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# CURE FOR CORRUPTION: A HIGH HDI SCORE?

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**Abstract**

This study examines the relationship between human development and corruption in a country. A multivariate statistical analysis drawing on data from the Human Development Index (HDI) and Corruption Perceptions Index (CPI) for 41 countries over a 28-year period indicates that increases in a country's HDI score is associated with significant declines in perceived corruption in that country. However, this relationship is not linear; above a certain point, improvements in HDI scores do not lead to further falls in corruption levels. For countries with lower levels of human development, investments in healthcare, education, and living standards can markedly reduce the extent of corrupt conduct there.

**Keywords**: Corruption Perceptions Index, Human Development Index, Human Development, Bribery, Corruption, Mixed Model Estimation and Copula Estimation

## 1. Introduction

Corrupt practices in international business are widely acknowledged to be a major barrier to a country's advancement - economically, politically, and socially. Corruption takes different forms, one of which is bribing government officials to sway decisions in the briber's favor. Bribery is one form of corruption, often used interchangeably, and which includes money laundering, influence peddling, fraud, and nepotism, among other behaviors.

Bribery is a global phenomenon. It was estimated that over USD1 trillion was paid in bribes annually, over 3% of the total global GDP of USD30 trillion (Labelle, 2006); however, some countries have higher incidences of such type of corruption than others. Since bribery is acknowledged as undesirable for a country's well-being, understanding the factors that contribute to bribery can assist in crafting policies to curb this practice.

While scholars have identified several factors - economic, political, cultural, and institutional - that contribute to the prevalence (or lower prevalence) of corruption in a country, this paper aims to delve deeper into the relevance of one particular determinant - the level of human development in a country. Though countries with a high degree of human development (in the form of a healthy, educated, and economically well-off populace) tend to report lower

corruption, we want to ascertain how strong this relationship is. Given the range of tools that can be prescribed to combat corruption, a goal of this paper is to identify those that can be most effective, based on empirical evidence across time and space, and which is primarily focused on one, albeit key, cause of corruption. The motivation of this scholarship is to recommend (or not recommend) macro-level approaches that could serve to reduce corrupt practices in a country.

The paper uses a variety of multiple regression tools (e.g., mixed estimation and copula estimation) applied to data on human development and perceptions of corruption for a large set of countries over several years. The data are reported by organizations such as the United Nations and Transparency International.

The principal contribution of this paper is a more complete understanding of one of the significant determinants of corruption in a country - its level of human development. While the empirical data reconfirms the negative relationship between the two - high human development is associated with low corruption and vice versa - we report here that this relationship is not linear. Above a certain level of human development, any further improvement does not translate into lowering corruption in a country. While improvements in human development are a desirable goal, in countries with high or higher levels of human development, addressing the other causes of corruption becomes relevant. This is a major insight and public policy advice that this paper offers.

The paper is organized as follows: We review extant literature on the deleterious effects and the principal determinants of bribery across countries. The section after this discusses the data - its source and nature - that has been subjected to a variety of statistical tests. The next section presents the methodology and statistical results, followed by a discussion of what the results indicate. The paper concludes with a discussion of the principal findings and the main contribution of this paper to understanding and combating corrupt practices.

## 2. Review of extant literature

The phenomenon of bribery is the subject of extensive enquiry by researchers. We review here some of the studies that point to its deleterious effects on a country and which identifies the determinants of this phenomenon.

### 2.1. Effects of bribery

Bribe giving and bribe taking arrests a nation's economic growth with consequent negative impact on income and tax receipts. In a report for the International Monetary Fund covering the period from 1980 to 1987, Tanzi and Davoodi (1997) found that a one standard deviation point increase in corruption reduced the annual income of poor people in a country by 7.8%. Gupta *et al.* (2002) reported that corruption contributed to increased income inequality through slower economic expansion, a skewed taxation policy, and insufficient and ineffective public expenditures. Research findings reveal that increased corruption also leads to a higher Gini coefficient, a measure of inequality, in a wide range of countries, both developing (Gyimah-Brempong, 2001) and developed (Dincer and Gunalp, 2008). This is because the main beneficiaries of corruption tend to be those who are well-connected and already relatively well-off; this, in turn, hampers the ability of governments to use state resources more equitably.

Corrupt practices also undermine public faith in the integrity of the legal system (Attila, 2008), discourages foreign investment from coming in (Sanyal and Samanta, 2008), and tilts the competitive environment in favor of some firms over others (Mauro, 1995).

Given these negative effects, a wide range of measures have been adopted at the national, inter-governmental, corporate, and civil society levels to combat bribery. These measures have included the enactment of laws such as the Foreign Corrupt Practices Act in the U.S., the adoption by members of the OECD of a treaty to make bribery illegal (the Convention on Combating Bribery), inclusion of stringent requirements of accountability and transparency in loans advanced by multilateral lending bodies such as the World Bank, and the embracement by business entities of codes of conduct to guide their employees. In addition, non-governmental organizations (e.g., Transparency International) have organized to highlight egregious corrupt

activities. As a result, government prosecution of illegal conduct has been stepped up and punishments imposed.

## 2.2. Determinants of bribery

A large number of studies have been conducted to identify the determinants of bribe giving and bribe taking in international business. Various factors contribute to the prevalence of bribery. These are cultural, economic, institutional, social and firm-specific (e.g., Husted, 1999; Lambsdorff, 2007; and Sanyal, 2005). Countries that rank high on masculinity, have a propensity to take risks, and are more rigidly hierarchical are more likely to be corrupt (Sanyal and Samanta, 2002). From an institutional perspective, the nature of political democracy in a country has been found to be a valid predictor of corruption, over both the short and the long term (Blum, 2017).

A high gender development index (GDI), indicating women's status and engagement in a country is close to those of men, has been shown to be a factor associated with lower levels of corruption (e.g., Dollar *et al.* 2001; Croson and Gneezy, 2009; and Samanta and Sanyal, 2016). Similarly, countries with high human development index (HDI) scores have less corruption (Sanyal and Samanta, 2004). In high HDI countries, the population, both men and women, are well-educated, the per capita income is also high with women playing an active role in the economy, civil society, and governance, the economy is well developed, and essential societal requirements (e.g., healthcare, housing, access to basic services) are provided. The extent to which the national economy is determined by market forces and is freer of government regulations impacts bribe taking. Countries that score high on the economic freedom index tend to be less corrupt (Sanyal and Samanta, 2004). Similarly, Husted (1999) found that high income countries with low Gini-coefficients had less corruption. In a paper by Samanta and Sanyal (2022) examining bribe taking in five countries of South Asia, they found that the most important explanatory variable for reduction in bribe taking by public officials in India, Nepal, and Pakistan were improvements in the HDI of those countries.

In contrast, countries with lower levels of human development tended to be more corrupt and similarly, corrupt countries tended to have lower HDI scores (Akcay, 2006). A study reported by The Economist Online (2011) found that high levels of bribery in a country bore little relationship with HDI scores. However, when bribe taking, as measured on an index of 1 to 10, rose above 4 for a country, the positive relationship with HDI becomes noticeable.

In this paper, we focus on one element of the many contributors to corruption, in an effort to direct attention and resources on the part of policy and decision makers to a possible solution to this problem. We use HDI to determine its relationship with the Corruption Perceptions Index (CPI). The working hypothesis, based on extant research, is that increases in HDI scores will contribute to increases in the CPI score, indicating lower levels of corruption.

## 3. Data

This study accessed reported data: Corruption Perceptions Index and Human Development Index. The measure of corruption in a country used here is the Corruption Perceptions Index (CPI). It is an index that captures in a single number the perceived level of corruption in a country. The index has a range from 0 to 100 where zero signifies the most corruption and 100 indicates the least corruption. Transparency International, a non-governmental body, with headquarters in Berlin, Germany, produces the CPI annually; the first edition being in 1995. In its first year, CPI scores for 41 countries were reported. No country has yet achieved a score of 100. In this sample, in 2019, Pakistan had the lowest CPI score of 32 while both Denmark and New Zealand had the highest score of 87 (Transparency.org, 2019).

The Index is created from the answers to surveys by businesspersons, the assessment of country-specific experts, and data from 13 different sources (such as the World Bank). Ever since its first release, the CPI has come to be seen as a credible proxy measurement of bribery and corruption in individual countries. It has been used extensively by researchers (e.g., Husted, 1999). There has been criticism of the Index for not being an actual measure of corruption and instead, a perception of corruption. Given that bribery and corrupt acts are clandestine by nature,

precise data on them would not be available. Thus, perception is the best available alternative. Additionally, Lambsdorff (2007) has pointed out that the manner in which the Index is calculated and since the results have been consistent over the years, a high degree of reliability and validity can be attached to it. The CPI and the role of Transparency International have been credited for highlighting the nature, extent, and perniciousness of corruption around the world and driving public policy makers to take appropriate actions (Andersson and Heywood, 2009).

The United Nations produces annually the Human Development Index (HDI), a single number ranging from 0 to 1.0, to capture a country's "average achievement in three basic dimensions of human development: a long and healthy life, knowledge and a decent standard of living" (UNDP, 2022). The first edition was issued in 1990. A country's HDI score is calculated by combining metrics from a large number of variables such as life expectancy, literacy levels, the population's access to electricity, per capita income, amount of foreign trade, extent of poverty, income inequality, phone and internet service availability, incidence of crimes, among many others. A score of 1.0 would indicate the country has reached the highest possible level of human development. The United Nations has categorized the range from 0.00 to 1.0 into four bands. Countries that have a score of 0.8 to 1.0 are designated as having "very high human development"; 0.7 to 0.79 are "high human development"; 0.55-7.0 are "medium human development"; and "low development" is for a score of less than 0.55. No country has reached the highest score of 1.0. In 2019, the country with the highest HDI, of 0.957, was Norway.

The CPI and HDI for 41 countries starting from 1995 through 2019 (25 years) were analyzed, the primary reason for selecting this sample being the availability of the data. The sample is varied – it has countries from different regions and a wide range of CPI and HDI scores. The first CPI report was issued in 1995 and it included 41 countries[1] listed in Appendix. The time frame is sufficiently long to determine trends for both CPI and HDI for these countries to draw meaningful conclusions.

## 4. Methodology & results

To determine whether HDI scores and CPI scores are positively correlated – that is, if a country's HDI score rises so will its CPI score (lower corruption levels), a quadratic regression model was used. The formal model is as follows:

$$CPI = \alpha_0 + \beta_1 HDI + \beta_2 HDI^2 + \epsilon \tag{1}$$

where $\alpha_0$ is the intercept, $\beta_1$ is the coefficient of HDI and $\beta_2$ is the coefficient of the square of HDI and $\epsilon$ is the random error. If $\beta_1$ is positive, it implies a positive relation; if $\beta_2$ is positive, it implies an increasingly (convex) positive relation; and if $\beta_2$ is negative, it would imply a decreasingly positive (a concave) relationship between the two variables.

The empirical results (based on all sample observations of HDI and CPI), presented in Table 1, show there is a significant relationship between CPI and HDI (the p-values for both HDI and $HDI^2$ are statistically significant). We have used a mixed estimation technique where country specific attributes are measured as a qualitative fixed effect (not an OLS method); in mixed estimation modeling the observations are not assumed to be independent (overcoming a possible endogeneity issue).

**Table 1. Fixed effects estimation results**

| Effect | Estimate | Standard Error | t-statistics | p-value |
|---|---|---|---|---|
| Intercept | 113.60 | 15.9593 | 7.12 | <.0001 |
| HDI | -348.01 | 43.3291 | -8.03 | <.0001 |
| $HDI^2$ | 343.21 | 28.855 | 11.89 | <.0001 |

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[1] Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Colombia, Denmark, Finland, France, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Ireland, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Pakistan, Philippines, Portugal, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Kingdom, United States of America, Venezuela.

It is assumed that both $\beta_1$ and $\beta_2$ are likely to be positive. From Table 1, the relationship between HDI and CPI is mostly positive, indicating higher HDI is associated with higher CPI. The coefficient of the first order (HDI) relationship has a negative sign and the second order (HDI$^2$) relationship has a positive sign, implying higher/lower HDI contributes to higher/lower CPI (after a certain value of HDI).  This suggests that a convex relationship exists between the two. We note that a simple regression model without the square term (HDI$^2$) exhibits a statistically significant positive relationship; this is consistent with expectations.

This "relationship" between HDI and CPI is further corroborated by the results from using copula estimation method, which is used for understanding the joint probabilities of a multivariate distribution. Copulas are useful for examining the dependence structure of multivariate random vectors. Copula representation of joint distribution function is written as a function of its marginal distribution functions and the conditional copula function. It has been demonstrated that if marginals are continuous, then copula function is uniquely determined. This suggests that a natural way of specifying the distribution function is to examine the copulas and marginals separately. As the case of independence is a special form of the copula, we are mainly concerned here with the correlation measures. Correlation measures typically summarize information in copula concerning the dependence or association between random variables.

Summary results about the correlation among the variables are presented first in Table 2, exhibiting the Kendall and Spearman correlations, and then, in Figure 1, the scatter plots of these correlations among bivariate frameworks is shown.

**Table 2. Correlation results using Copula Method**

| Variables | CPI | HDI |
|---|---|---|
| Kendall Correlations | | |
| CPI | 1.0 | 0.5036 |
| HDI | 0.5036 | 1.0 |
| Spearman Correlations | | |
| CPI | 1.0 | 0.6943 |
| HDI | 0.6943 | 1.0 |

We conducted a copula estimation using a standard normal distribution. Correlation results suggest a moderate, positive relationship between CPI and HDI. Scatter plot is positive, though diffuse, indicating a moderately positive relation. These results support the inference we have drawn from Table 1 that there is a co-movement between CPI and HDI across countries and over time.

The results we have obtained so far are quite consistent with both theory and other research findings. The expectation is that improvements in a country's HDI score will always lead to increases in its CPI score too, signifying declining levels of corruption.  Based on the results reported in Table 1, it is posited that improvements in HDI scores impacts the CPI scores up to a certain level, after which its effect becomes insignificant. To test this proposition -- discontinuity in the relationship between HDI and CPI exists -- a break point is identified. The median value of HDI scores in the sample was determined to be 0.845.  We have used this as the break point. Thus, the data was partitioned into two ranges: (a) countries with HDI equal to or above 0.845 (implying highly developed countries) and (b) countries with HDI below 0.845 (implying moderate or less developed countries), and two different regression models are estimated accordingly.
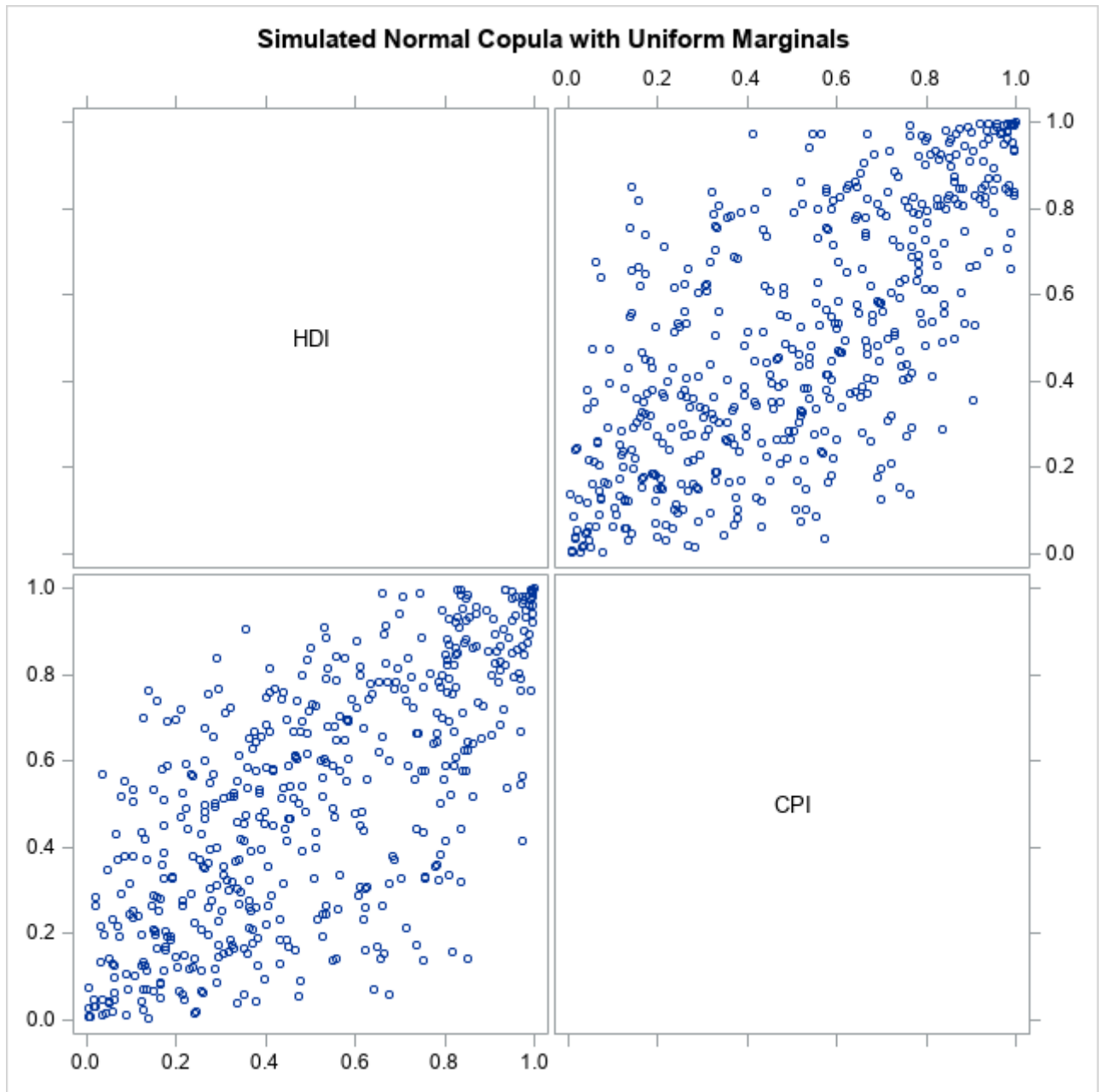
**Figure 1. The COPULA Procedure**

The fixed effects estimation results for the regression for the impact of HDI values greater than or equal to 0.845 on CPI scores are presented in Table 3.

**Table 3. Regression results (where HDI is more than 0.845)**

| Effect | Estimate | Standard Error | t-statistics | p-value |
|---|---|---|---|---|
| Intercept | -660.39 | 655.87 | -1.01 | 0.3145 |
| HDI | 1480.63 | 1463.86 | 1.01 | 0.3123 |
| HDI$^2$ | -731.41 | 816.29 | -0.90 | 0.3707 |

Based on the p-values (all p values > 0.10), it is evident that there is no significant relationship between HDI and CPI for this group of countries. The regression results for the group whose HDI is less than 0.845 is shown in Table 4.

**Table 4. Regression results (where HDI is less than 0.845)**

| Effect | Estimate | Standard Error | t-statistics | p-value |
|---|---|---|---|---|
| Intercept | 114.34 | 24.607 | 4.65 | <.0001 |
| HDI | -341.97 | 73.5242 | -4.65 | <.0001 |
| HDI$^2$ | 331.79 | 54.1724 | 6.12 | <.0001 |

Based on the p-values (all p values <.0001), we conclude that there exists a significant relationship between HDI and CPI when HDI is less than 0.845. Thus, these statistical analyses allow for the following conclusions: while there is an overall significant relationship between HDI and CPI, increases in a country's HDI up to a score of 0.845 has a positive impact on CPI. Rising HDI leads to rising CPI, meaning declining levels of corruption. However, there is no visible effect on the CPI score once a country crosses the HDI median threshold score of 0.845. The direction of causality is clear; where it exists, it is HDI that impacts CPI, but only when the HDI is below 0.845.

## 5. Discussion

This study offers important insight into what strategies can be adopted to curb corrupt practices. Investments, policies, and programs that raise a country's HDI score have a marked and positive impact on the extent of corruption in that country. The HDI score, as noted earlier, is calculated using the three dimensions of education, health, and standard of living. Hence, focusing on these elements and creating the enabling environment that leads to improvements in the educational level of the population, their positive health outcomes, and higher per capita income can contribute to the reduction in the incidences of corruption in a country. The statistical results reveal that it is HDI that impacts CPI. Hence, raising the HDI is a path to pursue to combat corruption.

The parallel rise of HDI and CPI continues to the threshold HDI level of 0.845. This is a very high bar, on a 0.00 to 1.00 scale. Countries with HDI between 0.80 and 1.00 are labeled as having "very high" human development index. In these countries, the lifespan of the population is higher as is the education level and living standards.

The findings reported here are of particular relevance to countries with "high" human development (0.70 - 0.79), "medium" human development (0.55 - 0.70), and "low" human development (below 0.55). In these countries, raising the HDI scores will likely lead to higher CPI scores signifying reduced corrupt behavior.

Once a country's HDI crosses a threshold score of 0.845, there is no significant improvement in its CPI score (whose scale is 0 to 100 where zero is most corrupt and 100 is least corrupt). In a sense, the law of diminishing returns sets in, at least with respect to corruption level. However, pursuit of higher HDI scores is a desirable goal in its own right for any nation. Countries that already have very high HDI scores and thus have reached that level of "very high" human development are likely to have very high CPI scores too (though no country has a CPI score of 100). This means that a level of corruption continues to persist even when the HDI rises and moves towards 1.0. Individual foibles, institutional lapses, distorted incentives, externalities, and policy dysfunctions occur no matter the general well-being and learning of a country's population. Other steps such as legal regulations and their strict enforcement,

transparent practices, voluntary codes of conduct, and sanctions that serve as deterrents might be more effective to keep corruption at a minimum in the "very high" HDI countries.

Combating corruption has become a global imperative. The findings reported here shows where the path to reduce corruption lies. It also points out that improvements in HDI can greatly reduce, but not totally eradicate, corrupt occurrences. Future studies can be directed towards identifying the barriers to and facilitating the necessary investments in health, education and raising the standard of living of the people in countries which do not have high HDI. Similarly, studies are needed towards developing the appropriate strategies to combat corruption in countries with very high HDIs. Data limitations have restricted the sample size in this study to 41 countries. Opportunity exists to expand the number of countries in future studies and possibly expand the time duration. This will require accessing alternative sources of data on corruption.

## 6. Conclusion

Earlier studies have indicated that the HDI is a significant determinant in a country's propensity for corruption. A puzzle was whether corruption led to low HDI or whether low HDI bred corruption in a country. Our study found an important fact regarding this relationship. It demonstrates that the higher the HDI, the corruption level as measured by CPI, in a country will be lower. While rising HDI curbs corrupt behavior, the beneficial impact ceases when the country reaches a very high HDI level of 0.85. In summary, steps to raise a country's HDI -- those that are currently classified as high, medium, and low human development -- can serve as an effective strategy to substantially reduce corruption. Beyond a certain level of HDI, however, it appears corrupt practices continue to persist, for which other steps will need to be taken.

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