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TAX REVENUES, CORRUPTION AND GOVERNANCE IN OECD COUNTRIES: A PANEL REGRESSION ANALYSIS

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Abstract

The public sector contributes to the economic growth and economic development through especially health, education, transportation and information technologies investments. However, the share of the public sector in overall economy has decreased significantly due to privatization and tax revenues have become the crucial source of income for making investments. So the determinants of tax revenues also have gained importance concordantly. In this study, we research the effect of corruption, government effectiveness, regulatory quality, and rule of law representing the quality of public administration on the total tax revenues in 35 OECD countries during the periods 2002-2015 by employing panel regression analysis. The findings revealed that improvements in corruption, government effectiveness, regulatory quality, and rule of law have positive effect on tax revenues.

Keywords: Tax revenues, corruption, rule of law, public governance

JEL code: C33, H21, D73

1. Introduction

From the classical economics to market economy, public sector's size and scope in the economy have continuously changed. The mentality of social welfare state has changed with the existence of global commodities and services (climate changes, tax evasion, etc.) and the state as public sector has resumed its position in the economy. Taxation is the major source of financing government expenditures to achieve economic growth and development. In this context; economic and political stability, rule of law, per capita income and tax consciousness are the

main determinants of tax revenues. Besides, corruption is a very significant determinant of a country's tax revenue performance. The variety in tax structures and tax levels are also important decisions of a government to increase tax revenues.

According to OECD Government at a Glance 2017, between 2009-2015 government expenditures as share of GDP decreased by 3,3% on OECD countries average and in 2015 government expenditures represented 40,9% of GDP on average. In the same report it was mentioned that between 2007-2015 government spending increased the most on social protection (2,6 per person) and health care (1,7 per person) across OECD countries. One-third of public investment is directed toward economic affairs, mainly to transportation, followed by defense. However, on average in OECD countries, 42% of citizens reported having confidence in their national government in 2016, compared to 45% before 2007.

Taxation is the legitimate and legal way of allocating resources from the economy. While taxation allocates resources and promotes economic growth, over-taxation may also have negative impact on the economy. Public resources are increased by taxation in terms of supply side leading to increase in quantity and quality of public goods and services (Nawaz, 2010: 5). Tax payers as demand side may incline towards tax evasion, tax avoidance and underground economy due to high taxes.

Effective taxation system in a country, higher quality of public administration and strong legal structure affect the quality of governance positively. The operation of an effective tax collection mechanism depends on the government policy which the government responds more to the needs of its citizens and the citizen representatives occupy more space in the governance (Moore, 2015: 3). The 'Government Effectiveness' of WGI assesses quality of public and civil services as governance sources. Quality of governance of a country is an important criterion for the country to develop in the long term (Ajaz and Ahmad, 2010: 405). Therefore, increase in tax revenues can be achieved by increasing government's quality of governance and effectiveness of tax structures (Bird and Zolt, 2008: 33).

Strong links between taxation and governance in public administration directly lead to the indirect relations with corruption. In order to support economic growth, governments should make public expenditures and therefore they should increase their tax revenues as their major financial resources. The most significant way of increasing tax revenues is to strengthen tax administration. Governments should be transparent, accountable and responsive against tax payers while attempting to increase their tax revenues (Prichard, 2016: 2).

The corruption is a multi-dimensional problem consisting of general and specific factors. In literature, corruption is defined as "abuse of entrusted power for private gain" (Transparency International, 2017). Another general definition of corruption is "the illegal use of public office or the process of selection to public office for private gain" (Theobald, 1990: 16). Theoretically a bilateral interaction between corruption and tax revenues is expected, because higher tax rates lead the corruption. In turn, corruption decreases the tax revenues. Taxation may cause problems by increasing the level of corruption in the country if perceived as excess burden by tax payers.

In other words, increase in corruption causes decrease in income taxes of tax payers. On the other hand, corruption exaggerates the volume of government spending and reduces the productivity of effective government expenditure. All these negativities trigger inflation and lower growth rates (Ghosh and Neanidis, 2010: 25).

Presence of asymmetrical information among bureaucrats/politicians versus public triggers corruption as well. Having specialized knowledge not easily understood by public brings out power to bureaucrats/politicians. Knowledge and power in public sector increase corruption especially in underdeveloped and developing countries. As public corporations have monopolized, certain interest groups become a part of government policies and begin to gain power, and all these lead to an increase in bureaucratic/political corruption in the country (Dong and Eom, 2008: 301). Additionally, asymmetrical information among bureaucrats/politicians affects level of expenditure per person and decrease tax revenues (Mačkić, 2014: 7).

In this study, we research the effect of corruption, government effectiveness, regulatory quality, and rule of law representing the quality of public administration on the total tax revenues in 35 OECD countries during the periods 2002-2015 by employing panel regression analysis. So the study will be one of the early studies investigating the effect of corruption and public governance on tax revenues and in turn make a contribution to the relevant literature. In the coming section, the relevant empirical literature will be summarized, then data and econometric methodology will be described in Section 3. Section 4 presents empirical analysis and major findings. Finally, the study will be over with Section 5.

2. Literature Review

The public sector has become an important determinant of economic growth in the context of endogenous growth theories. In this regard, the researchers have focused on the government expenditures and public finance especially tax revenues. So determinants of tax revenues has gained importance and some scholars have researched the interaction between corruption, governance and tax revenues in the recent years and discovered that both corruption and different governance indicators have had significant effect on the tax revenues.

Ghura (1998) conducted a research on the relationship between corruption and taxes in 39 Sub-Saharan African Countries and revealed strong statistical evidence that an increase in the level of corruption lowers the tax-revenue/GDP ratio. On the other side, Tanzi and Davoodi (2000) observe that corruption in developing countries is at a higher level and corruption has a greater impact on direct taxes in these countries. Also, corruption in developing countries displays a coherent correlation with the high level of tax evasion in these countries. In the paper, it is calculated that a 4 point reduction in corruption can increase direct taxes in developing countries, as a group, by 7,2 percent of GDP. In the study by Treisman (2000) analyzed ‘perceived corruption’ based on certain indexes. According to the analysis results; countries with Protestant traditions, histories of British rule, more developed economies, more democratic regime and higher imports are less corrupt. On the other hand federal states are more corrupt.

Studies are carried out by Weiss (1969), Tanzi and Zee (2000), Teera (2003) and Gupta (2007) on causes that affect tax revenues. In all these studies, it is stated that abuse of public duty for personal gain, that is corruption, is the most significant negative cause that affect tax revenues. Besides, Bardhan (1997), Jain (2001), Aidt (2003), Svensson (2005) and Imam and Jacobs (2007) in their studies determine that real per capita income, share of agriculture in GDP, trade openness, inflation and corruption are the most important determinants of tax collection.

Each of control of corruption, government effectiveness, and quality of government regulation and rules of law indicators has robust negative correlation with shadow economy. Schneider (2005a) calculated the size and development of the shadow economy for 145 countries, including developing, transition, and developed OECD countries, in between 1999-2003. Schneider (2005b) estimated of the shadow economy for 110 countries, including developing, transition and developed OECD economies. In both studies the econometric results show that the tax and social security payment burden are the main forces of the shadow economy followed by the developed and transition countries and by the tax moral variable for the highly developed OECD countries. The two papers obtain that for the developing countries, the burden of state regulation is the single most important factor. As seen in these studies, shadow economy and corruption follow the same path and even cross each other depending on the same factors.

In the study by Serra (2006) to examine the causes of corruption, 'Global Sensitivity Analysis', based on the Leamer's Extreme-Bounds Analysis gives clear answers about the variables which are strongly related to corruption. According to analysis results, corruption is lower in high-income countries, where democratic institutions have been preserved for a long time and the majority of population is Protestant. On the other hand corruption is higher where political instability is a major problem. Lastly, a country's colonial heritage appears to be a significant determinant of present corruption level.

In a study by Kurtz and Shrank (2007), based on ordinary least square (OLS) regression analysis, it is emphasized that there is a significant correlation between government effectiveness and economic performance (i.e. economic growth) of the country. Dreher and et al., (2009) analyzed the relationship between institutional quality, the shadow economy, and corruption. According to the analysis results, it is seen that improving corporate quality reduces shadow economy and affect the corruption market indirectly. However, according to the analysis results, the full relationship between corruption and corporate quality is indefinite, and depends on the relative effectiveness of corporate quality in shadow and corruption markets. The analysis also indicates that the shadow economy and corruption are substitutes.

In the study, by Méon and Weill (2010), results of the panel study which monitored the relationship between corruption, governance and efficiency in 69 developed and developing countries are analyzed. In their study, it is stated that in countries where institutions are less effective, corruption is less detrimental to efficiency. Corruption may even be positive relation with efficiency in countries where institutions are extremely ineffective.

Azka et al. (2014) analyzed the factors that affect tax revenues in Pakistan. In the study, corruption, political instability, trade openness, real per capita income and inflation are evaluated as main determinants of tax collection, and tax to GDP ratio is used as an indicator of tax revenues. The empirical results have shown that direct or indirect taxes are more affected by corruption, political instability and inflation. Also, it is fact that corruption is a major obstacle in increasing tax revenues for both direct taxes and indirect taxes.

In their study, Azka et al. (2014) have made some recommendations regarding the quality and effectiveness of governance. The first recommendation is exporting and archiving comprehensive records of all ministries and departments into a gigantic e-government system online. Another recommendation is that government should focus on establishing consciousness among people regarding the ethical and social obligations of tax payments and should empower transparent collection and use of taxes that are collected by improving social welfare. The recommendations of the study coincide with the main representative indicators for measuring 'Governance Effectiveness' in WGI project which are quality of bureaucracy, institutional effectiveness, quality of primary education and satisfaction with transportation system.

3. Data, Methodology and Empirical Analysis

Governance means official and unofficial regulations that determine how public decisions are made and public activities are carried out in terms of protecting the constitutional values of a country. Herein, public administration is the establishing basis of the management. Governance indicators evaluate, compare the corporate quality of countries and contribute to researches and determining policies. At first, these indicators were used to analyze economical growth and evaluate the performance of public sector. However today, governance indicators are used to evaluate decisions regarding conditional development aid and contribute to realizing a development for a longer term. Therefore, measuring the quality of governance is extremely important. There is a series of various governance indicators used by various organizations (DESA, 2007).

One of them is the project of World Bank's Worldwide Governance Indicators which has six broad dimensions of governance for over 200 countries and territories over the periods 1996-2015. These six dimensions are control of corruption, government effectiveness, regulatory quality, rule of law, voice and accountability, political stability and absence of violence (World Bank, 2017). In this paper, we investigated the impact of control of corruption (CoC), government effectiveness (GE), regulatory quality (RQ), rule of law (RoL) on the total tax revenues in OECD countries using panel regression analysis during the periods 2002-2015. The countries and the data period in our study were determined by the availability of data.

3.1. Data

The annual data of total tax revenues as a percent of GDP was used as a proxy for the tax revenues. On the other hand, control of corruption index of World Bank (2017) was employed as

a proxy for corruption and the public governance was represented by indexes of government effectiveness, regulatory quality, and rule of law of World Bank (2017). These indicators based on 31 data sources reporting the perceptions of governance of a large number of survey respondents and expert assessments worldwide (see Kaufmann et al. (2010) for detailed information). The value of each index changes between -2,5 (weak) and 2,5 (strong). Our study period and sample were determined by data availability and the sample consisted of Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Latvia, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, South Korea, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States. The variables used in the econometric analysis, their symbols and data sources were presented in Table 1.

Table 1: Data Description

Variables	Description	Source
TAXREV	Total tax revenues (% of GDP)	OECD (2017b)
COC	Control of corruption	World Bank (2017)
GE	Government effectiveness	
RQ	Regulatory quality	
ROL	Rule of law	

The econometric analysis is conducted with use of Stata 14.0, WinRATS Pro. 8.0 and Gauss 11.0 software packages. The descriptive statistics and correlation matrix of the variables in the study were presented in Table 2. The correlation matrix demonstrated that there was no multicollinearity problem among the independent variables.

Table 2: Descriptive Statistics and Correlation Matrix of the Dataset

Variables	Obs	Mean	Std.Dev.	Min	Max
TAXREV	490	33,37971	7,237841	12,649	49,583
COC	490	1,269294	0,8223721	-0,7421037	2,556869
GE	490	1,335486	0,5536063	0,0393416	2,358699
RQ	490	1,287847	0,4257166	0,0309615	1,970678
ROL	490	1,273343	0,6137272	-0,71572	2,120458
	TAXREV	**COC**	**GE**	**RQ**	**ROL**
TAXREV	1,0000				
COC	0,4115	1,0000			
GE	0,4293	0,270234	1,0000		
RQ	0,3357	0,235922	0,348895	1,0000	
ROL	0,4501	0,267050	0,304829	0,338866	1,0000

3.2. Econometric Model and Methodology

We investigated how the indicators of the corruption and public governance affect the total tax revenues in 35 OECD economies during 2002-2015 periods. Our dependent variable is total tax revenues as a percent of GDP (TAXREV), while our independent variables are the indicators of control of corruption (COC), government effectiveness (GE), regulatory quality (RQ), and rule of law (ROL). Therefore, we consider the following model:

$$TAXREV_{it} = \alpha_i + \beta_1 COC_{it} + \beta_2 GE_{it} + \beta_3 RQ_{it} + \beta_4 ROL_{it} + \varepsilon_{it} \quad (1)$$

First the cross-sectional dependence among the series was examined with Pesaran (2004) LM CD test, because cross-section dimension of the dataset (N=35) was found to be smaller than time dimension of the dataset (T=14). Furthermore, the homogeneity of the slope coefficients was analyzed by adjusted delta tilde test of Pesaran and Yamagata (2008). Then Pesaran (2007) panel CIPS unit root test was used to examine the stationarity of the series. Later we will benefit from Chow (F) and BP (χ^2) test to select the estimation method of panel regression. Finally serial correlation problem will be tested by Wooldridge (2002) autocorrelation test and heteroskedasticity problem will be tested by Greene (2003) heteroskedasticity test after estimating the panel regression.

4. Empirical Analysis

4.1. Results of Cross-Sectional Dependence and Homogeneity Tests

We employed Pesaran (2004) LM CD test, because N (=35) was found to be higher than T (=14) and the test results were displayed in Table 3. The null hypothesis (cross-sectional independence) was rejected at 1% significance level, and we revealed a cross-sectional dependence among the variables. Furthermore, the homogeneity of the slope coefficients was analyzed with adjusted delta tilde test of Pesaran and Yamagata (2008) and the results were presented in Table 3. The null hypothesis was rejected and the slope coefficients were found to be heterogeneous.

Table 3: Results of Cross-Sectional Dependence and Homogeneity Tests

Cross-sectional dependency tests		
Test	**Test statistic**	**p-value**
LM (Breusch and Pagan (1980))	887,5	0,0000
LM adj* (Pesaran and Yamagata, (2008))	7,935	0,0000
LM CD* (Pesaran (2004))	7,048	0,0000
Homogeneity Tests		
Test	**Test statistic**	**p-value**
Delta_tilde	19,674	0,001
Delta_tilde_adj	21,445	0,015

*two-sided test

4.2. Results of Panel Unit Root Test

The integration levels of the variables were examined with CIPS unit root test of Pesaran (2007) and the test results were displayed in Table 4. The results revealed that all the variables were not stationary at their levels, but became stationary after first-differencing.

Table 4: Results of Panel CIPS Test

Test	TAXREV	COC	GE	RQ	ROL
CIPS	5,902*	7,851*	7,426*	5,084*	6,077*

* it is significant at 5% significance level

4.3. Model Selection

Chow (1960) and Breusch-Pagan (BP) (1980) tests were employed to determine which estimation method we use in the panel regression analysis Chow test is used for the determination of common significance of country and time specific effects among the panel data. The null hypothesis shows that pooled OLS is effective, while alternative hypothesis shows that fixed effects model (FEM) is effective under the Chow test. BP test is used to determine whether we use pooled OLS or random effects model (REM) and the null hypothesis shows that pooled OLS is effective, while alternative hypothesis shows that REM is effective under BP test. Both Chow and BP tests were implemented and the results were presented in Table 5. Chow test dictated us to use FEM model, while BP test dictated us to use REM. So Hausman test will be used to select between two models in the next stage.

Table 5: Results of the Estimation Method Test of Panel Regression

Test	p value	Decision
Chow (F) test	0,015	Accept H_1
BP (χ^2) test	0,002	Accept H_1

Finally, Hausman test is used to make a selection between FEM and REM. The null hypothesis asserts that REM is efficient, while the alternative hypothesis shows that FEM is effective. We applied Hausman test and the results were presented in Table 6. So the null hypothesis was accepted and therefore we decided to use REM model considering the results of Hausman test.

Table 6: Results of Hausman Test

Test summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	1.052435	2	0.3462
Period random	2.172326	2	0.3905
Cross-section and period random	2.138541	2	0.3526

4.4. Results of Panel Regression

The different algorithms were tried for the analysis and therefore the estimation was implemented with the cross section SUR algorithm which yields the minimum sum of the squared errors and the estimation results were presented in Table 7. The results discovered that control of corruption (COC), government effectiveness (GE), regulatory quality (RQ), and rule of law (ROL) affected the total tax revenues positively. On the other side, the coefficients showed that ROL and RQ variables had the largest impact on the total tax revenues, while GE variable had the lowest impact on the total tax revenues. Corruption and public governance indicators explained 60% of the changes in the total tax revenues.

Table 7: Results of Panel Regression

Dependent Variable: DTAXREV				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
DCOC	0,213051	0,052191	4,082103	0,0001
DGE	0,159481	0,055346	2,881530	0,0041
DRQ	0,289948	0,058951	4,918448	0,0000
DROL	0,298495	0,045888	6,504888	0,0000
C	0,006817	0,003756	1,815072	0,0301
Effects Specification				
			S.D.	**Rho**
Cross-section random			0,120757	0,5076
Period random			0,025219	0,0221
Idiosyncratic random			0,116238	0,4703
Weighted Statistics				
R-squared	0,607794	Mean dependent var		0,316909
Adjusted R-squared	0,604560	S.D. dependent var		0,188718
S.E. of regression	0,118674	Sum squared resid		6,830474
F-statistic	87,78990	Durbin-Watson stat		2,174233
Prob (F statistics)	0,000000			
	Unweighted Statistics			
R-squared	0,900976	Mean dependent var		1,335429
Sum squared resid	14,85161	Durbin-Watson stat		0,484734

Public administration is the dominant actor which designs and controls the environment which households and firms live. Therefore, well-functioning of the public sector and the well-designed

institutions and regulations exhibit importance for operation of the economy. Our findings verified the theoretical considerations and discovered that the functioning of public administration and the quality of relevant legislative regulations especially rule of law and regulatory quality had significant impact on tax collection.

4.5. Results of Panel Regression Assumptions' Tests

The autocorrelation and heteroscedasticity problems which are major assumptions behind the regression were tested for the reliability of the results. First, Wooldridge (2002) autocorrelation test was employed to investigate the autocorrelation problem and the test results were displayed in Table 8. The null hypothesis was accepted and we revealed that there was no autocorrelation problem in our model.

Table 8: Results of Woolridge Autocorrelation Test

F value	P value
569,033	0,182

The heteroskedasticity problem was examined the test of Greene (2003) and the results were presented in Table 9. The results discovered that the null hypothesis (no heteroskedasticity) was accepted.

Table 9: Results of Greene Heteroskedasticity Test

chi2 (2) = 673,284
Prob>chi2 = 0,129

5. Conclusion and Recommendations

Tax revenues have become the crucial source of income for the funding of governments' current expenditures and capital expenditures (investments). On the other hand, many countries have decreased the share of public sector in the economy through privatization. In this study, we analyzed the effect of corruption and different indicators of public administration on the tax revenues in 35 OECD countries during the 2002-2015 periods by employing panel regression analysis. The findings discovered that improvements in corruption, government effectiveness, regulatory quality, and rule of law have positive effect on tax revenues.

Our findings were found to be consistent with the theoretical considerations and the relevant empirical literature. So, the functioning of public administration and the quality of relevant legislative regulations especially rule of law and regulatory quality are very important for tax collection and in turn decrease the size of shadow economy.

We have some recommendations to decrease corruption level and increase quality of governance. Primarily, as mentioned in the literature review, government should develop an effective tax mechanism in order to support regulatory quality. Here, Ministry of Finance carries a significant role. The Ministry should minimize tax amnesty in order to increase tax

consciousness and raise the fines and sanctions. Additionally, tax payers that pay their taxes in a timely manner should be honored by promotions. Thanks to effective tax collection mechanism, shadow economy will significantly regress under the conscious tax payer- responsible government structure.

Another recommendation is to support e-government applications and continuously control its improvement in order to provide government effectiveness and lower corruption. By this means, transparency and accountability will be provided. The third recommendation is, by taking the country's socio-economic and political conditions and deficiencies into account, to state more concrete short term and long-term goals within anti-corruption programs.

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