Corruption and Economic Growth in the BRICS: An Empirical Analysis

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Abstract:

This paper investigates the relationship between corruption and economic growth in Brazil, Russia, India, China and South Africa; collectively known as the BRICS. Given the rapid rise of the BRICS and the international spotlight placed on them, this research study aims to explore the effect corruption has on the GDP growth of the states. To do this, a time-series analysis is conducted on each of the five states in order to analyze corruption's effect on the individual countries. It is found that corruption only holds significance in Brazil and Russia, however, whilst there appears to be an inverse relationship between corruption and growth in Brazil, there is a positive correlation between the two in Russia.

JEL Classification: D73, O40, O43, O57,

Keywords: Corruption, BRICS, Growth, Brazil, Russia, India, South Africa, China, Control of Corruption

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1.0 INTRODUCTION

This paper explores the relationship between corruption and economic growth to determine the effect of corruption on the growth of a state. As such, a time series analysis will be done using OLS regression for each of the five (5) states chosen for the purposes of this study. These states are Brazil, Russia, India, China and South Africa, collectively known as the BRICS. The study will focus on the 25 year period between 1990 and 2014.

Corruption, as defined in Appendix B, is generally accepted to be a deterrent of economic growth and development. For the purposes of this study, corruption acts as the independent variable of interest. Literature, some of which will be reviewed in Section 2 of this paper, on the subject has greatly documented how corruption deters, or hinders, factors including (but not limited to) foreign direct investment (FDI), productivity and participation (economic and political), therefore obstructing economic progress. Given the recent and rapid upturn of the BRICS's economies in the past decades, as well as the expected positive development of these states, this study has chosen to focus on these specific states in order to see how corruption (a phenomenon arguably rampant in some of these states) has affected the economies thus far, and to conclude on whether or not it has had any sort of impact on the expanding economies of each state.

The BRICS are a collection of the five aforementioned states. They are emerging economies characterized as developing or newly industrialized states known to have rapidly growing economies and large amounts of political influence in regional, or global, affairs. The group was formally known as BRICs until South Africa was recognized as part of the group. The group have held five formal summits since 2010, with the leader of each state present, and discuss policies of structural, economic and political change.

This paper differs from other literature exploring the relationship between corruption and economic growth in the observation period which the analysis will be conducted on as well as the units of observation, the BRICS states. This will help generate policy suggestions for each state, possibly helping them identify policies moving forward that will help not only their political atmosphere but their economies as well. This is crucial especially given current events in countries

such as Brazil, China and South Africa where on-going fights against corruption have intensified and have even called for impeachment of high-level officials.

The rest of the paper is organized as follows: Section 2 gives information about the general trend on the topic at hand whilst section 3 gives a brief literature review. Section 4 explains the data collection and empirical methodology. Section 5 presents and interprets the empirical results. Finally, a conclusion is offered in section 6.

2.0 TREND (OF THE GIVEN TOPIC)

Figure 1.0 – Graph Showing Control of Corruption Evolution by Region

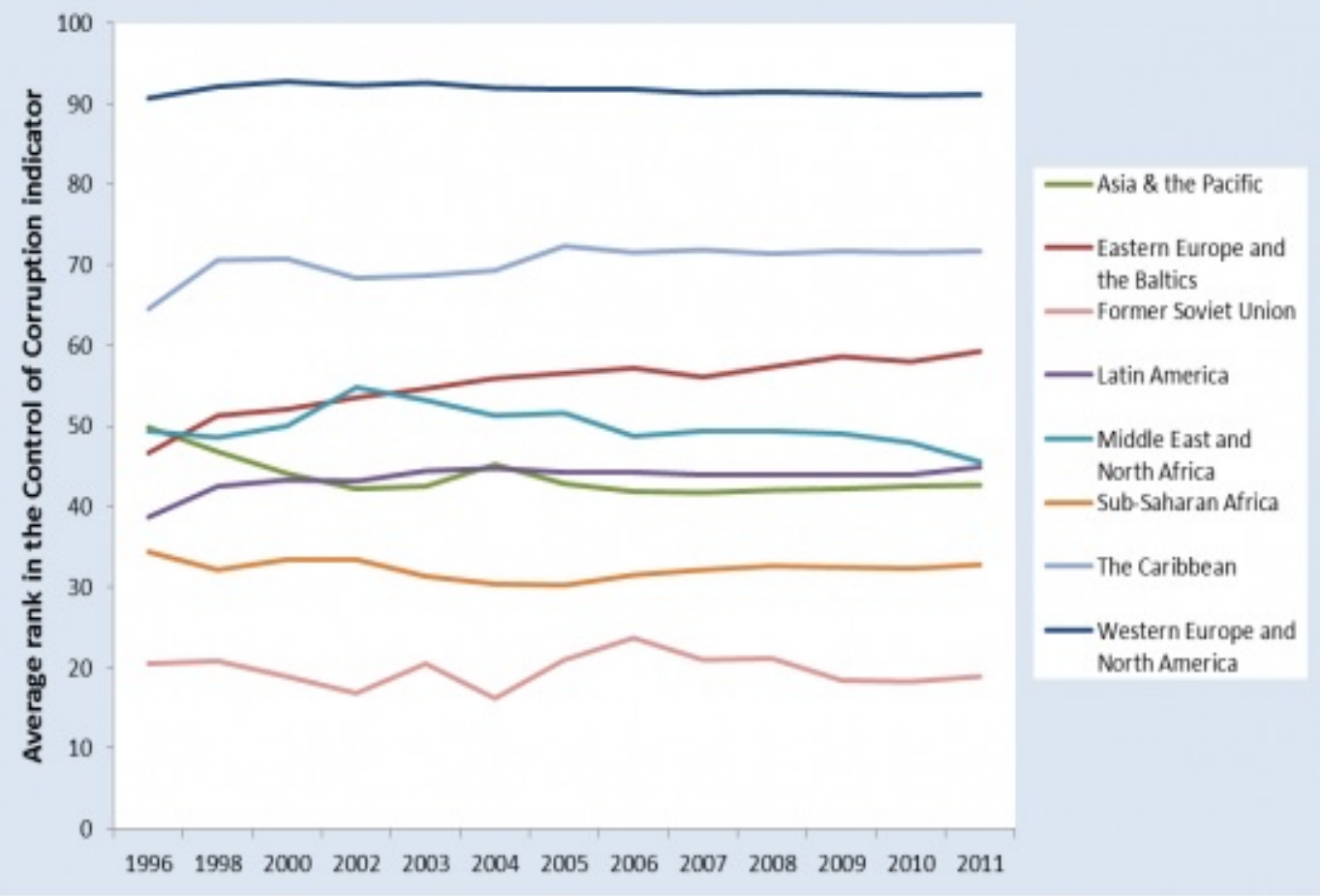
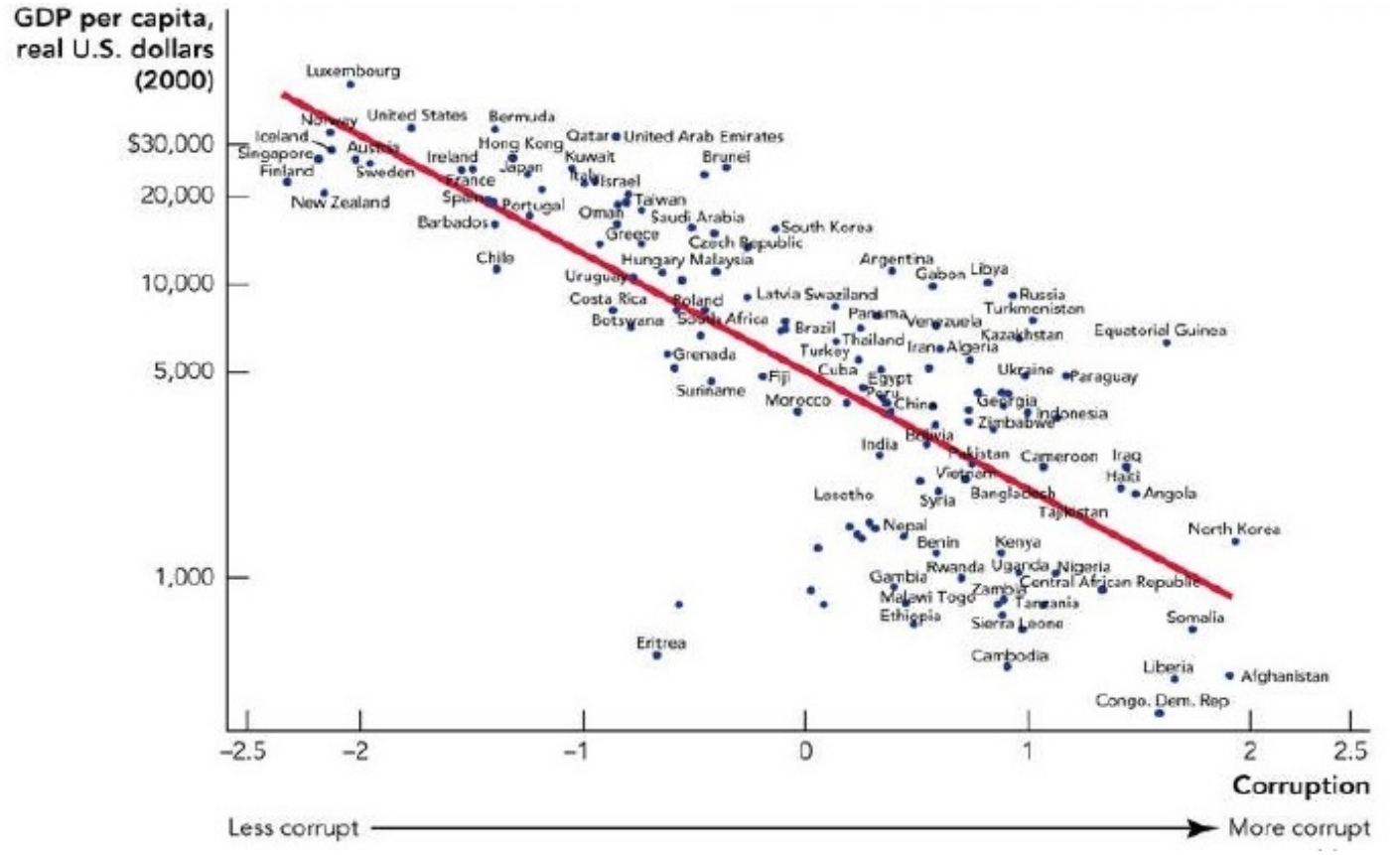


Figure 1.0 shows the general trend of Control of Corruption by region over the years.As it can be seen, there has been a general improvement in Control of Corruption over the years. Although there are some turbulent years, for instance 2002 to 2006 in the Former Soviet Union, many of the world regions have experienced an increase in Control of Corruption since 1996. Figure 1.0 also shows that whilst the Former Soviet Union ranks the lowest in this indicator, Western Europe/North America is ranked the highest. It must be noted that some of the regions represented by the BRICS are not represented in the diagram.

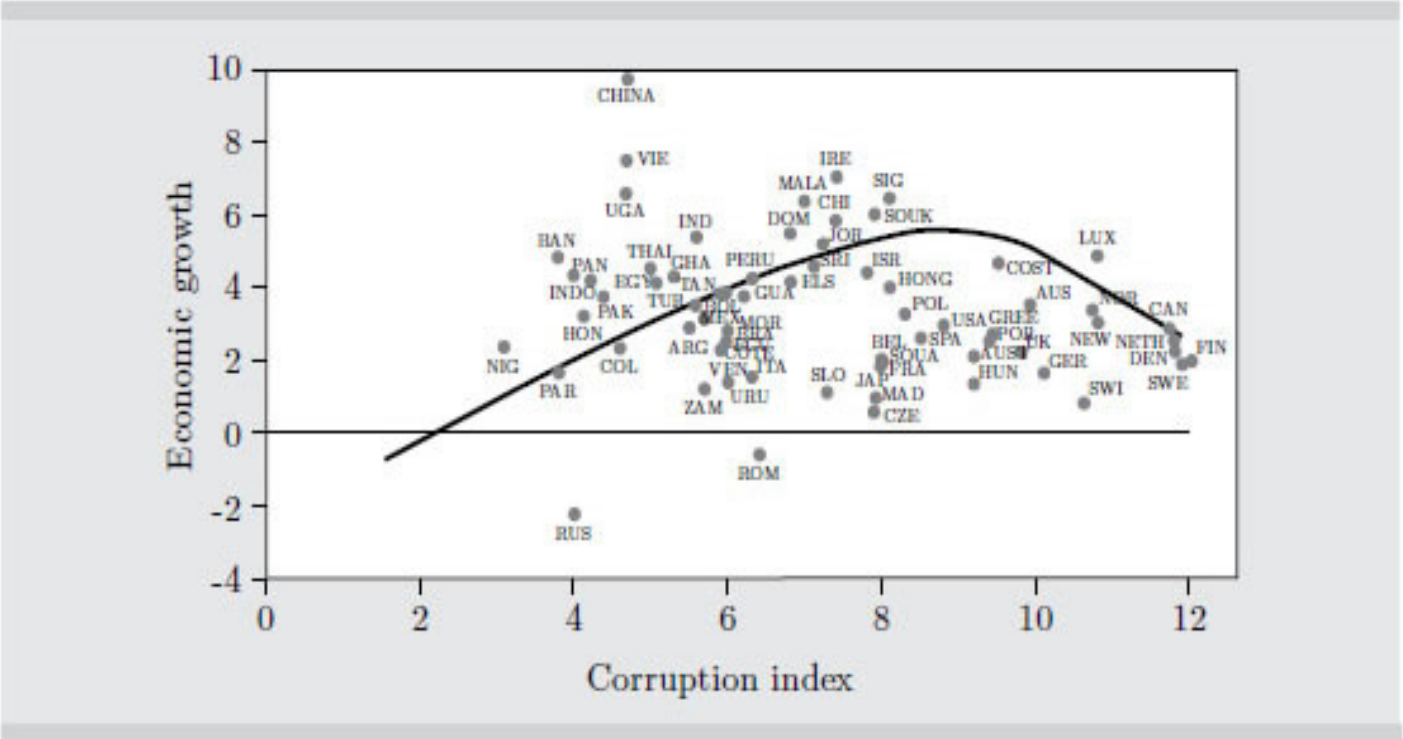
Figure 2.0 – Graph Showing Relationship between Corruption and GDP per Capita



Source: Penn World Tables and World Bank Group, World Development Indicators, 2015

Figure 2.0 shows the inverse nature of the relationship between corruption and GDP per Capita. From the graph, it can be seen that countries with low levels of corruption, such as Luxembourg, have a higher GDP per capita than countries with high levels of corruption, for example Liberia, who has a significantly lower GDP per capita. Looking specifically at the positioning of our BRIC states on the graph, the trend prevails. South Africa is listed to be at the -0.5 level of corruption with approximately US$9,000 in per capita GDP, Brazil measured to have corruption level of 0 is also in the US$9,000 GDP per capita range, but slightly lower than the per capita GDP of South Africa. China and India are both listed to have a corruption levels of 0.5 and GDPs per capita in the US$4,000 range, showing that higher levels of corruption are associated with lower levels of GDP per capita. Russia, however, appears to be an outlier as, with a corruption level of 0.9, the state's GDP per capita is relatively high at US$10,000.

Figure 3.0 – Graph Showing Relationship between Economic Growth and Corruption Index



Source: Latin American Journal of Economics

Figure 3.0 illustrates the relationship between economic growth and corruption, showing that the relationship, contrary to Figure 2.0, appears to be quadratic in nature.The graph aims to show that the less corrupt a country is, the greater the growth rate, however, beyond a certain threshold, the graph appears to show less corruption is associated with reduced growth. This trend is consistent with some of the literature that will be presented in Section 3.0.

2.0 LITERATURE REVIEW

Mauro (1995) explores the relations between corruption and growth by using a cross-sectional data set. In the study, corruption indicators such as judicial system efficiency, measures of political stability (such as institutional change, terrorism, relationship with neighbor states), amount of red tape corruption as well subjective corruption indicators (e.g. perception levels) in order to measure the effect corruption has on the growth of a country. In order to avoid multicollinearity, Mauro (1995) finds the aggregate of similar indicators and joins them in the creation of specific variables that encompass multiple variables. For example, taking the composite function for judiciary system and red tape creating one bureaucratic efficiency index that measures all the variables at once. Mauro (1995) finds there to be a significant, negative relationship between corruption and investment rate. Taking a closer look Mauro (1995) found that there is a stronger relationship between bureaucratic efficiency and equipment investment than bureaucratic efficiency and non-equipment investment, such as private investment. In addition, Mauro (1995) finds that improvements in bureaucratic efficiency lead to increases in the average GDP per capita growth rate.

The effect of corruption on investment growth is explored by (Asiedu and Freeman, 2009). This study focuses primarily on the firm-level in Latin America, Sub-Saharan Africa as well as transition countries and employs six measures of corruption (two at the firm level and four at the country level) to explore the relationship between corruption and firms' investment growth. Other independent variables considered included, firm size, industry, GDP growth and inflation, amongst others. (Asiedu and Freeman, 2009) explore this relationship by collecting data on internal (or perceived/experienced) corruption measures through surveys and questionnaires; external corruption data from private (typically foreign) agencies which provide risk ratings and assessments; and, hybrid corruption data which are composite indexes of corruption data from multiple sources. (Asiedu and Freeman, 2009) conclude by finding that the effect of corruption on investment varies with the region. That is, whilst corruption appears to have a significant, negative impact on firms in transition countries, corruption appears to have no significant impact on firms in Sub-Saharan Africa and Latin America.

(Ebben and de Vaal, 2009) uses a formal growth framework to find the relationship between corruption and economic growth. Findings of this study show that in states with poor institutions, corruption may actually be "conducive to growth." This is because the positive effect corruption has on the "working of the institutional system" is greater than corruption's negative effect on growth. (Ebben and de Vaal, 2009) use a two layer model, the first assuming an institutional vacuum and the second accounting for the effect institutions have on the relationship between growth and corruption. One of the most telling findings of the study was discovered in the second layer. It was found that, despite the positive effect corruption may have on the growth, that beyond a certain threshold, corruption begins to have a negative effect on growth. This results in an inverted U-shaped curve.

Similarly, Ahmad et al (2012) explores this relationship taking into consideration "growth-enhancing and growth-reducing levels of corruption" to conclude that the relationship can be illustrated by an inverted U-shaped curve. This study also took into account the factor of institutional quality. This panel data analysis examined two datasets of 60 and 71 countries. In order to avoid issues of multicollinearity, the simple averages of similar variables are composited to create one, all-encompassing variable.

Mo (2000) finds there to be a negative relationship between corruption (primarily in the form of political instability) and growth. The study finds that corruption lowers levels of human capital and private investment shares. Mo (2000) analyzes a panel data set of 54 countries for the period of 1960 and 1985, broken down to 5 year sub-periods.

Borensztein at al. (1998) does not explore the relationship between corruption and growth but rather provides an economic growth model. In the study, Borensztein et al. look at the effect of foreign direct investment (FDI) on economic growth concluding that FDI helps bring new technologies into countries which spurs growth, but only if there is an availability of human capital. This study provides a growth model that takes into consideration factors such as FDI, initial GDP per Capita, Human Capital Stock and a composite variable that comprises of Government Consumption, Inflation Rate and numerous corruption indicators.

4.0 DATA AND EMPIRICAL METHODOLOGY

4.1 Data

The study uses annual data for a time series data analysis from 1990 to 2010. The data was collected for the 5 BRICS, those are Brazil, Russia, India, China and South Africa.

Data for economic indicators was obtained from the from the World Bank's World Development Indicators. The publically available data from the WDI includes statistics from 248 countries for 1345 economic indicators for the 50 year period from 1966 to 2015. The WDI database has been used to obtain the data needed for all variables excluding corruption.

Data for the Control of Corruption has been obtained from the World Governance Indicators database. The WGI database is a World Bank catalogue that contains measures of bureaucratic efficiency, such as Political Stability, Government Effectiveness and Control of Corruption. The data is available for world countries as well as regional clusters; for instance, high- and low-income OECD and non-OECD states, Middle-East and North Africa, Latin America and Caribbean and so forth.

Summary statistics for the data are provided in Tables 1.1, 1.2, 1.3, 1.4, 1.5 in the Appendix section.

4.2 Empirical Model

Following Borenzstein et al (1998) economic growth model, this study adopted the following model:

$$gdp.gr = \alpha + \beta_1 CoC + \beta_2 gdp.pcap - \beta_3 infl + \beta_4 fdi - \beta_5 a.dpnd + \beta_6 govt.cons + \mathcal{E}$$

The model consists of six independent variables. Of the original equation, the following adaptations have been made in accordance to some of the models presented in the studies of the literature review; Age Dependency has been added as a measure of population, Control of Corruption has been isolated and made to be a measurable variable. Also, Government Consumption and Inflation have been added to the model whilst the Human Capital measure has been removed.

Appendix A provides the acronyms, names, explanations and expected signs of the independent variables. CoC which denotes Control of Corruption, GDP.PCAP denoting initial GDP per Capita, INFL denoting Inflation, FDI which denotes Foreign Direct Investment, A.DPND denoting age dependency ratio and GOVT.CONS denoting Government Consumption. GDP.GR (GDP Growth Rate) serves as the dependent variable.

Control of Corruption was chosen as the indicator for corruption. It measures the perceived levels of corruption (as defined in the Introduction section of this research) and is given as an index ranging from -2.5 (high levels of corruption) to 2.5 (low levels of corruption). The Control of Corruption indicator encompasses both petty forms of corruption as well as grand forms. It is for this reason that the CoC indicator was picked as the measure of corruption, for the purposes of this study. A list of the different factors included in the CoC index is included in the Appendix (Appendix B).

This study ran an OLS regression for each of the BRICS for the given time period. A time-series analysis was favored by this research so as to isolate the five countries in order to see not the general effect corruption has on growth amongst the BRICS but rather, the specific effect of corruption within each of the countries.

Results of this regression are presented and interpreted in the following section, Section 5.0.

5.0 EMPIRICAL RESULTS

The results of the regressions run are presented in Table 2.0. Both parameter estimates as well as significance levels are displayed in the table.

	Brazil	Russia	India	China	South Africa
GDP.PCAP	0.0000113**	-0.0000131**	0.0000974	-0.0000529*	-0.00105***
	[2.41]	[-2.38]	[1.56]	[-1.87]	[-3.57]
INFL	0.00192	-0.0162**	0.0229	-0.00924	8.75
	[1.58]	[-2.45]	[0.11]	[-0.37]	[1.01]
FDI	-6.32E-13	8.24E-13	-9.46E-13	5.37e-13**	-2.13e-10**
	[-1.44]	[0.83]	[-1.26]	[2.21]	[-2.53]
A.DPND	-1.270**	-0.449	-0.738	0.182	-0.0364*
	[-2.77]	[-0.85]	[-1.49]	[0.39]	[-1.96]
GOVT.CONS	-2.69e-12**	2.92e-12*	-1.61e-12*	4.16E-13	2.05e-10***
	[-2.33]	[2.05]	[-1.82]	[1.00]	[3.70]
CoC	-0.0716*	0.0308*	0.0394	0.0514	0.839
	[-2.07]	[1.78]	[0.06]	[0.67]	[1.39]
Constant	1.077**	-0.0531	0.604*	-0.0232	-4.695**
	[2.70]	[-0.15]	[2.04]	[-0.08]	[-2.42]

The results of the regression are mixed across the five countries. However, it can be seen that GDP per Capita is significant in four of the five states - Brazil, Russia, China and South Africa – at the 5%, 5%, 10% and 1% significance levels, respectively. It must be noted that while there is a positive correlation between GDP per Capita and growth in Brazil, suggesting that a 1% change in GDP per Capita fosters an increase in the GDP Growth Rate by the magnitude of the parameter estimate in Brazil; there appears to be an inverse relationship between GDP per Capita and growth in Russia, China and South Africa. The negative parameter estimates for these countries would suggest that a 1% increase in GDP per Capita would result in a decrease of the countries' GDP Growth Rates by the magnitude of their respective parameter estimates.

As per the results, Inflation is only significant in Russia with a significance level of 5%. The parameter estimate for Inflation is negative suggesting an inverse relationship to growth. This negative correlation was initially expected. As such, a 10% increase in Inflation would lead to a 0.162% decrease in Russia's GDP Growth Rate.

Foreign Direct Investment (FDI) is significant in China and South Africa both at 5% significance levels. However, whilst the parameter estimate for FDI is positive in China, it proves to be negative in South Africa. This would suggest that whilst increases in FDI in China would help increase their GDP Growth Rate, the opposite is true for South Africa, increases in the amount of FDI would lead to a decrease in South Africa's GDP Growth Rate.

Similarly, Age Dependency Ratio also proved to be significant in only two countries, Brazil and South Africa at the 5% and 10% significance levels, respectively. The parameter estimates for both countries are, as expected, negative. This means that a 10% increase in the Age Dependency Ratio of these countries would lead to a 10.270% and 0.364% decrease in the GDP Growth Rates of Brazil and South Africa, respectively. It is interesting to note the large discrepancy in the magnitude of this parameter estimate by the country.

According to the results, Government Consumption is significant in four countries; Brazil at the 5% significance level, Russia at the 10% significance level, India at the 10% significance level and South Africa at the 1% significance level. The parameter estimates for this variable is positive in all countries except Brazil. This suggests that whilst increases in Government Consumption may lead to reduced GDP Growth Rates in Brazil, increases in this variable would lead to increased GDP Growth Rates of Russia, India and China.

Finally, Table 2.0 also presents the parameter estimates and significance levels for the independent variable of interest, Control of Corruption (CoC). As per the results presented, Control of Corruption is only significant in Brazil and Russia both at the 10% significance level. However, it must be noted that whilst the parameter estimate for CoC is negative in Brazil, showing an inverse relationship to growth, it is positive in Russia, suggesting a positive correlation to growth. As such, it would follow that a 10% increase in the levels of CoC in Brazil and Russia would lead to a 0.716% decrease in the GDP Growth Rate of Brazil but a 0.308% increase in the GDP Growth Rate of Russia.

6.0 CONCLUSION

Section 5.0's empirical results show that GDP per Capita and Government Consumption appear to be more relevant factors contributing to the growth, compared to the other variables. This is given that both variables are significant in four of the five states. It must be noted that the parameter estimates for each country carry different signs, thus suggesting that the relationship between growth and GDP per Capita as well as growth and Government Consumption depends on the country. From Section 5.0's analysis, it can also be seen that inflation appears to be the least relevant factor contributing to growth rate given it is only significant in one state, Russia.

The regression analysis shows that Control of Corruption is significant in Brazil and Russia at the 10% level. It is, however, interesting to note that while the parameter estimate for Control of Corruption in Brazil is negative (suggesting that there is an inverse relationship between

changes in corruption levels and economic growth in Brazil), the same estimate is positive in Russia (suggesting an positive correlation between the corruption levels and growth). The results given by the regression analysis appear to be consistent with Ahmad et al. (2012) and (Ebben and de Vaal, 2009). Both studies conclude that certain types and levels of corruption can be conducive to growth. This could be the explanation for the differing signs in the parameter estimates for Brazil and Russia. Whilst the level, or type, of corruption experienced in Russia is growth-enhancing; the level, or type, of corruption experienced in Brazil hinders the country's economic growth.

As such, Russia could choose to take advantage of their growth-enhancing corruption, so long as they remain weary not to surpass the threshold after which corruption will begin to hinder their growth. However, this is not advisable given public perception and grave negative views of corruption. Also, given that many studies, some presented in the Literature Review section, have shown that corruption in a country can have numerous negative effects on a country and its economy; for instance, it can hinder the flow of investment and aid as well as reduce participation rates. All this, will only harm the country and so, Russia would have to weigh the costs and benefits of using their growth-enhancing corruption to help elevate their GDP Growth.

The topic of corruption and growth is an interesting one and future studies may choose to take into consideration the type of corruption, not just the level of corruption. This is because not all types of corruption are the same and different countries may experience different syndromes of corruption. This may give more insight into the relationship between corruption and growth in developing and transitional states.

APPENDIXES

Acronym	Name	Explanation	Expected Sign
GDP.GR	GDP Growth Rate	Annual GDP Growth Rate (%)	+/-
GDP.PCAP	GDP Per Capita	Initial GDP per Capita	+
CoC	Control of Corruption	Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	+
INFL	Inflation	Annual rate (%), Consumer Prices	-
FDI	Net Foreign Direct Investment (inflows)	Net inflows, Balance of Payments	+
A.DPND	Age Dependency	Age Dependency as percentage of working population	-
GOVT.CONS	Government Consumption	General Government Consumption	+

Control of Corruption

Control of corruption captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. This table lists the individual variables from each data sources used to construct this measure in the Worldwide Governance Indicators

Code	Concept Measured
Representative Sources	
EIU	Corruption among public officials
GCS	Public Trust in Politicians
	Diversion of Public Funds
	Irregular Payments in Export and Import
	Irregular Payments in Public Utilities
	Irregular payments in tax collection
	Irregular Payments in Public Contracts
	Irregular Payments in Judicial Decisions
	State Capture
GWP	Is corruption in governmnent widespread?
IPD	Level of "petty" corruption between administration and citizens
	Level of corruption between administrations and local businesses
	Level of corruption between administrations and foreign companies
PRS	Corruption
WMO	*Corruption.* The risk that individuals/companies will face bribery or other corrupt practices to carry out business, from securing major contracts to being allowed to import/export a small product or obtain everyday paperwork. This threatens a company's ability to operate in a country, or opens it up to legal or regulatory penalties and reputational damage.
Non-representative Sources	
ADB	Transparency, accountability and corruption in public sector
AFR	How many elected leaders (parliamentarians) do you think are involved in corruption?
	How many judges and magistrates do you think are involved in corruption?
	How many government officials do you think are involved in corruption?
	How many border/tax officials do you think are involved in corruption?
ASD	Transparency, accountability and corruption in public sector
BPS	How common is it for firms to have to pay irregular additional payments to get things done?
	Percentage of total annual sales do firms pay in unofficial payments to public officials?
	How often do firms make extra payments in connection with taxes, customs, and judiciary?
	How problematic is corruption for the growth of your business?
BTI	Anti-Corruption policy
	Prosecution of office abuse
CCR	Anti-Corruption and Transparency
FRH	Corruption (FNT)
GCB	Frequency of household bribery - paid a bribe to one of the 8/9 services
	Frequency of corruption among public institutions: Political parties
	Frequency of corruption among public institutions: Parliament/Legislature
	Frequency of corruption among public institutions: Media
	Frequency of corruption among public institutions: Legal system/Judiciary
	Frequency of corruption among public institutions: Public officials
GII	Accountability
IFD	Accountability, transparency and corruption in rural areas
LBO	Frequency of corruption
PIA	Transparency, accountability and corruption in public sector
PRC	To what extent does corruption exist in a way that detracts from the business environment for foreign companies?
VAB	Frequency of corruption among government officials

Variable	Mean	Std Dev	Minimum	Maximum	N
GDP.GR	0.0273908	0.0246066	-0.0310236	0.0757207	25
GDP.PCAP	6005.47	3404.25	2578.21	13042.42	25
INFL	3.4125116	7.8799883	0.0319859	29.4773293	25
FDI	29807921225	27619026102	989000000	96895162916	25
A.DPND	0.5321100	0.0608793	0.4514289	0.6498983	25
GOVT.CONS	163031092588	27474929007	130642923960	214756759293	25
CoC	-0.1296000	0.2062408	-0.6000000	0.1500000	25

Variable	Mean	Std Dev	Minimum	Maximum	N
GDP.GR	0.0079576	0.0688655	-0.1453107	0.1000000	25
GDP.PCAP	5881.60	4471.50	1330.75	14487.28	25
INFL	1.5715700	2.8472381	0.0506772	8.7462185	25
FDI	20584713933	24386869414	690000000	74782907000	25
A.DPND	0.4430246	0.0451317	0.3879549	0.5093273	25
GOVT.CONS	128702611837	12871968570	111775443511	158950839713	25
CoC	-0.9924000	0.6344504	-2.0000000	1.5000000	25

Variable	Mean	Std Dev	Minimum	Maximum	N
GDP.GR	0.0651299	0.0226872	0.0105683	0.1025996	25
GDP.PCAP	737.4602592	439.2528697	307.4110432	1581.51	25
INFL	0.0794175	0.0318536	0.0368481	0.1387025	25
FDI	1285065880 1	14249630199	73537638.39	43406277076	25
A.DPND	0.6277031	0.0592505	0.5314194	0.7171126	25
GOVT.CONS	89080722614	39840077237	43047931476	171864264215	25
CoC	0.1554000	0.0182529	0.1300000	0.1800000	25

Variable	Mean	Std Dev	Minimum	Maximum	N
GDP.GR	0.0983746	0.0244901	0.0393382	0.1427646	25
GDP.PCAP	2249.77	2257.14	316.2244304	7590.02	25
INFL	0.1212756	0.2261354	-0.0140000	0.9000000	25
FDI	102713271274	96304511166	3487000000	290928431467	25
A.DPND	0.4304904	0.0696433	0.3449331	0.5215567	25
GOVT.CONS	308364626456	188627371482	82498687910	689845500223	25
CoC	-0.3880000	0.1645891	-0.6500000	-0.1800000	25

Variable	Mean	Std Dev	Minimum	Maximum	N
GDP.GR	0.2881379	0.9205486	-0.0213704	3.7003744	25
GDP.PCAP	4705.31	1682.57	2535.49	8080.87	25
INFL	0.0747471	0.0342709	0.0138538	0.1533477	25
FDI	3094938853	3110506831	-75722412.12	9885001293	25
A.DPND	2.7079209	10.4355881	0.5372850	52.7981335	25
GOVT.CONS	48281261872	11155179910	37162085081	69150312645	25
CoC	0.1367449	0.4648955	-0.8000000	0.7600000	25

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