

Corruption and Government Regulations: An empirical analysis using threshold regressions

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Abstract

The current empirical literature on the determinants of corruption has presumed a linear relationship between corruption and government regulations. This study re-examines this relationship. This re-examination is carried out by testing the presence of threshold effects of government regulations on the level of corruption after controlling the effects of bureaucratic competition, level of education, GDP growth, and urbanization. Using different measures of corruption from the World Bank survey, the study finds the evidence of threshold; the inverse relationship between corruption and government regulations is profound in countries where the index of government regulations is less than the threshold level. Consequently, it suggests that government regulations spawn corruption before the threshold level is reached. Thus, reducing government regulations only up to the threshold level will not reduce corruption. The study suggests that government regulations should be reduced well below the threshold level to circumvent corruption. Thus, policies without government interventions are less corrupt and, therefore, are more conducive to economic growth.

Keywords: Government Regulations, Bribery, Corruption, Bureaucratic Competition, Threshold regressions, World Bank Survey 1996, and Transparency International.

I Introduction:

The theoretical literature on causes of corruption emphasizes that variations in corruption are a function of the size of government, the extent of economic distortions, the internal structure of bureaucracies, bureaucratic competition, and level of information². Some writers have also suggested that low/declining government real wages are an independent factor exacerbating corruption.

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Empirical studies have now been followed up by cross-country estimation of determinants of corruption.

The empirical literature has identified several determinants of corruption. Ades and Di Tella (1997, 1995a, 1995b) have found positive significant relationship between various measures of government intervention and corruption. Rijckeghem and Weder (1997) have estimated the impact of public-private wage differentials on corruption and found a significant negative relationship between public sector wages and corruption for a sample of 23 countries. Goel and Rich (1989) have found a negative and significant relationship between public sector wages and corruption at federal, state, and local levels in the United States. While examining the significance of a system of recruitment and promotion, Rauch and Evans (2000) empirically demonstrated that a merit-based method of recruitment and promotion of public officials increases the quality of bureaucracy and hence reduces corruption.

The empirical results on the impact of the size of bureaucracy on corruption are ambiguous, however. Husted (1999) concludes that there is no relationship between government size - measured as government consumption in total GDP - and corruption. However, LaPalombara (1994) confirms a weak positive relationship between the size of the public sector and corruption for a sample that exclude the Scandinavian countries. Meier and Holbrook (1992) also found a positive relationship between the size of the bureaucracy - measured as the number

² See Ades and Di Tella (1996), Alam (1989), Shliefer and Vishney (1993), and Tanzi (1994, 1998).

of government employees per thousand persons - and political corruption in the American States for the period of 1977-1987. Recently, Ahmad (2001) has presented a comprehensive empirical analysis of the determinants of corruption that includes several variables such as bureaucratic competition, urbanization, level of information, and democracy.

The current empirical literature on the determinants of corruption has presumed a linear relationship between corruption and government regulations. This study re-examines this relationship. This re-examination is carried out by testing the presence of threshold effects of government regulations on the level of corruption after controlling the effects of bureaucratic competition, level of education, GDP growth, and urbanization.

The study is organized as follows. Section II reviews the theoretical and empirical literature. Section III describes the data and their sources. Section IV explains the methodology of this empirical investigation. Section V presents the empirical results and last section summarizes the empirical results.

II Review of Literature

Several explanations for the variation in corruption levels across countries are presented in the literature. Some sociologists assert that corruption differs among nations because social norms vary across countries. Less-developed countries may be more susceptible to corruption than industrial countries because their dense personal relationships are more conducive to such behavior in the less-developed countries³. Liberal economists attribute variation in corruption levels among

³ See Tanzi (1994) for details.

countries to differences in the extent of market distortions arising from government intervention.

A Theoretical Approach

Until recently, the theoretical literature analyzed the determinants of corruption only from the winners' point of view. Alam (1995) develops a theoretical model that incorporates the losers' perspective in the analysis of causes of corruption. The theoretical work on the causes of corruption from the winner's perspective has identified several factors. These factors encompass measures of government interventions, or government regulations, public sector wages, system of recruitment and promotion, and size of the bureaucracy. Most of the government interventions are related to regulations involving licenses and permits, control over procurement contracts, control over public investment contracts such as roads and airports, programs related to the provision of tax incentive, subsidized credit and overvalued foreign exchange, control over hiring and promotions, and control over access to underpriced public services, e.g., electricity, telephone and water. Public sector wages, a system of recruitment and promotion and size of the bureaucracy determine the willingness of public officials to artificially create regulations that cause corruption.

Rose-Akerman (1978), Shliefer and Vishney (1993), Ades and Di Tella (1996), and others have recognized market competition as a possible deterrent to corruption. The argument that competition in the market place dampens corruption is as follows. In perfect competition, the profits of the firms are zero because each firm operates where price equals marginal cost. The firms have no incentive to

offer bribes for protection because the additional profit due to protection will soon be dissipated among new firms which enter the market. On the other hand, if a firm is enjoying monopoly power and reaping abnormal profits, the firm has incentives to keep this monopoly power intact and thus, it is willing to offer bribes to protect its monopoly. Corruption has a self-perpetuating tendency. A corrupt society is likely to create an environment where newcomers are also treated as corrupt. There is pressure on honest officials to be corrupt. Thus, the poor collective reputation of the previous corrupt government partly determines future corruption⁴.

Empirical Analysis of the Causes of Corruption

The empirical literature on the determinants of corruption for a large sample of countries is still in its early stages. This section will provide a review of this literature. Systematic empirical analysis of the causes of corruption first emerged during the late 1980s and early 1990s. Goel and Rich (1989), Meier and Holbrook (1992), and Goel and Michael (1998) have used regression analysis to study the determinants of corruption for the United States. There are several other studies, such as those by Wedeman (1997) and Kaufmann (1998), that are based on investigative reports and present some sort of data analysis. Empirical studies conducted during that period relied heavily on actual data on corruption. For example, Goel and Rich (1989) used the "proportion of all government employees who are convicted of bribery" as a measure of corruption at federal, state, and local levels in the United States for the period 1970-1983. Most studies were restricted to only one country. The statistical analysis of corruption for a cross-section of

⁴ See Tanzi (1994) and Tirole (1996) for details.

countries was made possible by the availability of corruption indices for a large number of countries.

Serious empirical studies for a large sample of countries on causes of corruption began to emerge during the mid-1990s. Ades and Di Tella (1997) have shown that active industrial policies are positively correlated with corruption: these tests were done for a sample of 32 countries for the period of 1989-1992. The authors first tested the effects of these policies on corruption by estimating the following model:

$$\text{CORR} = \beta_0 + \beta_1 \text{INDPOL} + \beta_2 \text{POL} + \beta_3 \text{SECURE} + \beta_4 \text{SCHOOL} + \beta_5 \text{GDP} + \beta_6 \text{OPEN},$$

where CORR are the corruption indices taken from the WCR (1989-1992) and Peter Neumann (1994) and his collaborators at *Impulse*, INDPOL are two indices of industrial policy taken from the WCR. A “procurement index” measures the extent to which public procurement is open to foreign bidders and a “fiscal index” measures the extent to which there is equal fiscal treatment to all enterprises. A political rights index (POL) is employed as a measure of extent of political competition. The index is taken from Gastil (1996) who calculated an index of freedom by indexing political rights for 165 countries. Political rights involve the right of a person to take part in political process freely and without any restrictions. An index on general law enforcement in the country (SECUR) is taken from the World Competitiveness Report (WCR). This index measures the extent to which people and property are protected. SCHOOL is the average years of total schooling, GDP is the level of per capita income, and OPEN is the total imports in GDP.

Ades and Di Tella (1995) found that active industrial policy induces corruption after controlling for the effects of other variables. A one standard deviation increase in the measure of industrial policy correspondingly increases the corruption index by 11.5%. After calculating the effect of active industrial policy on corruption, they calculated the effect of industrial policy on investment in the presence of corruption by estimating the following model:

$$\text{Investment} = f(\text{Industrial policy, Corruption, level of education, government consumption, GDP, number of revolutions and coups per year})$$

The coefficient of the measure of industrial policy is positive and significant after controlling for the effects of other variables. This demonstrates that industrial policy and investment are positively and significantly correlated. The negative coefficient of corruption indicates that corruption reduces investment. Thus, the total effect of industrial policy on investment is only slightly above 50% of what it would be if industrial policy did not induce corruption.

Ades and Di Tella (1995a) examined the effects of product market competition on corruption by controlling for the level of development and degree of political competition. They show that corruption is higher in economies dominated by a small number of firms or where domestic firms are protected by high tariffs. However, Bliss and Di Tella (1997) subsequently argued that market competition reduces corruption only under an impartial judiciary and an honest police force. The corrupt officials can force some firms to exit and induce others to pay bribes for protection of high and abnormal profits.

Ades and Di Tella (1995b) tested the empirical relationship between openness and corruption in the presence of well-developed judicial system for a sample of 55 countries for the period of 1981-1983. They ran the following regression:

$$\text{CORR} = \beta_0 + \beta_1 \text{GDP} + \beta_2 \text{SCHOOL} + \beta_3 \text{POL} + \beta_4 \text{OPEN} + \beta_5 \text{JUD} + \beta_6 \text{OPENJUD},$$

where CORR is the corruption index taken from Business International, GDP is GDP per capita, SCHOOL is the average years of total schooling, POL is an index of political rights, OPEN is the share of imports in GDP, and JUD represents the independence of the judiciary system. The data on the independence of the judiciary system, taken from Business International, are used to create a dummy variable. The value of a dummy variable is one if the index of independence of judiciary system is greater than the mean of the sample and zero if the index is less than its mean. OPENJUD represents the interaction between OPEN and JUD or OPEN x JUD. All these variables are the averages of their 1981-1983 observations.

The above model was estimated using the ordinary least square technique. The coefficients of openness and independent judiciary were found negative suggesting that openness and independent judiciary deter corruption. The main objective of the study, however, was to test the significance of the coefficient of interaction term (OPENJUD). The positive sign of the interaction term suggests that the openness or degree of competition is more effective in abating corruption in countries where the judiciary system is not well developed. A one standard deviation increase in openness reduces corruption by 0.38 points if the judiciary system is independent (above the mean), but a one standard deviation increase in

openness reduces corruption by 2.09 points if the judiciary system is relatively dependent (below the mean).

The above empirical review suggests that no empirical study to date has investigated the non-linear relationship between government regulations and corruption for a large sample of countries.

III Sources of Data:

The empirical analysis of corruption is made possible by the availability of data on indices of corruption that were created mostly for business-related purposes. The two most common characteristics of these corruption indices are that they measure the perception of corruption from the perspective of foreign firms and are aggregate in nature. To overcome these limitations, the World Bank conducted a survey that measures the perception of corruption from domestic and foreign firms' points of view. Moreover, these indices are also available for individual categories such as the police, customs, public health care, and the judiciary.

The World Bank data provides measures of corruption from several perspectives. For example one question asks respondents to rate how corruption is problematic in doing business. The other question asks respondents to rate on a scale of 1 to 6 whether these businesses accept bribes. Still another question asks about the pervasiveness of bribery. The importance of these indices was discussed by Brunetti, Gregory, and Beatrice (1997), who argue that foreign firms can avoid corruption more easily than the small domestic firms because politicians and bureaucrats treat the foreign firms differently. Kaufmann and Wei (1999) also

found that large firms with foreign participation spend less time with the government officials to settle transactions. Thus, foreign firms have the advantage over domestic firms in overcoming government regulations.

In this study three indices have been used to measure the perception of corruption. Question 12n of section III of the questionnaire represents the index of corruption. The question asks respondents to judge on a six-point scale how problematic corruption is for doing business. Question 14 of section IV of the questionnaire represents the index of bribery. The question is as follows: “ It is common for firms in my line of business to have to pay some irregular “ additional payments” to get things done. Is this statement true?” Six answers listed afterwards are “always”, “mostly”, “frequently”, “sometimes”, “seldom”, and “never”. Similar to question 14, question 16 of the same section represents the index of unorganized bribery. The question is as follows: “ Even if a firm has to make an “additional payment” it always has to fear that it will be asked for more, e.g. by another official. Is this true?” Six answers “always”, “mostly”, “frequently”, “sometimes”, “seldom”, and “never” are listed at the end of the question. For each country the replies to the 6 categories are aggregated, yielding categorical data on corruption, bribery, and unorganized bribery. The relationship between corruption and government regulations may be misleading as these two indices reflect the perception of the same group of respondents. To tackle this problem TI-corruption index has also been used.

The pervasiveness of government regulations is regarded as a source of corruption by several authors. The two measures of government regulations have

been used in the literature. The share of total imports in GDP has been used as a measure of government regulations by Ades and Di Tella (1995, 1995a, 1995b) and the share of government consumption in GDP has also been used by Husted (1999) as a measure of government regulations.

This study has utilized a more comprehensive measure of government regulations. The composite index of regulations measures the extent of regulations imposed by government regarding business operations, price controls, foreign trade (exports and imports), labor regulations, foreign currency regulations, tax regulations, and safety and environmental regulations. This index is a sum of seven indices and is taken from the World Bank (1996). All of these seven indices are available for 67 countries for 1996 and range from 1 (no regulation) to 6 (complete regulation). These seven indices are i) regulations for starting business and new operations, ii) price controls, iii) regulations on foreign trade, iv) labor regulations, v) foreign currency regulations, vi) tax regulations and/or high taxes, and vii) safety or environmental regulations. These seven indices are added with equal weights and converted to 0 to 10 index.

I have converted all corruption indices from a 1 to 6 scale to a 0 to 10 scale. An index of 0 means negligible corruption, while an index of 10 means high corruption. The conversion of the corruption index from 1 to 6 to 0 to 10 makes the analysis more convenient in two ways. First, it is now easier to compare results with the Transparency International index of corruption, which runs from 0 to 10. Second, it avoids confusion regarding both the positive and negative relationships

with other independent variables. Thus, the indices always represent low corruption as 0 and high corruption as 10.

The index of bureaucratic competition is taken from the worldwide survey of the private sector, World Bank (1996). The index measures the extent to which people can obtain fair treatment by avoiding corrupt officials. The index ranges from 1 (impossible to avoid corrupt official) to 6 (always possible to avoid corrupt officials). Data on GDP growth are taken from World Development Indicators (1998) for 1996; Data on urbanization are taken from world development indicators that are available for more than 100 countries for 1996. Urbanization is defined as the share of urban population in the total population.; The level of education is measured as average years of schooling at age 15 and above in the total population. The data are drawn from Barro and Lee (1993, 1996) and are available for 98 countries for 1990.

IV Methodology:

To the best of my knowledge the empirical literature, as discussed above, has not tested the presence of threshold effects. I hypothesize that the index of government regulations exceeding some critical value contributes less to corruption than if it is below the critical value. I approach this task by estimating the following single equation model with one dummy variable DREGXX and one interaction term between government regulations and the dummy variable REG*DREGXX.

$$\begin{aligned} \text{Corruption Index} = & \beta_0 + \beta_1(\text{Bureaucratic Competition}) + \beta_2(\text{GDP} \\ & \text{growth}) + \beta_3(\text{Level of Education}) + \beta_4(\text{Urbanization}) + \beta_5(\text{REG}) + \\ & \beta_6(\text{DREGXX}) + \beta_7(\text{REG} * \text{DREGXX}) + u. \end{aligned}$$

The dummy variable DREGXX equals 1 if the index of government regulations exceeds the critical value XX and zero otherwise. If the index of government regulations is greater than XX, the intercept is $(\beta_0 + \beta_6)$. Similarly if the index of government regulations is greater than XX, the coefficient of REG is $(\beta_5 + \beta_7)$. The slope coefficient of REG is β_5 if the index is less than XX. The data before conversion on index of government regulations ranges from 1 to 6. The index 1 and 2 indicates no regulations; index 3 and 4 indicates moderate regulations; and index 5 and 6 shows very strong regulations. The average (median) 3.5 is taken to be the critical value (or threshold level) in this study. The model is estimated using ordinary least square method. Each model is corrected for heteroscedasticity.

V Empirical Results:

The regression results are presented in Table 1. The overall explanatory power of the models ranges from 58 percent to 66 percent, indicating moderate explanatory power. In each model, the value of the F-statistic is significant

Table 1
Regression Results

Variables	Total Corruption	Bribery	Unorganized Bribery	TI-98
Constant	1.35 (0.52)	3.67 (1.35)	3.42 (1.154)	3.32 (0.76)
Regulations (REG)	2.23 (4.77)***	1.58 (2.88)***	1.37 (2.25)**	2.29 (2.50)**
Bureaucratic Competition	-0.68 (-4.14)***	-1.03 (-7.18)***	-0.93 (-6.26)***	-1.03 (-4.04)***
Total Years of Schooling	-0.32 (-3.64)***	-0.19 (-3.23)***	-0.23 (-3.82)***	-0.42 (-4.17)***
GDP Growth	-0.064 (-1.49)	-0.09 (-1.97)*	-0.08 (-2.01)*	-0.08 (-1.52)
Urbanization	-0.002 (-0.163)	-0.01 (-1.17)	-0.001 (-0.162)	-0.004 (-0.32)
DREGXX	8.67 (2.55)**	11.20 (2.97)***	8.52 (2.16)**	8.21 (1.58)
REG*DREGXX	-1.94 (-2.86)***	-2.29 (-2.99)***	-1.78 (-2.19)**	-1.94 (-1.76)*
Adjusted R ²	0.64	0.66	0.59	0.67
Number of Countries	43	43	43	36

* 10% level of significance, ** 5% level of significance, *** 1% level of significance
Results are adjusted for heteroscedasticity. Figures in parenthesis are t-values.

The coefficients of bureaucratic competition and level of education are significant with expected negative signs in all cases suggesting that increase in bureaucratic competition and increase in level of education circumvent corruption. The coefficient of GDP growth rate is significant with expected negative sign when bribery and unorganized bribery are used as a measure of corruption. The coefficient is negative in all cases however. The coefficient of urbanization is insignificant with expected negative signs in all cases.

The results show a significant positive relationship between the index of government regulations and corruption when the index of regulations is less than the threshold level for each measure of corruption. The coefficient of

REG*DREGXX is significant with negative sign suggesting the fact that there exist a non-linear relationship between government regulations and corruption. The increase in one unit of government regulations increases corruption by at least 1.8 units in countries where the index of government regulations is less than the threshold level. The adverse marginal effect of regulations on corruption is less in countries with index of government regulations exceeds the threshold level. The results hold when I use the TI98 corruption index. Thus, my results support the hypothesis that government regulations are more conducive to corruption in countries where the index of government regulations is less than the threshold level.

VI Conclusions:

This study empirically re-examines the relationship between corruption and government regulations for a cross section of countries by using World bank (1996) data on various corruption indices. This re-examination is carried out by using threshold regressions. The results reveal the presence of threshold effect after controlling the effects of GDP growth, bureaucratic competition, level of education, and urbanization. The study concludes that government regulations spawns corruption in countries where the index of government regulations is below the threshold level. The index of government regulations is contributing less to corruption where the index exceeds the threshold level.

The analysis suggests that policies should be designed to reduce the discretionary power of the officials that, in turn, reduce the ability of corrupt officials to contrive bribes. Thus, policies relating to the reduction of excessive

government regulations are helpful in limiting corruption. Moreover, the study suggests that by just marginally reducing government regulations in countries where the index of government regulations exceeds the threshold level will not reduce corruption. However, the regression results must be considered with caution because these results may be influenced by the small sample size. Nonetheless, this analysis has shed some light on the non-linear relationship between government regulations and corruption.

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