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RESEARCH PAPER

The Relation between Corruption and Economy in OECD Countries: A Moderating Role of Tax Revenue

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ABSTRACT

This research study's goal is to examine how tax income influences the relationship between corruption and the economy in OECD countries. OECD countries 35 panel data from the years 1996 to 2021 have been used for this purpose. Economic growth is used as the dependent variable, corruption and tax revenue as the independent variables, and education, foreign direct investment (FDI), inflation, and governance as the control factors. First, we used the cross-sectional dependence CD test to check whether the cross-correlations of the errors are zero. Next, Panel unit-root test is used to check whether the data are stationary. Hausman test is used test to check whether endogenous regressors (predictor variables) are present in the regression model. Finally, Panel ARDL (PMG) techniques used for short-run and long-run analysis of variables. Similarly, the Baron and Kenny estimating process has been used to assess the direct and indirect link between these variables to discover the mediating influence between corruption, tax revenue, and economic growth. According to the panel ARDL (PMG) analysis's findings, economic growth is long-term positively impact by corruption, tax revenue, education, FDI, and governance. While inflation and political unrest have a negative and considerable impact on economic growth. The study's main finding is that tax revenue and corruption have a positive and substantial relationship with economic growth. The principal-Agent theory aids in understanding both governmental structure and the effects of corruption. The mediation analysis's conclusion is that corruption not only directly affects economic growth, but also indirectly. The study provides policymakers with comprehensive knowledge that decreasing corruption results in higher tax receipts and economic growth.

| **Keywords:** | Corruption, Economic Growth, OECD Countries, Panel ARDL (PMG),Tax Revenue |

Introduction

The OECD countries were able to achieve a notable increase in living standards following World War II. Significant advancements in economic freedom were experienced alongside the quick development in economic riches (Heitger, 2001). Numerous theoretical and empirical investigations have been carried out for more than three decades to offer solutions to the corruption problem. When these studies arrived, they gave many perspectives on the subject. This depends on who the corruption originates from, who benefits from it, who enforces it, and who the participants are. It also included several additional acceptances, including the payment of bribes in exchange for favours, covert political and economic operations through which the official abuses his position of authority for private benefit, and misuse or theft of public monies. Corruption is a sickness that affects democracies and poor countries. Corruption has several facets and systematically affects all countries in the world.

The CPI (Corruption Perceptions Index), a survey of the countries' people to determine how prevalent corruption is, is published annually, according to the

Transparency International report from 2016. Business Insider (BI) chose to focus on the wealthy, democratic countries with the highest levels of corruption for this reason. They chose the nations with the greatest perceived levels of corruption after examining the rankings of nations within the OECD (Organization for Economic Cooperation and Development). The OECD provides a ranking from 0 to 100, with 100 being the least corrupt and 0 representing the most corrupt. This ranking helps to give a good idea of where corruption booms. In the developed world there are 18 most corrupt countries, i.e., Ireland (75), Japan, Chile (70), Estonia (70), France (70), Portugal (63), Poland (62), Israel (61), Slovenia, Spain (56), Czech Republic (56), South Korea (56), Hungary (54), Slovakia (51), Greece (46), Italy (44), Turkey (42), and Mexico (35).

The corruption problem affected certain industrialised countries. Given the current circumstances, it is suggested by reports that if we don't act quickly to solve this problem, economic growth and revenues might drastically fall. Bribery has a significant impact on a country's growth and economy. As a result, the country's overall wealth declines. According to Tanzi (1998) and Tanzi and Davoodi (1997), bribery reduces tax income if it leads to tax evasion, incorrect tax exemptions, or inefficient tax administration, which reduces overall government revenue. This research examines the relationship between corruption, tax income, and economic growth in OECD (Organization for Economic Cooperation and Development) nations during the past few decades because of their significant prominence and global attention. The transfer of interests from the public to the private sector is referred to as corruption. Corruption, according to the World Bank, is "the misuse of public office for private benefit." Every transaction involving participants from the public and private sectors that involves the illicit conversion of collective benefits into personal advantages is corrupt. Transparency International (TI) defines corruption as the abuse of political authority for one's own benefit. The TI study states that one of the biggest problems in the modern world is corruption. It undercuts effective governance, systematically distorts public policies, results in inefficient resource allocation, worsens the development of the public and private sectors, and has a disproportionately negative impact on the poor."

Literature Review

The presence of significant government interference, which is represented in overbearing and complicated rules as well as high tax and tariff rates, is one of the main causes of corruption. Therefore, rationalizing the government's involvement in the economy must be one of the primary priorities in the fight against corruption. Gire (1999) asserts that one of the most harmful social problems in every civilization is corruption. This is since corruption, like a fatal virus, affects the essential components of society's progressive functioning, thus endangering society's fundamental life. Unexpectedly, analysis of corruption has typically focused on other aspects of crime rather than on it. Amundsen (1999) investigated the many pathways that can be used to curb corruption. International financial institutions oversaw external control or global corruption. Indeed, "excellent governance" was one of the conditions of this conditionality. Mauro (2002) highlights the challenges of combating pervasive corruption; he uses the term "strategic complementarity," which states that "when one agent acts, it becomes more advantageous for another agent to act in a similar manner."

Every country in the world is at risk from corruption. A country's economic prosperity declines because of corruption. Corruption is pervasive in underdeveloped nations, where it has negative effects on the tax system. By decreasing state revenue, it makes it more difficult for the government to carry out its social duties. This is very concerning considering that several studies on the tax system in developing nations reveal that over 50% of tax revenues are not collected as a result of financial corruption and tax evasion (Richupan, 1984; Alm, Bahl, & Murray, 1991; Bird, 1990; and Krugman et al., 1992). When compared to the percentage of money received in bribes, the income losses and subsequent reductions in public spending are significant. The reduction of tax collection's

distributional function and subsequent rise in income disparity are two further unfavourable effects of corruption. Corruption and tax evasion were addressed individually, but their combined impact has received less attention. According to Tanzi and Davoodi (1998), data suggests that nations with high levels of corruption often collect less tax income relative to their GDP.
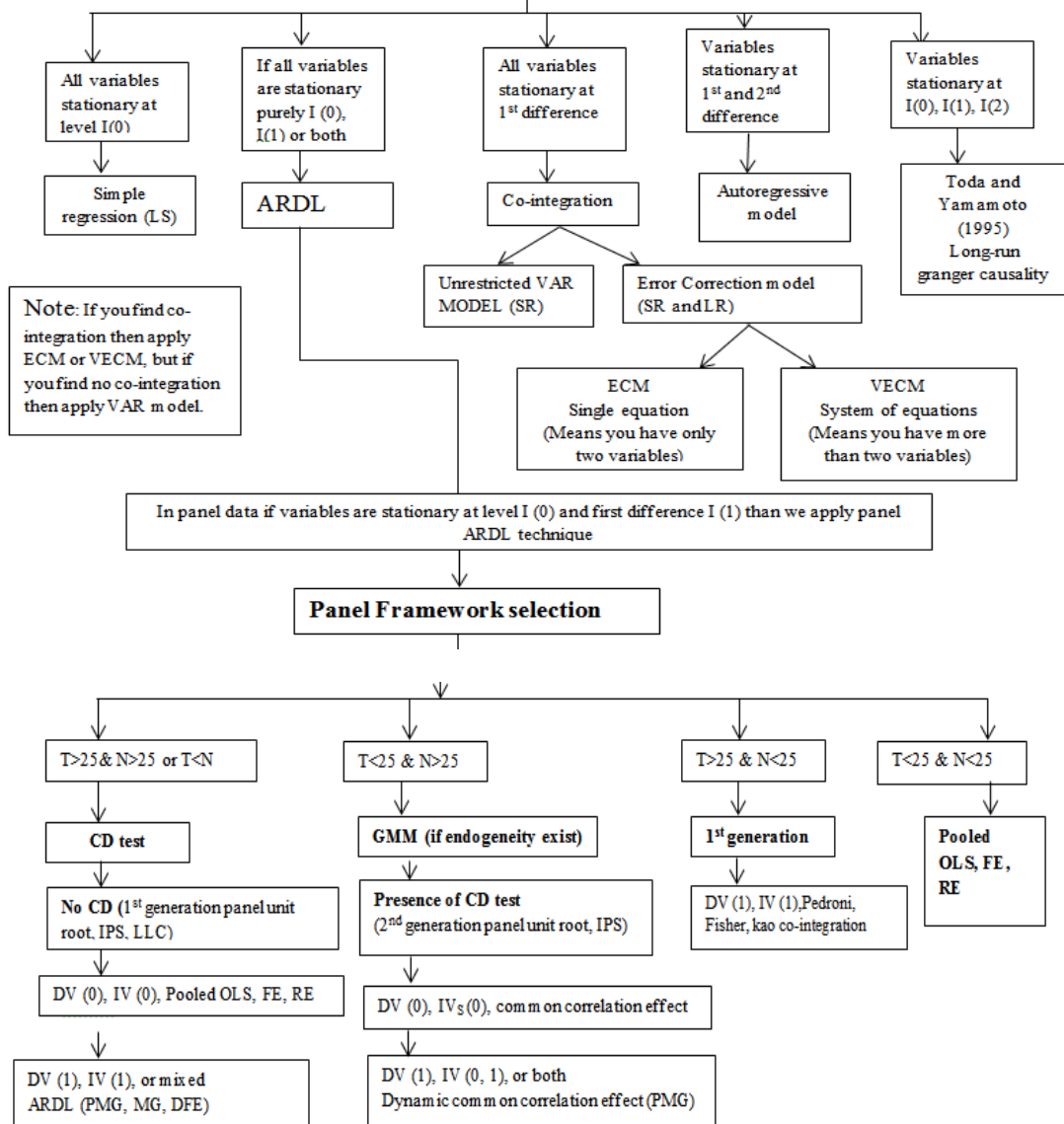
Canicio and Zachary (2014) examined the impact of economic growth on government tax collection for Zimbabwe using annual data covering the years 1980 to 2012 with 32 observations. By using the Johansen Co-Integration Approach, they investigated the hypothesis that high tax revenue growth rates are the primary indicator of raised living standards due to strong economic growth created by the government multiplier process. This study looked at the link between tax income and economic growth in Zimbabwe in both the short- and long-term. Takumah (2014) examined the effect of tax income on economic development in Ghana using quarterly data for the years 1986 to 2010 under the VAR system. The goal of this study is to examine the relationship between corruption and the economies of 35 OECD nations that have been hand-picked. The function of tax income as a moderator is significant for several reasons. First, industrialised nations place a strong emphasis on increasing their tax collections to strengthen their economies. Tax money is crucial to the process of economic growth. Developing nations must be able to raise their revenue to pay for the services that their population need and the infrastructures (physical and social) that will help them transcend poverty, according to the IMF (cited in TJN, 2012). "In the process of revenue generating, several countries encounter a wide range of institutional issues, which will play a vital part in this income mobilisation. One of the primary issues is corruption in the tax administration. Corruption is a long-standing phenomenon in human history that refers to all activities that are carried out in secret from tax authorities to evade or avoid paying taxes.

The study's focus would be on the 26-year period (1996 to 2021) in OECD nations, examining the relationship between corruption and the economy as well as the moderating effect of tax revenue. It is suggested that secondary data be used to finish the investigation. WDI (global development indicator) and WGI secondary data (global governance indicator). We chose OECD nations because, although they have some of the worst rates of corruption in the industrialised world, they also have some of the highest tax collections. Previous research has shown that corruption has a detrimental impact on economic growth and lowers tax collections in developing nations. Nobody looked at how it might affect wealthy nations. We shall examine its influence on economic growth in the current study. We will also check whether tax revenue plays a mediating role between corruption and economic growth.

Material and Methods

Either a random or fixed effect is employed with the panel data model. If the variables are stationary at level I(0) and the first difference I, then the estimate method of the panel ARDL (PMG) model is used (1).

Statistical Model Selection on the Base of Data stationarity Unit root and Selection of Panel Framework

All variables stationary at level I(0)	If all variables are stationary purely I(0), I(1) or both	All variables stationary at 1st difference	Variables stationary at 1st and 2nd difference	Variables stationary at I(0), I(1), I(2)
Simple regression (LS)	ARDL	Co-integration	Autoregressive model	Toda and Yamamoto (1995) Long-run granger causality

Note: If you find co-integration then apply ECM or VECM, but if you find no co-integration then apply VAR model.

Co-integration →
- Unrestricted VAR MODEL (SR)
- Error Correction model (SR and LR)
  - ECM Single equation (Means you have only two variables)
  - VECM System of equations (Means you have more than two variables)

In panel data if variables are stationary at level I (0) and first difference I (1) than we apply panel ARDL technique

Panel Framework selection

T>25 & N>25 or T<N	T<25 & N>25	T>25 & N<25	T<25 & N<25
CD test	GMM (if endogeneity exist)	1st generation	Pooled OLS, FE, RE
No CD (1st generation panel unit root, IPS, LLC)	Presence of CD test (2nd generation panel unit root, IPS)	DV (1), IV (1),Pedroni, Fisher, kao co-integration	
DV (0), IV (0), Pooled OLS, FE, RE	DV (0), IV$_S$(0), common correlation effect		
DV (1), IV (1), or mixed ARDL (PMG, MG, DFE)	DV (1), IV (0, 1), or both Dynamic common correlation effect (PMG)		

Data Source

Panel data were used to statistically examine the relationship between the stated variables from 1996 to 2021. There are 910 observations that are suitable for panel data regression analysis are employed with annual data for 35 OECD countries.

Table 1
provides variable labels, description, measures, and data sources

Variable	Description	Measures	Sources
Y	Economic Growth	GDP per capita (constant 2010 US$)	WDI
Edu.	Education	School enrollment, secondary (% gross)	WDI
FDI	Foreign Direct Investment	Foreign direct investment, net inflows (% of GDP)	WDI
Infla.	Inflation	Inflation, consumer prices (annual %)	WDI
Gov.	Governance	Government Effectiveness: Estimate	WGI
Pol.	Political stability	Political Stability and Absence of Violence/Terrorism: Estimate	WGI
TR	Tax revenue	Tax revenue (% of GDP)	WDI

Cor.	Corruption	Control of Corruption: Estimate	WGI

Econometric Modeling

To empirically examine the relationship between the economy and corruption, as well as the role that tax revenue plays in reducing it. GDP (Yt) is the dependent variable, and the independent variables are corruption, tax revenue, education, foreign direct investment, inflation, governance, and political stability.

$$Y_{it} = \alpha_0 + \alpha_1 TR_{it} + \alpha_2 COR_{it} + \alpha_3 Edu_{it} + \alpha_4 Infla_{it} + \alpha_5 FDI_{it} + \alpha_6 GOV_{it} + \alpha_7 Pol_{it} + u_{1it} \ldots\ldots\ldots Eq.1$$

Where:

Y_t = GDP per capita (constant 2010 US$), FDI_t = Foreign direct investment, net inflows (% of GDP), $Infla_t$=Inflation (consumer prices (annual %)), Edu_t = Education (School enrollment, secondary % gross), COR_t = Corruption (Control of Corruption: Estimate), $Govt_t$ = Governance (Government Effectiveness: Estimate), T_t = Tax revenue (% of GDP), Pol_t = Political stability (Political Stability and Absence of Violence/Terrorism: Estimate), i = Country in panel, U_t = Gaussian white noise, Panel dataset consist of a number of observations on various individuals (which ranges from i=1......n) which are observed over a time period at equal intervals. T refers to time period, N= number of cross-sections when data is observed, t = Years (1996, 1997, 1998,...., 2021), $\alpha_0, \alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6$ and α_7 = Partial slope coefficients.

Model Selection

In this research study, the researcher utilized Mean Group (MG) and Pooled Mean Group (PMG) two different dynamic-models, to examine the nexus between corruption, tax-revenue, and economic growth. This present study emphasis is only on OECD countries, the Hausman test is applied to select the appropriate model for the interpretation of results. In the study, we utilized the Panel ARDL (PMG) model for the data analysis. Panel ARDL (PMG) model is applied when the number of cross-sections (N) is greater than the time (T).

Econometric Analysis

Before proceeding to methodology and final analysis of data, few initial tests are applied on data to check its suitability and validity for analysis. Unit root tests applied on data to check the stationarity of the variables. The prescribed statistical procedure that is developed to test for cross-sectional dependence (CD) when N>T (small-T, large-N) panels are the Pesaran (2004) CD (cross-sectional dependence) test, Friedman's statistic (1937), and the test suggested by Frees (1995). Panel Unit Root test applied for Panel ARDL analysis, first, we check the stationarity of variables to avoid a spurious regression problem. According to Canning and Pedroni (2004) "panel data shows time series nature if each cross-section includes 26 years data, whereas time series data normally initiate non-stationary, therefore, to avoid from spurious regression unit root is most important. "Before estimating the model, first we identified the unit root in the series. Numbers of tests are available for testing panel unit root hypothesis (Maddala & Wu, 1999; Hadri, 2000; Breitung, 2001; Levin et al., 2002; Pesaran et al., 2003; Pesaran, 2007). We employed only the Levin-Lin-Chu (LLC), and Im-Pesaran-Shin (IPS) unit root tests.

There are many criteria available for optimal lag length, e.g.: Akaike information criterion (AIC), Schwarz information criterion (SC), Final prediction error (FPE) and Sequential modified LR test (LR). These tests help to determine the optimal length of the lag. The optimal lag order is then chosen (Pesaran & Pesaran, 1997) depending on the highest value of AIC or SC. Selecting the variables' lag orders is very important because with the help of correct lag selection we can define the true dynamics of the model. Hausman test applied

for long-run homogeneity assumption, PMG estimators are more efficient as compared to MG estimators. Subsequently, PMG is more suitable for this analysis.

Panel ARDL (Autoregressive Distributed Lag) model is used, to analyze the relationship between corruption, tax revenue, and economic growth in short-run and long-run or both. This model was originally developed and introduced by (Pesaran, Shin, 1999), and it underwent several modifications and redefined by (Pesaran, Shin, & Smith, 2001), since then, Panel ARDL has been used and it is preferred over traditional methods as its approach towards cointegration analysis among variables and the short-run and long-run estimates could be estimated separately.

The goal of the mediation investigation is to research the degree to which certain recognized causal variable X impacts explicit result Y through at least one variable is a mediator (Hayes, 2013). Furthermore, the mediating variable is receiving importance in social marvel, for example, the frame of mind causing aims and practices (Chmura, Kiernan, Essex & Kupfer, 2008) and according in this study, the tax revenue is a mediating variable causing an attitudinal point of view concerning the economic growth through corruption. In simple words, "mediating variable works like a bridge between two or more than two variables. "Mediation is a hypothesized causal chain in which one variable affects a second variable that, in turn, affects a third variable.
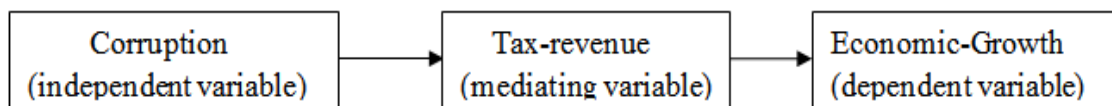

Figure 1: Mediating impact of tax revenue on corruption and economic growth

Model Estimation and Discussion

Descriptive Statistics

Table 2 present the number of observations (N) and the summary statistics (Mean and median values, maximum and minimum values, and standard deviation values) for all variables that used in our empirical analysis. This data set includes 910 observations for all the variables. Some of the values were missing from variables that have been estimated through interpolation. Total of 35 OECD countries for which data was collected, which consist of 26 years of annual observations for the period from 1996 to 2021.

Table 2
Descriptive Statistics of OECD countries

Variables	Obs	Mean	Std. Dev	Maxi	Mini
GDP_PC	910	44785.02	55815.76	418139.20	5321.39
Education	910	106.05	16.73	163.93	59.09
FDI	910	5.42	13.08	252.30	-58.32
Inflation	910	3.50	7.23	85.73	-4.47
Governance	910	1.32	0.57	2.35	-0.26
Political instability	910	0.77	0.66	1.76	-1.99
Tax revenue	910	19.51	6.74	38.51	1.22
Corruption	910	1.29	0.79	2.46	-0.76

Std. dev. 5 = Very Good, 4 = Good, 3 = Average, 2 = Poor, 1 = Very Poor,

Residual Cross-Section Dependence Test

The cross-sectional dependence test in Table 3 cannot be rejected at 0.01% level of significance. This implies that there is presence of cross-sectional dependence in our data.

Thus, to obtain unbiased estimates of our analysis, we conducted a diagnostic test by applying panel unit root tests in the presence of cross-sectional dependence on the residual estimates (Pesaran, 2007). The outcome of the panel unit root tests on the residual, as presented in Table 4, shows that the residual is stationary at level and first difference, and the stationarity validates the estimates of the PMG ARDL panel results.

Table 3
Residual cross-section dependence tests
Null hypothesis: No cross-section dependence (correlation) in residuals

Test	Statistic	Probability
Breusch-Pagan LM	4115.80	0.000
Pesaran scaled LM	101.04	0.000
Pesaran CD	34.74	0.000

Table 2 relates to the cross-sectional dependence (CD) of residual. We used the Pesaran (2004) CD (cross-section dependence) test, for the investigation of cross-section dependence and independence. We reject the null hypothesis and accept the alternative hypothesis If the p-value is < 5%. The results approving that the cross-sections are dependent.

Results of Panel Unit Root Test

To get reliable results, the stationarity of panel data is necessary to avoid spurious regression analysis because if the data is non-stationary, it is impossible to making forecasting. Table 4 shows Levin-Lin-Chu (LLC) and IM-Pesaran-Shin (IPS) unit root test on all the variables. Results are provided with trend and without trend at level and at the first difference. Inclusion of trend option means that a linear time trend is included in this model.

Table 4
Results of Levin-Lin-Chu (LLC) and IM-Pesaran-Shin (IPS) Panel unit root test at the level and first difference

	LLC test				IPS test			
	Without Trend							
	Level		1st difference		Level		1st difference	
Variable	T-statistic	Prob.	T-statistic	Prob.	T-statistic	Prob.	T-statistic	Prob.
GDP_PC	-3.61	0.000	-12.10	0.000	0.64	0.739	-9.21	0.000
FDI	-5.41	0.000	-12.50	0.000	-6.48	0.000	-15.53	0.000
Edu.	-0.17	0.431	-11.91	0.000	0.14	0.559	-10.40	0.000
Infla.	-6.33	0.000	-17.46	0.000	-5.89	0.000	-17.71	0.000
TR	-2.52	0.005	-9.64	0.000	-2.85	0.002	-10.67	0.000
Pol.	-1.16	0.122	-10.49	0.000	-1.12	0.129	-10.88	0.000
Gov.	-1.13	0.128	-12.17	0.000	0.01	0.507	-12.59	0.000
Corru.	-0.98	0.163	-10.10	0.000	-1.16	0.122	-9.99	0.000
	Trend and intercept							
Variable	T-statistic	Prob.	T-statistic	Prob.	T-statistic	Prob.	T-statistic	Prob.
GDP_PC	-4.09	0.000	-11.38	0.000	-1.23	0.108	-6.87	0.000
FDI	-5.57	0.000	-8.18	0.000	-4.99	0.000	-11.44	0.000
Edu.	-1.16	0.122	-9.46	0.000	-0.41	0.339	-6.95	0.000
Infla.	-5.83	0.000	-16.40	0.000	-4.34	0.000	-15.44	0.000
TR	-2.01	0.021	-7.20	0.000	-1.95	0.025	-7.22	0.000
Pol.	-1.10	0.134	-8.23	0.000	-1.17	0.120	-7.60	0.000
Gov.	-1.58	0.056	-10.04	0.000	-1.30	0.095	-9.68	0.000
Corru.	-0.49	0.309	-8.79	0.000	-0.21	0.413	-7.78	0.000

Notes: panel unit root tests were performed with restricted intercept and trend for all variables. GDP: GDP per capita (constant 2010 US$); Edu: School enrollment, secondary (% gross); FDI: foreign direct investment inflows; Infla: Inflation, consumer prices (annual %); TR: Tax revenue (% of GDP); Pol:

(Political instability and Absence of Violence/Terrorism: Estimate); Gov.: (Government Effectiveness: Estimate); Corru: (Control of Corruption: Estimate).

Optimal Lag Length

For this study, the criteria suggested by Schwarz (SC) is used, because its results are more authentic, appropriate, and better for small samples, so it was more appropriate for this study. Results of LR, FPE, AIC, SC, and HQ are given in table 5 and the Schwarz information criterion (SC) is considered for this study, among them. So according to Schwarz information criterion the optimal lag for our Autoregressive distributed lags was found to be 1 for our study. Results for the selection of optimal lag length are given below in table 5.

Table 5
Optimal lag selection

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-12554.57	NA	1.32e+14	55.22	55.29	55.24
1	-7936.15	9054.11	267725.9	35.20	35.85*	35.45*
2	-7851.52	162.94	244567.4	35.10	36.34	35.59
3	-7800.62	96.20	259221.7	35.16	36.97	35.88
4	-7752.04	90.11	277721.4	35.23	37.62	36.17
5	-7694.35	104.97	286077.3	35.26	38.23	36.43

* Indicates lag order selected by the criterion

Hausman Test

Under long-run homogeneity assumption, PMG estimators are more efficient as compared to MG estimators. Subsequently, PMG is more suitable for this analysis. None-the-less, to pick between the PMG and MG estimators, we applied the Hausman test. The Hausman test, for the significant difference between the MG and PMG estimation and the null hypothesis is that the difference between PMG and MG is insignificant. If p-value of the Hausman test is greater than 5% level of significant we reject the null hypothesis and we use PMG estimations.

Table 6
Results of Hausman (1978) test

Hausman Test		
	Chi-Sq. Statistic	Probability
Cross-section random	6.114	0.526

Table 6 presented the results of Hausman test which shows that if p-value of the Hausman test is greater than 5% level of significance we reject the null hypothesis and we use PMG estimations.

Long-Run Results of Panel ARDL (PMG) Model

Results of long-run coefficient estimates are given in Table 5.6 below which shows the existence of a long-run relationship between corruption, tax revenue, and economic growth including control variables. We used Schwartz criterion, and we impose following lag structure (1, 1, 1, 1, 1, 1, 1, 1) for panel ARDL lag selection.

Table 7
Long-Run Results of Panel ARDL (PMG) Model (with control variables)

Panel ARDL(PMG) Long-run estimation results				
Dependent Variable:		GDP Per capita		
Long term analysis				
Variables	Coefficient	St. Error	t-statistic	p-value

Education	203.85	30.26	6.73	0.000*
FDI	67.40	18.28	3.68	0.000*
Inflation	-815.14	67.40	-12.09	0.000*
Political instability	-3243.78	684.14	-4.74	0.000*
Governance	6459.47	1116.31	5.78	0.000*
Tax revenue	1065.11	134.41	7.92	0.000*
Corruption	11184.27	1400.79	7.98	0.000*

Note: *Schwarz criterion has been used for lag selection.
S.E. of regression   2055.59
Schwarz criterion   17.04
Log-likelihood -5202.31

Table 7 reports the Panel ARDL (PMG) long-run estimation results of the model. According to this model, the coefficient value of corruption is also positively and significantly associated with economic growth. These findings are in line with (Lombardo & Pagano, 1999; Asongu, 2012; Ajide, 2014; Matthew, 2016). The partial slope of the coefficient for corruption suggests that 1% increase in corruption will lead to improvement in economic growth 11184.27 US dollars. The results are also compatible with several of the previous studies, such as some studies conclude that corruption can have a positive effect on economic growth (Braguinsky, 1996); Kaufmann et al., 2000). This idea is based on the "greasing wheels hypothesis. "In other words, corruption allows us to by-pass bureaucratic procedures by facilitating economic activities. However, according to Mauro (1995), corruption would support economic growth because it significantly reduces the time needed to process archives and circumvent bureaucratic procedures.

According to Kaufmann et al. (1999), a study on competitiveness conducted by the World Economic Forum shows that entities with a high level of corruption also correspond to those in which bureaucrats spend more time managing administrative files related to licensing contracts, permits, signatures and taxes. Furthermore, corruption can support market performance because "good companies "can avoid bureaucratic heaviness and participate in the market (Lui, 1985). Graziano (1980) and Huntington (2002) deal with the impact of corruption on growth from another point of view. According to them, grand corruption can indirectly allow the strengthening of ties within populations. As a result, they will tend to be more connected because they feel they are in the same field: that of the victims. This has led to its tower, reducing the risk of conflicts within the population. This stability positively influences economic growth. Furthermore, it must be considered that the "greasing wheel hypothesis" does not claim, however, that corruption is beneficial constantly and everywhere. It becomes advantageous when some aspects of governance are defective and/or economic policy is inefficient (Aidt, 2003). However, it seems difficult to cause corruption to generate only its positive effects, which are only economically desirable (Rose-Ackerman, 1997).

The coefficient value of Tax revenue is positively and significantly linked with economic growth. The slope of the coefficient for Tax revenue suggests that a 1% increase in tax revenue will result in a 1065.1 US dollars improvement in economic growth. These findings are in line with (Lombardo & Pagano, 1999; Asongu, 2012; Ajide, 2014; Matthew, 2016). Our results are also in accordance with the results of (Koch et al., 2005; Arnold, 2008; Taha et al., 2011; Ahmad, Sial, & Ahmad, 2016) shows positive effects of tax revenue on economic growth.

The coefficient value of education is positively linked with economic growth in the long run; with 5 percent exact probability value. The scale of partial slope coefficient for education suggests that a 1% increase in education will result in a 203.8550 US dollars improvement in economic growth. Some of the earlier studies in which education has a positive and significant impact on economic growth (Barro, 1991; Barro, 1997) suggest that

an extra year of male schooling raises the scale of the convergence theory indicating the conclusion that education is essential to the ability to absorb new technologies in the economy. These results are compatible with the present study.

The FDI (Foreign Direct Investment) and Governance also have a significant and positive association with the economic growth at 5% significance level respectively. The coefficient values FDI and Governance indicate that 1% increase FDI and Governance lead to increase of 67.40 US dollars and 6459.48 US dollars in economic growth, respectively. According to the work of Myint (2000), when corruption is systemic, FDI is generally oriented towards the exploitation of the country's natural resources, with little positive impact on the national economy. Undoubtedly, investment remains the economic variable most directly affected by corruption. This relationship is highlighted in many empirical studies (Mauro, 1995; Lambs Orff, 2003; Pellegrini et al., 2004; Khamfula, 2007; Swaleheen et al., 2007; Aidt, 2003; Nadeem, Nazir & Anwar, 2013) according to their study "the role of governance is very important to determine the economic growth, and governance plays positive and significant impact on economic growth.

On the other hand, among all these variables, except Inflation and political instability that was negatively and significantly associated with the economic growth at 5% level of significance in the long run. For both variables, the partial slope coefficients suggest that 1 % change in inflation and political instability will lead to -815.1 US dollars and 3243.78 US dollars changes in economic growth in opposite direction. The negative relationship between inflation and political instability also investigated by (Ayaydın & Baltacı, 2013; Sergi et al., 2015). Ajaz & Ahmad (2010) examined that, "changes in macroeconomic policies environment play a significant role in increasing tax revenue, inflation is a good indicator used to gauge the economic policy environment. It captured the effect of macroeconomic policy. The literature regarding the impact of inflation on taxation was large and it can be difficult to describe this phenomenon. Some past literature showed that high inflation increased the rate of tax, but recent literature showed that this dilemma depends on collection lags. "Tanzi (1987) explained that the mixture of high inflation, low elasticity of the tax system, and a long delay in tax collection leads to a strong reduction in real revenues when inflation occurred. Therefore, the sign of inflation is negative (-).

Short-Run Results of Panel ARDL (PMG) Model

The results of our selected model panel ARDL are presented in Table 8 According to results, in short run, all variables are positively associated with economic growth except Governance, which is negatively associated with economic growth. Again, the results are generated with the inclusion of control variables, such as education, FDI, inflation, political instability, and governance.

Table 8
Short-Run Results of Panel ARDL (PMG) Model

Panel ARDL(PMG) short-run estimation results				
Dependent Variable:		GDP PC		
Short term analysis				
Variables	**Coefficient**	**Std. Error**	**t-statistic**	**p-value**
COINTEQ01	-0.08	0.02	-3.85	0.000
D(Education)	33.86	27.63	1.22	0.221
D(FDI)	16.61	18.48	0.89	0.369
D(Inflation)	300.80	62.48	4.81	0.000
D(Political instability)	1146.67	563.86	2.03	0.042
D(Governance)	-233.55	598.01	-0.39	0.696
D(Tax revenue)	261.25	210.59	1.24	0.215
D(Corruption)	75.70	556.18	0.13	0.891

Constant	-1172.58	1009.38	-1.16	0.246

Note: *Schwarz criterion has been used for lag selection.
S.E. of regression   2055.59
Schwarz criterion   17.04
Log-likelihood -5202.31

Table 8 presents short-run results of Panel ARDL, the coefficient value of corruption, 75.70 indicate that if corruption increased by 1 percent will increase economic growth by 75.70 US dollars. Tax revenue is positively associated with economic growth in the short run. It has coefficient value of 261.25 which shows that 1 percent increase in tax revenue will increase economic growth 261.26 US dollars. The coefficient value of education, 33.86 suggest that about 1 percent increase in education brings up economic growth 33.86 US dollars in short run. The coefficient value of FDI, 16.61 indicate that if FDI is increased by 1 percent will lead to increase in economic growth by 16.62 US dollars. Inflation is also positively associated with economic growth in the short- run; its coefficient value of 300.8020 shows that if inflation is increased by 1 percent, it will increase economic growth by 300.80 US dollars. All the variables are positively associated with economic growth except Governance which is negatively associated with economic growth. It has coefficient value of -233.55, which shows that a percent increase in governance will lower economic growth by 233.55 US dollars.

However, for all the variables, the relationship with economic growth is found to be significant during the period of short run except inflation and political instability. And other variables are insignificant, the main reason for this insignificant is that any change in corruption and tax revenue can't bring an abrupt or sudden change in the level of economic growth since it requires time for the implementation of new regulations and the overall effect usually become obvious after a certain period.

Mediation Analysis

In this study, there is one independent variable named as corruption affecting the dependent economic growth along with mediating variable named tax revenue. Mediation is a process in which independent variable affecting the dependent variable through intervening or mediator, in short, independent variable X causes to influence the mediator M and then M causes to affect the dependent variable Y. Typically, X→M→Y. The main objective is to test the mediation is to examine the amount to which specific accepted independent variable affect the dependent variable through one or more intervening. To test the mediating effects, we run the regression, how corruption influences economic growth. The equation 1st of the model examines the effects of corruption on tax revenue. The equation 2nd examines the impact of corruption on economic growth. The last equation of the modal explores the impact of corruption on economic growth, considering tax revenue as a control variable.

Table 9
Mediating effect of tax revenue on corruption and economic growth by following the Baron and Kenny 3 steps procedure

$TR = 15.606^* - 3.033^* Corr. + \varepsilon_1$
$LnEG = 9.692^* + 0.522^* Corr. + \varepsilon_2$
$LnEG = 10.256^* + 0.195^* Corr - 0.007^* TR + \varepsilon_3$

Note: *, **, *** shows the significance at 1, 5 and 10 percent respectively.

The above table shows the results of the mediation analysis by following three steps of Baron and Kenny. Step 1 show that there is significant and negative association between tax revenue and economic growth. The coefficient value of corruption (-3.033) shows that 1% change in corruption will lead to change in tax revenue -3.033 percent in opposite direction. These results are compatible with the results of the following studies (Fjeldstad

& Tungodden, 2003; Coppier, 2006; Thornton, 2008; Ajaz & Ahmad, 2010; Imam & Jacobs, 2014) etc. Step 2 examine that there is a significant and positive association between corruption and economic growth. The coefficient value of corruption (0.522) shows that 1% increase in corruption will lead to increase in tax revenue 0.522 percent same direction. These results are compatible with the results of the following studies (Braguinsky, 1996; Kaufmann et al., 1999; Brand & Cetina, 2016).

Step 3 shows that there is a positive and significant association between corruption, tax revenue, and economic growth. In the present study, these three steps have significantly affected each other. It also found that mediating effect (M) of tax revenue is partial on corruption and economic growth. The results of mediation analysis show that, there is partial mediation among corruption, Tax-revenue, and economic growth. The conclusion from the mediation analysis is that corruption is directly and indirectly effect on economic growth (Brandt & Cetina, 2016).

Conclusions

The research findings are compatible with previous literature. The analysis provided different results for the study's proposed hypotheses. From the results of the analysis, hypotheses 1st state that corruption has a positive and significant impact on economic growth. Our research findings don't support null hypotheses, reject null hypotheses, and accept alternative hypotheses in favor of OECD countries for a long period of time. From the results of the analysis, hypotheses 2nd was never supported by our results, which states that tax revenue doesn't have a significant impact on economic growth, but the results of the study suggest the presence of a positive and significant relationship between tax revenue and economic growth in the long run. Never support was found for the 3rd hypotheses, which states that corruption doesn't have a significant impact on economic growth but according to our results there exists a positive and significant relationship between corruption and economic growth."

The result of long-run panel ARDL (PMG) shows that all variable is positively associated with economic growth (GDP_PC) except inflation and political instability, which means that increase in education, FDI, governance, tax revenue, and corruption leads to increase in economic growth (GDP_PC). While in the case of inflation and political instability, an increase in inflation and political instability will lead to a decrease in economic growth (GDP_PC). The following variables were used by Gani (2011) presented the same result, i.e., governance and political stability positively influence by economic growth. All the variables are significant at a 5% significance level.

The result of short-run Panel ARDL (PMG) shows that all the variables, the relationship with economic growth are found to be significant during the period of short-run except inflation and political instability. And other variables are insignificant, the main reason for this insignificant is that any change in corruption and tax revenue can't bring an abrupt or sudden change in the level of economic growth since it requires time for the implementation of new regulations and the overall effect usually become obvious after a certain period. Finally, the result of the mediation analysis found that the mediating effect (M) of tax revenue is partial on corruption and economic growth."

This research study examines the nexus between growth, taxation, and corruption. Previous studies have shown the positive or negative relationship between taxes and growth. Our contributions are as follows. In this study, we have checked the short-run and long-run relation between the variables as we know that corruption indirectly effects economic growth instead of directly. So, in this study we also check the mediation effect of tax revenue on economic growth by following the Barron and Kenny steps of mediation analysis. Furthermore, several specifications using the Panel ARDL (PMG) model will help to make it possible to conclude that in the most corrupt countries there is a higher impact

of taxation on growth. Our theoretical model also suggests that the existence of a beneficial effect of corruption in terms of economic growth. We have extended these investigations by integrating corruption in implementing the empirical work to the principal-agent theory; the theory can help us determine how corruption evolves. In conclusion, the "Principal-Agent theory "is not deciding the outcome of corruption but only explaining how and where corruption feeds. This gives a better understanding of how to combat corruption."

Recommendations

There is no research study without limitations as it is incapable of handling and covering all and everything, so this research study has some limitations as well. This study analysis is based only on perspective of the 35 OECD countries, and the implementations of these results are only for these countries. This analysis may have not be applicable and generalized to other countries e.g., in developing countries which are not the subject of the current study. These analyses are based on the period from 1996 to 2021 to identify the nexus among the eight variables. We have considered economic growth (GDP per capita (constant 2010 US$)), corruption (Control of Corruption: Estimate) and tax revenue (% of GDP) but other measurements of economic growth, corruption and tax revenue can be used for further research. Here, from the perspective of future implications, there are very clear directions to make this study wider at the world level to investigate the effects of corruption on economic growth by using different variables; because corruption can't directly affect economic growth, its effects indirectly.

The present study recommends that it can be observed that tax revenue is the major determinant of economic growth and have a positive and significant impact on GDP per capita in selected OECD (Organization for Economic Cooperation and Development) countries. The economic growth of selected OECD countries strongly depends on tax revenues that are badly affected by corruption the government should make special policies to control it. The state should also make good policies to enhance tax revenues that are considered backbone for the developed and developing economies and particularly for these selected OECD countries. The state should find the root cause of these low tax revenues and then it will be easy to recommend new policies, budget allocation, and resource management as well. So that this region becomes a safe and sound place for home and foreign investors, and they can invest with full confidence and satisfaction.

Furthermore, under the light of the evidence of this research study the recommendations that we can be extended this study by looking at the individual component of the tax structure and its relationship with corruption and economic growth. We can also check the nexus between corruption, tax revenue, political stability, governance, and economic growth in developing countries. Future analyses might help evaluate how well the tax revenue performs in terms of economic activities development.

The analysis highlights that revenue performance depends on the level of development of the country, its institutional and governance quality and macroeconomic policy and political will for reforms. This analysis can be considered complimentary providing a broader picture of revenue performance but a detailed analysis of a country's revenue system that takes account of the country's overall fiscal policy, public expenditures needs and the overall level of development in the Asian region is needed for future research. The results imply that the architect of revenue reforms must be country-specific that requires a broad investigation of the country's revenue capacity, revenue performance, and institutional structure."

References

Ahmad, S., Sial, M. H., & Ahmad, N. (2016). Taxes and Economic Growth: an Empirical Analysis of Pakistan. *European Journal of Business and Social Sciences,* 5(2), 16-29.

Aidt, Toke S. (2003). Economic analysis of corruption: A survey. *The economic journal*, 113 (November).

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

Ajide, K. B. (2014). Quality of governance and stock market performance: the Nigerian experience. *Journal of Economics and Development Studies,* 2(2), 501-522.

Alm, J., Bahl, R., & Murray, M. N. (1991). Tax base erosion in developing countries. *Economic Development and Cultural Change,* 39(4), 849-872.

Amundsen, I. (1999). Political corruption: An introduction to the issues: Chr. Michelsen Institute. *Journal of Economic Literature*, 36, 77–114.

Arnold, Jens M. (2008), Do Tax Structures Affect Aggregate Economic Growth? Empirical Evidence from A Panel of OECD Countries, Organisation for Economic Co-operation and Development, *Working Paper*, No: 2008(51), October

Asongu, S. A. (2012). Government quality determinants of stock market performance in African countries. Journal of African Business, 13(3), 183-199

Bird, R. (1990). Expenditures, administration and tax reform in developing countries. *Bulletin for International Tax Documentation*, 44, 263-267.

Braguinsky, S., (1996), "Corruption and Shumpeterian Growth in different economic environments", *Contemporary Economic policy*, 14, 14-25.

Brandt Hjertstedt, A., & Cetina, H. (2016). Why does corruption have different effects on economic growth?:–A case study of Sub-Saharan Africa and Southeast Asia. *Linköpings universitet | Institutionen för ekonomisk och industriell utveckling Kandidatuppsats*

Breitung, J. (2001). Rank tests for nonlinear cointegration. *Journal of Business & Economic Statistics,* 19(3), 331-340.

Canicio, D., & Zachary, T. (2014). Causal relationship between government tax revenue growth and economic growth: a case of Zimbabwe (1980-2012). *Journal of Economic Literature*, 36, 77–114.

Canning, D., & Pedroni, P. (2008). Infrastructure, long-run economic growth and causality tests for cointegrated panels. *The Manchester School*, 76(5), 504-527. doi.org/10.1111/j.1467-9957.2008.01073.x

Chmura Kraemer, H., Kiernan, M., Essex, M., & Kupfer, D. J. (2008). How and why criteria defining moderators and mediators differ between the Baron & Kenny and MacArthur approaches. *Health Psychology*, 27(2S), S101.

Friedman, M. (1937). The use of ranks to avoid the assumption of normality implicit in the analysis of variance. *Journal of the American statistical association*, 32(200), 675-701.

Gire, J. T. (1999). A psychological analysis of corruption in Nigeria. *Journal of Sustainable Development in Africa*, 1(2), 1-15.

Graziano, L., (1980), "Clientelismo e Sistema Politico", II Caso dell Italia, F. Angeli, Milan.

Hadri, K. (2000). Testing for stationarity in heterogeneous panel data. *The Econometrics Journal,* 3(2), 148-161.

Heitger, B. (2001). The scope of government and its impact on economic growth in OECD countries (No. 1034). *Kiel Working Paper.*

Huntington, S. (2002), "Modernization and Corruption, in Political Corruption: Concepts and Contexts", (Eds) A. *Heidenheimer and M. Johnston, Transaction, New Brunswick,* NJ, pp. 253-63.

Imam, P. A., & Jacobs, D. (2014). Effect of corruption on tax revenues in the Middle East. Review of Middle East Economics and Finance Rev. *Middle East Econ.* Fin., 10(1), 1-24.

Kaufmann, D., & Wei S.-J. (1999). Does 'grease money' speed up the wheels of commerce? *NBER Working Paper No.* 7093

Kaufmann, D. and Wei, S. J., (2000), "Does 'grease money' speed up the wheels on commerce? "International Monetary Fund Working Paper No. WP/00/64, *International Monetary Fund. Washington, DC.*

Koch, S.F., Schoeman, N. J., and Tonder, J.J.V. (2005). Economic Growth and the Structure of Taxes in South Africa: 1960-2002. *South African Journal of Economics*, 73(2), 190-210

Kolstad, I., & Wiig, A. (2011). Does democracy reduce corruption? *CMI Working Paper.*

Krugman, P. (1992). Toward a counter-counterrevolution in development theory. *The World Bank Economic Review*, 6(suppl_1), 15-38.

Levin, A., C.F. Lin and C-S.J. Chu (2002). Unit Root Tests in Panel Data: Asymptotic and Finite Sample Properties. *Journal of Econometrics* 108 (1), 1–24.

Lui, F., (1985), "An equilibrium Queuing model of bribery", *Journal of Political Economy*, 93, 760-81.

Maddala, G.S. and S. Wu (1999). A Comparative Study of Unit Root Tests with Panel Data and a Simple New Test. *Oxford Bulletin of Economics and Statistics* 61, 631–652.

Mauro, P. (1995). Corruption and growth. *Quarterly Journal of Economics*, Vol.110, No 3, pp. 681–712.

Mauro, P. (1997). Why worry about corruption? (Vol. 6). *International Monetary Fund.*

Mauro, p. (2002) " The Persistence of Corruption and Slow Economic Growth*". International Monetary Fund Working Paper,* wp/02/213.

Matthew, E. T. (2016). Institutional Quality and Stock Market Development in Nigeria-An Application of the Ardl Approach (Doctoral dissertation). *Journal of Applied Econometrics,* 16, 289-326.

Pagano, M., & Lombardo, D. (1999). Legal Determinants of the Return on Equity. *Centre for Economic Policy Research Discussion Paper,* 2275, 64

Pesaran, M. H. and Pesaran, B. (1997) Working with Microfit 4.0: *Interactive Econometric Analysis, Oxford University Press, Oxford.*

Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). Pooled mean group estimation of dynamic heterogeneous pan-els. *Journal of the American Statistical Association*, 94(446), 621–634.

Pesaran, M.H, Shin, Y. and Smith, R. (2001) Bounds Testing Approaches to the Analysis of Level Relationships, *Journal of Applied Econometrics*, 16, 289-326.

Pesaran, M. H. (2004). General diagnostic tests for cross section dependence in panels general diagnostic tests for cross section dependence in panels. *SSRN Electronic Journal*. https ://doi.org/10.17863 /CAM.5113.

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. https ://doi.org/10.1002/jae.951.

Richupan, S. (1984). Measuring tax evasion. *Finance and Development; Washington*, D.C., 21(4), 38.

Rose-Ackerman, S. (1997). The political economy of corruption. *Corruption and the global economy,* 31(60), 54.

Taha, R., Nanthakumar, L., & Colombage, S. R. (2011). The Effect of Economic Growth on Taxation Revenue: The Case of a Newly Industrialized Country. *International Review of Business Research Papers,* 7(1), 319-329.

Takumah, W. (2014). Tax Revenue and Economic Growth in Ghana: A Cointegration Approach. *Munich Personal RePEc Archive.*

Tanzi, V. (1987) Quantitative Characteristics of the Tax System of Developing Countries. In Newbery and Stern (eds.) The Theory of Taxation for Developing Countries. New York: *Oxford University Press.*

Tanzi, V., & Davoodi, H. (1998). Corruption, public investment, and growth the welfare state, public investment, and growth (pp. 41-60): *Springer*.

Tanzi, Vito, 1998, "Corruption Around the World: Causes, Consequences, Scope, and Cures," *Working Paper No. 63 (Washington, DC: International Monetary Fund).*

Transparency International (2010) Global corruption report: Corruption in developed countries, *Cambridge University Press*. https://www.businessinsider.com/the-most-corrupt-countries-in-the-oecd-2016-6