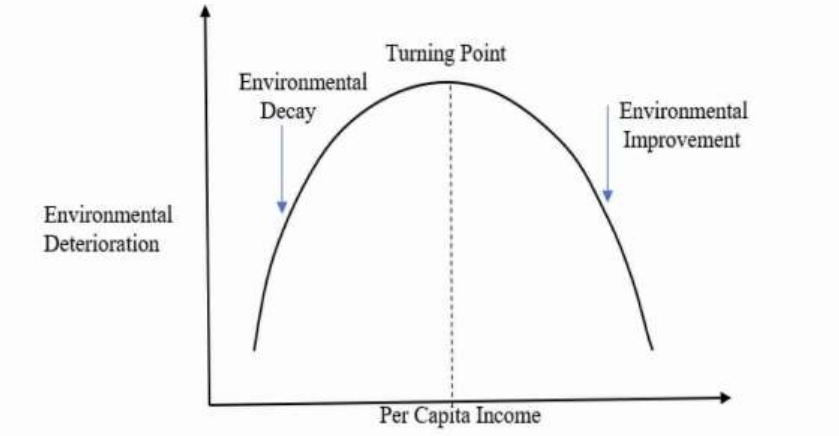
INTRODUCTION

The concept of sustainable environment was expressed in the Brundtland report (1987) prepared by the Environment and Development Commission. It is defined as a sustainable development process without harming the resources of future generations by using the resources in an optimal way. As countries continue their economic development, how the environment is affected by this process is an important issue (WCED, 1987; Kızılkaya, 2017: 106). The main causes of environmental pollution can be listed as population growth, urbanization, industrialization, problems arising from lack of education and poverty (Saygın, 2018).

In the 1990s, the Kuznets curve was reconsidered in a different context and the environmental degradation and per capita income level were examined (Kashyna, 2011: 6). In the studies of Grossman and Kruger (1991) examining the possible effects of the NAFTA (North American Free Trade Agreement) union on the environment, the Environmental Kuznets Curve (EKC) forms the basis of the hypothesis (Ullah and Awan, 2019: 158). In the hypothesis, although there is environmental degradation in countries up to a certain turning point depending on the increase in the income levels of the countries and the increase in the use of energy and resources, environmental degradation gradually decreases depending on the increasing income level of the countries after this turning point/income threshold level (Güney, 2018: 745). It is stated that there is an inverted U-shaped bell curve relationship in the Kuznets (1955) curve, the income level of countries (economic growth) and the inequality relationship in income distribution (Artan et al., 2015: 309). In the first part of the bell curve (the left side of the turning point), although there is an increase in income distribution due to the income increase of the countries, in the second part of the curve (right side of the turning point), it is explained in Figure 1 that the injustice of the income distribution will decrease even though the income increase continues (Lebe, 2016: 178).

In this study is intended, Financial and Environmental Kuznets Curve is to examine the validity for Turkey.When a detailed literature review is made, the studies on the Environmental Kuznets Curve are quite abundant, while the studies to test the Financial Kuznets Curve are more limited for Turkey. Therefore, in this study investigates the validity Enviromental Kuznets Curve for Turkey and aspect to investigate for Turkey a combination of both Financial and Environmental Kuzents curve, is thought to contribute to the literature.

Figure 1. Environmental Kuznets Curve (EKC)



Source: Yandle et. al. 2004: 3; Beyene and Kotosz, 2019: 641.

Financial Kuznets Curve is defined as the inverse-U relationship between growth and financing (Moosa, 2016: 366). Financial markets, which play an important role in the economic development of countries, also lead to an increase in physical and human capital development. The effect of financial development on increasing economic growth and reducing inequality in income distribution is expressed as trickle-down theory (Shahbaz et al., 2015: 358; Hepsag, 2017: 136).

The development of financial markets has a positive effect on income distribution. Because, with the financial development, the use of credit increases in developed markets and the human and physical capital investments of the relatively lower income segment increase. Thus, financial markets have the effect of improving or equalizing income distribution (Batuo et al., 2010: 3).

Financial development and income inequality are analyzed within the framework of three hypotheses. According to the first hypothesis put forward by Galor and Zeira (1993), there is a negative linear relationship between financial sector development and income inequality. In addition, financial development increases economic growth and causes inequality in income distribution to be more fair. According to the second view asserted by Greenwood and Jovanovic (1990), it is stated that there is an inverse-U shape between the financial sector and income inequality (Nikoloski, 2010). In the third hypothesis proposed by Rajan and Zingales (2003), there is a positive relationship between the both variables (Destek et al., 2017: 154, 155).

1.Emprical Literature

Among the studies examining the validity of the EKC hypothesis, there are some studies in which the hypothesis is valid and others where the hypothesis is invalid depending on the differences in the examined country, period, explanatory variable and applied econometric method. For this reason, it is seen that there is no consensus on the validity of the EKC hypothesis in the literature.

Basar and Temurlenk (2007) for the 1950-2000 period examined the validity of the theory for Turkey. Instead of finding an invalid EKC theory. They found likely that an inverse N-shaped relationship could exist between the income level and the amount of CO_2.

Tamazian et al. (2009) found that financial and economic development is a determining indicator of environmental quality and financial liberalization.

According to the findings, openness reduces CO_2 emission and the EKC hypothesis is valid in the study of BRIC countries.

Yang et al. (2015)'s study examined the validity of the EKC hypothesis on seven different environmental pollution indicators for 29 cities of China. The EKC hypothesis was found to be invalid.

In the study of Hao (2016), the period 1995-2012 was examined for 29 cities of China and it was found that the CKE curve was valid.

In Zhang (2011)'s study, it was found that financial development increased environmental pollution in China.

Saboori and Sulaiman (2013) showed in their studies that energy consumption in ASEAN countries increased CO_2 emissions in the short and long term and that the EKC hypothesis was valid solely in Thailand and Singapore countries.

Shahbaz et al. (2013a) showed that economic development and energy use increase environmental pollution in Malaysia, however, vice versa, financial development decreases the pollution.

In the studies of Zhang and Zhao (2014), the effect of income distribution on environmental pollution for 28 cities in China and the validity of the EKC hypothesis were examined. It has been concluded that income inequality causes environmental pollution.

In the studies of Javid and Sharif (2016), the validity of the EKC hypothesis for Pakistan for the period 1972-2013 was examined by ARDL method. It has been found that the EKC hypothesis is valid in both short and long term in Pakistan.

In the studies of Charfeddine and Khediri (2016), the validity of the EKC hypothesis was confirmed and the existence of an inverse-U shape relationship between financial development and CO_2 emission was confirmed.

In Özokçu and Özdemir (2017)'s studies, the validity of the EKC hypothesis was analyzed with two different models for 26 OECD countries. In the models, 52 developing countries were examined for the period 1980-2010. It was found that the inverse N shaped for 26 countries and the N-shaped environmental kuznets curve for 52 countries are valid.

Katircioglu et al. (2017)'s studies, the validity of hypotheses have been examined for Turkey's analysis with DOLS and ECM for the period 1960-2010. Turkey is valid for the EKC hypothesis and it was found that financial development has a negative impact on environmental degradation.

In Moghadam and Dehbashi (2018)'s studies, it has been shown that the EKC hypothesis for Iran is invalid and financial development increases environmental pollution, but commercial openness reduces environmental pollution.

Examining the literature of studies examining the validity of the financial kuznets hypothesis, Raiders (2015)'s work in the 2006-2012 period for Turkey 'trickle-down effect' was examined by the panel data analysis. As a result of the analysis, it was found that the effect of income transfers between the poor and the rich class is higher than the income transfers from the poor to the rich class, and the trickle-down effect is invalid. It is concluded further that it increases financial development and income inequality, respectively.

Satti et al., (2015) examined the relationship between financial development and income distribution for the period 1991-2001 with innovative accounting approach (IAA) and ARDL model for Kazakhstan. It has been found that financial development causes a decrease in income inequality and the financial kuznets hypothesis for Kazakhstan is invalid and the kuznets curve is U-shaped.

In the study of Shahbaz and Islam (2011), the period of 1971-2005 for Pakistan was examined by ARDL and Granger causality analysis. The financial kuznets hypothesis for Pakistan is rejected, where financial development reduces inequality in income distribution and financial fluctuations increase income injustice.

Shahbaz et al. (2014) examined the period 1965-2011 for Iran with ARDL and Granger causality analysis. It is found that financial development reduces the inequality in income distribution. It has been determined that the financial kuznets hypothesis is valid in the relationship between financial development and income distribution, and that the relationship between financial development and income distribution is U-shaped.

Batuo et al. (2012) has been examined with GMM model for 22 African countries in the period of 1990-2004. It is concluded that as the level of financial development increases, income distribution decreases inequality and its relation is not in the form of reverse-U.

Clarke et al. (2006) examined the period 1960-1995 with a panel data analysis of 83 developed and developing countries and it was concluded that the inequality in income distribution decreased with the development of the financial system.

In the study of Park and Shin (2015), 162 developing Asian countries in the 1960-2011 period were analyzed by panel data analysis. The direction and degree of the relationship between financial development and income distribution differs from country to country, and the relationship between financial development and income distribution has been found to be inverted-U.

In the study of Hoi and Hoi (2012), 59 cities in Vietnam for the period of 2002-2008 were analyzed by panel data analysis. The hypothesis that financial development reduces the income distribution injustice and that the inverse-U relationship is not valid, that is, the financial kuznets hypothesis has been rejected.

In Law and Tan's (2009) study, the period 1980: Q1 – 2000: Q4 was examined for Malaysia by ARDL method. The validity of the Kuznets hypothesis for Malaysia is not accepted.

In Liang (2006)'s study, 29 cities in China in the period of 1986-200 were examined by GMM method. Financial development reduces unfairness in income distribution and the financial kuznets hypothesis has been found to be invalid.

In the study of Sehrawat and Giri (2015), the period of 1982-2012 was examined for India with the ARDL model. It has been found that financial development does not reduce the income distribution injustice, the financial kuznets hypothesis is not valid.

The period 1951-2004 was examined for India in Ang (2008)'s study. It has been found that financial sector investments further increase the unfairness in income distribution and the financial kuznets hypothesis is not valid.

In the study of Akbiyik (2012), 60 developed and developing countries were examined with panel data analysis. It is concluded that the inverse-U shaped financial kuznets curve is valid in developing countries.

Rehman et al. (2008), 51 countries were examined with the classical LSC method and it was found that the reverse-U hypothesis was not valid.

In the study of Kim and Lin (2011), 53 countries were examined with threshold autoregressive (TAR) regression model and it was found that the inverse-U hypothesis was valid.

In the study of Nikoloski (2013), 75 developed and developing countries were examined with the panel generalized moments method and it was found that the financial cousins curve expressed as the inverse-U hypothesis was valid.

Shahbaz et al. (2015), it was examined with the ARDL model for Iran and it was concluded that the financial kuznets curve defined as the inverse-U hypothesis is valid.

In the study of Jauch and Watzka (2016), 138 developed and developing countries were examined by panel regression analysis. It was found that there is a U-shaped relationship where the financial kuznets curve is not valid.

In the study of Baiardi and Morana (2016), 19 Euro region countries were examined using the panel EKK and panel GMM method. It was found that the inverse-U hypothesis that the financial kuznets curve is valid.

In Lundberg and Squire's (2003) study, the relationship between finance-growth-inequality was examined for 38 countries. It has been found that there is a positive and strong relationship between growth and income inequality in the context of financial development.

2.Data Set, Econometric Method and Evaluation of Findings

In the environmental Kuznets curve analyzes, omitting variables problem and the problem of biasness of estimators may arise. According to Uchiyama (2016), it is pointed out that besides the income factor, important factors such as trade and energy prices that may affect environmental pollution can be neglected. Due to the variables not included in the model, deviation may occur in the model, and this situation may cause variance and autocorrelation problems in the changing econometric model. In panel data analysis, it is accepted that all parameter estimates included in the model have the same conditions. However, considering the parameters as homogeneous causes the problem of variance, since each country studied has different characteristics in social and economic aspects (Karahan, 2019: 12).

2.1.Data Set and Econometric Models

The purpose of this study is to test the validity of both financial kuznets curve for the period 2002-2017 and the environmental Kuznets curve hypothesis is to test for the 1990-2017 period for the Turkish case. In the study, PM_{10}[1] data are from the OECD database, financial development - FD (loans to private sector/GDP), foreign direct investments (FDI) and per capita income data (GDPP) are from the World Bank Database, and the Gini coefficient is from the taken from the 'World Income Distribution Inequality Data Base'. The models used in the study are as follows:

$$Model\ 1 = PM10_{i,t} = a_0 + \beta_1 GDPP + \beta_2 GDPP^2 + \beta_3 FDi + \theta_{i,t} \quad (1)$$

$$Model\ 2 = Gini_{i,t} = a_0 + \beta_1 FD + \beta_2 FD^2 + \beta_3 FDI + + \theta_{i,t} \quad (2)$$

[1] This indicator shows the annual average SO_2 and PM10 concentrations for different types of urban areas. Particulate Matter (PM_{10}) and other particles smaller than 10 micrometers in diameter can reach the lungs and cause inflammation or heart and lung diseases that will affect people very negatively.

2.2.Evaluation of Findings

Model 1 represents the Kuznets (1955) circumferential Kuznets Curve model, and if the coefficient of β_1 is positive and the coefficient β_2 is negative, an inverted U-shaped curve is formed, which shows the validity of the circumferential Kuznets curve. On the other hand Model 2, represents the financial Kuznets curve adapted to the environmental Kuznets curve by Greenwood and Jovanovic (1990). If the coefficient of β_1 is positive and the coefficient β_2 is negative, then the existence of an inverse-U curve is formed and this curve shows the validity of the financial Kuznets curve.

According to Dickey-Fuller (DF-1979) test, time series are explained by first order autoregressive process. Using DF tests, it becomes possible to test highly autoregressive processes (Enders, 1995). "When Y_t time series is expressed as AR (1) model while following the AR (p) process, defining the structure of Y_t incorrectly causes error terms to be autocorrelated". Autocorrelated error terms cause the DF distribution based on the assumption that the error terms are pure random to be invalid (Harris, 1995). Dickey and Fuller (1981) proposed the ADF unit root test, which is a test suggesting that the lagged value of the dependent variable should be on the right side of the equation to solve the autocorrelation problem of the series, and the generalized Dickey Fuller, which included the lagged values of the dependent variables of the three models expressed in the DF test, They suggested that ADF test regressions should be written as equations expressed in equations 3, 4 and 5 (İğde, 2010: 16, 17):

$$\Delta Y_t = \rho Y_{t-1} + \sum_{i=1}^{k} \beta_i \Delta Y_{t-i} + \varepsilon_t \quad (3)$$

$$\Delta Y_t = \alpha_0 + \beta_t + \rho Y_{t-1} + \sum_{i=1}^{k} \beta_i \, \Delta Y_{t-i} + \varepsilon_t \quad (4)$$

$$\Delta Y_t = \alpha_0 + \beta t + \rho Y_{t-1} + \sum_{i=1}^{k} \beta_i \, \Delta Y_{t-i} + \varepsilon_t \quad (5)$$

$H_0: \rho = 0$, Series is not stationary that is series is unit rooted,

$H_1: \rho < 0$, Series is stationary, it does not contain unit root in series. Using this hypotheses, ADF test is tested with H_0 and H_1 hypotheses.

Table 1. ADF Unit Root Test Result

Variables	I(0)	I(1)
PM10	-2.558	-5.4743***
GDPP	-3.595	-5.2887***
$GDPP^2$	-3.553	-4.4421***
FD	-1.118	-4.2348***
FD^2	-0.354	-5.6570***
FDI	-2.023	-4.321***
GINI	-0.615	-5.198***

Note: ***, **, * denote the stationary at 1%, 5% and 10% significance level of variables, respectively.

In the study, the stationarity of variables was examined with the ADF unit root test, and the H_0 hypothesis based on the fact that the variables are unit-rooted for the variables in the level value could not be rejected. In other words, it was determined that the variables are not stationary in the level value. Then, when the first differences of the variables are taken, it is determined that the variables become stationary. Following the unit root analysis, cointegration analysis was started.

In this study, Bayer and Hanck (2012) cointegration test was preferred as the cointegration analysis. Based on the different results of different cointegration tests from Bayer and Hanck (2012), Engle-Granger (1987), Johansen (1988), Boswijk (1994) and Banerjee et al. (1998) developed this test consisting of a combination of tests. Bayer and Hanck (2012) suggested combining the calculated significance level (p-values) of individual cointegration tests and proposed the following Fisher's formula (Govindaraju and Tang, 2013: 315):

$$EG - JOH - BO - BDM = -2\,[\ln(pEG) + \ln(pJOH) + \ln(pBO) + \ln(pBDM) \quad (6)$$

In equation 6, pEG, $pJOH$, pBO and $pBDM$ are Engle-Granger (1987), Johansen (1988), Boswijk (1994) and Banerjee Vd. (1998) are the p-values of the cointegration tests. If the calculated Fisher statistics exceed the critical values provided by Bayer and Hanck (2012), the null hypothesis of cointegration can be rejected (Govindaraju and Tang, 2013: 315).

According to the findings, since the test statistics obtained for model 1 are greater than the critical values, it was accepted that there was cointegration. In other words, PM10 and per capita income move together in the long term. On the other hand, it was determined in table 2 that the test statistics for model 2 are lower than the critical values. This finding shows that the Gini coefficient and financial development do not act together in the long run.

Table 2. Bayer ve Hanck Cointegration Test Results

Models	**EG-J-Ba-Bo Test Statistic**	Critical Value		
		%10	**%5**	**%1**
Model 1	16.508*	16.097	20.486	31.169
Model 2	10.859	16.097	20.486	31.169

Note: ***, **, * respectively indicates that at the 1%, 5% and 10% significance level there is a cointegration relationship.

Table 3. Long Term Coefficient Estimation Results

Model 1		**Model 2**	
GDPP	0.095* [0.049] (1.92)	**FD**	-0.0009 [0.0008] (-1.12)
$GDPP^2$	-0.002* [0.0001] (-1.16)	**FD^2**	8.17e-06 [8.71e-06] (0.94)
FDI	-1.777*** [0.361] (-3.25)	**FDI**	0.0000525 [0.0048001] (0.01)
C	12778*** [0.730] (17.50)	**C**	0.429*** [0.021] (20.40)

Note: a) ***, **, * denote significance at 1%, 5% and 10% significance level, respectively. b) Newey-West method was used to avoid possible autocorrelation and variance problems in models.

Cointegration long term coefficients were estimated by Newey-West Standard Errors method. This method was preferred because it gives consistent results against heteroscedasticity and autocorrelation. According to cointegration test result long-term coefficients estimation results given in Table 3. In the first model β_1>0 and β_2 <0, which indicates that for this findings is valid environmental Kuznets curve for Turkey. In other words, per capita income in Turkey's economy by increasing environmental pollution, but now after a certain threshold is reduced environmental pollution. In the second model, income inequality has been found to have no effect on the financial developments in Turkey's economy. Financial Kuznets curve for the economy of Turkey in this regard has been found to be invalid.

CONCLUSION

The aim of this study is to examine the validity of the environmental Kuznets curve and financial Kuznets curve for Turkey. For this purpose, two models were created to test the validity of environmental and financial Kuznets curves and analyzed by econometric methods. Turkey, these are several studies on the environmental Kuznets curve, although in this work the PM_{10} pollution index variable air quality index that distinguishes the present studies is used in this study.

According to the environmental Kuznets spin hypothesis, the increase in production level in the early stages of economic growth causes a rapid environmental pollution. However, after the income level of individuals living in the society reaches a certain level of increase, individuals, governments and state administrations begin to take more sensitive measures

against the environment. Using new technologies, an improvement in environmental pollution is started. More environmentally sensitive policies are developed, and a reduction in environmental pollution is expected by giving importance to the use of renewable energy sources and making investments. In this context, starting from econometric analysis is valid for Turkey in the period examined findings of the Environmental Kuznets Curve theory have been identified. In other words, environmental pollution is increasing in Turkey in the early stages of economic growth, but after a certain threshold is observed reduction in environmental pollution with national income growth review can be done.

According to the financial Kuznets curve hypothesis, in the early periods of financial development, income is not distributed evenly to the base and while financial development increases, unfairness in income distribution increases. However, the spread of income to the base after a certain income level brings about an improvement in the income distribution. In this context, starting from econometric analysis findings for Turkey, the financial Kuznets curve for Turkey was determined to be invalid. The analysis examined the findings of our study contradicts that the Destek et al. (2017) and Çetin and Şeker (2014) analysis findings of studies. This situation is thought to arise from the difference in the data set used, the econometric analysis method and the period examined.

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