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The corruption-growth relationship: Do political institutions matter?

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The corruption–growth relationship

Do political institutions matter?

Shrabani Saha¹ and Kunal Sen²

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Abstract: Corruption is widely believed to negatively affect economic growth. However, many East and Southeast Asia countries either achieved or currently are achieving impressively rapid economic growth despite widespread corruption — the ‘East Asian Paradox’. Is this negative relationship equally likely to hold for autocracies and democracies? This paper examines the role of political institutions in mediating the corruption–growth relationship using panel data over one hundred countries for the period 1984–2016. We find clear evidence that corruption–growth relationship differs by the type of political institution, and the growth enhancing effect of corruption is more likely in autocracies than in democracies. The perceived credibility of long-term ruling political elites by promoting economic freedom to do business gives confidence to the firms, vital for investment and growth. Our findings provide suggestive evidence in support of the East Asian Paradox.

Key words: corruption, democracy, economic growth, panel data

JEL classification: E02, O11, O43

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1 Introduction

How does corruption affect economic growth? The theoretical literature provides no clear guidance on this issue. One strand of the theoretical literature argues that corruption increases economic growth by enabling investors to avoid bureaucratic delay through the use of ‘speed money’ and by encouraging low-paid government employees to work harder if they could supplement their income by levying bribes (Leff 1964; Huntington 1968; Lui 1985; De Soto 1989, Egger and Winner 2005). Another strand of the theoretical literature contends that corruption has a negative effect on economic growth by reducing investment, both in physical and human capital (Mauro 1995; Keefer and Knack 1997; Reinikka and Svensson 2005) and by leading to a misallocation of public expenditures away from growth-enhancing areas (such as education and health) towards areas which are less productivity enhancing, but are more corruption-intensive (such as large and expensive infrastructural projects) (Mauro 1997; Tanzi and Davoodi 1997). In this paper, we test for the corruption–growth relationship by using panel data for over one hundred countries from 1984 to 2010, allowing this relationship to differ by political regime.

A vast empirical literature has studied the impact of corruption on growth. For example, Mauro (1995) finds that a one standard deviation increase in bureaucratic integrity will lead to a five percentage point increase in investment and an increase in the annual growth rate by half a percentage point. Fisman and Svensson (2001) estimate that a one per cent increase in corruption leads to a three per cent reduction in firm growth. Mo (2001) finds that a one percentage increase in the corruption level reduces the growth rate by about 0.72 per cent. Pellegrini and Gerlagh (2004) find that a one standard deviation decrease in corruption leads to an increase in growth of 1 per cent per year, for a given initial income level.

Similarly, there is a large empirical literature on the effect of democracy on economic growth. In one of the early empirical contributions to this literature, Barro (1996) finds that the overall effects of democracy on growth is weakly negative using repeated cross-sections for 84 countries, with growth rates of GDP per capita averaged over 1965–75, 1975–85, and 1985–90. A similar finding is obtained by Tavares and Wacziarg (2001), also with cross-sectional data. On the other hand, Rodrik and Wacziarg (2005) and Persson and Tabellini (2007) find a positive effect using panel data. More recently, Acemoglu et al. (2014) find a sizeable and robust effect of democracy on economic growth using annual panel data and GMM methods for 175 countries for 1960–2010.

In this paper we look at the joint effect of corruption and democracy on economic growth. A set of studies have highlighted the so-called ‘East Asian Paradox’, where countries in North and South East Asia grew rapidly in spite of high levels of corruption (Gill and Kharas 1998; Campos 2002; Rock and Bonnett 2004). The observed positive relationship between corruption and growth has been attributed, at least in part, to the authoritarian regimes prevalent in these countries, which made sure that corruption was growth-enhancing. On the other hand, there are several autocratic regimes, mainly in Africa and Latin Africa, where high rates of corruption had a deleterious effect on economic growth (Bates 1981; Bratton and Van de Walle 1994; Haber 2002).

From a theoretical standpoint, it is not clear whether the corruption–growth relationship will differ between democracies and autocracies, and if so, in which way. The postulated negative effect of corruption on growth may be lower in an autocracy than in a democracy if the centralization of authority in the former regime leads to more efficient bribe-taking and lower loss of output (Ehrlich and Lui 1999; Sheifer and Vishny 1993). On the hand, the possibility of the greater secrecy in corruption in an autocracy allows for less growth enhancing public and private investments which are not as corruption intensive than low value projects in areas such as defence and infrastructure (Shleifer and Vishny 1993), while the greater accountability pressures in a democracy

limits the possibility of such growth-retarding investments. On the other hand, democracies are more transparent than autocracies due to a higher probability of getting caught and punished. Hence corruption in democracy can act as speed money, which in turn increases the growth.

A large literature in heterodox economics has argued that corruption is unlikely to negatively affect economic growth, especially in autocracies (Khan and Jomo 2000). In autocratic regimes, with long-term time horizons on the part of the ruling elite, politicians are able to make the credible commitments to firms not to expropriate all of the rents that accrue from the investment decision, though some rent-sharing may exist in the form of bribes from firms to politicians (Bardhan 1997; Khan 1996). Thus, bribe-taking by politicians from firms may not have a deleterious effect on investment and growth as deals offered by politicians to firms are likely to be ‘ordered’ — firms can be confident that politicians will deliver on the deals that they have entered into with them (Pritchett and Werker 2013; Sen 2013). On the other hand, in democratic regimes, with frequent change of ruling parties, commitments made by politicians to firms are less likely to be credible. Here, bribe-taking by politicians is associated with deals that are ‘disordered’ as firms are less likely to believe that politicians are able to deliver on the deals offered to them. In this case, corruption is likely to have a negative effect on growth.¹

To examine whether the corruption–growth relationship is different in autocracies than in democracies we test for the relationship allowing it to differ by political regime. We use panel data for over 100 countries from 1984–2016. To test for the mediating effect of political regime on the corruption–growth relationship, we include an interaction term between our measure of democracy and of corruption, along with including the measures of corruption and democracy directly in the regressions we estimate.

We find clear and unambiguous evidence that the corruption–growth relationship differs by political regime, and that the growth enhancing effect of corruption is more likely in autocracies than in democracies. Our estimates suggest that a one standard deviation increase in corruption leads to a 6.51 percentage point increase in economic growth on average. However, we find that the positive effect of corruption on growth is stronger in an autocracy than a democracy — if a country is less democratic than an increase in corruption is associated with greater economic growth, yet once past a certain threshold point of democracy (i.e., between 75th and 95th percentile) a higher level of corruption substantially lowers growth as the economy becomes more democratic. The empirical evidence we present in our paper supports the argument that credible commitment necessary for investment and growth is more likely in autocracies than democracies, and that corruption per se may not have a negative effect on growth if the deals made by politicians and firms are seen as credible.

The rest of the paper is in three sections. In the next section, we present our empirical model and the data to be used in the empirical analysis. Section 3 presents the results of the empirical analysis and Section 4 concludes.

¹ For example, in South Korea personal ties between the business elite and the political elite and the mutual advantage that the system of exchanging bribes for political favours to the Korean conglomerates provided to both political and economic elites underpinned institutions of credible commitment in Korea all through the 1960s and 1970s, and was crucial for Korea’s success in the early stage of growth, in a context where the rule of law in Korea was vague and seldom enforced (Kang 2002).

2 Empirical model, methodology and data

This section discusses model, methodology and data used to explore the association between corruption and growth.

2.1 Model

The standard model of economic growth expresses the average rate of per capita income (growth) as dependent on various macroeconomic factors such as investment, population growth and average school enrolment etc. Are institutions and political factors as additional determinants of income in the presence of the standard income determinants (such as capital accumulation)?

To explore this observation, we develop a growth model as an extension of Solow (1956) by incorporating institutional factors such as corruption, democracy and their interaction term as additional explanatory variables in the standard income determinants. Solow (1956) argues that output/income in an economy over the long-term depends on its available factors of production and technology, based on aggregate Cobb-Douglas production function, which is consistent with the law of diminishing returns, an essential feature of modern growth theories.

The Cobb-Douglas production function asserts that output/income is a function of capital, labour force and productivity and it is well documented that research and development and education are important factors in influencing productivity (Romer 1990). We extend the Solow growth model by including corruption, democracy and the interaction term to explore the joint effects of corruption and regime type on economic growth. We also include openness (economic freedom) and money supply to measure the impact of globalization and macroeconomic stability in a country. The interaction effects measuring the effect of corruption on economic growth in different regime type is the main focus of this study. The base model using panel data over the period 1984–2016 is structured as follows:

$$LRGDPPC_{it} = \alpha_0 + \alpha_1 CORR_{it} + \alpha_2 DEMO_{it} + \alpha_3 CORR_{it} * DEMO_{it} + \alpha_4 \log\left(\frac{CAP}{POP}\right)_{it} + \alpha_5 EDU_{it} + \alpha_6 RND_{it} + \alpha_7 OPEN_{it} + \alpha_8 M2GDP_{it} + \varepsilon_{it} \quad (1)$$

where LRGDPPC is log of real per capita gross domestic product as measure of economic growth, CORR is corruption, DEMO is democracy indices, CAP is capital per capita, RND is research and development, EDU is educational attainment, OPEN (EF) is trade openness (economic freedom), M2GDP is money supply to GDP ratio, ε is error term. Subscripts i is country and t is for time.

The sign and significance of α_3 is of interest, which captures the interaction effect of corruption and democracy on per capita income. In addition, the marginal effects of corruption and democracy on income are computed as follows:

$$\frac{\partial LRGDPPC_{it}}{\partial CORR_{it}} = \alpha_1 + \alpha_3 DEMO_{it} \quad (2a)$$

$$\frac{\partial LRGDPPC_{it}}{\partial DEMO_{it}} = \alpha_2 + \alpha_3 CORR_{it} \quad (2b)$$

Equation (2a) is the marginal impact of corruption on income in the presence of democracy. If $\alpha_3 < 0$, then equation (2a) implies that a one unit increase in CORR yields a greater reduction in

income as the degree of democracy expands.² Alternatively, an increase in corruption level enhances growth when countries are strongly autocratic. Contrarily, if $\alpha_3 > 0$ a higher level of corruption increases growth with a greater democracy. Likewise, equation (2b) is the marginal effect of democracy in the presence of a corrupt system. If $a_3 < 0$ and exceeds $a_2 > 0$ then a one unit increase in the level of democracy lowers growth in a more corrupt nation.

Following neo-classical growth theory, it is expected that a greater capital per capita, higher educational achievement and research and development should boost income growth (Mankiw et al.; 1992 and Romer 1990). Hence, α_4 , α_5 and α_6 are expected to be positive. Rent-seeking theory suggests that the impact of openness should have positive impact on growth (Krueger 1974), we expect α_7 to be positive. Finally, following basic macroeconomic model, circular flow diagram suggests a greater money supply increases income as it is an injection. Hence, the expected sign of α_8 is positive.

2.2 Methodology

In order to test the proposed hypothesis, a panel estimation technique is used for over one hundred countries for the period 1984–2016. We first start employing an ordinary least square estimation with the average values of each variable for the period 1984–2016. Following Saha and Gounder (2013) and Dawson (2003), a seven-period panel (i.e., five 5-year average for 1995–2013 and a 3-year average for 2014–16) is estimated to defecate potential business cycle effects that are assumed to be present in annual data. Then we examine the fixed effect model with country and time specific variations in corruption–growth relationship. Next we test its validity, comparing the variances of parameters obtained from the random effect model using the Hausman test. According to Baltagi (2008) and Basu et al. (2019), all estimators in the fixed effect model even with small number of cross sections N , are consistent as time (t) increases and approaches to infinity. In the random effect model, with the regression error term $v_{it} = u_i + \varepsilon_{it}$, where u_i is the time-invariant random individual effect in addition to ε_{it} error term denoting all other missing elements. Furthermore, in both models (random and fixed effects) it is assumed that all explanatory variables are independent from error terms v_{it} , u_i , and identically distributed (*i.i.d*) and assumed to be normally distributed. The results are presented after correcting for both heteroskedasticity and serial correlation with robust standard errors.

Also, while the simple least square panel data with FE provide an important insight on the out of interest linkage, however, they can render biased estimates due to the potential problem of endogeneity between several of our variables such as growth and democracy, growth and corruption, which can cause the error terms to be correlated with dependent variables.³ Although a vector of control variables is used to reduce the problem of endogeneity, but there could be yet some factors that cause changes on both corruption and growth.

The potential issue of simultaneous causation is addressed here using the two-stage least square (TSLS) procedure and employing instrumental variables that may affect institutional variables but not be affected by growth. Ethnic tensions (ET) focusing ethnolinguistic fractionalization is used as an instrument for institutional variable such as corruption as Mauro (1995) points out that the extent to which countries are fractionalized along ethnolinguistic lines is exogenous and unrelated to economic variables other than through its effects on institutional efficiency. The raw data also confirms that the correlation between real GDP per capita and ethnic tensions is just 0.26 but the

² The corruption index ranges from zero to six and a higher value indicates a higher level of corruption.

³ Democracy and corruption are endogenously determined in the sense that they are both correlated with exogenous shocks that affect the level of growth of real GDP per capita.

correlation between per capita income and corruption is around 0.40. We also use lag of the other right-hand side variables as instruments.

For the robustness check, System-GMM-Dynamic-Panel is also employed to address the endogeneity issue. We test the instrument validity by using Hansen's J statistic of over-identifying restrictions.

2.3 Data

The empirical model employs macroeconomic data, corruption indices and democracy indicators to test the proposed hypothesis.

Corruption data

The major obstacles of comparative studies of corruption have been the lack of a general definition of corruption and the absence of objective cross-national data on corrupt behaviour given its illegal and secret nature. The subjective measure of corruption is used as a principal measure, source from International Country Risk Guide (ICRG). The ICRG index is constructed by Political Risk Services.⁴ It measures the corruption within the political system that threatens foreign investment by distorting the economic and financial environment and reducing the efficiency of government and business by enabling people to assume positions of power through patronage rather than ability. The ICRG corruption index (CORR) has been widely used in the literature and it is published since 1984.⁵ For simplicity and ease of exposition, the ICRG index has been converted into a scale from zero (least corrupt) to six (most corrupt).

We also use Transparency International's (TI's) Corruption perception index (CPI) for robustness check. The CPI index is a composite index based on individual surveys from different sources. The index is rescaled and ranges from zero to ten and a higher value indicates a higher level of corruption. The index is available since 1995.

Democracy indicators

Like corruption, democracy also suffers from the problem of measurement. The measurement of democracy is disputed due to the problems of conceptualization, measurement and aggregation and no single index offers a satisfactory response to these problems, and even the best indices have significant weaknesses (Coppedge 2002; Munck and Verkuilen 2002). For the purpose of this study, ICRG democratic accountability is used as a principal measure of democracy (DEMO). It is a measure of how responsive government is to its citizens and it is more likely that less responsive government will fall, peacefully in a democratic society, but possibly violently in a non-democratic one. The score for democracy index ranges from zero to six, higher values signalling dominated democracy. Polity2 institutionalized democracy index is used as an alternative measure of democracy. The index is based on the competitiveness of political participation, the openness and competitiveness of executive recruitment and constraints on the chief executives.⁶ It measures the degree of democracy and autocracy. The most widely used Polity score combines the scores on the democracy and autocracy indices to a single regime indicator. The score captures the regime authority spectrum on a 21-point scale ranging from -10 (hereditary monarchy) to +10

⁴ The definition of corruption used is the misuse of public office for private enrichment in this study. See the Political Risk Services (PRS) <http://www.prsgroup.com/countrydata.aspx>.

⁵ See Swaleheen (2011), Dal BÓ and Rossi (2007), Braun and Di Tella (2004) and Knack and Keefer (1995) for details.

⁶ See <http://www3.nd.edu/~mccoppedg/crd/PolityIVUsersManualv2002.pdf> for details.

(consolidated democracy). For ease of explanation, we rescaled the index from 1 to 21 and a higher value indicates a higher level of democracy.

Macroeconomic data

Real GDP per capita is the dependant variable. The real GDP per capita, capital formation, research and development expenditure to GDP, educational attainment and money supply (M2) to GDP data are obtained from the World Bank's World Development Indicators (WDI) database. For the purpose of the study economic freedom index is used along with openness variable and the data is from the Heritage Foundation. Ethnic tension data for the instrumental variable is from ICRG index, Political Risk Services. Due to missing data, the total number of countries used in any regression ranges from 103 to 136 for the period 1984–2016. The summary statistics and data description and sources are presented in Appendix Tables A.1 and A.2, respectively.

3 Empirical results

We start our investigation with the Kernel fit of the scatter plots of the relationship between per capita real GDP and corruption and per capita real GDP with democracy. The Kernel fit line depicting the relationship between real income per capita and corruption indicates that corruption lowers per capita income (Figure 1). In other words, a higher income growth is associated with low levels of corruption. For instance, the average level of income per capita for the period 1984–2016 in China is around US\$2520, and the corruption score is 2.26, whereas, the income per capita and corruption level in Congo Democratic Republic are US\$456 (approx.) and 5.26, respectively.⁷ The results support the common claim that less corruption enhances economic growth.⁸ Both ICRG and Transparency International corruption perception indices support the results.

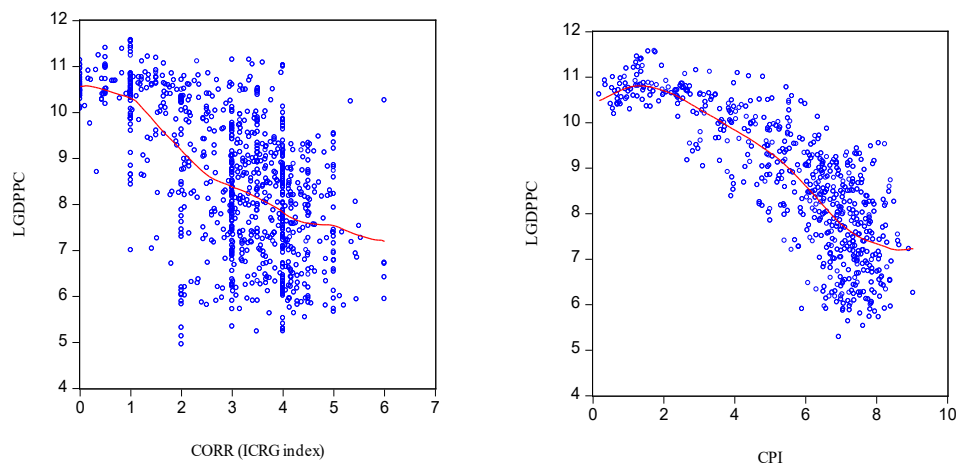
However, Figure 2 shows a U-shaped relationship between per capita income and democracy (for both the democracy indices) suggesting that some autocratic countries are performing well in terms of growth along with their democratic counterparts. In other words, a high level of income both at a greater level of autocracy and democracy but the income level decreases at the transition stage in the process of democratization. On the one hand, countries with greater democracy exhibit higher income (such as Australia and United Kingdom). Likewise, countries with stronger autocracy also demonstrate a higher income (for example, Brunei and Saudi Arabia). On the other hand, per capita income levels of the transition countries (i.e., from autocracy to democracy) such as Russia and Tunisia are quite low. However, countries with a very high level of democracy enjoy very high income compared to the strong autocratic countries. This result supports the widespread argument in the existing democracy literature that democracy provides the best opportunities for growth (e.g., Jalles 2010; Barro 1991). However, in order to get the firmer support of the results one should rigorously test whether the change in coefficients is significant or not. In addition, we also explore the interaction effect of corruption and democracy on economic growth to estimate the joint effect of democracy and corruption on growth.

⁷ A higher value of corruption indicates more corruption.

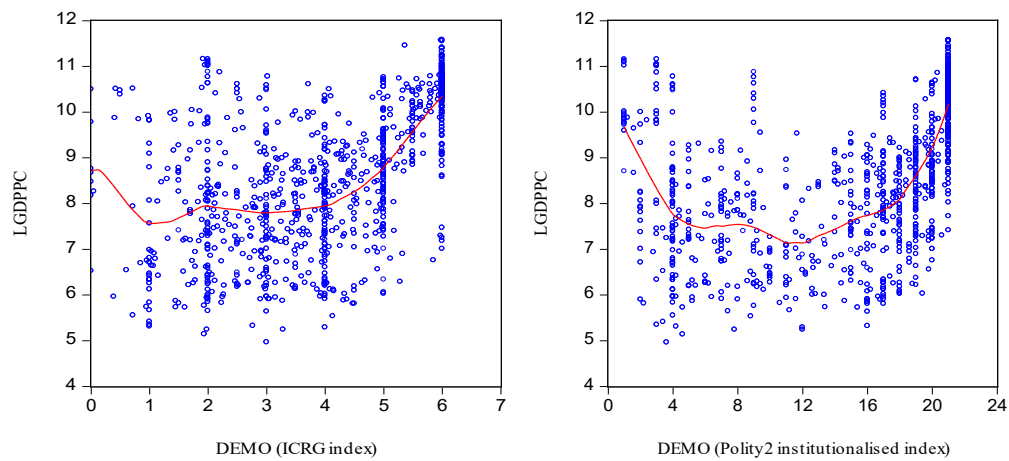
⁸ See for example Mauro (1995).

Figure 1: Kernel Fit plots for the relationship between corruption, democracy and growth

1a: Relationship between corruption and growth

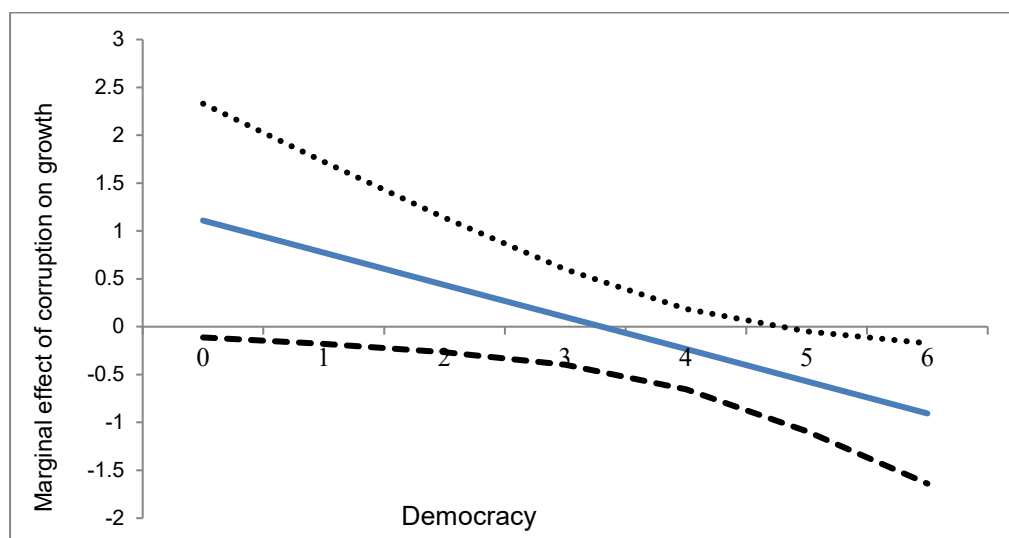


1b: Relationship between democracy and growth



Source: authors' illustration.

Figure 2 Marginal effect of corruption on growth



Note: higher values of the democracy measure indicate greater democracy.

Source: authors' illustration.

3.1 Regression results

The estimated regression coefficients using ICRG corruption and democracy indices for the base model in equation 1 are reported in Table 1. The OLS regression results without controls suggest that corruption coefficient is negative and significant but the coefficients for democracy and the interaction term are positive but insignificant. However, the results with control variables show that the coefficient of corruption is positive but not significant indicating that there is not enough evidence that corruption is growth enhancing. The coefficient for democracy is positive and significant at the five per cent level, suggesting that a greater democracy enhances growth.

The coefficient for the interaction term between corruption and democracy is negative and significant at the 1 per cent level of significance illustrating that democracy and corruption together have significant damaging effects on economic growth in a country. It suggests that the effect of corruption on growth is less positive as the level of democracy expands. A one unit increase in corruption level reduces log real GDP per capita by 155 per cent. Based on equation (2a), the interaction effect of corruption on real GDP per capita at the mean score of democracy of 3.81 is -5.85 , which is significant. It suggests that a one standard deviation point increase in CORR increases economic growth by 6.51 points at the mean democracy index. The impact of corruption on economic growth demonstrates some mixed effects. If a country is more autocratic then more corruption is associated with higher growth. Alternatively, the effect of corruption on growth is less positive as the level of democracy expands. On the other hand, the interaction effect of democracy on real GDP per capita at the mean corruption score 3.07 is 0.02 indicating that a one standard deviation point increase in democracy (DEM) increases economic growth by 0.028 points at the mean corruption index. Like corruption, democracy also illustrates the mixed effects on income growth, democracy stimulates (dampens) growth when corruption is low (high). In other words, corruption shows positive effect if a country is more autocratic. But if a country has more corruption then more democracy is growth inhibiting. The results of these two interactive factors are interpreted in detail in the partial effect estimation.

The panel least square and two-way fixed effects results both with and without control variables confirm the OLS results that corruption is growth enhancing in autocracies. Moreover, the magnitude of the coefficient of the interaction term increases after including the control variables. Control variables are expected in signs, such as higher capital per capita, educational attainment, research and development expenditure, more open economy and money supply increase the rate of per capita income. This is to note here that due to the large number of missing values of research and development expenditure data, which reduces the number of observations significantly, we reported the results without research and expenditure variable. The results remain same when the ICRG democracy index is replaced by Polity2 institutionalized democracy indicator (Table 2).

East Asian Paradox

East Asian countries present a number of puzzles and paradoxes mainly due to the growth rates in East Asia have greatly exceeded compared to all other regions of the world. The current economic wisdom holds that, *ceteris paribus*, higher levels of corruption should be associated with lower rates of development (such as Mauro, 1995). East Asian countries do not follow the wisdom and the economic success is paradoxical because most of the countries in the region have been plagued by relatively serious high-level corruption throughout the period of rapid growth and the political environment in the region is mostly autocratic. East Asian paradox is tested using interaction among East Asian dummy variable and corruption and democracy variables. The fixed effect result confirms that the interaction effect between corruption and democracy is positive in East Asian countries confirming the paradox that countries in East Asian countries grow faster despite of high level of corruption and restricted democracy. Both ICRG and Polity2 institutional democracy indices support these results.

Table 1: Growth–corruption relationship: five year average panel, 1984–2016

	ICRG Democracy Index								
	OLS (1984–2016)			5-Year Panel Least Square			5-Year Panel Fixed Effects		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Corruption	-0.891*** (0.306)	0.051 (0.347)	0.032 (0.343)	-0.0877 (0.230)	0.204 (0.246)	0.206 (0.245)	0.060 (0.062)	0.144** (0.073)	0.149** (0.073)
Democracy	0.089 (0.219)	0.497** (0.246)	0.480** (0.245)	0.585*** (0.174)	0.625*** (0.182)	0.626*** (0.181)	0.009 (0.012)	0.087 (0.056)	0.093* (0.057)
Corruption*Democracy	0.010 (0.053)	-0.155*** (0.060)	-0.151*** (0.060)	-0.097** (0.041)	-0.155*** (0.045)	-0.154*** (0.045)	-0.004 (0.003)	-0.025* (0.054)	-0.027* (0.015)
Corruption*Democracy*East Asia			-0.052 (0.063)			-0.017 (0.016)			0.011** (0.005)
Capital per capita		0.049*** (0.019)	0.054*** (0.018)		0.031** (0.013)	0.033*** (0.013)		0.283*** (0.054)	0.281*** (0.054)
Educational attainment		0.183*** (0.050)	0.184*** (0.049)		0.145*** (0.037)	0.146*** (0.037)		0.008 (0.007)	0.007 (0.007)
Openness/Economic Freedom		0.508*** (0.191)	0.471** (0.195)		0.266* (0.150)	0.258* (0.150)		0.004 (0.003)	0.004* (0.003)
Money supply (% of GDP)		0.008*** (0.003)	0.009*** (0.003)		0.009*** (0.002)	0.010*** (0.002)		0.002*** (0.001)	0.002***(0.001)
Constant		2.663 (1.953)	2.744 (1.937)	7.568*** (0.992)	3.463*** (1.254)	3.433*** (1.247)	8.053*** (0.218)	5.544*** (0.413)	5.533*** (0.414)
No. of observations	136	108	108	894	480	480	856	410	410
Adjusted R ²	0.482	0.562	0.536	0.406	0.537	0.538	0.515	0.769	0.771
Wald statistics	102.70	55.20	47.57	99.12	47.63	42.00	24.50	32.69	30.99

Note: Robust standard errors are in parentheses with robust standard errors; ***, **, * indicate significance level at the 1%, 5% and 10%, respectively.

Source: authors' estimation.

Table 2: Growth-corruption relationship: five-year average panel, 1984–2016

	Polity2 Institutionalized Democracy Index								
	OLS		5-year panel least square			5-year panel fixed effects			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Corruption	-0.590 (0.410)	0.452 (0.386)	0.453 (0.387)	0.085 (0.215)	0.153 (0.261)	0.155 (0.260)	0.022 (0.060)	0.144** (0.073)	0.149** (0.073)
Democracy	0.072 (0.078)	0.206*** (0.076)	0.207*** (0.076)	0.183*** (0.044)	0.146*** (0.058)	0.147*** (0.058)	0.024 (0.043)	0.087 (0.056)	0.093* (0.057)
Corruption*Democracy	-0.018 (0.021)	-0.064*** (0.020)	-0.063*** (0.020)	-0.041*** (0.011)	-0.042*** (0.013)	-0.042*** (0.013)	-0.003 (0.012)		-0.027* (0.015)
Corruption*Democracy*East Asia			-0.011 (0.014)			-0.004 (0.004)			0.011** (0.005)
Capital per capita		0.043** (0.018)	0.047*** (0.017)		0.028** (0.014)	0.029** (0.014)			0.281*** (0.054)
Educational attainment		0.186*** (0.048)	0.186*** (0.048)		0.154*** (0.038)	0.153*** (0.038)			0.007 (0.007)
Openness/Economic Freedom		0.580*** (0.197)	0.560*** (0.200)		0.278* (0.155)	0.273* (0.155)			0.004* (0.003)
Money supply (% of GDP)		0.010*** (0.003)	0.011*** (0.003)		0.011*** (0.002)	0.011*** (0.002)			0.002*** (0.001)
Constant		0.990 (2.094)	0.940 (2.077)	7.233*** (0.898)	3.872*** (1.351)	3.819*** (1.343)	8.158*** (0.211)	5.544*** (0.413)	5.533*** (0.414)
No. of observations	131	104	104	856	457	457	894	410	410
Adjusted R ²	0.472	0.595	0.600	0.406	0.524	0.524	0.515	0.769	0.771
Wald statistics	39.752	48.09	40.79	93.91	39.18	34.45	28.48	32.69	30.99

Note: Robust standard error are in parentheses with robust standard errors. ii) ***, **, * indicate significance level at the 1%, 5% and 10%, respectively.

Source: authors' estimation.

3.2 Robustness check

Two-stage least square

The two-stage least square estimates show that ethnic tensions and lagged variables are good predictors of corruption and also confirm the panel least square and two-way fixed effects estimates that joint effect of corruption and democracy is growth deterring. This finding is robust and provides strong evidence that higher corruption does itself increase growth when countries are more autocratic. However, the results are not reported here due to the limited space.⁹ System GMM results reveal the similar sign of the interaction term, however, the results are not reported here.

Transparency International Corruption Perception Index

We extend the analysis by estimating the equations by using Transparency International's corruption perception index (CPI). The results for CPI measure in both cases (ICRG and Polity2 democracy indices) show that the estimated coefficients for the interaction term remain the similar sign, although the level of significance varies. The evidence strongly supports the hypothesis that an increase in corruption increases the level of income per capita if the country becomes more autocratic. However, the results are not reported here.

3.3 Marginal effect of democracy and corruption

This subsection provides more rigorous analysis for the interaction effect between democracy and corruption on economic growth. The above findings show that a greater democracy does not foster growth in a more corrupt country. Oppositely, autocratic countries promote growth in the presence of corruption. In order to interpret the impact of democracy and corruption on per capita income growth the marginal effects are estimated based on equations (2a) and (2b). Table 3 reports the results of the marginal effect of democracy and corruption on per capita income at various percentiles (10th, 25th, 50th, 75th, 95th and mean) of democracy and corruption using panel two-way fixed effects.

For a deeper perspective, we provide the names of the countries to which these percentiles correspond in Table 3. The marginal effect of corruption on growth at the mean score of DEMO of 3.81 is 0.048. It suggests that a one standard deviation point increase in CORR increases income per capita by 0.05 points at the mean democracy index. As discussed earlier the impact of corruption shows some mixed results at different percentiles of democracy. If a country is less democratic then an increase in corruption is associated with greater economic growth; yet once past the threshold point (i.e. between 75th and 95th percentile), a higher level of corruption lowers growth as the economy becomes more democratic.¹⁰ Also, it is worth noting that the effect of corruption is significantly positive at the 10th percentile when democratic freedom is very restricted (such as Togo) whereas, the effect is negative when the degree of political freedom is very high (above 95th percentile). For example, Finland has a mature democracy (average score of 6) and is at the 95th percentile in the sample and it experiences negative growth if there is an increase in corruption level. Conversely, the results show that lowering corruption has a significant positive impact on economic growth in democracies. In other words, if a country is highly democratic then the existence of a corrupt economy reduces growth. This suggests that an anti-corruption effort is a cure for growth if a country is highly democratic. Otherwise, a high level of corruption dampens

⁹ The results are available upon request from authors.

¹⁰ Our results differ from Assiotis and Sylwester (2014) as the effect of corruption on growth is positive and significant in autocracy.

growth in a democratic setting of a country like India. These empirical findings appropriately describe the theoretical conjectures discussed in the introduction.

Table 3: The effect of democracy and corruption on growth of real GDP per capita: Marginal effect analysis^a

Marginal effects of corruption at different levels of democracy				Marginal effects of democracy at different levels of corruption			
Percentile of Demacc	Value of Demacc	Corresponding country	Estimates of corr	Percentile of corr	Value of corr	Corresponding country	Estimates for Demacc
10 th	1.5	Togo	0.106** (0.52)	10 th	1	Germany	0.062 (0.042)
25 th	2.33	Cote d'Ivoire	0.085** (0.041)	25 th	2	Ireland	0.037 (0.029)
50 th	4	Ecuador	0.043* (0.024)	50 th	3	Namibia	0.011 (0.017)
75 th	5	Greece	0.018 (0.020)	75 th	4	Mali	-0.014 (0.014)
95 th	6	Finland	-0.008 (0.025)	95 th	5	Haiti	-0.039* (0.022)
Mean	3.81	Bolivia	0.048* (0.025)	Mean	3.002	Malawi	0.012 (0.018)
Minimum	0	Somalia	0.144** (0.073)	Minimum	0	Sweden	3.0790*** (0.048)
Maximum	6	Australia	-0.008 (0.025)	Maximum	6	Congo Dem. Rep.	-0.065* (0.034)

Note: robust standard error are in parentheses with robust standard errors. ***, **, * indicate significance level at the 1%, 5% and 10%, respectively. ^a Two-way fixed effects.

Source: authors' estimation.

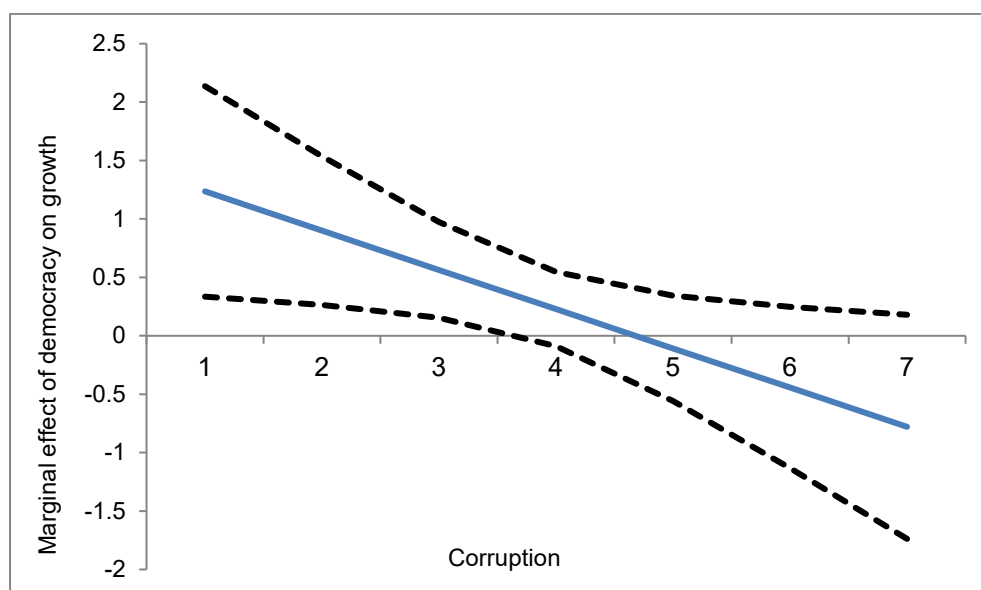
On the other hand, the marginal effect of democracy on per capita income at the mean corruption score of 3.0 is 0.012. This implies that a one standard deviation increase in democracy index increases growth by 0.02 points. The result indicates that the marginal effect of democracy has a positive impact on growth given an average level of corruption. In particular, democracy enhances growth significantly only when there exists a very low levels of corruption (at the minimum score of corruption). For instance, Sweden has a very low corruption levels (average corruption score is 0.0) and a one standard deviation rise in Sweden's democracy score, real per capita GDP increases by 4.31 points (3.08*1.40). However, the effect of democracy becomes negative when a country is very corrupt (for example Congo Democratic Republic). The result suggests that democracy is a cure for growth when a country is less corrupt. The results remain the same when Polity2 democracy index and TI's CPI are used.¹¹

The threshold level for the marginal effects of corruption and democracy are shown in Figures 2 and 3, respectively.¹² The threshold level for the marginal effect of corruption is between 3 and 4 of democracy indices suggesting that after the threshold level of democracy, economic growth decreases as corruption level increases. The threshold level for the marginal effect of corruption is a little lower than the threshold level for the marginal effect of democracy (between 4 and 5).

¹¹ The results are not reported here, will be available upon request.

¹² We have also used economic growth data instead of per capita GDP to estimate the marginal effects at the various levels of corruption and democracy.

Figure 3 Marginal effect of democracy on growth



Note: higher values of the corruption measure indicate higher corruption.

Source: authors' illustration based on data of study sample.

3.4 Results: autocratic countries

This final step is to explore the channels that why and how corruption is growth-intensifying in autocratic countries. To answer this, the whole sample is divided into two groups based on mean score of Polity2 democracy index and the countries with democracy value below the mean score are treated as autocratic. We re-run the estimations for the autocratic countries for the period 1984–2016 looking at our theoretical conjecture that credible commitments by the political leaders to the business can boost investment and in turn growth. The interaction effect of corruption and economic freedom on growth is estimated as Saha et al. (2009) predicts that economic freedom can enhance business activity by providing credibility to the investors. The results (Table 4) illustrate that corruption coefficients are mostly positive and significant (columns 1, 4-5) which is consistent with our earlier results. The interaction effect is positive revealing that corruption may greasing the wheel if greater economic freedom is provided. Moreover, column 4 suggests that corruption with higher economic freedom increases growth if capital formation in a country is escalated and the coefficient is highly significant. In other words, if political leaders in an autocratic country deliver credibility by providing freedom to run business even at the cost of sharing rents that definitely increase investment and growth in that country.

On the other channel, if a greater money supply is dechannelized from the economy due to a higher level of corruption that can cause negative growth by disturbing macroeconomic stability in autocratic countries. Column 5 in Table 4 shows the coefficient for the interaction effect between corruption and money supply is negative and significant demonstrating the fact that if autocracies (with greater monopolization of power) suffer from corrupt activities by political elites that eat up resources that results in negative growth and lower investment. The results explain not all autocracies are growth intensifying with the presence of corruption.

Table 4: Growth–corruption relationship in Autocracies: five-year average panel, 1984–2016

	Fixed Effects				
	(1)	(2)	(3)	(4)	(5)
Corruption	0.104** (0.049)	0.005 (0.204)	-0.019 (0.251)	0.935*** (0.344)	0.206*** (0.080)
Corruption*Economic Freedom		0.002 (0.003)	0.001 (0.003)	0.020*** (0.006)	
Corruption*Capital per capita			0.008 (0.029)	-0.114** (0.050)	
Corruption*Capital per capita*Economic freedom				0.003*** (0.001)	
Corruption* Money supply (% of GDP)					-0.028* (0.016)
Capital per capita	0.389*** (0.104)	0.383*** (0.103)	0.343** (0.146)	0.290** (0.124)	0.410*** (0.097)
Educational attainment	-0.010 (0.026)	-0.006 (0.025)	-0.009 (0.025)	-0.026 (0.022)	-0.008 (0.025)
Economic Freedom	0.009 (0.007)	0.004 (0.010)	0.006 (0.011)	0.0178 (0.012)	0.010 (0.007)
Money supply (% of GDP)	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.003** (0.001)	0.003*** (0.001)
Constant	4.444*** (0.744)	4.754*** (0.763)	4.939*** (0.972)	7.568*** (0.992)	4.239*** (0.707)
No. of observations	149	149	149	149	149
Adjusted R ²	0.741	0.742	0.741	0.793	0.748
Wald statistics	13.09	11.99	10.82	12.73	13.79

Note: robust standard errors are in parentheses with robust standard errors. ***, **, * indicate significance level at the 1%, 5% and 10%, respectively.

Source: authors' estimation.

4 Conclusions

A large literature has examined the effect of corruption on growth. In this paper, we examine whether the corruption–growth relationship is likely to be different in autocracies as compared to democracies. We use a panel data set of over one hundred countries, for the period 1984–2016. We estimate the relationship between corruption and growth using various panel estimation techniques including fixed effects, two-stage least square and dynamic panel-system-GMM methods. We also use different measures of democracy and corruption. Our results are remarkably consistent. We find that on average, the effect of corruption on growth is positive in autocracies as compared to democracies.

Our results provide support for the so-called East Asian paradox of high corruption and high growth and suggest that the benign effect of corruption on growth is because of the authoritarian nature of the political regimes in these countries for a large duration of their development experience that gives firms confidence that the ruling powers will deliver on the deals that they have entered into and these credible commitments are vital for investment and growth. These credible commitments can be achieved through promoting economic freedom and maintain macrocosmic stability in a country. On the contrary, for the average democratic countries, the

effect of corruption on growth is likely to be strongly negative. Democratization is likely to weaken the positive relationship between corruption and growth in previously autocratic countries, and the increasing wave of democratization observed in the developing world suggests that corruption may be more of a threat to economic growth in the years ahead.

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Appendix

Table A1: Descriptive statistics

	GDPPC	CORR	DEM	DEMP	EDU	CAPPC	OPEN	EF	RND	M2GDP
Mean	13491.30	3.057	3.817	14.241	9.199	3457.210	80.907	60.886	0.917	52.433
Median	4910.661	3.267	4.000	17.000	9.000	1439.777	69.192	61.100	0.571	40.981
Maximum	106791.1	6.000	6.000	21.000	16.000	24312.39	419.974	89.720	4.244	366.916
Minimum	143.4264	0.000	0.000	1.000	4.000	-2881.580	0.250	16.800	0.007	3.090
Std. Dev.	18096.42	1.286	1.599	6.666	2.164	4414.655	53.401	10.925	0.921	41.426
Observations	913	919	920	900	629	754	881	639	467	766

Source: see text.

Table A2: Data: source

Variables	Data source
Corruption	Source from International Country Risk Guide (ICRG). The ICRG index is constructed by Political Risk Services. http://www.prsgroup.com/countrydata.aspx .
Corruption perceptions index	Transparency International http://www.transparency.org/policy_research/surveys_indices/cpi
Democracy	Source from International Country Risk Guide (ICRG). The ICRG index is constructed by Political Risk Services. http://www.prsgroup.com/countrydata.aspx
Polity2 institutionalized democracy index	http://www3.nd.edu/~mcoppedg/crd/PolityIVUsersManualv2002.pdf .
Real GDP per capita (constant 2010 US\$)	World Bank (2017) World Development Indicators. http://data.worldbank.org/data-catalog/world-development-indicators
Gross capital formation (constant 2010 US\$)	World Bank (2017) World Development Indicators. http://data.worldbank.org/data-catalog/world-development-indicators
Population	World Bank (2017) World Development Indicators. http://data.worldbank.org/data-catalog/world-development-indicators
Openness (constant 2010 US\$) (%)	World Bank (2017) World Development Indicators. http://data.worldbank.org/data-catalog/world-development-indicators
Economic freedom	The Heritage Foundation https://www.heritage.org/index/
Educational attainment	World Bank (2017) World Development Indicators. http://data.worldbank.org/data-catalog/world-development-indicators
Research and development expenditure (% of GDP)	World Bank (2017) World Development Indicators http://data.worldbank.org/data-catalog/world-development-indicators
Ethnic tensions	Source from International Country Risk Guide (ICRG). The ICRG index is constructed by Political Risk Services. http://www.prsgroup.com/countrydata.aspx .

Source: see text.