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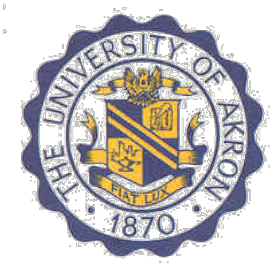

A Comparative Analysis on the Measurement and the Effects Fiscal Decentralization has on Corruption

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Abstract

Past literature on the economics of fiscal decentralization propose both positive and negative effects on governance in a country. Both theoretically and empirically there are studies that have contrary significant results on decentralization and corruption. In this study, I examine a specific paper that uses a data set comprised of sixty-four developed and developing economies that utilize an older and commonly used metric for fiscal decentralization. In addition, I take a newer metric for fiscal decentralization and also other decentralization variables and investigate the effects this may have on ICRG data (corruption variable) using 182 countries while comparing it with the original measure. The results indicate with significance that fiscal decentralization does in fact deter corruption. However, the magnitude of the reduction is substantially less, relative to the other paper being examined.

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Introduction

There is a significant interest surrounding corruption in government. Decision makers want to make sure a government can be ran efficiently. Corruption reduces efficiency and it increases inequality. Estimates show that the cost of corruption equates to more than 5% of global GDP, which is equivalent to 2.6 trillion U.S. dollars (OECD, 2011). Each year there are over one trillion dollars paid in bribes (OECD, 2011). Further, corruption increases the cost of doing business, it leads to waste or the inefficient use of public resources, corruption excludes poor people from public services and perpetuates poverty, corrodes public trust, undermines the rule of law and ultimately delegitimizes the state (OECD, 2011). If quality in government is amplified the better off the population will be in many different areas. It is not only an inquiry of ethics; economies simply cannot afford such waste.

One possible approach considered by policymakers to reduce corruption is to transfer decision making closer to the governed population while establishing fair, accountable, incorruptible, and responsive governance. Decentralization defined is the process of redistributing or dispersing functions, powers, people or things away from a central location or authority to subnational units of government. In this paper, we want to attempt to answer the question; does fiscal decentralization improve government outcomes (measured by corruption levels) and does the answer to this question depend on how decentralization is measured?

There appears to be a global consensus since the 1980's that a disproportionate amount of centralization has a negative effect to the governance of a country. The major international organizations such as the International Monetary Fund, United Nations, and the World Bank have promoted decentralization in the past couple of decades (http://www.ciesin.columbia.edu/decentralization/English/General/history_fao.html). Recent

examples of countries that actually have undertaken this transformation are as follows: Bolivia, Brazil, China, India, Indonesia, Pakistan, South Africa, and Uganda (Bardhan, 2002). It is recognized internationally that decentralizing government structures would be a positive move, ceteris paribus.

This paper utilizes new measures of local government decentralization designed to overcome some of the shortcomings of the measures that have been used in past literature. The newer data was constructed by putting together statistics from 182 countries from a large variety of sources that surveys success towards decentralized decision making around the world (Ivanyna and Shah, 2012). The essential features of these measures is that they take into account the structure, size, degree of local autonomy in decision making, and the significance of local governments including the legal and constitutional foundation of its existence.

Traditionally, the measurement for fiscal decentralization has been sub-national government revenues, tax effort, expenditure, and compensation of employees where each is expressed as a proportion of general government revenues and expenditures. The short comings of this measurement is the fact that it does not accurately take into account all the different unobserved factors each country can face such as those noted above.

In this paper I will be comparing my paper's methodology to Altunbas and Thornton's (2012) paper, which is a study on the economics of fiscal decentralization and how it affects governance in a country. I will be interchanging their traditional data sets of decentralization with the new measures. The fiscal decentralization metric in Altunbas and Thornton's (2012) paper is comprised of the common indicators in the International Monetary Fund (IMF) *Government Finance Statistics Yearbook,* which is data for about 80 countries over periods of up to twenty years (1990-2008). The author's measure of fiscal decentralization is sub-national

government expenditure where it is expressed as a proportion of general government revenues and expenditures. The authors Altunbas and Thornton mention in their own study that it is well known that this indicator is imperfect. They state that the gauge utilized for fiscal decentralization does not recognize that high subnational revenue and spending shares do not necessarily indicate high local autonomy (Altunbas and Thornton, 2012).

The next section in this paper is the literature review, which will be comprised first, of an investigation on previous literature on the theory behind decentralization and its potential impact on corrupt behavior by public officials. Previous empirical work on the connection between decentralization and corruption will be reviewed next. At that juncture, a further and more detailed description of the newer data sets used in this analysis will follow. After that, will be the transition into the econometric methodologies, which will include the actual econometric models. Following that, there will be a section on the empirical results and its corresponding comparative analysis of what changes occur with the two dissimilar forms of decentralization measures. Finally, in the conclusion I will discuss the policy implications and also identify areas for further research on this important subject matter.

Literature Review

In this section, I will review the theoretical and the empirical work that discuss the contradicting views as to whether decentralization promotes or deters corruption.

Decentralization Deters Corruption: Theory

It has been argued in the past by some that decentralization in the different capacities of government is essential to advance governance. Local governments understand the concerns of local residents. Moreover, local decision making is responsive to the people for whom the

services are intended. Thus, encouraging fiscal responsibility and efficiency, especially if financing of services is also decentralized (Ivanyna and Shah, 2012).

Fiscal incentives from increased local business activity can deter corruption. When corruption is greater in a government, firms are less motivated to perform their business in that particular corrupted government. Some argue corruption will fall if local officials can attain a large personal stake in local economic activity. Under tax-sharing systems, the larger the share local governments can retain from the escalation in the marginal benefit from augmented local business activity, the larger the drop should be in corruption (Montinola et al., 1995; Zhuravskaya, 2000; Jin et al., 2005). Thus, if the local official's total benefit/stake outweighs the total cost of entering corruptive practices of the increased local economic activity (measured by the proportion of local income at the margin relative to the local government's revenue) corruption is said to decrease (Fan, Lin, Treisman, 2009). Additionally, let us assume capital and labor are mobile and local governments have the autonomy to tailor their policies to attract labor and capital (Hayek, 1939; Tiebout, 1956). This creates "interjurisdictional competition" where local governments would participate in providing public goods and services that are efficient in attempt to increase the total tax base by attracting residents and businesses. Public officials would be less inclined to steal or waste resources and over-regulate in order to extract bribes due to the fear of losing labor and capital to another jurisdiction (Brennan and Buchanan, 1980). The net marginal cost of missing out on the taxes of the extra business and resident (more bribers) in their jurisdiction will exceed the net marginal benefit the region would gain from it. This is why an official will have the incentive in being disciplined in supplying more effective and more efficient public goods and services than their competition. In turn, this produces an increasingly

net aggregate positive outcome for the people in the region while facing a natural deterrence of corruption due to the higher degree of autonomy a local government has in creating policy.

Holding elections at a local level creates a positive relationship on the accountability of a government (Seabright, 1996). Voters are simply able to acquire better information on their own local governments and incumbents. Furthermore, as jurisdictions become smaller the greater the opportunity becomes for citizen voters to make "yardstick" appraisals on bureaucratic actions through comparing local outcomes with other nearby jurisdictions (Brennan and Buchanan, 1980; Salmon, 1987; Besley and Case, 1995; Breton, 1996; Esteller-Moré and Rizzo, 2014). Comparisons that are unfavorable would negatively affect local politicians in being reelected and thereby raising the cost in participating in corrupt activity. Therefore, independent from the fear of losing out on mobile factors of production "political competition" also makes available another reason as to why decentralizing deters local corruption. Besides, nationwide performance may not be as vital for the voter and their vote may be less likely to matter in a larger jurisdiction relative to a smaller one. Whereas, local elections focus on performance in a specific region, which at the end of the day will more directly affect the voter. The cost of deciphering through information of their own local government versus a centralized government is significantly less than the benefit the voter would secure in accurately choosing an incumbent that will directly improve their specific region. Dividing up responsibilities and roles among several levels of elected government will further decrease the cost and make it more attainable for the voter to differentiate and recognize more accurately where to attribute blame or credit among the elected. The smaller and more decentralized a region's electorate is, the more encouraged and stimulated voters will be to organize and collaborate on a voting strategy for their specific region (Fan, Lin, and Treisman, 2009). With elections more decentralized, the benefit outweighs the cost for the

voter in obtaining the capacity and forefront to cast a more refined and precise vote that connects more to their well-being, which ultimately is parallel to improving accountability and deterring corruption in a government.

In regards to local government collusion the question is; whether elected local governments with decision making power are likely to be more or less corrupt than centrally appointed local agents with more restricted authority? Some would argue that the potential kickbacks and payoffs for officials to conspire into corruptive practices are far larger when connected to a more centralized government than they would be in a smaller decentralized local government. Simply stating, the cost of being corrupt outweighs the benefit of the potential kickbacks and payoffs an official could possibly receive in a diminutive government. In addition, they continue to argue that the public is assumed to being better informed about their local government and its officials (Fan, Lin, Treisman, 2009). This naturally further increases the total cost due to the likelihood of a government official getting caught and realizing the consequences when one is deciding whether or not to collude. Thus, administrative decentralization deters corruption.

The above has summarized arguments in the literature that greater decentralization deters corrupt behavior by government officials. Others have made precisely the opposite arguments, that greater decentralization is corruption enhancing. These arguments are summarized next.

Decentralization Leads to Higher Corruption: Theory

Economists have argued that decentralization could destabilize governance. It has been contended that local officials are more susceptible to be influenced by local economic interests, because of frequent opportunities of face-to-face interactions with businessmen (Prud'homme, 1995; Tanzi, 1996; Bardhan and Mookherjee, 2000). Furthermore, it is suggested that the

harmful local economic interests would occur, because local governments would be monitored substantially less than how the central government would monitor these situations, due to having more resources (Prud'homme, 1995; Tabellini, 2000). It is also proposed, increasing the share in local income to local officials in proportion to the local governments' revenue to entice better practices would then signify, reducing the shares of other levels of government. Moreover, if local officials control an increased share of local income the officials may still derive a benefit from bribe takings, which enhances corruption additional to the cost of increasing the share of local income. Therefore, decentralizing fiscal incentives will not only decrease the motivation of the higher levels of government to support economic performance, but also will enhance corruption (Treisman, 2006).

In regards to local governments' autonomy tailoring their policies to the mobility of capital and labor; economists state that the cost of possibly losing these mobile factors may not remotely come near to the benefits that amount in attracting labor and capital with corruptive measures. Local governments will then compete to attract capital and labor by promising crooked benefits to local businesses at the expense of further increasing corruption (Cai and Treisman, 2005). If the cost in executing these anti-corruption measures exceeds the local bureaucrats' crooked benefits then most likely the corruption will continue.

Economists have also claimed that decentralizing politically and administratively create an increased number of cohesive interest groups. The outcome is greater amounts of local collusion that creates a larger amount of affairs of intimidation or cooptation that become more prevalent in a government. This widespread negative environment, will mostly affect the local press and local citizen groups that have fewer resources than their more centralized counterparts from uncovering the truth. In addition, local investigative journalists and watchdog groups that

may have more resources tend to be more attracted and devote those resources towards monitoring national government since the stakes are generally higher. Thus, press and citizen groups will be far less effective at exposing corruption at a more decentralized state of government, which then leads to higher corruption (Fan, Lin, and Treisman, 2009).

The theory of decentralization of governance goes both ways as to whether it promotes corruption or enhances it. Thus, it is an empirical matter now, next I turn to empirical work I have reviewed.

Decentralization and Corruption: Empirical

After reviewing the past literature that theoretically examines decentralization and corruption. I can see that there are many factors that impact the level of corrupted activity and many different variables creating outcomes as to whether decentralization deters corruption or promotes corruption in a government. The theoretical literature shows that it can go both ways. Thus, it is now a matter of empirical analysis to weigh in on this. I have constructed a table on the following page, which summarizes the empirical work that was reviewed. Refer to table 1.1 on the next page. Within the table, the work that is shown utilizes a varied group of fiscal decentralization measures. For fiscal decentralization we can see that many of the papers above utilize subnational and local government revenue share in proportion to the total revenue and expenditures as we discussed earlier. Also, in these studies for administrative and political decentralization measures they utilize dummy variables attempting to capture the following: whether a country has a federal constitution, whether the bottom-tier of government is directly elected, whether the constitution for a country allows for limited autonomy at the level of subnational government, whether a country has maintained democratic institutions for a continuance period since 1950, and whether a country is a presidential democracy. As one can

Table 1.1 Empirical Literature Review on Decentralization and Corruption

Author	Corruption Data Set	Fiscal Decentralization Measure	Conclusions	Controls
Altunbas, Thornton (2012)	ICRG	Subnational government revenue share of GDP	Negative & significant	Various country control variables
Ivanyn, Shah (2012)	TI CPI	Fiscal decentralization composite index	Negative & significant	Various country control variables
Ivanyn, Shah (2010)	WBES, TI GCB, TI CPI	Fiscal decentralization composite index	Negative & significant	Various country control variables
Fan, et al. (2009)	WBES (Bribe frequency or amount)	Subnational government revenue share of GDP	Both positive, negative & significant	Other decentralzation measures various country and respondent characteristics
Fisman, Gatti (2002)	WBES (Bribe frequency or amount)	Subnational government revenue share of GDP	Negative & significant	Various country control variables
Zhuravskaya (2000)	Goskomstat (Russian statistical agency)	Subnational and local government revenue sharing budgets	Positive & significant	Various province and city control variables

Notes: Corruption measures - International Country Risk Guide (ICRG), Transparency International Corruption Perception Index (TI CPI), Transperancy International Global Corruption Barometer (TI GCB), World Busines Environment Survey (WBES)

see in the table above, the empirical results for the fiscal decentralization variable is inconclusive due to the variance of positive and negative significance in the conclusions of the work above. The fiscal decentralization measures utilized in most of the studies I reviewed above are flawed. The measures simply do not capture unobserved heterogeneity factors that occur when comparing countries. The newer indices used in this paper attempt to close this discrepancy; next I will discuss this particular data and its descriptive statistics.

Data Description and Descriptive Statistics

One can take data of expenditures and taxation, and employment wages of the population and create proportions of what a government spends and brings in, but does that really tell us as to how close the population is to decision making in their own government? The indices I utilize in this paper have taken a different approach in attempt to develop a stronger picture as to the peoples' reach in actually impacting government enough to be heard. The data that was available in the past were figures that measured the subnational government, now we have this innovative data that creates measurements at a local level in a much more thorough methodology.

In my paper, we take the empirical framework of measuring a government's closeness to its people from a World Bank working paper. This paper takes a look into the *unit of analysis* past literature has taken into perspective and argues how local governments are unequivocally the appropriate unit of measurement rather than subnational governments (Ivanyna and Shah, 2012).

Decentralization Measures

- *Fiscal Decentralization Composite Index (FDI)*: This index is one of the component parts of the Aggregate Decentralization Composite Index (DI) that focuses on local

government's fiscal autonomy. The construction of this index evaluates the following: local government's range of local functions, their autonomy in rate and base setting for local revenues, the transparency, predictability, and unconditionality of higher level transfers, the degree of self-financing of local expenditures, the responsibility and control over municipal and social services, the autonomy on local planning, autonomy on local procurement, its ability to borrow domestically and from foreign sources, the ability to issue domestic and foreign bonds, and examines higher level government assistance for capital finance (Ivanyna and Shah, 2012). This index captures the degree of fiscal empowerment a local government has from its central units.

  - In this data set, the value of FDI varies from 0.06 (i.e. Somalia) to 1.0 (i.e. Singapore), where larger values imply greater decentralization. The correlations between this index and the dependent variable corruption (ICRG_NEW) and the aggregate decentralization variable (DI) are -0.55 and 0.69. See Appendix- 1 & 2 for full statistics and calculations.

- *Political Decentralization Composite Index (PDI):* This index is also one of the component parts of the Aggregate Decentralization Index (DI) that centers around the following criteria: whether legislative bodies at the local level are elected, appointed, or something in between; whether executive heads (mayors) at the local level are elected directly or indirectly, or appointed; whether there are democratic provisions for obligatory local referenda for major spending, taxing and regulatory decisions, recall of public officials; and whether there are requirements for direct citizen participation in local decision making processes (Ivanyna and Shah, 2012). This index capitulates

whether a local government actually is able to self-govern independent from general government.

  - In this data set, the value PDI varies from 0.08 (i.e. Saudi Arabia) to 1.0 (Japan, Switzerland, United states) when 1 implies complete decentralization. The correlation between PDI to the corruption variable and DI is -0.35 and 0.45. See Appendix- 1 & 2 for full statistics and calculations.

- *Administrative Decentralization Composite Index (ADI)*: This index again is also one of the components to the Aggregate Decentralization Index (DI) that centers itself on local government control regarding hiring, firing, and other human resource policies of their own employees (Nelson, et al., 2016). The assembly of the index refers to the local government share of total public-sector employment and an indicator of local government discretion related to employment and setting the terms of that employment (Ivanyna and Shah, 2012). This captures a local government's freedom to enforce employment contracts with its own personnel independent from its central counter parts.
  - In this data set, the value of ADI varies from 0.01 (Macedonia) to 0.9 (i.e. Denmark, Finland, Norway) where greater values imply greater decentralization. The correlation between this index and corruption and the aggregate decentralization variable is -0.50 and 0.61. See Appendix- 1 & 2 for full statistics and calculations.
- *Aggregate Decentralization Composite Index (DI)*: This is a comprehensive variable of the importance and authority of local government, which begins formulation with the fiscal decentralization index referenced above. It is then adjusted with institutional factors that are significant when assessing the actual authority and independence of decision

making by local officials. The institutional factors include (1) the security of the existence of local governments, (2) local expenditure, tax, and borrowing autonomy, (3) home rule for self-governance, and (4) local government control regarding hiring, firing, and other human resource policies of their own employees (Nelson, et al., 2016).

- In this data set, the value DI varies from 0.01 (i.e. Liberia, Jamaica) to 34.03 (Denmark) where larger values signify greater proportions of local sectors to central government and would imply more authority in decision making. The correlation of this index to our dependent corruption variable is -0.55. See Appendix- 1 & 2 for full statistics and calculations.

Corruption

For the dependent corruption variable (ICRG_NEW) I use the 2008 index of corruption in government for 139 countries, produced by the International Country Risk Guide. This index is intended to quantify the probability that government officials will demand special payments. This data initially is ranked on a scale from 0 to 6, with higher values indicating less corruption. Nonetheless, to facilitate ease of interpretation of the coefficients, I have rescaled the corruption index to take on values between 0 (least corrupt) and 1 (most corrupt).

Baseline Control Variables

The baseline control variables are a standard set that many utilize in these types of studies. These variables include: a country's population (logPOP), a country's real gross domestic product per capita (logGDP), a country's fuel exports (FE), and lastly the ethnic fractionalization (FZ). These baseline controls are utilized in order to account for and level off the various heterogeneity factors that are intermixed within a country when comparing many countries to each other as this study uses 182 of them. For complete variable definitions,

Table 1.2 Variable Definitions and Descriptive Statistics

Variable Short Name	Variable Description	Mean	Standard Deviation	Source
ICRG_NEW	Corruption Index, Dependent Variable	0.5785218 N = 140	0.1981576	International Country Risk Guide. Year 2008
FDI	Fiscal Decentralization Index Composite	0.3283516 N = 182	0.2463177	Ivanyna, M. and A. Shah (2012). Index of decentralization, World Bank Institute.
PDI	Political Decentralization Index Composite	0.5177246 N = 167	0.2011314	Ivanyna, M. and A. Shah (2012). Index of decentralization, World Bank Institute.
ADI	Administrative Decentralization Index Composite	0.3651678 N = 149	0.2645537	Ivanyna, M. and A. Shah (2012). Index of decentralization, World Bank Institute.
DI	Aggregate Decentralization Index Composite	2.4198065 N = 155	4.8217828	Ivanyna, M. and A. Shah (2012). Index of decentralization, World Bank Institute.
POP logPOP	Population	37398.74 8.9312904 N = 175	135338.73 1.8229049	World Development Indicators, World Bank. Year 2007
FZ	Fractionalization, Ethnic	0.4491959 N = 171	0.2519848	National Census Data, World Directory of Minorities, Levinson, CIA, Encyclopedia Brit, Scarrit & Mozaffar
GDP logGDP	Real Gross Domestic Product per Capita	14419.73 8.9303997 N = 174	16274.62 1.2406769	World Bank National Accounts data, and OECD National Accounts data files. Year 2007
FE	Fuel Export	18.490703 N = 139	28.0327963	World Bank staff estimates from the Comtrade database maintained by the United Nations Statistics Division. 2008
SSBS	Subnational Share of Budget Spending	21.5924242 N = 66	14.27281	International Monetary Fund Government Finance Statistics Yearbook. Years 1990-2008

Notes: ICRG data initially was scaled from 0 to 6; where higher values indicate less corruption. ICRG_NEW is rescaled from 0 to 1; where now lower values indicate less corruption. The decentralization indices range between 0 and 1; where one is compeltely decentralized. Population (POP) is times 1000, larger numbers for Fractionalization (FZ) indicate greater heterogeneity, Fuel Exports (FE) is the percent of total merchandise exports for a country, Subnational Share of Budget Spending (SSBS) is the older fiscal decentralization variable that will be compared with the newer (FDI).

descriptions, and data sources please refer above to table 1.2, additionally the years for the data used is also shown within the table.

Econometric Methodology

The methodology in this paper uses cross-section ordinary least squares regression. I will do a comparison of the basic model (1) utilized in Altunbas and Thornton's 2012 paper to my model (2) by replacing the decentralization data sets with the newer ones. The model with the older data sets is as follows:

$$COR_i = \alpha + \beta_1 FDEC_{it} + \beta_2 X_i + \varepsilon_i , \qquad (1)$$

where COR_{it} is the corruption index; $FDEC_{it}$ is subnational government expenditures; and X_i is the set of baseline controls that comprises the natural log of real per capita GDP, the natural log of a country's population, the ethnic fractionalization ratio, and their dummy variable indicating whether country is a major energy exporter. The following is my econometric models, which I later run each independent variable separately, see section "Empirical Results":

$$COR_i = \alpha + \beta_1 FDI_i + \beta_2 ADI_i + \beta_3 PDI_i + \beta_4 DI_i + \beta_5 X_i + \varepsilon_i , \qquad (2)$$

COR_{it} is the same corruption index from equation (1). FDI_i is the new fiscal decentralization index. ADI_i is the new administrative decentralization index. PDI_i is the new political decentralization index. X_i is the set of baseline control variables comprised of $(logGDP_i)$ the natural log of real per capita GDP, which is expected to have a negative relationship since richer and more developed countries tend to be more decentralized and usually these conditions tend to create a demand for better government. Also included are the natural log of population $(logPOP_i)$ and the degree of ethnic fractionalization (FZ_i) these are projected to have a

positive connection to corruption. Because, as ethnic heterogeneity increases and with growth in population, the more difficult it is to achieve efficiency with public goods and many other things thus, governments become more interventionist and less efficient. The ratio of a country's fuel exports relative to the total of their merchandise exports is last on the baseline controls and it is likely to have a positive relationship with corruption (FE_i). Governance could be undermined if countries receive substantial nontax revenues from natural resource rents, because citizens are likely to be less motivated to scrutinize how government revenues are collected and spent. Presumably, this could even apply if these revenues were decentralized.

Empirical Results

In this section the results from running the OLS models are reported for the various decentralization measures. First things to note before reviewing the results is the differentiating facts that the authors Altunbas and Thornton in their 2012 paper utilize a data set comprised of annual observations for up to sixty-four developed and developing economies for the period 1995-2008, though observations are not available for all countries for all years. In this paper, we run models using 182 countries for the most recent year, which are around 2008, these observations may also not have available for all countries for all years.

If you refer to table 1.3 below there will be five columns of results. The first two columns (1 & 2) show the results for the different measures of fiscal decentralization. Column one utilizes the older measure spoken about earlier in this paper (SSBS), which is expressed of the proportion of subnational fiscal expenditure relative to the total of general government revenues and expenditures. Column two replaces the original fiscal decentralization measure with the newer index that focuses on local government fiscal autonomy (FDI). Moving on to the next three

Table 1.3 Cross-Sectional Ordinary Least Squares (OLS) Results; Corruption, Decentralization Measures, and Basic Controls

	1	2	3	4	5
Intercept	2.2679 ***	1.1188 ***	1.4462 ***	1.4972 ***	1.2312 ***
	(6.84)	(4.74)	(6.21)	(6.74)	(5.50)
Subnational Fiscal Expenditure Variable	-0.0022				
	(-1.31)				
Fiscal Decentralization Composite Index		-0.3002 ***			
		(-3.65)			
Administrative Decentralization Composite Index			-0.2445 ***		
			(-3.33)		
Political Decentralization Composite Index				-0.1003	
				(-1.13)	
Aggregate Decentralization Composite Index					-0.0125 ***
					(-3.95)
Population	0.0064	0.0128	0.0069	-0.0010	0.0088
	(0.48)	(1.21)	(0.62)	(-0.10)	(0.84)
Real GDP per Capita	-0.1899 ***	-0.0628 ***	-0.0911 ***	-0.0979 ***	-0.0789 ***
	(-6.84)	(-3.22)	(-4.91)	(-5.52)	(-4.53)
Fuel Exporter	0.0021 *	0.0012 **	0.0012 *	0.0020 ***	0.0016 ***
	(1.96)	(2.06)	(1.95)	(3.17)	(2.77)
Fractionalization Ratio	0.0741	-0.0136	-0.0938	-0.0229	-0.0639
	(0.77)	(-0.19)	(-1.19)	(-0.31)	(-0.89)
Adjusted R^2	0.6096	0.4312	0.4168	0.3690	0.4395
Number of Observations	60	115	105	114	110

*Notes: t - Values are in parenthesis below the coefficients. ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels, respectively.*

columns (3, 4, & 5) one can see the results looking at the other decentralization variables, which are the administrative, political, and the aggregate. All models (Columns 1 – 5) are run with the basic control variables. Of primary interest however, are what the varying effects of the different measurements of fiscal decentralization (Columns 1 & 2) have to the dependent variable corruption.

When looking at columns one and two one can see a few differences and some similarities as well. First, the relationships each variable have with corruption for the most part associate similarly in both columns. The only variable that proposes a contradicting relationship is the variable that measures the degree of ethnic heterogeneity in a country. This could be explained by the fact that the newer data set accounts for these differences already thus, resulting in the opposite relationship. Model one shows a positive relationship, which indicates holding everything else constant that as fractionalization increases in a country, corruption is said to increase as well. Then model two projects the contrary effect whereas fractionalization increases, corruption will do the opposite and be deterred. Nonetheless, these variables are shown to project insignificant against the model.

Looking at significance respectively at the 1, 5, and 10 percent levels; the table conveniently labels the variables using asterisk to show the significance of each. Looking at the different measures of fiscal decentralization (Column 1 & 2) I notice a substantial difference where the newer measurement (FDI) shows to be statistically significant at the 99^{th} (***) percent level and the older measurement does not even reach the 90^{th} percent level of statistical significance. Candidate explanations for this result may be, because as I mentioned above, Altunbas and Thornton in their 2012 paper utilizes sixty-four developed and developing economies for the period 1995-2008. Therefore, their paper did propose results that had

significance at the 99th percent level for the fiscal decentralization variable; again in this paper it does not show significance possibly due to the differences in the number of countries used and possibly the variance in years utilized.

Comparing both models in this paper specifically however, one can see that also the second model has more variables that are statistically significant and that the fuel exporter variable moves up to the five percent level (**) in significance from the ten percent level (*). In addition, the magnitude of the sign for fiscal decentralization also varies where FDI shows a larger t-value of -3.65 where the older measurement SSBS shows a t-value of -1.31. Thus, the OLS estimates indicate that a one standard deviation increase in fiscal decentralization using the newer measurement will be associated with a reduction in corruption rating at 0.074, which is larger than the reduction of 0.031 projected from the older measurement. Conversely however, the reduction of corruption resulting in this paper versus Altunbas and Thornton is substantially less, because they projected a reduction in corruption in their paper with their model of 0.5417. This again may be the cause of the substantial disparity in the number of countries utilized in this paper (182) versus the other paper (64).

Comparing the other decentralization indices in this paper to its effects on corruption versus the fiscal decentralization variable we can see that they are all statistically significant at the one percent level (***) except for the political decentralization index variable, which does not reach any significance level. The projected reductions in corruption for the decentralization variables are as follows: Administrative 0.065, Political 0.020, Aggregate 0.060, versus Fiscal 0.074. In addition, for the most part throughout all the models the relationships associated with corruption for all the variables stay consistent as anticipated as well as the significance levels and

the magnitudes of the signs. Some limitations to this study are as followed: multicollinearity, endogeneity factors, and robustness need further examination to improve this study.

Conclusion

The decentralization of government continues to increase in interest for policymakers. The goal is to reach an optimal level of decentralization in order to conserve resources and improve the well-being of the population. The distinguishing factors of this analysis from the literature of the effects of fiscal decentralization on quality of governance are presented in several important ways. First, my focus is on how fiscal decentralization is measured up to this point and is it accurate? Second, I have implemented newer measurements for decentralization that potentially bring us closer to the reality of whether a government is able to serve its people efficiently and effectively. Lastly, these decentralization indices considered control for institutional key factors that could affect how much control local governments have to deliver public services independent from central government.

The underlying question in this paper is comparing the effects of fiscal decentralization measures to its promotion or deterrence to corruption. While also, investigating whether the outcomes vary on the difference of how fiscal decentralization is measured. The contribution this paper has to future exploration on this matter is the examination of the significant outcomes in motivating further research whether the measurement of fiscal decentralization we are using is correct. One policy implication is that the type of performance and type of decentralization being measured needs to be regarded before concluding on whether the shift towards decentralization would necessarily deter corruption. Today there is a world where population continues to grow, it continues to increase in ethnic heterogeneity, its disparity level of wealth continues to expand,

and progressions in technology also continue. While all these changes occur our world needs to recalibrate on how certain performance factors are measured before determining the shift a government should make.

References

Yener Altunbas, John Thornton, 2012. "Fiscal Decentralization and Governance" *Public Finance Review,* 40: 66, November.

Bardhan, P., Mookherjee, D., 2000. Corruption and decentralization of infrastructure delivery in developing countries. Mimeo, Department of Economics, Boston University.

Bardhan, P., Mookherjee, D., 2000. Decentralizing anti-poverty program delivery in developing countries. Mimeo, Department of Economics, Boston University.

Bardhan, Prahab and Dilip Mookherjee. 2000. "Capture and Governance at Local and National Levels," *American Economic Review*, 90, 2, May, pp.135-9.

Besley, T., Coate, S., 1999. Centralized versus decentralized provision of local public goods: a political economy analysis. NBER Working Paper no. 7084.

Brennan, Geoffrey and James M. Buchanan. 1980. *The Power to Tax: Analytical Foundations of a Fiscal Constitution*, New York: Cambridge University Press.

Breton, Albert. 1996. *Competitive Governments: An Economic Theory of Politics and Public Finance*, New York: Cambridge University Press.

Cai, Hongbin and Daniel Treisman. 2000. "Decentralization, Capital Mobility and Governance in Weak States," UCLA: manuscript.

Cai, Hongbin, Treisman, Daniel, 2005. Does competition for capital discipline governments? decentralization, globalization, and public policy. American Economic Review 95 (3), 817–830.

Fan, C.S., C. Lin and D. Treisman, 2009, "Political decentralization and corruption: Evidence from around the world", Journal of Public Economics, 93:14-34.

Fisman, R. and R. Gatti, 2002, "Decentralization and corruption: Evidence across countries", Journal of Public Economics, 83(3): 325-345.

Hayek, Friedrich von. 1939. "The Economic Conditions of Interstate Federalism," reprinted in Friedrich von Hayek, *Individualism and the Economic Order*, ch.12. Chicago: University of Chicago Press, 1948.

International Monetary Fund, 2009, Macro Policy Lessons for a Sound Design of Fiscal Decentralization, Washington, DC: International Monetary Fund.

Ivanyna M. and A. Shah (2011). "Decentralization and corruption: new cross-country evidence" *Environment and Planning C: Government and Policy, 2011,* **29**(2) 344 – 362.

Ivanyna, M. and A. Shah, 2014, "How close is your government to its people? Worldwide indicators on localization and decentralization", Economics: The Open-Access, Open-Assessment E-Journal, http://dx.doi.org/10.5018/economics-ejournal.ja.2014-3

Jin, H., Qian, Y., Weingast, B.R., 1999. Regional decentralization and fiscal incentives: federalism, Chinese style. Working Paper, Hoover Institution, Stanford University.

Kyriacou, A.P. and O. Roca-Sagalés, 2011a, "Fiscal decentralization and government quality in the OECD", Economics Letters, 111: 191-193.

Montinola, Gabriella, Yingyi Qian, and Barry R. Weingast. 1996. "Federalism, Chinese Style: The Political Basis for Economic Success," *World Politics*, 48, 1, pp.50-81.

Prud'homme, R., 1995, "The dangers of decentralization", World Bank Research Observer, 10(2): 201-220.

Salmon, Pierre. 1987. "Decentralization as an Incentive Scheme," *Oxford Review of Economic Policy*, 3, 2, summer, pp.24-43.

Seabright, Paul. 1996. "Accountability and Decentralizationin Government: An Incomplete Contracts Model." *European Economic Review.*40:1, pp. 61– 89.

Tabellini, Guido. 2000. ''Constitutional Determinants of Government Spending.'' CESifo Working Paper No. 265, Munich, Germany.

Tanzi, Vito. 1995. "Fiscal Federalism and Decentralization: A Review of Some Efficiency and Macroeconomic Aspects," in World Bank, *Annual World Bank Conference on Development Economics 1995*, Washington DC: World Bank.

Tiebout, Charles. 1956. "A Pure Theory of Local Expenditures," *Journal of Political Economy*, 64, October, 416-24.

Treisman, D., 2006, "Fiscal decentralization, governance, and economic performance: A reconsideration", Economics & Politics, 18(2): 219-235.

Zhuravskaya, Ekaterina V. 2000. "Incentives to Provide Local Public Goods: Fiscal Federalism, Russian Style." *Journal of Public Economics.* June, 76:3, pp. 337–68.

Appendix

Appendix – 1

Full statistics

Simple Statistics						
Variable	**N**	**Mean**	**Std Dev**	**Sum**	**Minimum**	**Maximum**
ICRG	139	2.54706	1.17352	354.04167	0.50000	6.00000
ICRG_NEW	140	0.57852	0.19816	80.99306	0	1.00000
FDI	182	0.32835	0.24632	59.76000	0.06000	1.00000
PDI	167	0.51772	0.20113	86.46000	0.08000	1.00000
ADI	149	0.36517	0.26455	54.41000	0.01000	0.90000
DI	155	2.41981	4.82178	375.07000	0.01000	34.03000
POP	175	37399	135339	6544780	72.37700	1321852
FZ	171	0.44920	0.25198	76.81250	0.00200	0.93020
GDP	174	14420	16275	2509034	408.71453	104707
FE	139	18.49070	28.03280	2570	0.0009752	99.73948
SGES	85	40.06588	20.96227	3406	9.10000	92.90000
SSBS	66	21.59242	14.27281	1425	2.06000	57.24000
logPOP	175	8.93129	1.82290	1563	4.28189	14.09454
logGDP	174	8.93040	1.24068	1554	6.01302	11.55893

Appendix – 2

Calculations and Further Description on Decentralization Variables

The following are more elements that The World Bank paper looks into in assessing local government autonomy. These include: *local government tiers, local government size, significance of local government, security of existence of local government, empowerment of local government, democratic or political decentralization, fiscal decentralization, and*

administrative decentralization. All these dynamics are concerning on how to attain a superior measurement of how disconnected a government really is to their people. In the next sections, we will look into more detail on the new variables and their expected associations with corruption, which will also include the descriptive statistics.

Policy Research Working Paper 6138 from the World Bank written by Maksym Ivanyna and Anwar Shah from the Poverty Reduction and Economic Management Unit, March 2012 contains the new fiscal, political, and administrative decentralization indices. These indices were constructed by dissecting fiscal, political, and administrative aspects of government while considering the local government's empowerment from subnational and central governments.

- **The Fiscal Decentralization Index** takes a set of variables used to assess local government fiscal autonomy, these variables are as follows:
    - Local Government Vertical Fiscal Gap (*lgvergap)*
    - Local Government Taxation Autonomy (*lgtaxaut*)
    - Local Government Unconditional Transfers (*lgtransf*)
    - Local Government Expenditure Autonomy (*lgexpaut*)
    - Local Government Borrowing Freedom (*lgborrow*)
- **The Political Decentralization Index** refers to home rule for local self-governance. This is examined using the following variables:
    - Local Government Legislative Election (*lglegel*)
    - Local Government Executive Election (*lgexel*)
    - Local Government Direct Democracy Provisions (*lgdirdem*)

- **The Administrative Decentralization Index** utilizes the following variables to measure the local government's ability to hire, fire, and setting terms of local employment:
    - Local Government Human Resource Policies (*lghrpol*)
    - Local Government Employment (*lgempl*)

Furthermore, these variables take into account the structure, size, degree of local autonomy in decision making, and the significance of local governments including the legal and constitutional foundation of its existence into their derivation of each index. Each variable has their own methodology of coming up with their own index, which creates accuracy in the metrics for actually accounting the differentiating aspects of each variable and giving a more dense analysis into them. When the index data more precisely measures the closeness of the population to their country's government; this kindles a more accurate outcome on how fiscal decentralization actually will effect corruption.

Fiscal Decentralization

For fiscal decentralization in this paper I am comparing two different measures. First one is the data set (SSBS) of subnational (state and local) government expenditure expressed as a proportion of general government revenues and expenditures. This data is from the International Monetary Fund (IMF) Government Finance Statistics for 66 countries over periods of up to twenty years (1990 – 2008) and it is the older data set that has been utilized in past literature.

The second is the Fiscal Decentralization Index Composite (FDI). This data set is argued in taking a more accurate unit of analysis to measuring government's closeness to its people. The question that is attempted to get answered is whether the local government (LG) has the empowerment and ability without subnational (SG) and central government (CG) in acquiring

fiscal means to provide services it is entitled to provide? The formula used for the FDI is the following:

$$FDI = lgexpaut * (0.25 + 0.375 * (lgtaxaut + lgborrow),$$

The following variables to assess the local government's fiscal autonomy are explained:

- *LG Vertical fiscal Gap (lgvergap).* This variable measures the dependence a local government has on higher level government financing to fill their gap between expenditure needs and their means of revenue.
- *LG Taxation Autonomy (lgtaxaut).* This measures the local government's empowerment to determine policy on local taxation and as well as autonomy in tax collection and administration in order to finance its own expenditures without recourse to higher level governments.
- *LG Unconditional Transfers (lgtransf).* Unconditional, formula based grants preserve local autonomy. Even though these grants are now conventional, conditional grants still dominate, which is a variable that needs to be measured.
- *LG Borrowing Freedom (lgborow).* This measures whether local government can borrow money to satisfy their capital finance needs without consent or regulation of the central government.
- *LG Expenditure Autonomy (lgexpaut).* This variable is dependent on a couple factors. First, local governments may have little choice over how the money in their budget should be spent making them simple distributors of the upper-tier government funding transferred to them. If the LG vertical gap (LG expenditure minus LG non-transfer revenues) is wide, and if the upper-tier government transfers are earmarked and discretionary, the actual spending power of LG would be much lower. Second, if LG is

not permitted to regulate its own tax revenue without interference of subnational or CG (usually in such cases they receive a revenue-share of a tax, which is regulated by CG) then they cannot fully rely on the revenues from these taxes, and their policy would still be partly dependent on CG. Therefore, this variable has a methodology to adjust to these arguments, it is as follows:

- *lg_expaut = 1 – lg_vergap * (0.75 – 0.5 * lg_transf)*
  - Referring to this equation even if a country has the widest possible vertical gap, which is (1), and the smallest possible share of unconditional formula-based transfers (0) it still keeps 0.25 share of its original expenditure decentralization. This shows that discretionary conditional grants from CG still provide more autonomy to the LG than the direct spending of CG. At the same time, a country with a positive vertical gap and the best possible set of transfers reflects that it does not give LG as much fiscal independence as its own revenues.

Political Decentralization

The variable here is also an index, which is called the Political Decentralization Index Composite (PDI). The following criteria and formula here attempts to answer the question whether the local government (LG) has the means to provide policymaking that is independent from subnational (SG) and central government (CG):

PDI = ¼ (lglegel + lgexel + lgdirdem),

The variables followed are explained:

- *LG Legislative Election (lglegel).* Are legislative figures at the local level elected, appointed, or somewhere in between? In some cases part of council members are appointed, part is elected, or members of councils are elected from preapproved CG lists.
- *LG Executive Election (lgexel).* Are executive leaders (mayors) at the local level elected – directly or indirectly – or appointed?
- *Direct Democracy Provisions (lg_dirdem).* Are there legislation provisions for obligatory local referenda for major spending, taxing and regulatory decisions, recall of public officials, and requirements for direct citizen participation in local decision making processes?

Administrative Decentralization

The last index in this paper is called the Administrative Decentralization Index Composite (ADI). The following set of variables and formula attempts to measure the ability for local governments to hire, fire, and set terms of employment of local employees as well as regulatory control over their own functions:

$$ADI = \frac{1}{2}\,(lghrpol + lgempl),$$

The explanations of the variables are as follows:

- *LG HR Policies (lghrpol).* Is local government able to craft their own policies regarding hiring, firing, and setting terms of local employment?
- *LG Employment (lgempl).* This measures the proportion of local government employment of subnational and central government employment.

Appendix – 3

Data Set

Country	ICRG	ICRG_NEW	FDI	PDI	ADI	DI	POP	FZ	GDP	FE	SGES	SSBS
Afghanistan			0.18		0.05		31889.92	0.7693	797.4008			
Albania	1	0.833333333	0.63	0.33	0.9	2.99	3600.523	0.2204	4975.978	7.453003	12.2	20.17
Algeria	1.5	0.75	0.24	0.28	0.14	0.05	33362.74	0.3394	7267.523	97.78888	35.8	
Angola	2	0.666666667	0.14		0.07	0.01	12263.6	0.7867	5448.872		14.3	
Argentina	2.5	0.583333333	0.53	0.75	0.4	1.1	40048.82	0.255	16500.01	10.994	76	48.1
Armenia	1.5	0.75	0.46	0.33	0.88	0.87		0.1272		1.202724	82.5	
Australia	4.5	0.25	0.78	0.67	0.56	1.54	20749.63	0.0929	39694.06	24.42232	63.6	41.91
Austria	5	0.166666667	0.76	0.75	0.7	6.68	8199.783	0.1068	38302.66	2.674997	42.5	31.02
Azerbaijan	1.5	0.75	0.41	0.5	0.75	0.16	8120.247	0.2047	10988.44	81.39897		25.12
Bahamas	4	0.333333333	0.06	0.42			305.655	0.4228	25830.72			
Bahrain	2	0.666666667	0.11	0.33	0.1		708.573	0.5021		80.83025		2.71
Bangladesh	2.041667	0.659722222	0.45	0.25	0.35	0.44	152033.9	0.0454	2470.896	1.623045		
Barbados			0.06				282.359	0.1423	26084.69	22.98841		
Belarus	2	0.666666667	0.22	0.42	0.42	0.68	9724.723	0.3222	24072.93	34.91931	25	30.79
Belgium	3.5	0.416666667	0.72	0.67	0.67	4.23	10392.23	0.5554	35953.3	7.008901	57.1	11.07
Belize			0.19	0.39	0.35	0.17	294.61	0.7015	9854.833	28.20804		
Benin			0.23	0.25	0.01	0.03	8278.158	0.7872	1491.229	3.066383		
Bhutan			0.16	0.58	0.05	0.04		0.605	6062.815	36.51446		
Bolivia	2	0.666666667	0.4	0.71	0.54	3.68	9425.936	0.7396	4103.382	49.17657	11.8	19.77
Bosnia and Herzegovina			0.76	0.75	0.65	3.06	4552.198	0.63	6439.17	7.731123		
Botswana	3.958333	0.340277778	0.16	0.33	0.37	0.09	1913.422	0.4102	10169.61	0.241993	24	3.42
Brazil	2	0.666666667	0.78	0.83	0.7	8.09	193918.6	0.5408	10056.67	8.289251		35.24
Brunei Darrusalam	2.5	0.583333333	0.06	0.67		0.15	374.577	0.5416	52103.85			
Bulgaria	2	0.666666667	0.32	0.75	0.7	2.07	7322.858	0.4021	10605.26	14.60918	26.1	17.61
Burkina Faso	2	0.666666667	0.08	0.5	0.08	0.01	14797.17	0.7377	1443.576	0.004515		
Burundi			0.14	0.33	0.05	0.02	8390.505	0.2951	686.6338	5.729812		
Cambodia			0.2	0.33	0.28	0.02	13995.9	0.2105	3015.901			
Cameroon	3.291667	0.451388889	0.12	0.42	0.05	0.01	18060.38	0.8635	2938.102	58.68062	30	
Canada	5	0.166666667	0.9	0.83	0.75	8.69	32935.96	0.7124	39088.61	22.41729	63.8	57.24
Cape Verde			0.06	0.17	0.08	0.01	424.395	0.4174	8266.289			
Central African Republic			0.1		0.05		4377.386	0.8295	924.178		17.4	
Chad			0.1	0.39	0.05	0.01	9885.661	0.862	2829.579			
Chile	4.5	0.25	0.57	0.5	0.62	2.09	16303.85	0.1861	21548.43	1.76269	33.3	7.73
China	2.125	0.645833333	0.57	0.25	0.71	6.32	1321852	0.1538	9034.232	1.686112	92.9	54.66
Colombia	2.5	0.583333333	0.55	0.67	0.55	5.23	44379.6	0.6014	8379.293	37.24141	81.3	
Comoros			0.11	0.67	0.25		711.417		1808.308			
Congo, Dem. Rep.	1	0.833333333	0.12	0.17	0.05	0.01	64390.2	0.8747	414.0398	87.02462	11.8	
Congo, Rep.	2	0.666666667	0.15	0.17	0.05	0.01	3802.332		3965.273	0.580701		
Costa Rica	2	0.666666667	0.49	0.31	0.02	0.14	4137.374	0.2368	12353.53	32.7101		2.67
Cote d'Ivoire	1.541667	0.743055556	0.13	0.39	0.27	0.07	19746.95	0.8204	2377.472	12.75683		
Croatia	2.5	0.583333333	0.41	0.58	0.59	1.14	4493.312	0.369	14861.67		26.4	8.9
Cuba	2.5	0.583333333	0.28	0.67	0.15	0.74	11394.04	0.5908	11762.46			
Cyprus	4	0.333333333	0.22	0.75		0.04	788.457	0.0939	26780.39	0.007632		
Czech Rep.	2.5	0.583333333	0.73	0.58	0.45	3.71	10228.74	0.3222	23125.8	2.579428		19.97
Denmark	5.5	0.083333333	0.9	0.58	0.9	34.03	5468.12	0.0819	36198.32	8.452249	65	43.3
Djibouti			0.06	0.5			496.374	0.7962	4649.568			
Dominica			0.16	0.33			72.377	0.2003	5250.669			
Dominican Republic	2	0.666666667	0.14	0.58	0.04	0.05	9365.818	0.4294	10180.31	5.825158		2.06
Ecuador	3	0.5	0.44	0.67	0.5	1.37	14134.96	0.655	6510.662	59.53164	19	
Egypt	2	0.666666667	0.1	0.33	0.28	0.04	80335.04	0.1836	6142.84	52.48057	60.7	
El Salvador	2.5	0.583333333	0.39	0.42		0.13	6948.073	0.1978	5926.762	2.864948		
Equatorial Guinea			0.06	0.44			599.763	0.3467	17680.07			
Eritrea			0.06				5357.676	0.6524	624.6618			
Estonia	3	0.5	0.23	0.42	0.58	1.83	1315.912	0.5062	20977.74	12.32082	34.4	22.86
Ethiopia	2	0.666666667	0.36	0.5	0.45	2.37	79935.8	0.7235	1203.685	0.006189		
Fiji			0.06	0.46	0.02		918.878	0.5479	6159.881	0.075359	34.2	3.37
Finland	6	0	0.76	0.67	0.9	16.04	5238.46	0.1315	33911.96	5.473706	77.8	33.58
France	4.375	0.270833333	0.75	0.58	0.66	4.35	63681.74	0.1032	31446.69	3.824605	44	17.61
Gabon	1	0.833333333	0.22	0.5			1456.451	0.769	9178.648	83.41377	49.1	
Gambia	2.041667	0.659722222	0.06	0.67	0.3		1688.359	0.7864	1554.455		25	
Georgia			0.78	0.42	0.69	5.48	4646.003	0.4923	9184.987	3.948584	18.8	
Germany	5	0.166666667	0.67	0.75	0.64	4.86	82401	0.1682	33181.09	2.293107	87.7	41.22
Ghana	1.5	0.75	0.41	0.33	0.3	0.21	22931.3	0.6733	1814.844	1.292176	28.6	
Greece	2	0.666666667	0.34	0.83	0.13	0.33	10706.29	0.1576	29482.53	12.16721	25.6	
Grenada			0.06				90.005	0.2661	16507.34	0.282854		
Guatemala	1.5	0.75	0.18	0.33	0.3	0.22	12728.11	0.5122	6445.477	5.073291		9.6
Guinea	2	0.666666667	0.22	0.21	0.25	0.02	9569.216	0.7389	3794.399	1.042485	26.7	
Guinea-Bissau	2	0.666666667	0.06		0.13	0.01	1472.78	0.8082	658.0308		20.8	
Guyana	2	0.666666667	0.06	0.5	0.18		769.095	0.6195	2604.139	0.00116		
Haiti	1	0.833333333	0.06				8710.825	0.095	1669.384			
Honduras	2	0.666666667	0.29	0.42	0.31	0.35	7483.763	0.1867	3796.462	5.52228	12.1	
Hong Kong, China	4	0.333333333	1	0.67	0.65	17.29	6980.412	0.062	45446.26	1.979918		
Hungary	3	0.5	0.62	0.75	0.82	6.91	9956.108	0.1522	18041.7	2.799713	48.1	23.41
Iceland	5.5	0.083333333	0.79	0.75	0.65	10.53	301.931	0.0798	40907.56	1.453811		23.79
India	2.5	0.583333333	0.48	0.67	0.35	0.58	1129866	0.4182	4099.724	15.89887	50	45.8
Indonesia	3.041667	0.493055556	0.5	0.53	0.39	3.48	234694	0.7351	5468.304	25.38673	30	12.94
Iran, Islamic Rep.	2	0.666666667	0.6	0.21	0.05	0.1	65397.52	0.6684	10739.85			
Iraq	1	0.833333333	0.06	0.5	0.3	0.08	27499.64	0.3689	5103.17	99.73948		
Ireland	3.5	0.416666667	0.27	0.58	0.31	0.64	4109.086	0.1206	43351.25	0.771217	39.5	23.81
Israel	3	0.5	0.2	0.67	0.08	0.13	6990.062	0.3436	25301.54	0.153334		14.16
Italy	2.5	0.583333333	0.49	0.83	0.35	4.07	58147.73	0.1145	30505.24	3.858581	48.4	20.27
Jamaica	1.5	0.75	0.22	0.5	0.03	0.01	2782.221	0.4129	8758.995	15.08861		
Japan	3	0.5	0.68	1	0.56	15.31	127433.5	0.0119	32063.24	1.289585	63.2	
Jordan	3	0.5	0.16	0.13	0.5	0.04	6053.193	0.5926	5562.904	0.82882	50	

Kazakhstan	1.5	0.75	0.37	0.33	0.2	0.72	15284.93	0.6171	17275.15	66.55231	25	
Kenya	0.5	0.916666667	0.36	0.33	0.15	0.14	36913.72	0.8588	2191.482	4.323022	19	3.77
Korea Rep.	1	0.833333333	0.7	0.75	0.53	12.33	48250.15	0.0392	24949.65	6.530612		
Korea, Dem. Rep.	2.5	0.583333333	0.22	0.5	0.08	0.1		0.002			55.2	
Kosovo	3	0.5	0.19	0.67	0.45	0.62						
Kuwait			0.11	0.17		0.03	2505.559	0.6604	47753.24	96.30702		
Kyrgyz Rep.			0.22	0.28	0.27	0.3	5284.149	0.6752	4024.66	15.59017		
Lao PDR			0.17	0.53	0.04	0.2	6521.998	0.5139	2419.475		81.8	
Latvia	2	0.666666667	0.53	0.5	0.7	4.11	2259.81	0.5867	16333.77	3.658718		23.39
Lebanon	1	0.833333333	0.21	0.5	0.06	0.17	3925.502	0.1314	8228.166	0.247741	58.8	
Lesotho			0.38		0.03	0.01	2125.262	0.255	2425.246			
Liberia	2.5	0.583333333	0.11		0.05	0.01	3195.931	0.9084	408.7145			
Libya	1.5	0.75	0.11	0.67	0.05	0.05	6036.914	0.792	24280.57	96.62472		
Lithuania	2	0.666666667	0.39	0.75	0.7	3.46	3575.439	0.3223	15330.53	13.3555	37.5	30.1
Luxembourg	5	0.166666667	0.89	0.58	0.35	2.16	480.222	0.5302	88335.05	0.77873		15.72
Macao, China			0.13			0.01	525.531		50485.25			
Macedonia			0.19	0.75	0.01	0.05	2055.915	0.5023	7641.929	4.922223	9.1	
Madagascar	4	0.333333333	0.13	0.75	0.35	0.03	19448.82	0.8791	918.1976	4.701841		
Malawi	1.875	0.6875	0.13	0.67		0.01	13603.18	0.6744	1397.401	0.035776		
Malaysia	2.833333	0.527777778	0.41	0.08	0.54	0.14	24835.24	0.588	19012.83	14.41232		
Mali	2	0.666666667	0.11	0.44		0.02	11995.4	0.6906	1357.52	1.917027		
Malta	3.5	0.416666667	0.1	0.58		0.01	401.88	0.0414	23006.44	2.288816	31.7	17.71
Mauritania			0.13	0.33		0.01	2981.452	0.615	2417.89	25.7443		
Mauritius			0.17	0.5	0.05	0.03	1263.899	0.4634	20269.64	0.144914	13	4.68
Mexico	2	0.666666667	0.42	0.83	0.28	0.32	108700.9	0.5418	12026.71	15.76684		28.59
Moldova	1.5	0.75	0.18	0.5	0.84	1.56	4328.816	0.5535	3785.882	0.243903	50	29.47
Mongolia	2	0.666666667	0.36	0.42	0.2	0.8	2951.786		3711.736	10.29686		35.06
Montenegro			0.16	0.75	0.7	1.54	684.736	0.3682	7434.046			
Morocco	3	0.5	0.26	0.5	0.39	0.15	33826.3	0.4841	5720.169	2.267671	36.8	
Mozambique	1.666667	0.722222222	0.41	0.17			20905.59	0.6932	2306.26	15.48881		
Myanmar	1.375	0.770833333	0.09					0.5062				
Namibia	1.5	0.75	0.11	0.58	0.28	0.02	2069.028	0.6329	6805.396	0.431614		
Nepal			0.22	0.75	0.03	0.04	27827.89	0.6632	2049.012			
Netherlands	5	0.166666667	0.36	0.5	0.7	3.81	16570.61	0.1054	36394.13	8.72787	24.8	24.13
Netherlands Antilles			0.06	0.67								
New Zealand	5.5	0.083333333	0.79	0.67	0.55	2.21	4132.341	0.3969	27439.76	4.59777	49	9.57
Nicaragua	2.5	0.583333333	0.16	0.75	0.05	0.04	5680.208	0.4844	2305.804	0.878276		8.79
Niger	1.291667	0.784722222	0.44	0.39	0.03	0.02	14214.71	0.6518	869.7368	2.565066		
Nigeria	1.5	0.75	0.24	0.67	0.2	1.87	143312.1	0.8505	2519.717	93.66636		
Norway	5	0.166666667	0.74	0.58	0.9	15.11	4627.926	0.0586	53967.52	64.31957	38.1	31.82
Oman	2.5	0.583333333	0.06		0.05	0.01	3206.906	0.4373	25383.16	89.07469		
Pakistan	1.958333	0.673611111	0.5	0.56	0.35	1.35	169340.5	0.7098	3675.807	5.633076	59.3	
Panama	2	0.666666667	0.2	0.33	0.03	0.03	3258.329	0.5528	9480.511	0.680461		2.38
Papua New Guinea	1	0.833333333	0.14	0.5	0.05	0.05	5806.036	0.2718	2100.779			
Paraguay	1	0.833333333	0.39	0.67	0.55	0.72	6669.086	0.1689	4912.961	0.000975		2.62
Peru	2.5	0.583333333	0.37	0.75	0.65	1.46	28809.3	0.6566	7245.124	10.0825		19.16
Philippines	2	0.666666667	0.5	0.75	0.64	3.02	94157.47	0.2385	4822.9	2.817994	26.5	8.7
Poland	2.5	0.583333333	0.62	0.58	0.7	7.93	38518.24	0.1183	15447.54	3.665684	63.6	16.2
Portugal	4	0.333333333	0.56	0.75	0.59	2.29	10642.84	0.0468	21526.84	4.151971	32.7	11.05
Qatar	2.5	0.583333333	0.12	0.33		0.02	814.897	0.7456	104707.5	90.65782		
Romania	2.5	0.583333333	0.43	0.58	0.45	1.46	22276.06	0.3069	10506.91	7.524701		11.07
Russian Federation	2	0.666666667	0.34	0.71	0.25	2.31	141377.8	0.2452	14669.92	61.44698	36.4	38.43
Rwanda			0.08	0.53	0.04	0.03	9907.509	0.3238	1216.32	0.010773		
Samoa			0.06				214.265		6125.351	0.333092		
Sao Tome and Principe			0.06	0.5			199.827		5020.657			
Saudi Arabia	2	0.666666667	0.06	0.08	0.05	0.01	27586.53	0.18	22391.74	90.10599		
Senegal	2.5	0.583333333	0.24	0.42	0.54	0.18	12981.93	0.6939	2017.821	19.44461	10	
Serbia	2	0.666666667	0.69	0.75	0.48	2.33	7447.093	0.5736		2.621057		
Seyshelles			0.06	0.17		0.07	85.702	0.2025	12944.52			
Sierra Leone	1.5	0.75	0.06	0.25		0.01	6152.359	0.8191	1987.668			
Singapore	4.5	0.25	1	0.67	0.65	17.29	4553.009	0.3857	48489.62	13.74968		
Slovak Rep.	2.5	0.583333333	0.56	0.75	0.46	2.09	5447.502	0.2539	18172.81	4.471523	39.6	
Slovenia	3	0.5	0.39	0.75	0.7	2.59	2009.245	0.2216	27867.76	1.965242		10.87
Somalia	1	0.833333333	0.06	0.17		0.01	9291.609	0.8117	491.0778			
South Africa	2.5	0.583333333	0.58	0.42	0.4	2.03	48367.13	0.7517	11306.94	10.43867	44.6	29.62
Spain	4	0.333333333	0.74	0.5	0.37	2.06	40448.19	0.4165	33615.8	4.501227	60.5	29.93
Sri Lanka	2.5	0.583333333	0.22	0.47	0.59	0.2	20926.32	0.415	6270.975	0.030508	17.3	
St. Lucia			0.06	0.58			158.875	0.1769	13793.56	0.009885		
St. Vincent and Grenadines			0.06	0.17			105.307	0.3066	6635.017			
Sudan	1	0.833333333	0.22	0.39	0.38	0.41	39379.36	0.7147	2569.708			
Suriname	2	0.666666667	0.06	0.33			470.784	0.7332	10815.94	4.50358		
Swaziland			0.22	0.13	0.03	0.01	1133.066	0.0582	7746.05	1.258367		
Sweden	5	0.166666667	0.77	0.54	0.9	20.71	9031.088	0.06	35270.78	4.849181	56.7	31.4
Switzerland	4.5	0.25	0.96	1	0.9	19.84	7554.661	0.5314	39161.44	2.469088	54.5	48.26
Syrian Arab Republic	2	0.666666667	0.16	0.25	0.12	0.03	19314.75	0.5399	2689.452	41.10717	22	
Taiwan	2.5	0.583333333	0.56	0.67		0.92	22828.56	0.2744	27883.79			
Tajikistan			0.22	0.25	0.2	0.31	7076.598	0.5107	3018.359			
Tanzania	3.333333	0.444444444	0.21	0.5	0.32	0.63	39384.22	0.7353	944.8938	0.896347	16.7	
Thailand	1.5	0.75	0.46	0.58	0.35	2.55	65068.15	0.6338	10302.93	4.26831	41	7.39
Timor-Leste			0.13		0.1		1086.174		996.3787			
Togo	1.5	0.75	0.44	0.75	0.12	0.06	5701.579	0.7099	951.6452	0.004952	23.1	
Trinidad and Tobago	2	0.666666667	0.11	0.5			1232.811	0.6475	29394.51	66.07585		4.44
Tunisia	2	0.666666667	0.34	0.5	0.28	0.08	10281.21	0.0394	10641.26	16.20789	15.4	
Turkey	2.5	0.583333333	0.46	0.58	0.31	0.69	74767.84	0.32	8101.29	4.818847	29.4	
Turkmenistan			0.18	0.36	0.15		4774.232	0.3918	12118.94			
Uganda	2	0.666666667	0.2	0.75	0.49	1.87	30262.61	0.9302	1298.826	1.379451	42.9	
Ukraine	2	0.666666667	0.35	0.64	0.74	3.65	46299.86	0.4737	11173.81	5.123396	46.7	
United Arab Emirates	2	0.666666667	0.56	0.42	0.25	1.73	4444.011	0.6252	57259.23	65.34524		
United Kingdom	4	0.333333333	0.52	0.67	0.51	4.29	60776.24	0.1211	34319.8	10.27451	63.5	22.43
United States	4	0.333333333	0.9	1	0.75	14.19	301279.6	0.4901	45597.07	3.950846	72.5	46.58
Uruguay	3	0.5	0.55	0.83	0.17	1.19	3460.607	0.2504	13608.6	4.362821	33.8	9.99
Uzbekistan			0.18	0.53	0.5	1.7	27079.27	0.4125	2208.557			
Venezuela	1	0.833333333	0.48	0.67	0.15	0.28	26023.53	0.4966	13721.79		30.2	22.2
Vietnam	2.958333	0.506944444	0.16	0.58	0.55	1.14	85262.36	0.2383	3731.199	20.72598	78.4	
West Bank and Gaza			0.34	0.25	0.5	1.64						
Yemen	2	0.666666667	0.08	0.17		0.02	22230.53		1172.797	91.22717	23.4	
Zambia	3.333333	0.444444444	0.31	0.25	0.13	0.03	11477.45	0.7808	2296.513	0.50365	20	
Zimbabwe		1	0.17	0.42	0.1	0.08	11443.19	0.3874	2448.497	0.585205	28.6	13.7

Appendix – 3

SAS Input

```
data work.SET2;
set SET;
logPOP = log(POP);
logGDP = log(GDP);
run;

ODS RTF FILE="E:\DIFF_COMBOS.rtf";
proc print data=set2;
run;

proc means data=SET2;
title 'Variables that Effect Corruption';
run;
proc corr data=SET2;
run;


PROC REG DATA=SET2;
MODEL ICRG_NEW=SSBS FZ logGDP logPOP FE;
RUN;
PROC REG DATA=SET2;
MODEL ICRG_NEW=FDI FZ logGDP logPOP FE;
RUN;
PROC REG DATA=SET2;
MODEL ICRG_NEW=ADI FZ logGDP logPOP FE;
RUN;
PROC REG DATA=SET2;
MODEL ICRG_NEW=PDI FZ logGDP logPOP FE;
RUN;
PROC REG DATA=SET2;
MODEL ICRG_NEW=DI FZ logGDP logPOP FE;
RUN;
PROC REG DATA=SET2;
MODEL ICRG_NEW=FDI ADI PDI DI FZ logGDP logPOP FE;
RUN;

PROC REG DATA=SET2;
MODEL ICRG_NEW=FDI;
RUN;
PROC REG DATA=SET2;
MODEL ICRG_NEW=ADI;
RUN;
PROC REG DATA=SET2;
MODEL ICRG_NEW=PDI;
RUN;
PROC REG DATA=SET2;
MODEL ICRG_NEW=DI;
RUN;
PROC REG DATA=SET2;
MODEL ICRG_NEW=FZ;
RUN;
```

```
PROC REG DATA=SET2;
MODEL ICRG_NEW=logGDP;
RUN;
PROC REG DATA=SET2;
MODEL ICRG_NEW=logPOP;
RUN;
PROC REG DATA=SET2;
MODEL ICRG_NEW=FE;
RUN;

PROC REG DATA=SET2;
MODEL FDI=ICRG_NEW ADI PDI DI FZ logGDP logPOP FE;
RUN;
PROC REG DATA=SET2;
MODEL ADI=FDI ICRG_NEW PDI DI FZ logGDP logPOP FE;
RUN;
PROC REG DATA=SET2;
MODEL PDI=FDI ICRG_NEW ADI DI FZ logGDP logPOP FE;
RUN;
PROC REG DATA=SET2;
MODEL DI=FDI ICRG_NEW ADI PDI FZ logGDP logPOP FE;
RUN;
PROC REG DATA=SET2;
MODEL FZ=FDI ADI PDI DI ICRG_NEW logGDP logPOP FE;
RUN;
PROC REG DATA=SET2;
MODEL logGDP=FDI ADI PDI DI FZ ICRG_NEW logPOP FE;
RUN;
PROC REG DATA=SET2;
MODEL logPOP=FDI ADI PDI DI FZ logGDP ICRG_NEW FE;
RUN;
PROC REG DATA=SET2;
MODEL FE=FDI ADI PDI DI FZ logGDP logPOP ICRG_NEW;
RUN;
```