

## DO LITERACY AND A MATURE DEMOCRATIC REGIME CURE CORRUPTION?

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Using a cross-national panel data, we investigate the combined effect of education attainment and a durable democratic system on the corruption levels of a nation. Higher levels of education foster a sense of ethical behavior and civic duty in the citizenry by raising awareness, which in turn, should reduce corruption. Decades-long tradition of democracy, on the other hand, increases government transparency and accountability as politicians have to seek reelection, and thus, stable democratic system should reduce political corruption. Our empirical results suggest that the combined effect of these variables reduces corruption significantly, and a durable democracy and education behave as complements in combating corruption. Additionally, our marginal estimates show that durability successfully enhances the effect of literacy in curbing corruption.

*Keywords:* Corruption, Educational Level, Political Durability, Panel Data

*JEL classification:* D73, I20, P16, Z1

### 1. INTRODUCTION

Why is corruption more prevalent in some countries than in others? Do mature democracies nurture less corruption than young democracies? Does an educated populace compel government to become more transparent? The present paper attempts to find answers to these questions by examining the interactive impact of the durability of a democratic regime and educational attainment on corruption levels of a nation. A vast strand of literature<sup>1</sup> has explored the factors that can affect the corruption level of nations (Kwok and Tadessee, 2006; Akhter, 2004; Treisman, 2000; Ades and di Tella, 1999; Leite and Weidmann, 1999; La Porta *et al.*, 1997; La Porta *et al.*, 1997). Yet, the interactive role of democratic durability and educational attainment has not been

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<sup>1</sup> The impact of corruption on economic development of a country has been a question in academic research for many years starting from Leff (1964), Huntington (1968).

explored in the literature. Can higher levels of educational attainment results in a stronger impact of democratic durability on corruption?

The nature and stability of political regimes have received strong attention from the researchers of recent world polity. Recent literature suggested that democracy fosters economic growth and development through protected property rights (Prezeworski and Limongi, 1993), via increased rule of law and more efficient allocation of resources (Scully, 1988), and by providing effective regulation of anti-competitive practices that allows private corporations to grow (Ayres, 1996). Bahmani-Oskooee and Goswami (2006) show that political rights and civil liberties, two fundamental characteristics of democracy, reduce the presence of black market in an economy. Hence, researchers, in general, tend to agree that the presence of democracy constituting of institutions like political rights, civil liberties, press freedom, and freedom of speech, paves the way of economic prosperity. Literature has been ambiguous about the effect of democracy on corruption (Qizilbash, 2008; Chowdhury, 2004; Shleifer and Vishny, 1998). The dominant view in the literature is that democracy has a deterrent effect on corruption, be it through a direct channel or an indirect channel. The mass uprising against the incumbent authoritarian regimes in the Middle East, dubbed by the media as 'Arab Spring' has again instigated interests in this area. Reportedly, one of the main trigger of such uprisings is the rampant corruption by the incumbent regimes. Corruption in the democracy is perceived to be less, however not free either. Recent 2G spectrum scam in India (largest functional democracy since its independence from the British colonial rule in 1947) of US\$ 5.61 billion is an example of marginal scale of corruption indicating perhaps that the presence of democracy only is not sufficient to curb corruption.

In this context, durability of a democratic<sup>2</sup> regime might be an important factor to consider that has received relatively less attention. Montinola and Jackman (2002) show that corruption is actually lower in authoritarian regime than in nascent democracies, although once democratization reaches a certain threshold, this relationship changes and democratic regimes fare better. Similar to their study, Sung (2004) stresses on the non-linear association between democracy and corruption. His study shows that starting from an authoritarian regime, democratization initially results in greater corruption before it eventually leads to a decline in corruption. Similar findings have been established by Mohtadi and Roe (2003) and Rock (2009). Mohtadi and Roe (2003) show that young democracies suffering from insufficient checks and balances and lack of transparency, provide rent-seekers with greater access to public officials and hence greater opportunities for collecting public sector rents, at least up to a point, without making the corrupt acts of rent-seekers and officials open to public scrutiny. As democracy matures, transparency and monitoring activities become stronger and, thus, the probability of getting caught rises as well. Thus, corruption should go down.

<sup>2</sup> The definition of democracy has been extensively debated in the related literature. Some have defined democracy as an institutional arrangement where citizens express their preferences through elections (Schumpeter, 1950). Dahl (1971) defined democracy in terms of freedom of expression.

Additionally, free entry in the market allows the entry of more rent seekers in a mature democracy and competition drives rent down. Taken together; this combination implies an inverted U pattern between corruption and the durability of the democratic regime.

The extent of institutionalization of a matured democracy will be fully effective when masses make efficient use of the attributes of such a system. To be able to do that, educational attainment should be an important factor. Depending on the personal stock of human capital the perception about corruption can vary a great extent across different sections of the populace. Hence, equality in educational attainment among the citizens is a necessary step that leads to a more coordinated approach in controlling corruption. Several studies support this argument. For instance, Magnus, Polterovich, Danilov and Savvateev (2002) use cross-country data to show that the level of intolerance to cheating increases with years of schooling. Similarly, Eicher, García-Peñalosa and Ypersele (2009) illustrate that a more educated electorate is able to better identify corrupt behavior and thus can reduce rent-seeking activities. Hence, a standardized minimum educational attainment of the populace should allow the monitoring agents to coordinate effectively and make a monitoring threat against corrupted officials. This credible anti-corruption initiative could potentially control corruption.

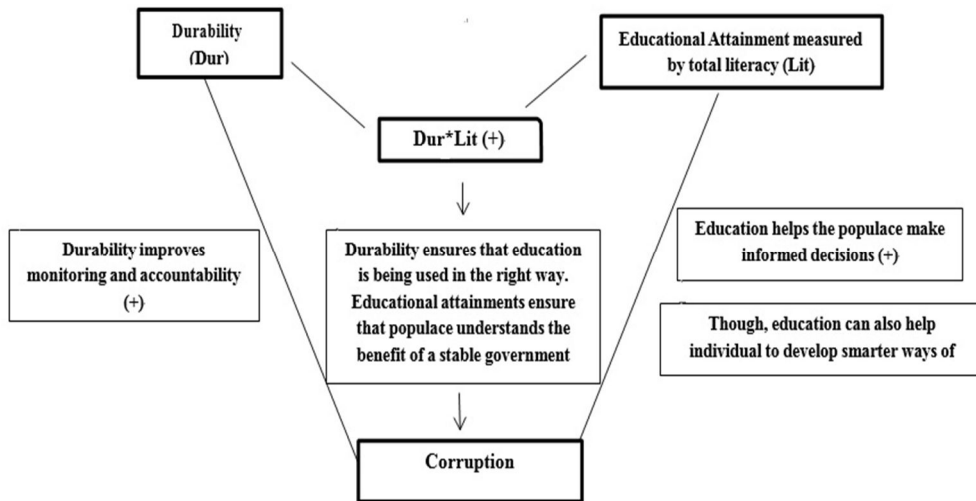
In this paper we analyze the combined effect of the durability of democracy and the educational attainment of the populace on the corruption level of a country. Our results find that educational attainment and durability of a democratic system act as complements with regard to their impact on curbing corruptions levels of a nation. Further, we estimate marginal estimates to gain greater understanding of the complementarity in the relationship. Based on the estimated marginal estimates, we find that durability enhances the impact of literacy in reducing corruption. Yet, literacy does not significantly affect the impact of durability on corruption. The next section delineates the foundation of our paper while Section 3 discusses data. Sections 4 provide the methodology of our analysis and present the findings Section 5 elucidates the robustness of our results while Section 6 concludes.

## 2. SCHEMATIC FOUNDATION AND RESEARCH QUESTION

A durable democracy and an educated populace can complement and reinforce each other in combating corruption. Durable democratic system ensures free and fair election, and the electoral power of the mass ensures reduction in corruption (Rock, 2009). Masses become aware of their rights and civic responsibilities and compel the incumbent authorities' to act on their behalf. Such awareness from an alert and politically aware populace ensures that the conflicts of interests from the people in power remain in checks. On the contrary, in the absence of a pressure from an opposition, corruption can result from the political immunity enjoyed by government leaders in authoritarian countries. Therefore, a durable democratic regime should reduce corruption.

In a similar way, an educated populace is aware of the duties and responsibilities of a civic society. In a mature democratic society, such awareness voice concerns that improves the mechanism of monitoring of the system. If the disparity of educational attainment among the populace is high then educated elite may simply use their newly acquired capacities to become more capable rent seekers. Hence, it is essential that a certain level of educational attainment is achieved across the populace to ensure that it plays a positive role in reducing corruption.

We hypothesize and present a schematic analysis that a long-lasting democracy and an educated populace, act as complements and reinforce the positive impact of the other with regard to combatting corruption - *Durability of a democratic system along with greater educational attainment should reduce corruption levels in a nation.*



Notes: + sign indicates that the factor acts in reducing corruption; - sign indicates that the factor potentially enhances corruption.

**Figure 1.** Schematic Model

### 3. DATA

Our data comes from three main sources - the International Country Risk Guide (ICRG) database, Polity IV Database, and World Bank Development Indicators Database as primary sources. Additionally, we use two measures of educational attainment from Cross-National Times Series (Banks) database. While we describe the variables in this section, Appendix 2 provides the data description and the sources.

### 3.1. Dependent Variable

Our dependent variable attempts to quantify corruption. The corruption variable is taken from the International Country Risk Guide (ICRG) database. As ICRG defines the measure is “an evaluation of corruption within the political system, which reduces the efficiency of the government and the businesses alike.” It considers several forms of corruption - corruption faced by business and actual or potential forms of corruption. Corruption faced by business includes special payments and bribes connected with import and export licenses, exchange controls, tax assessments, police protection, or loans. As mentioned by ICRG, such forms of corruption hamper the business environment of a nation. Actual or potential corruption takes the form of ‘excessive patronage, nepotism, job reservations, ‘favors-for-favors’, secret party funding, and suspiciously close ties between politics and business’. The variable ranges from 0 to 6 with a higher integer implying a less corrupt condition. As can be seen, from Table 1, the mean of our sample is 3.24 with a standard deviation of 1.3. Approximately 44 percent of our sample has corruption values above 3, which would imply that these countries have moderate, low or very low levels of corruption. Approximately, 24 percent of our sample has extreme levels of corruption, based on ICRG ratings, with values being less than or equal to 2.

**Table 1.** Summary Statistics

Variables	Obs.	Mean	S.D.	Min.	Max
Corruption	392	3.2	1.3	0.4	6.0
Durable	400	29.0	36.4	0.0	199.0
Literacy (WB)	170	84.2	18.0	26.2	99.8
Dur*Lit	169	215.3	101.2	21.9	498.9
Polity	400	7.5	2.7	0.0	10.0
Internet users	388	13.3	21.2	0.0	88.2
Mobile users	400	29.3	38.6	0.0	146.2
Life expectancy	400	68.9	9.7	38.4	82.6
Mortality	400	68.9	9.7	38.4	82.6
Poverty (\$1.90 per day)	235	18.5	21.8	0.0	91.2
Poverty (\$3.10 per day)	235	32.0	28.0	0.0	96.9
Poverty ( national poverty lines)	116	35.2	17.3	3.7	72.9
Literacy (Banks)	392	849.1	199.8	126.0	1086.0

The corruption measure from ICRG is a popular measure used frequently in the

literature. It has been used by studies such as Knack and Keefer (1995), Wei (2000), Tavares (2007) among others. The advantage of this index is that it spans over the largest number of countries and the longest time frame (1984 to present), compared to all other available measures of corruption. Also, Treisman (2000) finds that the different available indicators of corruption -the measure by ICRG, measure by the Business International organization and Corruption perception Index (CPI) by Transparency International- are highly correlated. Thus, we can assume that the conclusions based on ICRG's measure of corruption should not differ significantly across the different measures. We do not deny though that each measure of corruption has subjective components and thus is subject to a certain degree of measurement error.

### 3.2. Independent Variables

Our independent variables of interest are durability of a democratic system and measures of educational attainment. Based on our hypothesis, we are interested in exploring the interactive impact of these two variables on corruption levels of a nation. We consider durability data from Polity IV database. Rather than treating democracy and autocracy as two mutually exclusive governing institutions, the concept of 'polity' in the Polity IV database aims to capture the authorities in a spectrum of governing establishments. The Polity IV database is one of the most widely used databases used in studies exploring regime characteristics and their impacts. Since the durability variable is based on the construction of the variable 'polity2' from Polity IV database, we first describe polity2. Polity2, in turn, is based on the variable Polity from the same database. Polity is constructed by subtracting the 'Autoc' score from the 'Democ' score. These variables are separate indices that are constructed based on several components like competitiveness of executive recruitment, openness of executive recruitment, constraints on chief executive, regulation on participation and competitiveness of participation. The modified version of Polity has been named Polity2 that has been constructed to facilitate time-series analysis by converting where 'standardized authority scores' (-66, -77, -88) have been converted to conventional polity scores.

Durability implies the sustainability of any political regime. According to the definition provided by Polity IV database, regime durability is "the number of years since the most recent regime change (defined by a three-point change in the POLITY score over a period of three years or less) or the end of transition period defined by the lack of stable political institutions (denoted by a standardized authority score)". The variable is constructed by coding the year when a new polity (post-change) is established, as zero and then adding 1 for each subsequent year until a new regime change or transition period occurs. So if a country switches from a democratic to an autocratic country regime or vice-versa, the durability value is zero and then increases in value by a point for each year in which the country continues on that regime. For example, the Democratic Republic of Congo over interval of 1 year (1991 to 1992) had its polity2 score change from -1 to 5 and accordingly, its durability score changed from 27 to 0.

Again, when the polity scores for the same country changed from 5 in 1996 to -6 in 1997, the durability score changed from 4 to 0 over the same period. As mentioned, durability also considers improvement or deterioration in political institutions even when a country is on the same regime path. To state another example from the data, Dominican Republic had its polity score changed from 5 to 8 over the period 1995 to 1996, implying that it experienced a significant betterment of its democratic institutions and that is coded in the durability variable as a change from a score of 17 to 0. The idea is that while a regime change is definitely a big transition; a significant change within a regime also implies a break in the sustainability of the current regime. The values have been entered for all nations from 1800 onwards or since the date of independence if that date occurred after 1800.

The other variables of interest are different measures of educational attainment. Our benchmark measures of educational attainment come from the World Development Indicators (WDI), 2012 database. Our main measure is adult literacy which is defined by the World Bank as ‘the percentage of people ages 15 and above who can, with understanding read and write a short, simple statement on their everyday life’. The other measures considered, as part of robustness analysis, are male and female literacy rates which apply the same definition but to male and female population separately. While the mean for total literacy (see Table 1) is approximately 80 percent, the male literacy number is higher (84.2%) and the female literacy number is lower (76.9%). We further consider alternate literacy measure from Cross-National Time Series Database (Banks, 2005). Literacy rate is defined according to the UN Demographic Yearbook as ‘ability to both read and write’. The mean for total literacy is similar from Banks database, approximately being equal to 84.9 percent.

### **3.3. Control Variables**

Many of our control variables come from the World Development Indicators (WDI), 2012 database. The controls GDP per capita (Purchasing Power Parity (PPP)) and trade openness come from WDI, 2012. Literature (Tanzi and Davoodi, 2000; Treisman, 2000) has shown that there is a negative correlation between corruption and GDP per capita. Regarding the association between trade openness and corruption, researchers have looked into the problem from either side; how corruption impacts trade and vice versa. Studies have argued that corruption in the form of lobbying pressures from special interest groups, strategic interactions between the government and such groups or corruption coupled with lack of contract enforcement affect trade openness negatively (Bandyopadhyay and Roy, 2006; Grossman and Helpman, 1994; Olson, 1965). On the other hand, according to Wei (2000), countries that are smaller in size and have a “natural” propensity to trade, invest more in improving institutions and thus have lower levels of corruption. Ades and Di Tella (1999) point out that competition from foreign firms reduce rent seeking possibilities of domestic firms and thus reduce corrupt behavior of government officials. The potential endogeneity concerns are taken care of

by the dynamic panel estimators - System GMM and Difference GMM estimators.

Though durability is one of our main explanatory variables, we also control for the quality or strength of democracy by including Polity2 in our specifications. Studies like Kunicova and Rose-Ackerman (2005), Brunetti and Weder (2003), Persson and Tabellini (2003) have shown that there is a strong relationship between corruption and democracy. While studies like Kunicova and Rose-Ackerman (2005) and Brunetti and Weder (2003) have argued since democracy makes political parties more accountable to the electorate, democracy reduces corruption. But as noted by Kunicova and Rose-Ackerman (2005) and Persson and Tabellini (2003), there are aspects in democratic elections that may create opportunities for corruption.

We also control for communication infrastructure of nations. Better communication infrastructure can empower citizens to expose corruption in a fast and efficient manner. We control for internet users (per 200 people) and mobile users (per 100 people) in alternate specifications. Further, we also control for health infrastructure of nations by incorporating health indicators like life expectancy rate and mortality rates.

Finally, we control for different measures of poverty in our specifications as a part of robustness analysis. To proxy for poverty, we consider three variables - percentage of the population who are living on less than \$1.90 per day at 2011 prices, percentage of the population who are living on less than \$3.10 per day at 2011 prices and percentage of populace who are below national poverty lines.

A survey of the literature shows that there are two broad research domains regarding the relationship between corruption and poverty. The first perspective argues that corruption is not a major cause of poverty. The second research is more pertinent and argues that there is some correlation between corruption and poverty, but that this relationship is an indirect one. It is argued that corruption by itself does not produce poverty; rather, corruption has direct consequences on economic and governance factors intermediaries that in turn produce poverty. The second model contends that corruption affects poverty in the sense that corruption reduces governance capacity. Corrupt behaviors erode the institutional capacity of government to deliver quality public services; divert public investment away from major public needs into capital projects; lower compliance with safety and health regulations, and increase budgetary pressures on government. The above factors, which are caused by corruption, are in turn responsible for producing poverty (Chetwynd, Chetwynd and Spector, 2003; Gupta, Davoodi, and Alonso-Terme, 2002; Uslaner, 2008; Hellman, Jones and Kaufmann, 2006; Shleifer, 1997; Kaufmann, Kraay and Mastruzzi, 2006).

As part of our last set of results under robustness analysis, we have considered each of the individual characteristics as an alternate proxy of polity 2 for robustness analysis. XRREG or the extent to which changes in chief executive is institutionalized, ranges from 1 to 3, with higher values implying more competitive situations rather than transfer through forced power (1 implies such a situation). XRCOMP denotes competitiveness of executive recruitment, ranging over 1 to 3 with 3 implying competitive elections and 1 implying executives being determined by hereditary succession. XROPEN implies

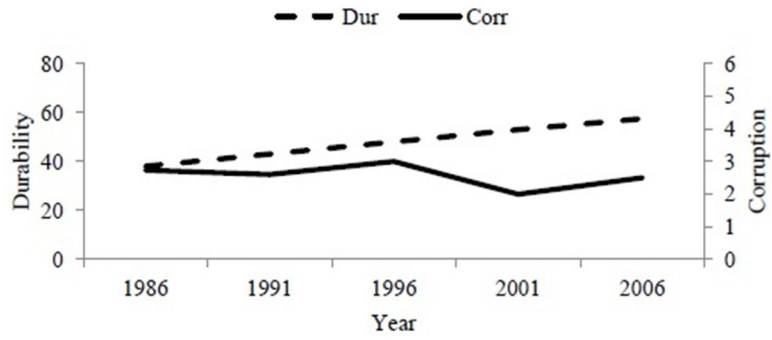


openness of executive recruitment and ranges over 1 to 4. While 1 implies chief executives being selected through hereditary succession, 4 implies a selection through competitive elections. XCONST implies constraints on the chief executive. It ranges from 1 to 7 with higher values implying greater restriction on power of the chief executive. The variable PARREG implies regulation of participation and varies over 1 to 5, with 1 implying unregulated participation of political groups in the sense that ‘no systematic regime controls on political activity’ (Polity IV, 2012). A 7 represents a situation where ‘political groups regularly compete for political influence and position with little use of coercion’. As explained in the following section, the time-invariant (fixed-effect) determinants of corruption like legal origins, ethnic fragmentation, and religious affiliations are accounted for in the System GMM and Difference GMM models. We consider a panel of 92 developed and developing countries over a period of 24 years - 1986 to 2009. 5-year averages have been considered to smooth out cyclical fluctuations in the data.

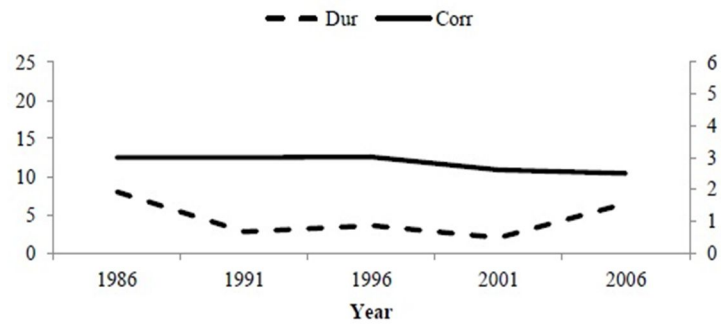
Before proceeding to the next section, we provide anecdotal evidence using raw data (see Figure 2) in support of our theory. The first example is India; India has had a stable functional democratic regime for the past six decades. We can see from Figure 2 that its durability score has always been on the rise. Since 1986, in terms of literacy, it scores significantly poorly. India’s average literacy over our sample period is 57.3. India scores quite poorly in corruption indices as well (scores ranging from 2.5 to 3 over our sample period). Thus, a nation that has sustained democracy without any major hiccups over a considerable period of time has failed to control corruption. On the other hand, Peru has relatively much higher levels of literacy compared to India (approximately 88 percent) but has low durability. Yet, the corruption level is very similar to India (approximately around 3). Both case evidence suggests that democratic setup or a strong education base in isolation is not sufficient to reduce corruption. It would be interesting to compare the results from India, and Peru with a country like Portugal. We find that Portugal has high levels of both durability of democracy and literacy and, we see it has low levels of corruption. The findings hint to a possibility that there could be a potential combined effect of the relevant factors that can deter corruption that we want to analyze further, and carry out in the next section.

Table 1 presents the summary statistics. We consider an unbalanced panel of 92 countries over the period of 1986-2009. We explain later how the sample is selected based on polity score. We consider 5-year averages with all countries having data for at least one 5 year period. As mentioned before, our benchmark measures of literacy from the World Development Indicators (WDI) database suffer from the problem of missing values. On average, we have 1.85 observations for each country for the literacy measures. Yet, 70 countries are represented for most of the sample periods - so in terms of a better approximation, we have 2.4 observations per country. For the alternate literacy measure from Cross-National Time Series (Banks) Database, we have 4.3 observations per country. For the literacy measures from WDI, on average 84 percent of our sample are literate. The mean for literacy from Banks Database is slightly higher

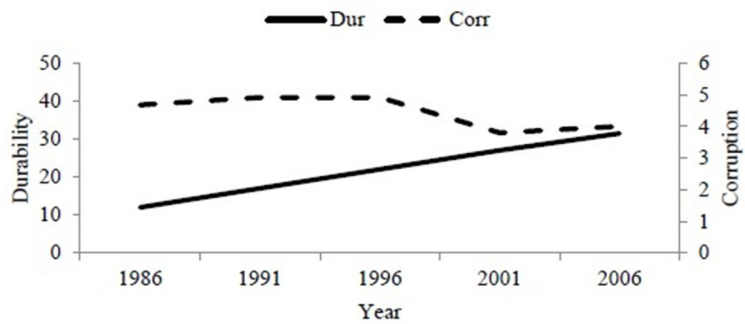
(=84.9). On average, durability scores around 29 for our sample with a high standard deviation of 36.4.



A. India (Literacy -57.3)



B. Peru (Literacy -88.01)



C. Portugal (Literacy -91.4)

**Figure 2.** Examples from Data

## 4. METHODOLOGY AND BENCHMARK RESULTS

### 4.1. Methodology

We rely on dynamic panel data<sup>3</sup> model based on generalized method of moment (GMM) estimators for deriving our estimation results. We prefer using such estimators for multiple reasons. First, a common but critical challenge of panel data models is the associated endogeneity of the variables. We face similar challenges for our model. While our focus is on the impact of both the durability of a political system as well as education on corruption levels of nations, it is very reasonable to assume that corruption can affect such variables too. A highly corrupt nation might result in an overthrow<sup>4</sup> of the ruling authority due to resentment of the masses. Further, higher level of corruption might make the populace disinterested about being educated since honest efforts might not be rewarded. Therefore, it is desirable to control for their joint determination with corruption. One way to overcome this challenge is to employ the method of two-stage least square (IV estimation). The challenge is to find instruments that are truly exogenous in nature, implying they are uncorrelated with the error term. Further, even though IV estimates are consistent, both Baum (2008) and Murray (2006) mention that IV estimates suffer from inherent bias and problematic finite sample properties. As Baum points out that in the presence of weak instruments, IV instruments may not be an improvement over OLS estimators.

For both system GMM and difference GMM estimators, the model is transformed into first differences and sequential moment conditions are then used. Lagged levels of the variables are used as instruments for the endogenous differences and the parameters estimated by GMM (Arellano and Bond, 1991). Second, it is important to capture the persistence of the dependent variable; corruption and the dynamic panel estimators handle are designed to handle such persistence. Third, many determinants of corruption, like colonial origins, legal origins, regional groups, are time invariant. The dynamic panel estimators are well-suited to handle fixed effects and, further, they are designed to avoid dynamic panel bias (Nickell, 1981). Finally, the dynamic panel estimators also handle heteroscedasticity and autocorrelation across panels.

First differenced GMM estimators can result in weak instruments which, in turn, can cause poor finite sample properties when they are used to estimate autoregressive models (Blundell and Bond, 1998). System GMM estimators use lagged levels as instruments for equations in first differences and also suitable lagged first differences as instruments for equation in levels (Arellano and Bover, 1995). Thus, the system GMM

<sup>3</sup> Roodman (2006) and Bond (2002) have pointed out that dynamic panel estimators are particularly designed for short, wide ( $N > T$ ) linear panels which involve a single dependent variable, are subject to fixed country effects and suffer from serial correlation and heteroscedasticity among error terms.

<sup>4</sup> In a similar context see Blanco and Grier (2007) who have shown that measures of mass resentment towards the party in power are critical sources of political instability of a nation.

estimator uses extra moment conditions that ‘rely on certain stationarity conditions of the initial observation’ (Blundell and Bond, 1998). We use System GMM estimators to test our hypothesis.

Our reduced form equation takes the following form:

$$\begin{aligned} Corr_{it} = & \beta_0 + \beta_1 Dur_{it} + \beta_2 Edu_{it} + \beta_3 (Dur * Edu)_{it} + \beta_4 X_{it} + \beta_5 \gamma_i + \beta_6 \theta_t \\ & + \epsilon_{it}, \end{aligned} \quad (1)$$

where  $Corr_{it}$  is corruption level for country  $i$  in period  $t$ . While  $Dur_{it}$  is the value of durability for country  $i$  in period  $t$ ,  $Edu_{it}$  is the education proxy for the same.  $X_{it}$  is the matrix for control variables.  $\gamma_i$  is the time-invariant country fixed effects,  $\theta_t$  is the vector for time dummies and  $\epsilon_{it}$  represents the random error term. As mentioned before, durability is constructed based on the polity2 score and we consider democratic durability only. We consider 5-year averages over the period. If  $Polity2_{it} > 0$ , then the corresponding durability score is included in our sample. Otherwise, it is not included in our sample. So although we consider 5 year averages over the period 1986 to 2009, and, thus, 5 observations for every country, for quite a few countries we have fewer than 5 observations. Thus, we have an unbalanced panel of 92 countries. We are interested in the sign of  $\beta_3$ . The level of education,<sup>5</sup>  $Edu_{it}^*$ , at which Durability has no impact on corruption, can be defined as

$$Edu_{it}^* = -\frac{\beta_1}{\beta_3}. \quad (2)$$

Thus for the education level less than the threshold value  $Edu_{it} < -\frac{\beta_1}{\beta_3}$ , durability has a negative impact on corruption and otherwise. Based on the coefficients of  $\beta_1$ ,  $\beta_3$  and the magnitude of literacy, the impact of democracy on corruption will be positive or negative. Similarly, the critical level of durability at which durability has no impact on corruption can be given by,  $Dur_{it}^* = -\frac{\beta_2}{\beta_3}$ .

#### 4.2. Benchmark Results

Table 2 provides the correlations among our main variables of interest. Both literacy measures have significant positive association with corruption. Durability also has significant positive association with corruption. Durability and literacy are positively correlated with each other as well. Keeping in mind that higher numbers mean lower

<sup>5</sup> A similar threshold value of durability can be calculated in the following way. the level of Durability,  $Dur_{it}^*$ , at which education has no impact on corruption is given by  $Dur_{it}^* = -\frac{\beta_2}{\beta_3}$ , education has a negative impact on corruption, otherwise the impact is positive. We are more interested in the impact of durability of a political system on corruption levels of a nation at different levels of education.

corruption, the correlations suggest that with higher literacy and durability, we can expect lower corruption. Additionally, 'polity' and 'corruption', both variables are also significantly correlated and the association is positive.

**Table 2.** Correlation Matrix

	Corr	Dur	Lit(WB)	Polity	Internet	Mobile
Corr	1					
Dur	0.54*	1				
Lit(WB)	0.25*	0.23*	1			
Polity	0.51*	0.46*	0.58*	1		
Internet	0.22*	0.44*	0.45*	0.37*	1	
Mobile	-0.01	0.25*	0.44*	0.32*	0.84*	1
Life Exp.	0.51*	0.47*	0.73*	0.65*	0.48*	0.42*
Mortality	0.51*	0.47*	0.73*	0.65*	0.48*	0.42*
Pov(\$1.90)	-0.19*	-0.17*	-0.81*	-0.41*	-0.36*	-0.35*
Pov(\$3.10)	-0.22*	-0.14*	-0.81*	-0.46*	-0.45*	-0.42*
Pov(Nat)	0.05	-0.24*	-0.54*	-0.29*	-0.58*	-0.59*
Lit(Banks)	0.43*	0.37*	0.94*	0.63*	0.37*	0.34*
	Life Exp.	Mortality	Pov(\$1.90)	Pov(\$3.10)	Pov(Nat)	Lit(Banks)
Corr						
Dur						
Lit(WB)						
Polity						
Internet						
Mobile						
Life Exp.	1					
Mortality	1.00*	1				
Pov(\$1.90)	-0.84*	-0.84*	1			
Pov(\$3.10)	-0.83*	-0.83*	0.95*	1		
Pov(Nat)	-0.57*	-0.57*	0.70*	0.67*	1	
Lit(Banks)	0.80*	0.80*	-0.82*	-0.82*	-0.57*	1

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

In Table 3, we present the benchmark results. In column (1), we include the controls trade and GDP per capita along with our variables of interest. In column (2) we include polity2 as an additional control. As we can see from the results, the coefficient of the interaction term,  $\beta_4$ , is positive and significant for all the specifications suggesting that educational attainment and democratic durability act as complements in curbing corruption. The individual effects of literacy and durability on corruption seem negative.

Yet, this does not make much sense since the overall impact of literacy or durability on corruption depend on the levels of durability or literacy respectively. In the presence of the interaction term between two variables like X and Y, the overall impact of X on the dependent variable can only be analyzed based on the values of Y. The direct impact of X on the dependent variable can be interpreted as X's impact when Y is equal to zero. So the negative impact of literacy on corruption means that when durability is zero which is economically possible as evident from the summary statistics, a rise in literacy worsens corruption. So improvement in literacy fails to curb corruption when nations have no durability. Yet, as durability rises, literacy can work in conjunction with durability to lower corruption. Similar conclusions are true for durability. We analyze in detail the marginal impacts,  $\frac{\delta Corr_{it}}{\delta Lit_{it}} = \hat{\beta}_1 + \hat{\beta}_2 * Dur$  and  $\frac{\delta Corr_{it}}{\delta Dur_{it}} = \hat{\beta}_1 + \hat{\beta}_2 * Lit$ , in Tables 4A, 4B.

**Table 3.** System GMM Specifications: Interactive Impact of Educational Attainment and Durability on Corruption

	(1)	(2)
Corruption <sub>t-1</sub>	0.0211 (0.0527)	0.0328 (0.0553)
Durable	-0.0471** (0.0226)	-0.0524 (0.0322)
Literacy	-0.0223** (0.0093)	-0.0217** (0.0104)
Dur*Lit	0.0005** (0.0002)	0.000640* (0.0003)
Polity		-0.0113 (0.0288)
GDP per capita	0.0001*** (2.29e-05)	0.0001*** (2.84e-05)
Trade	0.0039*** (0.0014)	0.0038** (0.0015)
Constant	3.1580*** (0.7020)	3.2070*** (0.7580)
Observations	139	139
Number of countries	70	69
Number of instruments	32	33
Sargan test (p values)	0.6200	0.6900
Second order auto correlation (p values)	0.6700	0.9800

*Notes:* Standard errors in parentheses;\*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Period dummies are included in all specifications. GDP per capita and trade openness are treated.

**Table 4A.** Marginal Effect of Literacy on Corruption at Different Levels of Durability

Value of Durability	Percentile of Durability	Country	$\frac{\delta Corr_{it}}{\delta Lit_{it}}$
3.7	10 <sup>th</sup>	Algeria	-0.02** (0.01)
13	50 <sup>th</sup>	El Salvador	-0.013** (0.01)
77.9	90	Ireland	0.03* (0.02)
29	Mean	Venezuela	-0.003 (0.007)

Notes:  $\frac{\delta Corr_{it}}{\delta Lit_{it}} = \hat{\beta}_1 + \hat{\beta}_2 * Dur$ , evaluated at various percentiles of Durability. Specifically, we estimate  $\frac{\delta Corr_{it}}{\delta Lit_{it}}$  at the 10th, 50th and 90th percentile as well as the mean of durability based on the estimates from Table 3. The country names correspond to the particular percentiles of durability for our sample.

**Table 4B.** Marginal Effect of Literacy on Corruption at Different Levels of Literacy

Value of Literacy	Percentile of Durability	Country	$\frac{\delta Corr_{it}}{\delta Dur_{it}}$
49	10 <sup>th</sup>	Algeria	-0.02 (0.015)
90	50 <sup>th</sup>	El Salvador	0.005 (0.007)
99.3	90	Ireland	0.01 (0.009)
81.3	Mean	Venezuela	-0.0003 (0.007)

Notes:  $\frac{\delta Corr_{it}}{\delta Dur_{it}} = \hat{\beta}_1 + \hat{\beta}_2 * Lit$ , evaluated at various percentiles of Durability. Specifically, we estimate  $\frac{\delta Corr_{it}}{\delta Dur_{it}}$  at the 10th, 50th and 90th percentile as well as the mean of durability based on the estimates from Table 3. The country names correspond to the particular percentiles of durability for our sample.

The System GMM estimators are based on the assumption that there is no second order autocorrelation in the idiosyncratic errors. The reported p values suggest the absence of second- order autocorrelation. The p values from the Sargan test suggest that the exclusion restrictions for the instruments have been met. We report the number of instruments for all the specifications. For all our specifications, ' $r$ ', the ratio of countries to instruments is greater than one indicating that the assumptions for second order autocorrelation and overidentifying restrictions tests are not violated. Further, as suggested by Roodman (2009b) and Asiedu and Lien (2011),  $r$  being greater than one, suggests that our estimates are not prone to Type I error, an error that arises when

significant correlations are generated even in there is no underlying association.

In Tables 4A and 4B, we present the marginal estimates. We report the marginal effects of durability on corruption for different levels of literacy as well as the marginal effect of literacy on corruption for different levels of durability. Following Asiedu *et al.* (2009), Dutta and Williamson (2016), we calculate the means for  $\widehat{Dur}$  and  $\widehat{Lit}$  for each country. Based on the country means, we calculate the marginal impacts -  $\frac{\delta Corr_{it}}{\delta Lit_{it}}$  at the 10<sup>th</sup>, 50<sup>th</sup>, 90<sup>th</sup> and the mean of durability. Similarly,  $\frac{\delta Corr_{it}}{\delta Dur_{it}}$  is estimated at similar values of literacy.

We have some interesting conclusions from the tables. In Table 4A, we present the results for  $\frac{\delta Corr_{it}}{\delta Lit_{it}}$  for different levels of durability. We find that, literacy hurts corruption, for low levels of durability. As a country gets more durable, literacy can compact corruption more effectively. Thus, in the present of an unstable regime or not so matured democracy, the country still suffers from uncertainty in policy environment and, thus, literacy fails to see combat corruption. But, an interesting thing to note, is that as a country gets more durable, the negativity goes down. So democratic durability helps in combatting corruption in conjunction with literacy although the effect may not be positive as yet. But, for a country like Madagascar with a durability in the 90th percentile, the impact is positive.

To put some more perspective into our empirical findings, we consider the countries in the same region (Latin American and the Caribbean or LAC) with the same level of average literacy over our sample period. The countries considered are Brazil (with a literacy level of 88.3%) and Peru (with a literacy level 88.03%). With Peru's durability score of 4.6, standard deviation rise in literacy will lower corruption score by  $\left\{ \left[ \frac{\delta Corr_i}{\delta Lit_i} = \beta_1 + \beta_3 * 4.6 \right] * s.d. of lit. \right\}$  or by 0.36 percentage points. For Brazil with a durability score of 13, a S.D. rise in literacy would lower corruption score by 0.18 percentage points which is more than 150 percent improvement in corruption score compared to Peru. But in Table 4B we find that different levels of literacy does not significantly impact  $\frac{\delta Corr_{it}}{\delta Dur_{it}}$ .

## 5. ROBUSTNESS ANALYSIS

We check the robustness of our findings to the inclusion of several sets of controls that can potentially affect corruption and, thus, we make sure that we are minimizing omitted variable bias as much as possible. In Table 5, we control for communication infrastructure. One such control is internet users per 100 people. Internet users have been associated with the extent of corruption levels of a country (Garcia-Murillo, 2010). Further, bloggers in China have been found to expose more corruption in China (Google news source, 2012). So we control for internet users per 100 people. The data are taken



from the World Development Indicators database (World Bank, 2012). In addition to internet, we also control for mobile users in column (2). We also control for other aspects of development -such as life expectancy (in years) and mortality rate of infants in their first five years. These factors indicate the degree of overall development of a region.

**Table 5.** System GMM Specifications: Interactive Impact of Educational Attainment and Durability on Corruption -Inclusion of Controls

	(1)	(2)	(3)	(4)
Corr <sub>t-1</sub>	-0.1170** (0.0552)	-0.1110** (0.0565)	-0.0029 (0.0516)	-0.0029 (0.0516)
Durable	-0.0869*** (0.0288)	-0.0927*** (0.0285)	-0.0888*** (0.0342)	-0.0888** * (0.0342)
Literacy	-0.0345*** (0.0105)	-0.0332*** (0.0112)	-0.0294*** (0.0101)	-0.0294** * (0.0101)
Dur*Lit	0.0010*** (0.0003)	0.0011*** (0.0003)	0.0008** (0.0004)	0.0008** (0.0004)
Polity	-0.0404 (0.0323)	-0.0417 (0.0320)	-0.0386 (0.0297)	-0.0386 (0.0297)
GDP per Capita	0.0002*** (5.90e-05)	0.0002*** (6.05e-05)	6.75e-05* (3.80e-05)	6.75e-05* (3.80e-05)
Trade	0.0071*** (0.0024)	0.0069*** (0.0024)	0.0037*** (0.0010)	0.0037*** (0.0010)
Internet Users	-0.0271*** (0.0074)	-0.0244*** (0.0084)		
Mobile Users		-0.0018 (0.0024)		
Life Expectancy Rate			0.0845** (0.0411)	
Mortality Rate				0.0845** (0.0411)
Constant	4.5470*** (0.816)	4.5410*** (0.827)	-0.9070 (2.217)	-0.9070 (2.217)
Observations	138	138	139	139
Number of Countries	69	69	69	69
Number of Instruments	34	34	34	34
Sargan Test (p value)	0.6700	0.6800	0.8000	0.7500
Second order auto correlation (p value)	0.3500	0.3400	0.7400	0.8000

Notes: Standard errors in parentheses;\*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Period dummies are included in all specifications. GDP per capita and trade openness are treated.

Greater overall development, in turn, should have a positive impact on corruption (reduce corruption). The coefficients of our variables of interest retain their sign and significance. The coefficient of the interaction term is positive and significant for all the specifications. The newly included controls are not significant. The estimated marginal impacts point us to the same conclusions. Keeping space constraint in mind these have not been reported but they are available on request. The p values for second order autocorrelation and Sargan test show the absence of autocorrelation and that over-identification restrictions have been met.

**Table 6.** System GMM Specifications: Interactive Impact of Educational Attainment and Durability on Corruption -Inclusion of Poverty Variables

	(1)	(2)	(3)
Corr <sub>t-1</sub>	0.0604 (0.0591)	0.0252 (0.0919)	0.1250* (0.0700)
Durable	-0.0132 (0.0587)	-0.0729*** (0.0255)	-0.0948*** (0.0325)
Literacy	-0.0120 (0.0112)	-0.0342*** (0.0079)	-0.0266 (0.0188)
Dur*Lit	0.0002 (0.0006)	0.0007* (0.0003)	0.0010** (0.0004)
Polity	-0.0401 (0.0461)	0.1500 (0.0966)	0.0103 (0.1370)
GDP per Capita	0.0002*** (6.07e-05)	0.0001*** (5.78e-05)	0.0003** (0.0001)
Trade	0.0048*** (0.0013)	0.0009 (0.0030)	0.01490* (0.0077)
Poverty ratio at \$1.90 per day (% of pop)	0.0114 (0.0075)		0.0115 (0.0087)
National below poverty line (% of pop)		0.0015 (0.0074)	
Internet Users (per 100 people)			-0.0245* (0.0134)
Life Expectancy Rate			-0.0235 (0.0910)
Constant	2.0310** (0.9290)	3.4060*** (1.1310)	3.6660 (4.4810)
Observations	111	78	78
Number of Countries	58	50	58
Number of Instruments	33	26	28
Sargan Test (p value)	0.7100	0.5400	0.6700
Second order auto correlation (p value)	0.2700	0.3700	0.3400

*Notes:* Standard errors in parentheses;\*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Period dummies are included in all specifications. GDP per capita and trade openness are treated.

Next we test our benchmark findings to the inclusion of poverty variables. As explained earlier, levels of poverty can be an important determinant of corruption. The results are presented in Table 6. We consider three different measures of poverty that are described in the data section. We have included these in alternate specifications. Keeping space constraint in mind, we have reported the results from two of them. The not reported findings are qualitatively similar. In column (3), we include one of the poverty measures along with controls included in Table 5. Our main conclusions remain unchanged. The interaction term,  $Dur*Lit$ , is positive and significant in two out of the three specifications suggesting the complementarity between durability and literacy. Our included controls, the different measures of poverty, have no significant impact on corruption. The marginal estimates remain similar to our benchmark marginal estimates.

We test our benchmark findings from Table 3 by including individual components of Polity2 instead of Polity2 itself. Factors like constraints on chief executive, competitiveness of participation, and openness of executive recruitment are critical components of a democratic system and, thus, are extremely critical in curbing corruption levels of nation. We check if our results alter to the inclusion of these individual components. Our results remain robust to the inclusion of these additional controls. Again keeping space constraint in mind, the results have not been reported but they are available on request. The marginal estimates remain qualitatively similar as well. The individual components of polity2 are not significant.

**Table 7.** Marginal Effect of Literacy on Corruption at Different Levels of Durability

Value of Durability	Percentile of Durability	Country	$\frac{\delta Corr_{it}}{\delta Lit_{it}}$
3.7	10 <sup>th</sup>	Algeria	-0.001* (0.001)
13	50 <sup>th</sup>	El Salvador	-0.0001 (0.001)
77.9	90	Ireland	0.006** (0.003)
29	Mean	Venezuela	0.001 (0.001)

Notes: Standard errors in parentheses;\*\*\* p<0.01, \*\* p<0.05, \* p<0.1.  $\frac{\delta Corr_{it}}{\delta Lit_{it}} = \hat{\beta}_1 + \hat{\beta}_2 * Dur$ , evaluated at various percentiles of Durability. Specifically, we estimate  $\frac{\delta Corr_{it}}{\delta Lit_{it}}$  at the 10th, 50th and 90th percentile as well as the mean of durability based on the estimates from Table 6 (Column 3 specification). The country names correspond to the particular percentiles of durability for our sample.

As stated before, though the literacy measure from World Bank database is one of the popular measures of literacy, it has the potential problem of too many missing values. Thus, we consider an alternate measure of literacy from Cross-National Time Series Database (Banks, 2010), that has much better data coverage. The results remain similar.

The interaction term, Dur\*Lit, remains positive and significant. We estimate the marginal estimates based on the new measures of literacy. The results are reported in Table 7. We only report the estimates,  $\frac{\delta Corr_{it}}{\delta Lit_{it}}$  at the different values of durability. We do not report  $\frac{\delta Corr_{it}}{\delta Dur_{it}}$  since, similar, to our benchmark findings, the impacts are not significant. The marginal estimates are qualitatively similar to the ones in Tables 4A and 4B. At low levels of durability (at the 10th percentile), literacy fails to reduce corruption. But as durability rises, the negativity goes down as literacy can more effectively fight corruption. For high levels of durability, the impact becomes positive.

**Table 8.** System GMM Specifications: Interactive Impact of Educational Attainment and Durability on Corruption -Male and Female Literacy

	(1)	(2)
Corr <sub>t-1</sub>	0.0182 (0.0539)	0.0248 (0.0554)
Durable	-0.0793** (0.0337)	-0.0290 (0.0317)
Literacy (Male)	-0.0304*** (0.0108)	
Lit. (male)*Dur	0.0009** (0.0003)	
Literacy (Female)		-0.0197** (0.0087)
Lit. (female)*Dur		0.0004 (0.0003)
Av GDP per capita a constant 2000 us	0.0001*** (2.76e-05)	0.0001*** (2.82e-05)
Trade	0.0039*** (0.0014)	0.0038** (0.0016)
Polity	-0.0026 (0.0283)	-0.0083 (0.0298)
Constant	4.0040*** (0.8407)	2.9100*** (0.5870)
Observations	139	139
Number of Countries	69	69
Number of Instruments	33	33
Sargan Test (p value)	0.6700	0.6800
Second order auto correlation (p value)	0.3500	0.3400

Notes: Standard errors in parentheses;\*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Period dummies are included in all specifications. GDP per capita and trade openness are treated.

As part of our next set of robustness results, we explore if our benchmark findings

are quantitatively similar if we consider male and female literacy separately. We consider the measures from World Bank. We report the findings in Table 8. The interaction term, Dur\*Lit, is positive and significant in the case of male literacy but not for female literacy. The authors opine that the low levels of female literacy around the world could be the reason that the interaction with this variable fails to create a significant impact on corruption.

Finally, for our last set of results as part of robustness analysis, we check our results with Difference GMM specifications. Again these are not reported keeping space constraint in mind, but they are available upon request. As mentioned before, System GMM estimator improves over Difference GMM estimator in terms of reduced bias and precision. However, Hahn and Hausman (2002) have stated that the system GMM estimator utilizes more instruments and thus, raises worries about the estimates being heavily biased. The coefficient of the interaction term is positive for our benchmark specification. The marginal estimates also point to a similar conclusion.

## 6. CONCLUSION AND POLICY IMPLICATIONS

In this paper, we examine the joint role of the durability of democratic regimes and educational attainment of the populace in reducing corruption. Our results indicate that a stable democratic regime and an educated populace behave as complements in combating corruption. The findings remain robust to alternate model specifications, alternate measures of literacy and inclusion of different controls.

These findings are timely and strongly influence today's policy issues especially in the context of doing business. To remain sustain in the path of economic growth and development, the developing world requires to attract foreign capital and corruption is a major deterrent to that. According to the United Nations, corruption adds 10 percent or more to the cost of doing business in many parts of the world and as much as 25 percent to the cost of public procurement. Existing research shows strong correlation between corruption and doing business. Corrupt nations tend to make business more difficult and complex and on the contrary, transparent countries tend to make things easier for foreign or local investors. Corruption also impedes economic growth, distorts competition, and creates serious legal and reputational risks. Therefore, curbing corruption is an important is an essential pre-context of a sustainable growth path. Our results suggest that a young democracy like the ones in Sub-Saharan Africa may not immediately be successful in fighting against corruption. Such countries must make sure that democratic institutions are sustainable over time and every effort should be made to better the quality of democratic institutions so that monitoring mechanisms are in place, transparency in action is achieved, and rent-seeking activities are minimized. Yet, at the same time, it has to be ensured that the education infrastructure develops so that the populace of the nation gets the required education.

From the perspective of the policy implications, the most important outcome of a

reduction in corruption would be to alleviate millions of people across the world out of poverty. The World Bank's World Development Report for 2000/01 summarizes the corruption-poverty vicious circle in the following words: "For those without money and connections, petty corruption in public health or police services can have debilitating consequences. Corruption affects the lives of poor people through many other channels as well. It biases government spending away from socially valuable goods, such as education. It diverts public resources from infrastructure investments that could benefit poor people, such as health clinics, and tends to increase public spending on capital-intensive investments that offer more opportunities for kickbacks, such as defense contracts. It lowers the quality of infrastructure since kickbacks are more lucrative on equipment purchases. Corruption also undermines public service delivery (World Bank, 2000/2001)."

For the both the issues mentioned above, raising awareness against corruption becomes critical especially for the developing world. The public awareness campaigns should target various stakeholder groups, such as university students, small and medium-sized enterprises, and professional groups that represent a broad cross-section of the economy. Various media should be used, including radio, newspapers, billboards, and advertisements. The World Bank's Governance Global Practice conducted Business Ethics awareness in Guatemala & Colombia with relative success. In Colombia, it conducted a series of 11 workshops on integrity and responsible corporate practices. Both efforts were successful that contributes to demonstrate that increasing public awareness is the key in controlling corruption. Hence, Public policy should be catered in such a way to provide a free education to ordinary people. From the context of developing economies, if such economies fail to spread free and impartial education across its populace, and it remains in the hands of the elite minority, even as these countries have democratized-they remain mired in high levels of corruption. International organizations like UNESCO and the World Bank's initiatives are very active in 'attaining quality education for all' and that has been ones of its primary objectives. The Anti-Corruption Network for Eastern Europe and Central Asia, a program of OECD, assists non-member countries in their fight against corruption (OECD, 2008). One of the main functions identified by the network is 'education and awareness raising'. Our findings support such programs of 'education and awareness raising' in reducing corruption.

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