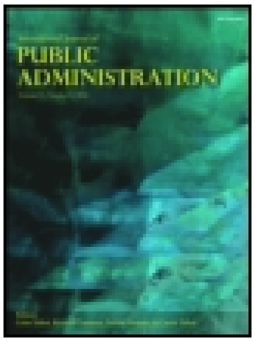

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A Cross-Country Comparison of Corruption and Public Expenditures: A Panel Data Approach

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Corruption is an especially serious problem for all countries, and has damaging effects on sustainable economic growth. Although there is a significant relationship between corruption and public expenditures, the degree and way of this relationship is changed according to countries. The main objective of this article is to analyze the relationship between corruption and the level and composition of public expenditures, using data from 21 countries which are classified as countries in above and below average corruption perception indices. In empirical analysis, panel data were used in modeling of the effects of corruption on public expenditures. The empirical results show the findings support the hypothesis that the composition of public expenditures has an important element on corruption for countries.

Keywords: corruption, public expenditures, panel data

INTRODUCTION

Corruption is a complex social, political, and economic phenomenon that affects all countries to varying degrees. The issue of corruption has grown considerably in importance in recent years. For this reason, combating corruption is an urgent issue. Although theoretical and empirical studies on corruption have a long history in economics, since the 1990s corruption has become an especially prominent focus of economic research. Although some economists argue that corruption may promote economic development, corruption can become a major obstacle to social-economic development. Where corruption is rife, economic development is not possible. But, it can be seen in some exceptions like some Asian countries.

There is a relationship of causality between corruption and public expenditures. The causes of corruption are based on a lot of factors. The main factors that determine the extent of corruption include the monopoly power of a state, the discretionary powers of a state, accountability and transparency. Especially the lack of transparency and accountability in public expenditures can make corruption easy for government agencies. Public expenditures are an essential indicator of government size.

In some countries, the amount of public expenditures is the main element that determines the degree of corruption. The impacts of public expenditures on corruption may change depending on the level and composition of public expenditures because certain types of public expenditures provide more opportunities to bribe government officials.

In this study, public investment (fixed capital) expenditures and public consumption expenditures were used to represent the kinds of public expenditures. The relationship between public expenditures and corruption has been investigated in academic studies, but in this area, there is no consensus among studies. different from these others, this study focuses on the effects of the composition of public expenditures on corruption from the point view of countries which have different level of corruption.

This article is composed of five sections. Section 1 is the introduction. Section 2 presents a brief explanation of the concept of corruption. In addition, this section presents the impact of corruption on economic growth, in order to understand why corruption is a serious problem for countries. Section 3 explains the relationship between corruption and public expenditures. Section 4 presents the case of corruption and public expenditures in countries. Section 5 presents

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empirical analysis that incorporates a panel data approach. The panel data approach was used to analyze the relationship between corruption and public expenditures. Data and variables are described and model tests and estimation results are presented. Section 6 concludes.

CORRUPTION

Corruption is not a new issue, but corruption is attracting more attention now than in the past. In particular, since the 1990s, corruption has attracted a great deal of attention (Tanzi, 1998). The reasons for this are summarized below:

- The Cold War has ended. During the Cold War, there was a tendency to ignore corruption in certain countries.
- Due to the increase in the number of countries with democratic governments, corruption is not a taboo subject.
- Globalization has contributed to the international attention paid to corruption. Specifically, countries with high levels of corruption have been incorporated into competitive global markets.
- Nongovernmental organizations like Transparency International and empirical studies have devoted increased attention to corruption. A suitable environment has been created for anti-corruption movements. Individuals, policy-makers, and organizations have been increasingly confronting corruption.
- In addition to governmental organizations, the individual citizen's opinion about some institutions in the private sector has deteriorated over time.

Corruption is defined from frameworks that vary widely in literature. Corruption can be defined as the abuse of public power to promote private benefits. Although this definition only covers the public sector, it is the most popular and simplest definition, and it is used by the World Bank (World Bank, 2000). The grandest example of corruption is state capture. Classic examples are President Mobutu Sese Seko's kleptocracy in Zaire and Slobodan Milosovic's Serbia (Bray, 2007).

Corruption may stem from illegal acts or constitute departures from ethical standards without violating the law. Corruption is not only limited to individual benefits. It also includes political parties, social groups, and the family and friends of the individual. Fundamentally, corruption is based on relationships of complicity (Carvajal, 1999). For this reason, corruption is such a complex subject that it cannot be explained by a single cause.

In addition corruption is a comprehensive concept because corruption is not only a social pathology, but also an economic and political problem. Corruption includes activities that abuse public positions for personal use. In other words, corruption is related to legal issues (rule of law, independence of judiciary), economic issues (trade policy, and privatization), bureaucratic issues, cumbersome and dilatory administrative procedures (government rules and pay structures), transnational factors, civil liberties, press freedoms, and electoral processes. In practice, the international discussion has focused on bribery (Bray, 2007). Although bribery is the most popular kind of corruption, it is not the only kind of corruption.

Corruption can occur in other ways, such as patronage, nepotism, the theft of state assets, or the diversion of state resources (Obayelu, 2007).

Acts of corruption can be classified in different ways:

1. Bureaucratic or political, and
2. Economic and financial.

From this perspective, combating corruption must not only depend on limited policies.

Three main factors determine the extent of corruption: the monopoly power of state, the discretionary power of the state, accountability and transparency. Accountability is a function of transparency. The importance of these factors may change according to countries or transactions. Monopoly power can be larger in regulated economies. Discretionary power is often large in developing countries and transition economies. Transparency may be weaker in weak administrative and financial systems, and during periods of political instability (Dye & Stapenhurst, 1998). Corruption is present in both developed and developing countries. However, corruption is most widespread in low-income countries.

The public's view on corruption is different across countries. For example, political parties are considered to be corrupt by more than four in five respondents in Argentina, Bosnia and Herzegovina, Bulgaria, Bolivia, Cameroon, India, Japan, Panama, and Nigeria — but by fewer than two in five in Denmark, The Netherlands, Norway, Sweden, Switzerland, and Singapore (Transparency International, 2007). Also, the degree of corruption can vary across different industries as well. Certain industries, such as construction and the oil, gas, and mining sectors, have created the most opportunities for corruption (Bray, 2007).

There are some economists who argue that corruption may promote economic development (Leff, 1964; Khan, 1996). According to this argument, corruption arguably helps grease the wheels of a slow-moving, low-wages and over-regulated economy. However, the evidence demonstrates that corruption increases the cost of goods and services, promotes unproductive investment, leads to a decline in the quality of public goods, fails to remove red tape, feeds inequality and injustice, and reduces public revenue (Dye & Stapenhurst, 1998). Corruption is transfer of welfare from corruptor to the corrupted. This transfer represents deriving some advantage from corruption resulting in the non-compliance with the arm's-length principle (Tanzi, 1995). In addition, corruption is one of the most important obstacles to doing business in different countries. Corruption leads to shifts in the international investor's decisions and expectations (Lambsdorff, 2005).

As a result, corruption is likely to reduce economic growth. Due to the fact corruption is an important obstacle to socio-economic development, countries with higher perceptions of corruption have lower real per capita GDP. Many studies suggest that corruption has a negative impact on the rate of economic growth (Mauro, 1998; Carvajal, 1999; Tanzi & Davoodi, 2000). Within this analytical framework, corruption can be seen as a type of tax (Mauro, 1997).

Although individuals with high-incomes often benefit from corruption, the poorest individuals in all societies face the highest demand for bribery. Therefore, corruption diverts resources from the poor to the rich. This means that corruption plays a role as a regressive tax that increases income inequality (Transparency International, 2007). As a result, due to corruption, distribution of income becomes more skewed.

Various factors cause corruption in countries. Some of these factors have direct impacts and others indirect.[1] One the of factors that direct impacts have is public expenditures. Other factors with direct impacts include judicial arrangements and authorizations, the taxation structure, administrative problems, discretionary decisions, political party financing, electoral processes, and decentralization. Consequently, it can be said that corruption is affected by the public finance policy followed in a country (Schleifer & Vishny, 1993).

CORRUPTION AND PUBLIC EXPENDITURES

Governments undertake expenditures to performance a variety of goals, only one of which is economic growth. The role of public expenditures in economic growth is an important issue for governments. There are many studies in this area of research (Barro, 1991; 1996; Mo, 2007; Devarajan, Swaroop, & Zou, 1996). Both public expenditures and corruption affect economic growth. A good public expenditure policy is an essential part of a successful national economic and social policy. For this reason, guaranteeing the effectiveness of public expenditures is crucial for each country.

Governments undertake many different kinds of expenditures. Investment spending, in terms of fixed capital expenditures and consumption expenditures, is considered to be the main public expenditure that directly affects economic growth. For the last two decades, public expenditures analyses have gained tremendous attention due to unsatisfactory performances of public sectors in many countries, especially in developing countries.

Performance of public expenditures depends on many factors one of which is corruption. Government activities can be categorized as regulation, entrepreneurship, or consumption. Governments realize these activities through public expenditures. Corruption is the main obstacle to good decision-making concerning public expenditures. Because some expenditures like investment expenditures have highly political discretion, this case lays the grand for corruption (Hillman, 2004).

So corruption can be seen as a method of state capture. State capture means the creation of a legislative regulatory framework favourable to the interests of particular economic firms (Hellman et al., 2001; Grey et al., 2004). Due to corruption, the government may tend to choose projects that, to a lesser extent, advance the public welfare.

The strong possibility of corruption creates distortion in the composition of public expenditures. In particular, the government tends to prefer large projects that are difficult to monitor (Mauro, 1997). Furthermore, corruption appears to be most prevalent in public procurement and contracting. According to Goorha, under the Pigovian theory of government, corruption is a by-product of government intervention (Goorha, 2000).

There are many studies on the relationship between public expenditures and corruption. In these studies, different results have been found. Some studies have found a relationship between public expenditures and corruption (Lapalombara, 1994; Goel & Nelson, 1998; Treisman, 2004). Other studies have found that corruption is inversely related to education spending (Mauro, 1998), but positively correlated with public investment and military spending (Tanzi & Davoodi, 1997; Gupta, de Molle, and Sharan, 2001). Paolo Mauro showed that corruption has a negative impact on investment. Studies have also found that the more corruption is reduced, the more investment increases (Mauro, 1997, 1998).

Still, other research by Hopkin and Rodriguez-Pose has found that high levels of public expenditures are strongly associated with low levels of corruption. Hopkins and Rodrigez-Pose's analysis is based on distinguishing the roles of the government as regulator, entrepreneur, and consumer. Additionally, this analysis showed the strong and positive relationship between the regulatory role of government and the existence of corruption (Hopkin & Rodriguez-Pose, 2007). The results of R.K. Goel and M.A. Nelson's study showed that public expenditures (or government size) had have a strong positive influence on corruption (Goel & Nelson, 1996). In Hillman's 2004 study, corruption was shown to be the cause of ineffective social policies backed by public expenditures (Hillman, 2004). The effects of public expenditures on corruption change according to the types of public expenditures.

CORRUPTION AND PUBLIC INVESTMENT EXPENDITURES

Most studies show a positive connection between investment expenditures and economic growth. Economists typically

[1] Indirect factor can include red-tape, wage level, punishment system, audit, lack of transparency and cultural factors and so on.

favor investment expenditures. According to the World Bank (2000), public capital expenditures provide the “wells” of economic activity. In the traditional view, public expenditures financed by taxes or debt create crowding-out effects. Barro (1990) divides tax-financed public expenditures into consumption expenditures (unproductive expenditures) and investment expenditures (productive expenditures). Public expenditures prompt private investment increase growth. The increase in wealth exceeds the negative effect of higher taxes on growth. Additionally, if resources in the economy are underemployed, public investment expenditures can increase private investment. In this case, the crowding-out effects of public expenditures are not seen (Ahmed & Miller, 2004).

While public investment expenditures have a positive impact on growth, corruption negatively affects growth. In this sense, the relationship between corruption and investment expenditures is very important. Investment projects create opportunities for corruption. Because of state discretionary power, investment decisions do not depend on objective criteria, such as cost-benefit analysis (Tanzi, 1998).

Corruption in public investment expenditures area causes different results:

1. due to corruption, the level of total public investment expenditures can be changed,
2. the productivity of public investment and,
3. investments shift away from investments that are important for development, such as education and health, to investments that are more profitable for individual parties and also investments that provide more opportunities for rent-seeking.

Especially, if corruption reduces public investment and/or distortions in the composition of public investment, economic growth will be affected. For example, Devarajan et.al showed that the relationship between the public investment expenditures and per-capita growth is negative in their analysis which involved data from 43 developing countries. Consequently, productive expenditures, when used in excess, could become unproductive. This result creates especially developing countries governments have been misallocating public expenditures in favour of public investment expenditures of the expense of consumption expenditures (Devarajan, Swaroop, & Zou, 1996).

Based on the discussion above, in literature, there are many studies connecting to relationship between public investment and corruption. According to Mauro, an improvement in the corruption index seems to be associated with an increase in current expenditures as a ratio of GDP and with a decrease in capital expenditures (Mauro, 1997). In another study, Mauro showed that a two-point reduction in the level of corruption due to positive effects from investment could increase the growth rate by about 0.5 percent (Mauro, 1998). According to Tanzi and Davoodi, although higher corruption increases public investment, it reduces the productivity of public investment (Tanzi & Davoodi, 1997). According to Hillman, the hypothesis that, on average, high corruption is associated with high public investment is not rejected (Hillman, 2004).

CORRUPTION AND PUBLIC CONSUMPTION EXPENDITURES

Consumption expenditures deal with the purchase of governmental goods and services. Consumption expenditures, in contrast to investment expenditures, have negative effects on growth. Barro supported this proposition in his research. Barro found that public consumption expenditures negatively and significantly affected real per capita GDP growth (Barro, 1991). Recently, Pack Hung Mo (2007) found that all public expenditures, except for investment expenditures, have negative marginal effects on productivity and GDP growth. According to this empirical finding, a one percentage point increase in public investment expenditures causes a 0.167 percentage point increase in growth rates.

Consumption expenditures cause corruption, too. Goods and services are purchased at above market prices. Complex and costly procedures and a lack of transparency create a fertile ground for corruption.

When we compare consumption expenditures with investment expenditures from view of corruption, investment expenditures can lead more corruption than consumption expenditures. Investment expenditures are highly politically discretionary, whereas consumption expenditures are less discretionary. Governments may choose projects that have corruption capacity. But consumption expenditures are inflexible, Political and bureaucratic decisions makers can not find opportunities for corruption (Hillman, 2004).

ANALYSIS OF CORRUPTION AND PUBLIC EXPENDITURES IN COUNTRIES

In this section, we consider explaining the situation of corruption and public expenditures in countries.

Extent of Corruption

To evaluate corruption from point view of various countries, some indicators, such as the corruption perception index, control of corruption, the global competitiveness index, and the percentage of firms identifying corruption as a major constraint are utilized.

Table 1 depicts the global competitiveness index from the World Economic Forum’s Global Competitiveness Report for 2007–08. The countries which have high level of corruptions have relatively weak competition power. For example, Turkey, a high level country, was ranked 53rd among 130 countries. While Turkey had 61.52% of firms expecting to

TABLE 1
Global Competitiveness Index 2007–2008

Country/economy	*Rank*	*Score*
United States	1	5.67
Sweden	4	5.54
Finland	6	5.49
Singapore	7	5.45
Netherlands	10	5.4
Canada	13	5.34
New Zealand	24	4.98
Chile	26	4.77
Spain	29	4.66
South Africa	44	4.42
Italy	46	4.36
Hungary	47	4.35
Poland	51	4.28
Mexico	52	4.26
Turkey	53	4.25
Indonesia	54	4.24
Russian Federation	58	4.19
Colombia	69	4.04
Philippines	71	3.99
Brazil	72	3.99

Source: The World Economic Forum. The Global Competitiveness Report 2007–2008, Retrieved May 12, 2009, from http://www.gcr.wefo-rum.org/http.

pay some form of informal payment to public officials compared to other economies in 2002, this percentage dropped to 45.69% in 2005 (Enterprise Surveys, 2008). Thus, corruption diminished Turkey's international prestige in trade.

Over the years, Turkey has continued to perform poorly in terms of corruption control. As can be seen from Figure 1, the rate of control of corruption saw a dramatic reduction from 2001 to 2002. The main reason for this reduction was an economic crisis in 2001.

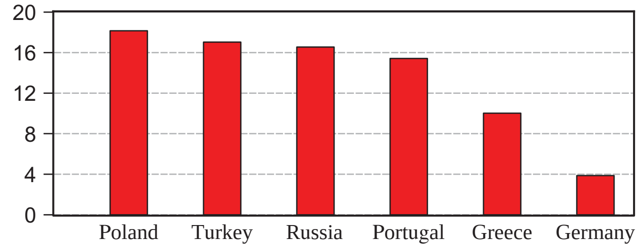

FIGURE 2 Percentages of firms identifying corruption as a major constraint in 2005.

Source: Enterprise Surveys 2008. Retrieved May 12, 2009, from, http://www.enterprisessurveys.org/ExploreEconomies/?economyid=121&year=2005.

Regarding this framework, corruption can be considered as an additional tax on investment by lowering the potential return for an investor on his/her initial investment.

Figure 2 depicts the percentage of firms that identify corruption as a major constraint. Corruption is considered by entrepreneurs as a major issue in countries with the high level of corruption.

Table 2 shows the percentage of respondents who report that they paid a bribe to obtain a service. Developing countries are among the countries that are most affected by bribery. The main causes of corruption in these countries include low wages, poor working conditions, red tape, slow budget processes, lack of transparency, and weak monitoring mechanisms.

According to Transparency International Global Corruption Barometer Report 2007, high corruption level will continue in the future (Table 3). Because the society

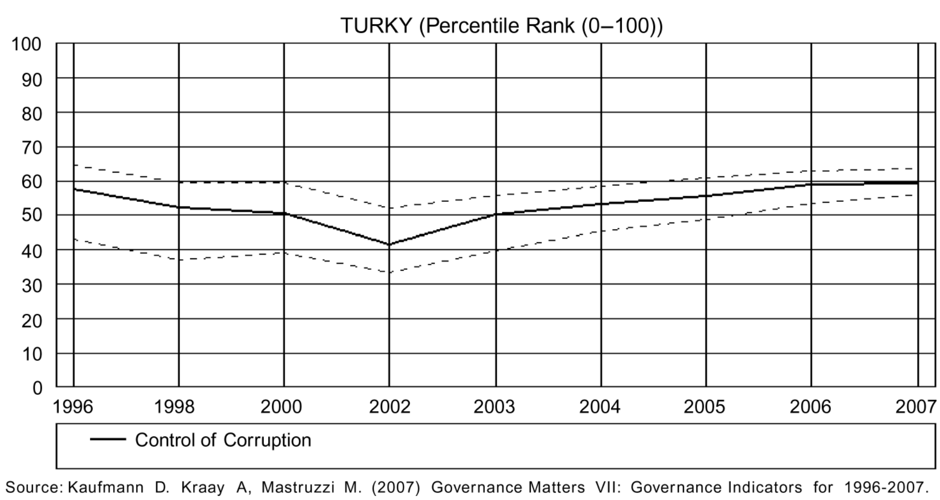

FIGURE 1 Control of corruption in Turkey.

Source: Kaufmann D., Kraay A., & Mastruzzi M. (2007). Governance Matters VII: Governance Indicators for 1996–2007. Retrieved June 8, 2009, from http://info.worldbank.org/governance/wgi2007/sc_chart.asp.

TABLE 2
Countries Most Affected by Bribery (%)

Quintile	*Countries/territories*
Top quintile: More than 32%	Albania, Cambodia, Cameroon, Macedonia, Kosovo, Nigeria, Pakistan, Philippines, Romania, Senegal
Second quintile: 18–32%	Bolivia, Dominican Republic, Greece, India, Indonesia, Lithuania, Moldova, Peru, Serbia, Ukraine
Third quintile: 6–18%	Bulgaria, Croatia, Czech Republic, Luxembourg, Malaysia, Panama, Russia, Turkey, Venezuela, Vietnam
Fourth quintile: 2–6%	Argentina, Bosnia-Herzegovina, Finland, Hong Kong, Ireland, Portugal, South Africa, Spain, United Kingdom, United States
Bottom quintile: Less than 2%	Austria, Canada, Denmark, France, Iceland, Japan, South Korea, Netherlands, Sweden, Switzerland

Source: Transparency International, Transparency International Global Corruption Barometer 2007.

TABLE 3
Views of Corruption in the Future

	Percentage of respondents who think that in the next three years corruption will		
Country/territory	*Decrease*	*Increase*	*Stay the same*
Africa	58%	9%	3%
Asia Pacific	15%	21%	64%
EU	18%	24%	58%
Latin America	23%	25%	52%
North America	7%	36%	58%
South East Europe	26%	30%	44%
Turkey	24%	30%	46%

Source: Transparency International, Transparency International Global Corruption Barometer 2007.

TABLE 4
Respondents' Evaluation of Their Government's Efforts to Fight Corruption

	Percentage of respondents who think their governments efforts to fight corruption are		
Country/territory	*Effective*	*Ineffective*	*Neither effective nor ineffective*
Africa	62%	11%	27%
Asia Pacific	24%	14%	62%
EU	28%	12%	60%
Latin America	29%	17%	54%
North America	19%	27%	54%
South East Europe	44%	15%	41%
Turkey	49%	14%	37%

Source: Transparency International, Transparency International Global Corruption Barometer 2007.

believes that the efforts of government to fight corruption is ineffective (Table 4).

Public Expenditures

While Turkey is among the countries with high levels of corruption, Finland is among the countries with low levels of corruption. We chose Turkey and Finland to compare the level of public expenditures in Figure 3. From 1996 to 2006, although Turkey's public investment expenditures rate diminished for short time, it has still been relatively higher than Finland's.

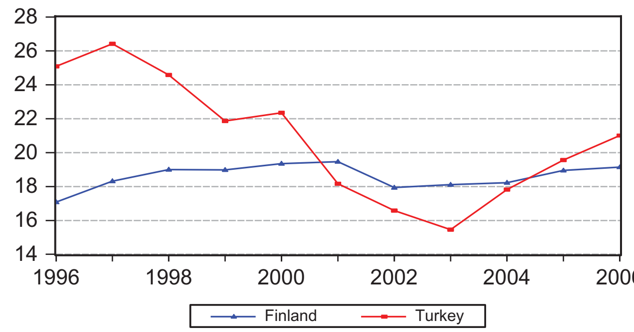

FIGURE 3 Public investment expenditures (PIE) for Turkey and Finland during 1996–2006 (%).

Source: International Monetary Fund's Government Finance Statistics, 1995, 2007.

The trend in public consumption expenditures from 1996 to 2006 is shown in Figure 4. In contrast to public investment expenditures, public consumption expenditures in Turkey have been lower than Finland's (see Figure 4). The main reason of decline in consumption expenditures is budget constraints in Turkey.

The following section discusses empirical evidence of the relationship between corruption and public expenditures.

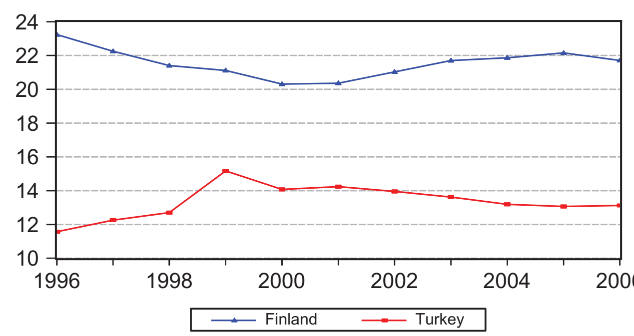

FIGURE 4 Public consumption expenditures (PCE) for Turkey and Finland during 1996–2006 (%).

Source: International Monetary Fund's Government Finance Statistics, 1995, 2007.

We try to prove the hypothesis that the composition of public expenditures is an important factor in reducing corruption in countries, because corruption affects different countries' public expenditures differently.

A PANEL DATA APPROACH

Description of Data

There is no direct measurement of corruption available because most of it is clandestine. A general idea of the level of the corruption can be obtained from: reports published by various sources: studies performed by government institutions and questionnaire-based surveys. The results obtained from the surveys are widely used in research. These surveys measure perceptions of corruption.

The following is a summary of the data used in this empirical analysis:

1. Corruption perception indices (CPI) were taken from Transparency International. The indices are annual and are based on a scale from 1 (worst, most corrupt) to 10 (best, least corrupt).
2. Total public expenditures, public investment (fixed capital) expenditures, public consumption expenditures, and per capita GDP were taken from the International Monetary Fund's Government Finance Statistics (GFS)(). The data are observed annually (1995, 2006, 2007).

In this study, we found the average score of the corruption perception index for OECD countries. According to the average corruption perception index, 21 countries which have the same data were taken, because we saw that there were not standard data for all countries. Consequently, the data were analyzed based on 21 countries during from 1996 to 2006.

The dependent variable used in the study is the corruption perception index. The explanatory variables are total public expenditures (TEX), public consumption expenditures (PCE), public investment expenditures (PIE), and per capita gross domestic product (PGDP).

We found that the average score of the corruption perception index was 5.9 during 1996–2006. According to the average corruption perception index, 21 countries were classified. The corruption perception indices of 13 countries were below 5.9, and the corruption perception indices of 8 countries were above the average. These countries are presented in Table 5.

TABLE 5
Countries According to the Average of the Corruption Perception Index

Countries above average	*Countries under average*
Canada	Bolivia
Chile	Brazil
Finland	Colombia
Netherlands	Hungary
New Zealand	Indonesia
Singapore	Italy
Sweden	Mexico
USA	Philippines
	Poland
	Russia
	South Africa
	Spain
	Turkey

Source: Transparency International Index. Retrieved April 3, 2009, from http://www.tranparency.org/news_room/in_focus/2009gcr2008.

Methodology

We used panel data approach in this analysis. Panel data are defined as the same cross-section data that are observed over time (Gujarati, 2003). Due to the fact that panel data consist of two dimensions as cross-section and time period. In empirical studies nowadays, the researchers have preferred in-panel data analysis more than time series and cross-section analyses. The availability of the data in both dimensions gives the researcher a large number of data points, increasing the degrees of freedom and reducing the collinearity among explanatory variables — hence improving the efficiency of econometric estimates (Hsiao, 2003). In addition, panel data models take into account the individual differences between cross-sections and time differences between periods, or both, by introducing the dummies into the model specification.

The Ordinary Least Squares (OLS) model, the Fixed Effects (FE) models and Random Effects (RE) models are the focus point in panel data approach. The FE model can be appropriate specification if we are focusing on a specific set of N (Baltagi, 2005). The focus of this study will be on a set of N. Therefore, here we are going to explain FE model specifications and OLS model.

In the OLS model, all the coefficients are assumed to be common. One-Way or Two-Way regression models can characterize FE model. In spite of this the One-Way model connotes the model coefficients can vary in only one dimension, the cross-section dimension or the time dimension, the Two-Way model connotes the model coefficients can vary in both dimensions. The main panel data model can be show as follows:

$$y_{it} = \alpha_{it} + X_{it}\beta + \varepsilon_{it} \quad \begin{array}{l} i = 1,....,N \\ t = 1,....,T \end{array} \tag{1}$$

Where i denotes the individuals, firms, countries, etc., and t denotes time-series dimension. α_{it} is a scalar and can be change by individual and/or time dimensions. β is $K \times 1$ vector and X_{it} is the K observation on F explanatory variables. Eq. (1) can be tested by F-tests for determine appropriate model. If the calculated F statistics is higher than F table statistics in the related significance level, the null hypothesis is rejected. This means that the individual effects and/or time effects are important and they had to be involved in the model specification.

The standard Two-Way or One-Way models are valid under econometric assumptions such as cross-sectional dependence, serial correlations, and group wise heteroscedasticity. If these assumptions are not valid, estimated coefficients by standard FE are not efficient. Besides, the estimated standard errors will be biased. Therefore, these econometric assumptions must be tested.

Cross-Sectional Dependence

A growing body of the panel data literature comes to the conclusion that panel data sets are likely to exhibit substantial cross-sectional dependence, which may arise due to the presence of common shocks and unobserved components that become part of the error term ultimately, spatial dependence, as well as due to idiosyncratic pair-wise dependence in the disturbances with no particular pattern of common components or spatial dependence (Hoyos & Sarafidis, 2006). If cross-sectional dependence assumption is not valid, standard FE estimators will be consistent, but not efficient, and the estimated standard errors are biased. Therefore, the above indicates that testing for cross-sectional dependence is important in estimating panel data models.

When the time dimension (T) of the panel is larger than the cross-sectional dimension (N), one may use for these purposes the LM test, developed by Breusch and Pagan (1980). On the other hand, when T < N, the LM test statistic does not enjoy any desirable statistical properties in that it exhibits substantial size distortions. Three statistical procedures designed to test for cross-sectional dependence in large-N small-T panels namely, Pesaran's (2004) test, Friedman's (1937) statistic and the test statistic proposed by Frees (1995).

The basic Pesaran (2004) test statistics can be show as follows.

$$CD = \sqrt{\frac{2T}{N(N-1)}}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{\rho}_{ij}\right) \tag{2}$$

Where $\hat{\rho}_{ij}$ are correlations coefficients, which are calculated from residuals. The distribution of Pesaran (2004) test is N (0, 1). Secondly, Friedman (1937) statistic is based on the average Spearman's correlation and is given by

$$R_{AVE} = \frac{2}{N(N-1)}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{r}_{ij}\right) \tag{3}$$

Where $\hat{r}_{ij}$ is the sample estimate of the rank correlation coefficients of the residuals. Friedman showed that test statistics are asymptotically chi-squared distributed. Third, Frees (1995) used a square spearman rank correlation coefficient of Friedman (1937).

$$R_{ORT} = \frac{2}{N(N-1)}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{r}_{ij}^2\right) \tag{4}$$

Free (1995) showed that test statistics are Q distribution. The Q distribution is a (weighted) sum of two chi-squared distributed.

Serial Correlations

As cross-sectional dependence, serial correlations are important assumptions for panel data models. Because serial correlation in linear panel-data models biases the standard errors and causes the results to be less efficient, researchers need to identify serial correlation in the idiosyncratic error term in a panel-data model (Drukker, 2003). For testing serial correlation in FE panel data models, we will use LM and LM tests are described by Baltagi (2005).

LM and LM5 tests can be calculate as follows:

$$LM = \left[NT^2/(T-1)\right](\hat{\nu}'\hat{\nu}'_{-1}/\hat{\nu}'\hat{\nu})^2 \tag{5}$$

$$LM_5 = \sqrt{NT^2/(T-1)}(\hat{\nu}'\hat{\nu}'_{-1}/\hat{\nu}'\hat{\nu})^2 \tag{6}$$

Where LM test statistics have asymptotically chi-squared distributed, but LM5 test statistics are asymptotically N (0, 1) distributed.

Groupwise Heteroscedasticity

The error process may be homoskedastic within cross-sectional units, but its variance may differ across units: a condition known as group-wise heteroskedasticity (Baum, 2001). One way of testing group-wise heteroscedasticity, using modified Wald statistic in the residuals of a fixed-effect regression model (Greene, 2000). His test statistics can be calculated as follows:

$$W = \sum_{i=1}^{N_g}\frac{\left(\hat{\sigma}_i^2 - \hat{\sigma}^2\right)^2}{V_i} \tag{7}$$

Where N_g is the number of cross-sectional units, $\hat{\sigma}_i^2$ is the estimator of the ith cross-sectional unit's error variance, and

V_i is equal to $T_i^{-1}(T_i - 1)\sum_{t=1}^{T_i}\left(e_{it}^2 - \hat{\sigma}_i^2\right)^2$. This text statistics can be calculated as follows:

Getting Consistent Standard Errors: PCSE

After cross-sectional dependence, serial correlations, and heteroscedasticity tests, these problems must be corrected. Beck and Katz (1995) showed that Panel-Corrected Standard Errors (PCSE) can be used for these problems.

Beck and Katz (1995) revised generalized least square (GLS), which was developed Park (1967). The GLS estimators not true under cross-sectional dependence, serial correlations, and heteroscedasticity situations. However, GLS has optimal properties for panel data. While it is assumed that we have knowledge about the error process, in practice, we never have. Thus analysts do not use GLS, but, instead, feasible generalized least squares (FGLS). It is "feasible" because it uses an estimate of the error process, avoiding the GLS assumption that the error process is known. Monte Carlo analysis shows that these PCSE perform well (see Beck & Katz, 1995).

TABLE 6
Estimation Results

	Above average		*Below average*	
	Level	*Mix*	*Level*	*Mix*
Explanatory Variables				
C	8.591*	8.693*	3.826*	3.913*
	(0.117)	(0.132)	(0.041)	(0.074)
TEX	−3.49E-06*		−8.43E-08*	
	(9.85E-07)		(1.56E-08)	
PCE		9.12E-05*		−4.10E-06
		(3.05E-05)		(2.63E-06)
PIE		−9.47E-06		1.75E-06
		(1.03E-05)		(2.66E-06)
PGDP	3.32E-05*	−4.16E-05	1.90E-10	−3.88E-10
	(1.14E-05)	(3.18E-05)	(2.19E-09)	(6.13E-09)
$\bar{R}^2$	0.94	0.94	0.89	0.87

Notes: The dependent variable of the above models is CPI. Standard errors are shown in parentheses.
*denotes that the parameter is significant at the 1 % significance level.
**denotes the parameter is significant at the 5 % level.
***denotes the parameter is significant at the 10 % level.

Estimation Results

This section analyzes further how the components of public expenditures affect corruption. Table 6 denotes the results of the parameter estimation for panel regression.

When the results in Table 6 are assessed, there is a negative and significant relationship between TEX and CPI for countries in above average. That is, when the total public expenditure increases, corruption index decreases. A decreasing corruption index means an increase of corruption. With respect to the composition of public expenditures, in the model, these results are reached:

- When public consumption expenditures increase, the corruption index increases too; that is, corruption diminishes for countries in question. On the contrary, when public investment expenditures increase, corruption will increase, due to diminish corruption index.
- Providing that econometric assumptions are proven, the results of the FE regression model estimated will be valid. For this reason, after panel data regression model for each corruption level estimates, tests for heteroscasticity, serial dependence and especially horizontal cross-dependence are applied. Table 7 denotes the results of these tests.

TABLE 7
Cross-Sectional Dependence, Autocorrelation, and Heteroscedasticity Tests Results

	Cross-sectional dependence			*Autocorrelation*		*Heteroscedasticity*
				Baltagi		
Models	*Friedman*	*Frees*	*Pesaran*	*LM*	*LM5*	*Greene*
Above Average						
Level	23.977*	0.253***	3.409*	18.917*	4.349*	783.74*
Mix	17.273**	0.300*	2.024**	25.112*	5.011*	327.24*
Below Average						
Level	5.580	0.902*	−1.750	43.808*	6.618*	529.80*
Mix	5.678	1.566*	−1.476	39.976*	6.323*	805.28*

*denotes that the parameter is significant at the 1 % significance level.
**denotes the parameter is significant at the 5 % level.
***denotes the parameter is significant at the 10 % level.

When we look at the results of tests in Table 7, it is seen that cross-sectional dependence, autocorrelation, and heteroscedasticity problems exist in the errors of estimated level and composition FE model for countries above average. However, the countries whose corruption indices are below average do not present Cross-Sectional Dependence. Autocorrelation and Heteroscedasticity problems are founded. In this model, these problems present causes the fact that standard FE estimations are consistent, but inefficient and estimated standard errors biased (Baltagi, 2005).

Consequently, applying the results of estimation in the circumstances is not true. The model requires estimation by a new method which can produce consistent standard errors against these problems. Beck and Katz (1995) argued a feasible generalized least squares (FGLS) approach in their studies. Therefore, they suggest a PCSE method that corrects standard errors against these problems. After doing required revisions, according to the model PCSE approach, the consistent effects model is estimated again and the results are presented in Table 8.

As shown in Table 8, for countries in the above average corruption index, a negative relationship between total public expenditure level (TEX) and corruption (CPI) is found. That is, while the total public expenditure increases, corruption index decreases. When public consumption expenditures increase, corruption index increase. As a result corruption declines.

In Table 8, it can be denoted the results of corruption index estimation for countries in below average. The relationship between the composition of public expenditures and corruption shows between countries in below average and countries in above average. However, among classified countries is seen a difference in terms of the relationship between the composition of public expenditures and corruption. When it is investigated the results of the model which includes the composition of public expenditures, it is reached these results: When public consumption expenditures increase, corruption index declines. So, the level of corruption shows increase trend. Contrary to public consumption expenditures, an increase in public investment expenditures induces an upward pressure corruption index, so it will increase corruption.

We would not reach a significant result between per capita GDP and the level and composition of public expenditures.

TABLE 8
Estimation Results

	Above average		*Below average*	
	Level	*Mix*	*Level*	*Mix*
Explanatory Variables				
C	8.787	8.736	3.770*	3.907*
	(0.161)	(0.128)	(0.050)	(0.061)
TEX	−9.00E-07		−9.01E-09	
	(4.99E-07)		(1.20E-08)	
PCE		6.18E-05*		−5.23E-06*
		(2.54E-05)		(1.76E-06)
PIE		−1.48E-05		3.24E-06***
		(9.99E-06)		(1.79E-06)
PGDP	3.43E-06	−2.27E-05	3.70E-09	−1.26E-09
	(1.44E-05)	(1.93E-05)	(2.24E-09)	(5.20E-09)
$\bar{R}^2$	0.96	0.96	0.95	0.96

Notes: The dependent variable of the above models is CPI. Standard errors are shown in parentheses.

*denotes that the parameter is significant at the 1% significance level.

**denotes the parameter is significant at the 5% level.

***denotes the parameter is significant at the 10% level.

CONCLUSION

Corruption is a global problem. This article focuses on to prove the hypothesis that the composition of public expenditures is an important factor in reducing and/or increase corruption in countries with empirical analysis.

This study consists of two essential stages. The first stage involves a comprehensive discussion of the meaning of corruption and the relationship between corruption and public expenditures from an economic growth perspective.

The second stage presents an empirical analysis of the relationship between corruption and public expenditures. There are many academic studies on this subject, which often find conflicting results. The originality of this article is that it shed light on the effects of the composition of public expenditures on corruption from the point of view of countries that have different level of corruption.

The data used in this study are composed of 21 countries with varying degrees of corruption from 1996 to 2006, because 21 countries have same standard data in OECD countries was founded. We will find the average corruption perception index and classify 21 countries as countries in the above and below of the average corruption perception index.

This paper reaches two important empirical results. First, although a significant relationship between corruption and public expenditures exists, it would not be founded a significant relationship between per capita GDP and corruption.

The second main result of this study is that the relationship between the composition of public expenditures and corruption demonstrates differences among classified countries. This difference is seen in both public consumption expenditures and public investment expenditures. There is a negative relationship between total public expenditure level and corruption in both groups of countries. However, for countries in the above average corruption index, when public consumption expenditures increase, the corruption index increases. As a result corruption declines. If public investment expenditures increase, the corruption index decreases. For countries with a below average corruption index, when public consumption expenditures increase, the corruption index declines. So, the level of corruption shows an increasing trend. Contrary to public consumption expenditures, an increase in public investment expenditures induces an upward pressure corruption index, so it will increase corruption.

The empirical results show that the composition of public expenditures has more effects on corruption than the level of public expenditures for all countries. In order to tackle corruption, countries with high levels of corruption, and thus a below average corruption index, must reduce public consumption expenditures and increase public investment expenditures.

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