İstatistik Araştırma Dergisi
Journal of Statistical Research
ISSN: 2791-7614

(2023), 13 (1)
Başvuru/Received: 15/06/2023
Kabul/Accepted: 05/07/2023

https://journal.tuik.gov.tr/

ARAŞTIRMA MAKALESİ RESEARCH ARTICLE

The Effect of Corruption on the Tax Revenues: Case of EU Transition Economies

Ceyda TUNÇ YILANCI
Çanakkale Onsekiz Mart University / M.A.
ceyda.yilanci@comu.edu.tr
Orcid No: 0000-0003-3253-1693

Mahmut Ünsal ŞAŞMAZ
Uşak University / PhD
mahmut.sasmaz@usak.edu.tr
Orcid No: 0000-0001-9485-3933

Abstract

Taxation has historically been one of the primary sources of revenue for governments to meet their public needs. However, social, political, and economic factors have continued to shape the role of taxes in society over time. These factors directly or indirectly impact the determination of tax revenues. Economic factors, such as financial development, growth, economic freedom, tax rates, and globalization, also significantly influence taxation. Corruption, which involves the abuse of public power or resources for private gain, can have numerous economic effects. This study aimed to examine the relationship between corruption and tax revenues in 11 EU transition economies during the 2003-2015 period, utilizing the Westerlund and Edgerton (2007) panel cointegration test and the Emirmahmutoglu and Kose (2011) panel causality tests. The results indicate a long-run relationship between corruption and tax revenue, as well as a bidirectional causality relationship between the two variables.

Keywords: Corruption, Tax Revenues, Panel Data Analysis

Corresponding Author / Sorumlu Yazar: 1- Ceyda TUNÇ YILANCI, Çanakkale Onsekiz Mart University Çanakkale Vocational School of Social Sciences Accounting and Tax Applications Department

2- Mahmut Ünsal ŞAŞMAZ, Uşak University, Faculty of Economics and Administrative Sciences, Department of Finance

Citation / Atıf: TUNÇ YILANCI C., ŞAŞMAZ M. Ü. (2023). The Effect of Corruption on the Tax Revenues: Case of EU Transition Economies. İstatistik Araştırma Dergisi, 13 (1), 73-84.

This paper is taken from the thesis "Yolsuzluğun vergi gelirleri üzerindeki etkisi: Avrupa Birliği geçiş ekonomileri örneği" conducted in 2018 at Usak University under the direction of Mahmut Ünsal Şaşmaz.

Citation / Atıf: TUNÇ YILANCI C., ŞAŞMAZ M. Ü. (2023). The Effect of Corruption on the Tax Revenues: Case of EU Transition Economies. İstatistik Araştırma Dergisi, 13 (1), 73-84.

Yolsuzluğun Vergi Gelirleri Üzerindeki Etkisi: AB Geçiş Ülkeleri Örneği

Geçmişten günümüze, devletlerin kamusal ihtiyaçlarını karşılamada en önemli kaynaklardan biri olan vergiler, sosyal, siyasal ve ekonomik bir olgu olarak karşımıza çıkmaktadır. Vergi gelirlerinin belirlenmesinde kilit rol oynayan bu sosyal, siyasal ve ekonomik olgular, doğrudan ya da dolaylı olarak vergi üzerinde belirleyici olmaktadır. Vergi gelirlerinin belirlenmesinde önemli bir rol oynayan yolsuzluk, küreselleşen dünyada yaygın bir sorun haline gelmiştir. Kavramsal olarak, kamu gücünün veya kaynaklarının özel çıkarlar için kötüye kullanılması olarak tanımlanan yolsuzluğun birçok ekonomik sonucu bulunmaktadır. Bu çalışmada, 11 AB geçiş ekonomisinde 2003-2015 döneminde yolsuzluk ve vergi gelirleri arasındaki ilişki Westerlund ve Edgerton (2007) panel eşbütünleşme testi ve Emirmahmutoglu ve Kose (2011) panel nedensellik testi kullanılarak analiz edilmiştir. Bu çalışmanın sonuçları yolsuzluk ve vergi gelirleri arasında uzun dönemli bir ilişki olduğunu ve bu iki değişken arasında çift yönlü bir nedensellik ilişkisi olduğunu göstermektedir.

Anahtar Kelimeler: Yolsuzluk, Vergi Gelirleri, Panel Veri

Introduction

Corruption is defined as the abuse of public force or resources for private benefits (World Bank, 1997). With globalization, corruption has become a common problem worldwide. Corruption is more commonly observed in developing and transition economies than in developed economies. Corruption has serious repercussions for economic life. In particular, it negatively affects tax revenues, investments and savings, income distribution, the informal economy, foreign direct investments, efficiency of public expenditures, and economic growth and development.

The role of corruption in determining tax revenues has been studied since the 1990s. In recent years, much attention has been paid to the development of anticorruption strategies. To this end, the world's leading organizations, such as Transparency International, the World Bank, and the World Trade Organization, have begun to develop regulations to prevent corruption. Determining the effect of corruption on tax revenues is important to prevent corruption and facilitate efficient taxation.

In this context, panel data techniques are used in this study to determine the effect of corruption on tax revenues. Several studies have been carried out to determine the relationship between corruption and tax revenues, and in general, the studies found that corruption negatively affects tax revenues (see also Johnson et al., 1998; Tanzi & Davoodi, 2000; Imam & Jacobs, 2007; Brasoveanu & Brasoveanu, 2009; Hunady & Orviska, 2015; Ozekicioglu & Bayar, 2017; Epaphra & Massawe, 2017).

1. Theoretical and Empirical Literature Review

One of the most important costs that corruption imposes on economic life is the reduction in tax revenues. Tax revenues, which are the main source of public expenditures, decrease due to corruption and change the course of expenditures that should be made by public administration. A change in the course of public expenditure leads to a reduction in social welfare, and also leads to decreased efficiency and diversity in the goods and services offered by the state (Bakırtas, 2012, p.91).

The field in which public finances are most affected by corruption is the accrual and collection of taxes. Corruption has a significant impact on tax accruals and the collection process. Reductions in taxes are most commonly experienced in tax offices. When this takes the form of tax avoidance, tax evasion, improper tax exemption, and exception depending on corruption, income losses to the state become inevitable (Gedikli, 2011, p.180). In addition, corruption affects tax-free income, with the exception of tax income. This causes reductions in fees, betterments, tax-like incomes, real estate, and entity incomes. However, this leads to an increase in borrowing (Bagdigen and Dokmen, 2006, p.66).

The negative impact of corruption on tax revenues is generally evaluated in two aspects. Taxes are the main source of income for public finance. Depreciation in tax revenues as a result of corruption decreases the income elasticity by causing public borrowing. Additionally, corruption negatively affects the tax structure. Tax revenues decreasing as a result of corruption lead to additional taxes and an increase in tax rates and put pressure on taxpayers to fulfill their tax duties regularly (Asher, 2001, 2).

Corruptions can affect tax revenues indirectly, as follows (Bagdigen and Dokmen, 2006, 63):

- Corruption causes the tax base to reduce, and therefore, tax revenues decrease by increasing informality.
- The fact that corruption reduces investments and negatively influences economic growth and causes tax revenues to shrink.
- Taxpayers' unwillingness to satisfy the illegal demands of illegitimate public officials causes tax revenues to be reduced by leading taxpayers to transfer their financial activities to informal activities or to finish their activities.

The degree of tax revenue problems also varies according to the tax type. Each tax has different characteristics in terms of tax objects, tax causing events, imposition, accruals, and collection processes. For instance, corruption influences direct and indirect taxes in different ways. Frequent taxpayers' and tax authorities' confrontation with direct taxes increases the probability of corruption. However, taxpayers and tax offices do not frequently confront each other because indirect taxes are collected on sales. In addition, the auditing process works effectively because indirect taxes require an effective accounting registry and taxpayers consist of a few large companies. Therefore, indirect taxes are less affected by corruption than indirect taxes. However, both indirect and direct taxes decline in economies in which corruption is common (Dokmen, 2012, 44).

The fact that corruption due to the structure of the tax would both reduce tax revenues and cause inequity in the distribution of tax burden was also indicated in literature. For instance, Tanzi, in a study in 1998, analyzed the effect of corruption on tax revenues theoretically. As a result, he states that corruption has a negative effect on tax revenues. He stated that the devastating effect of corruption on tax revenues would decrease through a transparent taxation system and structural reforms. Bagdigen and Dokmen, in their study in 2006, aimed to theoretically analyze the relationship between corruption and public incomes and expenditures. Their study found that corruption may negatively affect public income.

2. Literature

Johnson et al. (1998) researched the relationship between corruption and tax revenues of 49 countries in three different parts of the world in the 1990's by using regression analysis. As a result, they identified a negative relationship between corruption and tax revenue.

Ghura (1998) attempted to identify the effects of the economic policies and corruption levels of 39 African countries between 1985 and 1996 on tax revenues and Gross National Product (GNP) rates by using panel data analysis. The results revealed that an increase in corruption rates decreased tax revenues and the proportion of tax revenues to GNP.

The study conducted by Fisman and Svensson (2000) aimed to investigate the impact of corruption and taxation on the growth rates of companies operating in various sectors in Uganda during the period of 1995-1997, utilizing time series analysis. The results of the study indicated that both corruption and taxation had a detrimental effect on the growth rate of the companies. Furthermore, the authors suggested that the negative impact of corruption on companies could potentially lead to a decrease in tax revenues.

Tanzi and Davoodi (2000) attempted to identify the effect of corruption levels in 97 countries between 1980 and 1997 on tax and tax-free revenues using regression analysis. The results show that corruption has a negative effect on tax revenue. In addition, they reveal that corruption and direct taxes in tax revenues have more negative effects than indirect taxes.

Imam and Jacobs (2007) conducted a study to examine the relationship between corruption and tax revenues in 12 Middle Eastern countries from 1990 to 2003, utilizing the Generalized Method of Moments (GMM) approach. Their analysis revealed that trade and individual taxes had a more pronounced negative impact on corruption levels.

Attila (2008) researched the relationship between corruption, economic growth and taxation based on the data between 1980 and 2002 in 90 countries using the GMM method. As a result of the study, he found out that corruption may affect economic growth positively under some conditions but may affect negatively through taxes. In addition, he states that corruption may lead to excessive tax rates that could be harmful to growth.

Brasoveanu and Brasoveanu (2009) aimed to identify the relationship between corruption and tax revenues in 27 European Union countries in 1995-2008 by using panel data analysis. As a result, they presented a negative relationship between corruption and tax revenues.

Ajaz and Ahmad (2010) tried to identify the effect of corporate and structural variables (corruption and governance) of 25 developing countries between 1990 and 2005 on tax revenues by using panel data set. They find that governance and corruption are the two main determinants of tax revenue. The findings suggest that corruption had a negative and significant effect on tax revenues, but governance had a positive and significant effect on tax revenues.

The study conducted by Potanlar et al. (2010) sought to investigate the relationship between corruption and tax revenues in 27 developing countries over the period from 2002 to 2006, employing panel data analysis. The findings of the research demonstrated a negative association between corruption and tax revenue.

Monteiro et al. (2011) tried to identify the relationship between corruption and corporate tax in 27 EU countries between 1998 and 2009 employing the least squares method. The analysis reveals that corruption has a decreasing effect on corporate tax revenues.

The research conducted by Hunady and Orviska (2015) aimed to examine the relationship between corruption and the total tax revenues of 46 OECD and Latin American countries between 1998 and 2013, utilizing panel data analysis. The results of the study indicated that corruption had a significant negative effect on the total tax revenues of the countries in question.

Ozekicioglu and Bayar (2017) attempted to identify the effect of corruption and public administration in 35 OECD countries between 2002 and 2015 on tax revenues using panel data analysis. As a result, they determined that improvements in corruption, government efficiency, legislation regulations, and the supremacy of law would have a positive effect on tax revenues.

In their study, Epaphra and Massawe (2017) employed panel data analysis to investigate the influence of corporate variables, including corruption and governance, on tax revenues across 30 African countries from 1996 to 2016. The findings of the analysis revealed that corruption adversely affected tax revenues, whereas good governance, efficient government, the rule of law, and regulatory accountability measures contributed to an increase in tax revenues. Furthermore, the study established that governance had a substantial impact on tax revenues.

3. Data

This study analyzes the effect of corruption on tax revenues in 11 EU transition economies—Bulgaria, the Czech Republic, Estonia, Croatia, Latvia, Lithuania, Hungary, Poland, Romania, Slovakia, and Slovenia— using annual data from 2003 to 2015. In this study, we use tax revenue as the dependent variable, corruption as the independent variable, and economic growth as the control variable. Table 1 presents the variables used in this study and their sources.

Table 1: Data Set

Variables	**Symbol**	**Source**
Corruption	CORRUP	World Bank (2018a)
Tax Revenues (%)	TAXR	World Bank (2018b)
Economic Growth (%)	GRW	World Bank (2018c)

In this study, the long-run relationship and causality relationship between corruption and tax revenues are analyzed using panel data techniques. In the following section we describe these methods.

4. Econometrical Methodology and Empirical Results

4.1. Cross-Sectional Dependence Tests

Cross-sectional dependence is generally identified as an effect of an economic shock occurring in another country on one country. In the case of cross-sectional dependence among variables, tests that consider cross-sectional dependence must be used to obtain reliable results. Therefore, cross-sectional dependence in the series

must be tested first (Pesaran, 2004).

The first study on cross-sectional dependence is the CDLM test by Breusch and Pagan (1980). Pesaran's (2004) Cross-Sectional Dependence (CD) test, and Pesaran et al. (2008) LM test (LM_{adj}) was used in conjunction with a CD test.

The CDLM test statistic proposed by Breusch and Pagan (1980) is computed as follows:

$$CDLM = T\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\check{\rho}_{ij}^{2} \quad x^{2}\frac{N(N-1)}{2} \tag{1}$$

Pesaran's (2004) CD_{LM} test statistics can be obtained as the following;

$$CD = \sqrt{\frac{1}{n(n-1)}}\sum_{i=1}^{n-1}\sum_{j=i+1}^{n}(T\check{\rho}_{ij}^{2} = \pi r^{2} - 1) \tag{2}$$

The adjusted LM test statistic developed by Peseran et al. (2008) is as follows.

$$LM_{adj} = \sqrt{\frac{2}{N(N-1)}\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\frac{(T-k)\hat{\rho}_{ij}^{2} - \mu_{Tij}}{v_{Tij}}} \tag{3}$$

By using the CD tests, we test the null hypothesis of no cross-sectional dependence against the alternative of cross-sectional dependency among the panel members.

If the time dimension of cross-sectional dependence is higher than the cross-section dimension (*T>N*), the Breusch-Pagan (1980) CDLM1 test is applied. Since the cross-sectional dimension (N=11) of the dataset in this study is lower than the time dimension (*T=13*), cross-sectional dependence between the variables was tested using Breusch-Pagan's (1980) CDLM1 test.

We apply several cross-section dependency tests and report the results in Table 2. As the results show, the null hypothesis of no cross-sectional dependence is rejected at the 10% level; thus, it is determined that a cross-sectional dependence exists between the series.

Table 2: Results of CD Tests

Variable	CD_{LM1}	CD_{LM2}	CD_{LM}	CD_{adj}
GRW	99.754 (0.000)	4.267 (0.000)	-1.934 (0.027)	-0.064 (0.526)
TAXR	244.991 (0.000)	18.115 (0.000)	-1.599 (0.055)	6.892 (0.000)
CORRUP	172.055 (0.000)	11.161 (0.000)	-1.393 (0.082)	2.388 (0.008)

4.2. Panel CIPS Unit Root Test

The panel CIPS unit root test which is developed by Peseran (2007) considers the cross-sectional dependency among the panel members.

The equation of the Panel CIPS test is presented as following:

$$y_{it} = (1-\phi_i)\mu_i + \beta_i y_{i,t-1} + u_{it}, i = 1, \dots., N; t = 1, \dots, T \quad u_{it} = \Upsilon_i f_t + \varepsilon_{it} \tag{4}$$

The null and alternative hypotheses of the panel CIPS unit root test are presented as follows (Pesaran, 2007, 268);

$$H_0 : \beta_i = 0 \qquad \text{(The series has a unit root.)} \tag{5}$$

$$H_1 : \beta_i < 0, i = 1,2, \dots, N_1, \beta_1 = 0, i = N_1 + 1, N_1 + 2, \dots, N \quad \text{(The series is stationary.)} \tag{6}$$

The CIPS test statistics can be computed by using the average of test statistics value (for β);

$$CIPS(N,T) = t - bar = N^{-1} \sum_{i=1}^{N} t_i(N,T) \quad (7)$$

Because the study confirmed the cross-sectional dependence between the series, we next employed the CIPS unit root test. The results, shown in Table 3, indicate that each variable is stationary in different ways.

Table 3. Panel CIPS Unit Root Test Results

LEVEL	**CORRUP**	**GRW**	**TAXR**
Constant	-1.413	-2.207	-1.914
Constant + Trend	-1.887	-2.545	-1.940
FIRST DIFFERENCE	**CORRUP**	**GRW**	**TAXR**
Constant	**-2.866*** **	**-2.941*** **	**-3.062*** **
Constant + Trend	**-2.415**	**-2.784***	**-2.803***

Note: *, **, and *** indicate the significance at the 10%, 5%, and 1% significance levels, respectively. Critical values were constant -2.97 (1%), -2.52 (5%), -2.31 (10%); constant + trend is -3.88 (1%), -3.27 (5%), -2.98 (10%). The critical values were obtained from Pesaran (2007).

4.3. Westerlund and Edgerton (2007) Cointegration Test

Prior to applying Westerlund and Edgerton's (2007) cointegration test, a homogeneity test should be used. The homogeneity test is employed to identify whether the cointegration slope coefficients are homogenous or heterogeneous (Pesaran and Yamagata, 2008, 56).

According to Pesaran and Yamagata (2008), the delta test is calculated as follows:

$$\tilde{\Delta} = \sqrt{N\left(\frac{N\hat{}(-1)S^{-}-k}{2k}\right)} \sim X_{k\hat{}2} \quad (8)$$

$$\tilde{\Delta}_{\text{adj}} = \sqrt{N\left(\frac{N\hat{}(-1)S^{-}-k}{\text{v}(T,k)}\right)} \sim N(0,1) \quad (9)$$

where N indicates the number of cross-sections, S, k, and v(T,k) indicate Swamy test statistic, number of explanatory variables, and the standard error. The null hypothesis of slope coefficients are homogeneous is tested against the alternative of slope coefficients are not heterogeneous.

The outcomes of the homogeneity tests are displayed in Table 4. Since the probability values of these tests, as calculated in Table 4, are higher than 0.10, the null hypothesis is not rejected. Consequently, the results support the evidence that the slope coefficients in the cointegration equations are homogeneous. So, to test the long-run relationship between the series, this homogeneity should be considered.

Table 4: Homogeneity Test Results

	Test Statistics	**Probability Value**
$\tilde{\Delta}$	0.517	0.302
$\tilde{\Delta}_{\text{adj}}$	0.612	0.270

Following the homogeneity test, we employed the panel bootstrap cointegration test suggested by Westerlund and Edgerton (2007) to investigate the cointegration relationship. This cointegration test, based on the Lagrange multiplier test suggested by McCoskey and Kao (1998), takes into account the dependence among cross-sectional units. Notably, Westerlund and Edgerton's (2007) cointegration test has been shown to produce reliable results in small samples (Westerlund and Edgerton, 2007, 185-190).

Westerlund (2007) cointegration test include four new panel cointegration tests based on structural dynamics. The first two tests in the panel cointegration tests indicate group-average statistics. The last two tests indicate panel statistics. Panel statistics are computed by coupling information about error correction in the cross-sectional dimension of the panel together. However, this information is not used in group-average statistics. The difference between the tests is based on alternative hypothesis tests (Westerlund, 2007, 710-712).

While H_0^p: $\alpha_i = 0$ for the null hypothesis and H_A^p: $\alpha_i = \alpha < 0$ for the alternative hypothesis is used in panel statistics, H_A^β: $\alpha_i = 0$ null hypothesis and H_A^β: $\alpha_i = \alpha < 0$ alternative hypotheses are used in group-average statistics. The rejection of the null hypothesis indicates that cointegration exists; however, the acceptance of the null hypothesis indicates that cointegration does not exist. It is suggested that group and panel tests conducted by Westerlund obtained very steady results if the cross-sectional dependence exists (Westerlund, 2007, 721-722).

Because all variables are *I*(1), Westerlund and Edgerton's (2007) cointegration test is used to identify the long-term relationship between variables. The null hypothesis of the existence of a cointegration relationship between the variables H_0: $\sigma_i^2 = 0$ (for all values of i), is tested against the alternative hypothesis, H_A: $\sigma_i^2 > 0$ (for some values of *i*), which proposes that there is no cointegration (Westerlund and Edgerton, 2007, 185-186). Table 5 presents the results.

Table 5: Cointegration Test Results

Model	LM- Statistics	Bootstrap Probability Value
Constant Model	14.740	0.427
Constant + Trend Model	9.784	0.553

Note: Bootstrap p-values were obtained from 10,000 simulations.

We cannot reject the null hypothesis of cointegration according to the findings in Table 5, that is, there is a long-run relationship between corruption (CORRUP), economic growth (GRW), and tax revenues (TAXR) since the bootstrap p-values are higher than the traditional significance levels.

4.4. FMOLS

In this study, to estimate the long-run coefficients we employ fully modified ordinary least squares method (FMOLS) which corrects the deviations in estimators (consisting of problems such as changing variance and autocorrelation). According to Pedroni (2000), the power of the FMOLS method in small samples is good (Kok and Simsek, 2006, 7-8).

After determining the cointegration relationship, we estimate the panel FMOLS to identify the degree of long-term relationships among the variables. Table 6 shows the estimation results.

Table 6: Long-run Coefficients

Variable	Coefficient	Std. Error	T-Statistic	Prob.
GRW	**0.111099*** **	0.028507	3.897202	0.0002
CORRUP	**-1.979744** **	0.907551	2.181415	0.0310

Note: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The results shown in Table 6 indicate that a one-unit increase in corruption causes tax revenues to decrease by 1.97 units. This result may be due to an increase in tax losses due to corruption. Tax losses cause the tax base to shrink, tax revenues to decrease, and the tax burden to be unfairly distributed. These negative effects also negatively affect social welfare by changing the state of public expenditures. For this reason, countries must consider the effects of corruption if they follow policies to increase tax revenues. In addition, states can positively contribute to the struggle against corruption by devising a tax system suited to the economic conditions of their own countries.

However, economic growth positively affects tax revenues. In other words, a one-unit increase in economic growth leads to a 0.11 unit increase in tax revenues. This increase is attributable to the expansion of the tax base because of an increase in economic growth, production, and consumption. The expansion of the tax base positively affects tax revenues.

4.5. Emirmahmutoglu and Kose (2011) Causality Test

Emirmahmutoglu and Kose (2011) developed a panel causality test which is based on Toda-Yamamoto causalit test and considers cross-sectional dependence and allows the examination of causality relationship for the panel members individually.

Emirmahmutoglu and Kose (2011) considered following VAR model to apply the panel causality test:

$$x_{i,t} = \mu_i^x + \sum_{j=1}^{k_i+d\ max_i} A_{11,ij}\, x_{i,t-j} + \sum_{j=1}^{k_i+d\ max_i} A_{12,ij}\, y_{i,t-j} + u_{i,t}^x \qquad (10)$$

$$y_{i,t} = \mu_i^y + \sum_{j=1}^{k_i+d\ max_i} A_{21,ij}\, x_{i,t-j} + \sum_{j=1}^{k_i+d\ max_i} A_{22,ij}\, y_{i,t-j} + u_{i,t}^y \qquad (11)$$

Where $dmax_i$, indicates the maximum integration level of variables. Tables 7 and 8 present the Emirmahmutoglu and Kose (2011) test results, respectively.

Table 7: Panel Causality Test Results

Countries	CORRUP-TAXR		TAXR-CORRUP	
	Test Statistics	**Prob. Value**	**Test Statistics**	**Prob. Value**
Bulgaria	**4.225****	0.040	0.141	0.708
Croatia	**4.419****	0.036	**6.180****	0.013
Czech Republic	0.423	0.515	1.538	0.215
Estonia	**3.410***	0.065	0.053	0.819
Hungary	0.943	0.332	0.000	0.994
Latvia	0.122	0.727	1.632	0.201
Lithuania	0.000	0.983	1.666	0.197
Poland	**7.551*****	0.006	**8.727*****	0.003
Romania	0.089	0.765	1.075	0.300
Slovakia	0.740	0.390	1.049	0.306
Slovenia	0.180	0.742	**6.719****	0.010
Panel	**36.050****	0.030	**44.946*****	0.003

Note: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

When the test results shown in Table 7 are analyzed, we can identify a significant and bidirectional causality relationship between corruption and tax revenues, according to the panel test results. In other words, a change in corruption may lead to a change in tax revenue. Similarly, a change in tax revenue may lead to a change in

corruption. It can be thought that the fact that an increase in corruption in a country may affect tax revenues negatively may be the reason for it. Alternatively, starting to obtain more tax revenues in countries will increase the tax burden; this is thought to cause an increase in corruption by directing individuals to some behaviors such as tax evasion, tax refusal, bribery, and so on.

Table 8: Panel Causality Test Results

Countries	GRW-TAXR		TAXR-GRW	
	Test Statistics	**Prob. Value**	**Test Statistics**	**Prob. Value**
Bulgaria	**4.559****	0.033	**3.926****	0.048
Croatia	0.208	0.648	**3.186***	0.074
Czech Republic	0.284	0.594	0.116	0.734
Estonia	0.679	0.410	0.002	0.963
Hungary	**3.437***	0.064	0.023	0.878
Latvia	0.040	0.842	0.306	0.580
Lithuania	0.543	0.461	1.292	0.256
Poland	0.796	0.372	**5.888****	0.015
Romania	**2.769***	0.096	1.279	0.258
Slovakia	0.335	0.563	2.365	0.124
Slovenia	**3.485***	0.062	1.428	0.232
Panel	**31.303***	0.090	**34.235****	0.046

Note: ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The findings presented in Table 8 indicate a statistically significant bidirectional causality relationship between economic growth and tax revenue, based on the panel average which suggests that changes in economic growth may result in changes in tax revenues, and vice versa. Similarly, a change in tax revenue may lead to a change in economic growth. It can be thought that the fact that an increase in economic growth in a country may affect tax revenues positively may be the reason for it.

Conclusion

Among the top issues surrounding corruption is its effect on tax revenue. This study empirically analyzes the implications of such an effect on EU transition economies. The analysis identifies a cointegration relationship between corruption and tax revenue. In other words, a long-term relationship is detected between the variables. In addition, according to Emirmahmutoglu and Kose's (2011) causality test, a significant and bidirectional causality relationship between corruption and tax revenues is identified.

When the results obtained from the study are generally evaluated, it can be seen that an increase in corruption in a country negatively affects the country's tax revenues. This negative effect on tax revenues leads to an unfair distribution of the tax burden among the population. In addition, the loss of revenue resulting from corruption causes the tax base to shrink, with a corresponding reduction in public expenditure.

Decreased tax revenues resulting from corruption lead to surtaxes or expensive public services by causing an increase in tax rates. This paves the way for increased activity in the informal economy and taxpayer resistance to tax. In addition, it causes public debt to increase public expenditure. These effects influence economic growth and employment negatively by causing fiscal gaps in the public sector. Therefore, a struggle against corruption is important for the development of countries.

As corruption is a phenomenon that is impossible to complete completely, it can be said that taking precautions to reduce corruption to a reasonable level is important for countries. The precautions to be taken are as follows.

- Education level is highly important for reducing corruption. Corruption is experienced more frequently in countries with low education levels. For this reason, it is highly important for countries to determine

policies to increase educational levels in the struggle against corruption. However, an increase in education level reduces negative behaviors. Therefore, it can be said that rules to prevent negative behaviors would reduce corruption.

- NGOs, an important factor in reducing corruption, play a role in leading related issues and laws to wide ranges. NGOs are important for a healthy, sensitive, and strong society. It can be stated that corruption can be reduced by increasing the organizational awareness of countries through NGOs.
- Telling a lie and cheating underlying corruption may cause individuals' loss of trust in the state and the state to lose power by affecting the social system. In addition, the desire to earn money quickly and easily may increase the possibility of experiencing corruption because of financial inequality among individuals. For this reason, it may be important to reinforce public awareness of society in order to ensure fair salary levels and income distribution in the struggle against corruption.
- Corruptions cause significant fiscal problems for the public by negatively affecting tax revenue. Corruption must be considered if a tax revenue-increasing policy is followed. The fact that states determine a tax system that is suitable for their own conditions and economic conjuncture may positively contribute to the process of the struggle against corruption.
- Owing to the negative effects of corruption on the accrual and collection of taxes, reductions may occur in tax bases. To prevent these reductions, the negative effects of corruption can be minimized by applying restrictions through taxes in fields that lead to corruption. In addition, the tax revenues of countries can be increased by reducing corruption by increasing the number of tax auditing personnel working in the taxation system.
- Equivalent and fair distribution of the tax burden is important in the struggle against corruption. Tax burden is a phenomenon that affects the attitudes and behaviors of citizens towards taxes. A high tax burden causes citizens to act negatively by leading activities such as tax evasion, smuggling, tax refusal, and an informal economy. Therefore, these negative actions may lead to an increase in corruption. In this sense, an increase in corruption may lead to a reduction in tax revenue. Benefiting from the decision-making characteristics of the tax burden in tax policies, it can be utilized in the struggle against corruption.

Inflation, which is one of the reasons for corruption, negatively affects the economies of countries in many ways. Because inflation may lead individuals to take illegal actions by affecting their purchasing power, corruption may lead to an increase in informality and unethical actions but a decrease in tax revenues. Therefore, inflation may be reduced to a reasonable level in the struggle against corruption. Therefore, corruption can be reduced by preventing individuals from engaging in illegal action.

References

Ajaz, T., Ahmad, E. (2010). The effect of corruption and governance on tax revenues. *The Pakistan Development Review*, 49(4), 405-417.

Asher, M.G. (2001). Design of tax systems and corruption. *In Conference On "Fighting Corruption: Common Challenges and Shared Experiences"*, 1-19.

Attila, G. (2008). Corruption, taxaion and economic growth: theory and evidence. *Cerdi, Etudes et Documents.*

Bagdigen, M., Beskaya, A. (2005). The impact of corruption on government revenues: The turkish case. *Yapı Kredi Review*, 16(2), 31-54.

Bagdigen, M., Dokmen, G. (2006). Yolsuzluğun kamu gelir ve giderleri üzerine etkisi. *ZKÜ Sosyal Bilimler Dergisi*, 2(3), 53-69.

Bakırtas, D. (2012). Yolsuzluğun vergi gelirleri üzerindeki etkisi: Türkiye örneği. *Yönetim ve Ekonomi Dergisi*, 19(2), 87-98.

Brasoveanu, I.V., Brasoveanu, L.O. (2009). Correlation between corruption and tax revenues in EU 27. *Economic Computation and Economic Cybernetics Studies and Research*, 43(4), 133-142.

Breitung, J. (2005). A parametric approach to the estimation of cointegration vectors in panel data. *Econometric Reviews*, 24(2), 151-173.

Breusch, T.S., Pagan, A.R. (1980). The lagrange multiplier test and ıts applications to model specification in econometrics. *The Review of Economic Studies*, 47, 239-253.

Dokmen, G. (2012). Yolsuzlukların vergi gelirleri üzerindeki etkisi: Dinamik panel veri analizi. *Doğuş Üniversitesi Dergisi*, 13(1), 41-51.

Emirmahmutoglu, F., Kose, N. (2011). Testing for granger causality in heterogeneous mixed panels. *Economic Modelling*, 28, 870-876.

Epaphra, M., Massawe, J. (2017). Corruption, governance and tax revenues in Afrika. *Business and Economic Horizons*, 1(4), 439-467.

Fisman, R., Jakob, S. (2000). Are corruption and taxation really harmful to growth? firm –level evidence. *The World Bank Policy Research Working Paper*, 2485, 1-24.

Gedikli, A. (2011). Kamu hizmetlerinin yönetimi sürecinde yolsuzluğun derinleştirdiği ekonomik büyüme ve yoksulluk sorunu üzerine bir değerlendirme. *Öneri*, 9(36), 169-188.

Ghura, D. (1998). Tax revenue in Sub-saharan Africa: Effects of economic policies and corruption. *IMF Working Paper*, WP/98/135, 1-25.

Hunady, J., Orviska, M. (2015). The effect of corruption on tax revenue in OECD and Latin America countries. *The Oretical and Practical Aspects of Public Finance*, 20, 1-6.

Imam, P.A., Jacobs, D.F. (2007). Effect of corruption on tax revenues in the Middle East. *IMF Working Paper*, WP/07/270, 1-34.

Johnson, S., Kaufman, D., Lobaton, P.Z. (1998). Regulatory discretion and the unofficial economy. *American Economic Review*, 88(2), 387-392.

Kao, C., Chiang, M.H. (2000). On the estimation and inference of a cointegrated regression in panel data B. H. BALTAGI, T. B. FOMBY and R. C. HILLS (der), nonstationary panels, panel cointegration and dynamic panel advances in econometric. *Elsevier Science***,** Amsterdam, 179-222.

Kok, R., Simsek, N. (2006). Endüstri-içi dış ticaret, patentler ve uluslararası teknolojik yayılma. *Türkiye Ekonomi Kurumu Uluslararası Ekonomi Konferansı*, 11-13.

Kok, R., Ispir, M.S., Arı, A.A. (2010). Zengin ülkelerden azgelişmiş ülkelere kaynak aktarma mekanizmasının gerekliliği ve evrensel bölüşüm parametresi üzerine bir deneme. *Uluslararası Ekonomi Konferansı*, Türkiye Ekonomi Kurumu, Kıbrıs.

McCoskey, S., Kao, C. (1998). A residual-based test ff the null of cointegration in panel data. *Econometric Reviews*, 17(1), 57–84.

Monteiro, M.R., Brandao, E.F.M., Martins, F.V.S. (2011). A panel data econometric study of corporate tax revenue in European Union: structural, cyclical business and institutional determinants. *FEB Working Papers*, 437, 1-36.

Ozekicioglu, S., Bayar, Y. (2017). Tax revenues, corruption and governance in OECD countries: A panel regression analysis. *The Journal of Economic Sciences: Theory and Practice*, 74(2), 51-63.

Pedroni, P. (2000). Fully-modified ols for heterogeneous cointegrated panels. *Advances in Econometrics*, 15, 93-130.

Pesaran, M.H. (2004). General diagnostic tests for cross section dependence in panels. *Cesifo Working Paper*, 1229, 1-40.

Pesaran, M.H. (2007). A simple panel unit root test in the presence of cross section dependence. *Journal of Applied Econometrics*, 22(2), 265-312.

Pesaran, M.H., Ullah, A., Yamagata, T. (2008). A bias-bdjusted LM test of error cross-section independence. *Econometrics Journal*, 11(1), 105-127.

Pesaran, M.H., Yamagata, T. (2008). Testing slope homogeneity in large panels. *Journal of Econometrics*, 142(1), 50-93.

Potanlar, S.K., Samimi, A.J., Roshan, A.R. (2010). Corruption and tax revenues: New evidence from some developing countries. *Australian Journal of Basic and Applied Sciences*, 4(9), 4218-4222.

Tanzi, V. (1998). Corruption around the world; causes, consequences, scope, and cures. *IMF Staff Paper*, 45(4), 559-594.

Tanzi, V., Davoodi, H.R. (2000). Corruption, growth and public finances. *IMF Working Paper*, 182, 1-27.

Toda, H.Y., Yamamoto, T. (1995). Statistical inferences in vector autoregressions with possibly integrated processes. *Journal of Econometrics*, 66, 225-250.

Vergil, H., Ayas, N. (2009). Doğrudan yabancı yatırımların istihdam üzerindeki etkileri: Türkiye örneği. *Iktisat, Isletme ve Finans*, 24(275), 89-114.

Westerlund, J. (2007). Testing for error correction in panel data. *Oxford Bulletin of Economics and Statistics*, 69(6), 709-748.

Westerlund, J., Edgerton, E. (2007). *A* panel bootstrap cointegration test. *Economics Letters*, 97(3), 185-190.

World Bank. (1997). World development report 1997: The state in a changing world. *New York: Oxford University Press.* http://hdl.handle.net/10986/5980.

World Bank. (2018a). Control of Corruption, http://info.worldbank.org/governance/wgi/#home.

World Bank. (2018b). Tax Revenue (% of GDP), https://data.worldbank.org/indicator/GC.TAX.TOTL.GD.ZS?view=chart.

World Bank. (2018c). GDP Growth (Annual %), https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?view=chart.