Countries Fighting More against Corruption Possess Higher GDP Growth Rates

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Abstract

In order to investigate whether government regulations against corruption can affect the country growth, we analyze foreign direct investments received by world countries and find a statistically significant power-law functional dependence between foreign direct investment per capita and the corruption level measured by the Corruption Perceptions Index (CPI). On average, an increase of one unit CPI due to government fight against corruption increases the annual GDP per capita growth rate by 1%. We introduce a new indicator which we call \textit{Honesty per Dollar} to quantify corruption in term of dollar.

Corruption, defined as abuse of public power for private benefit, is a global phenomenon that affects almost all aspects of social and economic life. Examples of corruption include the sale of government property by public officials, bribery, embezzlement of public funds, patronage and nepotism. The World Bank estimates that over 1000 billion USD annually are lost due to corruption, representing 5\% of the world GDP. The African Union estimates that due to corruption, African continent loses 25\% of GDP. According to the World Bank, corruption is the main reason why poor countries remain poor.

Governance and corruption are related. In weakly-governed countries especially poor people are affected, because they cannot afford something that is expected to be free (e.g., public health clinics) because in corrupt countries bribes are needed in order to receive public service. By contrast, in well-
governed countries it is assumed that public institutions and public officials provide citizens with good services.

Previous studies have mainly reported a negative association between corruption level and country wealth [1–4], i.e., on average richer countries are less corrupt. There is ongoing debate concerning the relation between corruption and economic growth [5]. Some earlier studies suggested that corruption may even help the most efficient firms bypass bureaucratic obstacles and rigid laws [6], while recent papers do not find a significant negative association between growth and corruption [1,2]. The majority of studies have found an insignificant negative association between the corruption level and foreign investments [2,7,8].

Governments around the World are trying to improve governance and fight corruption, believing that improving governance and thus reducing corruption are important for increasing country wealth. In order to find a quantitative relation between improvement of governance and increase of country wealth, we analyze the Corruption Perceptions Index (CPI) [9] introduced by Transparency International, a global civil organization supported by government agencies, developmental organizations, foundations, public institutions, the private sector, and individuals. The CPI is a composite index based on various independent surveys and on assessments of corruption in different countries provided by more than ten independent institutions around the world. The CPI ranges from 0 to 10, where 0 denotes the most corrupt and 10 denotes the least. Thus the higher the CPI level for a given country, the lower the corruption.

As far as corruption level is considered, besides in absolute terms countries should be also compared in relative terms, consistent with previous statement that rich countries are on average expected to be less corrupt than poor countries. This indicates that corruption level should be related to country wealth, where to measure country wealth we use GDP per capita. We use different definitions for GDP per capita among which are the annual nominal GDP per capita in current prices in US dollars [10], GDP per capita in constant dollars [11], and purchasing-power parity provided by the International Monetary Fund (IMF) [10].

Table I reports the first ten countries and some important countries ranked according to the CPI values obtained in 2006. Besides some Western European countries, among the least corrupt ten countries are New Zealand, Singapore, and Australia. Chile and Botswana are the least corrupt countries in South America and Africa, whereas Singapore and Hong Kong are the least corrupt Asian countries. Table I provides information about corruption levels throughout the World in absolute terms, where each country, whether rich or poor, is given only its CPI value.
Table 1
CPI values for different countries.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>CPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Finland, Iceland, New Zealand</td>
<td>9.6</td>
</tr>
<tr>
<td>4</td>
<td>Denmark</td>
<td>9.5</td>
</tr>
<tr>
<td>5</td>
<td>Singapore</td>
<td>9.4</td>
</tr>
<tr>
<td>6</td>
<td>Sweden</td>
<td>9.2</td>
</tr>
<tr>
<td>7</td>
<td>Switzerland</td>
<td>9.1</td>
</tr>
<tr>
<td>8</td>
<td>Norway</td>
<td>8.8</td>
</tr>
<tr>
<td>9</td>
<td>Australia, Netherlands</td>
<td>8.7</td>
</tr>
<tr>
<td>11</td>
<td>United Kingdom</td>
<td>8.6</td>
</tr>
<tr>
<td>15</td>
<td>Hong Kong</td>
<td>8.3</td>
</tr>
<tr>
<td>16</td>
<td>Germany</td>
<td>8.0</td>
</tr>
<tr>
<td>17</td>
<td>Japan</td>
<td>7.6</td>
</tr>
<tr>
<td>18</td>
<td>France Ireland</td>
<td>7.4</td>
</tr>
<tr>
<td>20</td>
<td>Belgium, Chile, USA</td>
<td>7.3</td>
</tr>
<tr>
<td>37</td>
<td>Botswana</td>
<td>5.6</td>
</tr>
<tr>
<td>40</td>
<td>Italy</td>
<td>5.0</td>
</tr>
<tr>
<td>70</td>
<td>China, India, Mexico, Brazil, Ghana, Egypt, Peru, S.Arabia, Senegal</td>
<td>3.3</td>
</tr>
<tr>
<td>121</td>
<td>Russia</td>
<td>2.5</td>
</tr>
</tbody>
</table>

In the modern economy, globalization forces each country to compare with other countries, either with those in the neighborhood or with the entire world. To this end, for the year 2006, we calculate the average CPI value for the world, Europe, Latin America, Asia, and Africa: we find 3.7 and 5.4, 3.3, 3.3, and 2.7 respectively, where for the statistical weights we take the population of each country [12].

Different societies are not equally sensitive on corruption practice. In undeveloped and developing countries it is common that politicians who are corrupt are reelected, unlike in developed countries. In Ref. [4] we raised the question: “Is it possible to measure expected level of corruption for a country with a given country wealth?” We have assumed a power-law dependence [see Fig. 1]

\[ \text{CPI} \propto (\text{GDP}_{pc})^\mu \]  

between country wealth (measured by GDP per capita) and corruption level (measured by CPI), where \( \mu > 0 \) indicates that richer countries are less corrupt. The power-law fit has a statistical explanation. It gives us information about what is the expected level of corruption for a given level of country wealth.
wealth. A country above (or below) the fitting line is less (more) corrupt than expected for its level of wealth. We may say that for a country above the fitting line politicians and public officials are less corrupt than that is expected for a given level of country wealth.

The previous finding indicates that in order to compare the corruption level between two countries, the comparison should be considered not only in terms of CPI values but also in terms of country wealth. If comparing two neighboring countries — one above and the other below the regression line in Fig. 1 — a foreign investor hesitates where to invest money, the better choice for him (her) when both CPI and GDP per capita are considered is the country above the line. But if both countries are above the line, which has the better performance? To answer this question we propose a new index which we call *Honesty per Dollar* (HpD)

\[
HpD = \log(CPI) - E[\log(CPI)].
\]  

We postulate that all countries, with reasonably close GDP per capita, laying on the fitting line are equally good (HpD = 0). Generally, the larger value for HpD, the better performance. For 2006 based on regression obtained for the entire World, we calculate the values of the index for some countries:

\[
\begin{align*}
HpD(UK) &= 0.29 \\
HpD(USA) &= 0.1 \\
HpD(Italy) &= -0.23 \\
HpD(Greece) &= -0.3
\end{align*}
\]

The indices for Italy and Greece, relatively corrupt countries (more corrupted than would be expected for countries with theirs level of wealth), have negative values.

One of the reasons for a country to reduce corruption is to attract more foreign investments, and thus to additionally increase the GDP. This is because corruption generally increases start-up costs for new businesses. If an investor can choose between two countries with different levels of corruption, they may choose not to start their business in a more corrupt country since the profit in that country will be reduced. Reference [4] analyzes how the corruption level relates to foreign direct investments received by different countries from the United States. For each continent we have found that the functional dependence between the U.S. direct investments per capita, \( I \), and the corruption levels across countries exhibits scale-invariant behavior characterized by a power law \( CPI \sim I^{\lambda} \). Since \( \lambda > 0 \) for each continent, less corrupt countries have received on average more U.S. investment per capita.

Here, for each country in the World we analyze the foreign direct investments (FDI) received from all foreign countries, not only the US — for each country
we sum up the foreign direct investments over the period 1999-2004, calculate the average and divide by the number of population. In Fig 2 we find that the functional dependence between the average foreign direct investment per capita, \( I \), and the corruption level measured by CPI exhibits power-law behavior \( CPI \sim I^\lambda \) with scaling exponent \( \lambda = 0.19 \) and \( t = 11.7 \). Since \( t - test \) exceeds \( t = 2.0 \) with 29 df at the 5% level of significance, we conclude that power-law exponent is statistically significant at the 5% level. As for the case of the foreign direct investments originating from the US, we find that less corrupt countries on average receive more foreign investments per capita than more corrupt countries. We repeat the whole analysis but this time for different continents. Again we obtain the power-law dependence \( CPI \sim I^\lambda \) with scaling exponents: for Europe \( \lambda = 0.23 \) (7.86), Asia \( \lambda = 0.21 \) (7.27), Latin America \( \lambda = 0.23 \) (2.74) and Africa \( \lambda = 0.18 \) (3.08). In the brackets we put \( t \)-values from which we conclude that for each continent the power-law exponent is statistically significant at the 5% level. Note that the scaling exponent we obtain for Europe is larger than the scaling exponent \( \lambda = 0.14 \) obtained for the US foreign direct investments in Ref. [4].

In the last decade, China and Russia have displayed large growth rates, even though these countries are considered very corrupt. The question is "Would these two countries have grown faster if their corruption level had been lower?" In order to answer this question, we investigate whether government regulations against corruption (through increase of CPI) can additionally increase the country growth. For the period 1999-2004 and all World countries ranked by Transparency International for the given period, we run regression between GDP per capita growth rate in constant dollars as dependent variable and difference of CPI as the explanatory variable [Fig3(a)]. The estimated exponent in this regression is positive (0.051), and it is significantly different from zero \( (t - test = 2.32) \). From the results we conclude that governments fighting corruption more have grown with larger growth rates. Even more, from the exponent obtained for 5 years period on world level, we find that increase of unit CPI is followed — on average — by additional annual increase of GDP per capita growth rate of approximately 1%.

Next we perform the same analysis for all European countries and obtain insignificant power-law dependence between GDP per capita growth rate and difference of CPI (exponent 0.1 and \( t - test = 0.58 \)). Then we repeat the same analysis for 18 European developing or transition countries. In Fig 3(b) for the period 1999-2004 we show the GDP per capita growth rate in constant dollars vs. difference of CPI. We find a positive functional dependence that can be approximated by a power law, where the exponent 0.048 with \( t = 2.67 \) is statistically significant at the 5% level. Again, from the exponent obtained for 5 years period, the increase of unit CPI is followed by additional annual increase of GDP per capita growth rate of approximately 1%. Plot of the GDP per capita growth rate in constant dollars vs. difference in CPI with similar
statistically significant exponent ($0.046$), we find by analyzing all new EU members [see Fig. 3].

The same analysis as shown in Fig. 3 we repeat for the period 1999-2006 for all World countries ranked by Transparency International in 1999, but this time using GDP per capita based on purchasing-power parity. In Fig. 4 we obtain a statistically significant association between the GDP per capita growth rate and difference of CPI with the estimated exponent $\lambda = 0.29$ with $t-test = 2.94$. In Fig. 5 for developing and undeveloped countries [13], we obtain even larger exponent between the GDP per capita growth rate and difference of CPI. From the data of GDP per capita based on purchasing-power parity we conclude that countries which improved their corruption level additionally increased their wealth. Additionally, comparing Figs. 4 and 5 for the same increase of CPI, the larger increase of GDP per capita growth rate is expected for the developing and undeveloped countries than for developed countries.

In the private sector, the main objective of company’s department responsible for human resources is to best utilize the organization’s human capital and thus maximize the return. Due to corruption, especially political corruption, in public sector the same objective is not of the same priority. It is not unexpected that reference [1] has found that many of the most corrupt countries are governed, or have recently been governed, by socialist governments where affiliation to a ruling political party is commonly needed to get appointed in the public administration. In an ideal, least corrupt country, the hierarchy of public services can be considered as a "social pyramid", where public services on the top of the pyramid are occupied by the most educated and most skilled public officials, while services on the bottom of the pyramid are occupied by the least educated and least skilled officials. This optimal type of society — where human resources are optimally employed — obviously generates the best output, both social and economic, and therefore, e.g., the best possible GDP per capita. In a corrupt country people are usually appointed in public services not based on their skill and education, but based on nepotism or political corruption. Clearly, widespread political corruption in transition countries is a possible explanation why more corrupt countries on average are characterized by lower GDP per capita growth rates [see Figs. 3-5]. For this reason government regulations against corruption are needed in order to additionally increase the country growth [see Figs. 3-5], attract more foreign investments [see Fig. 2], and finally ensure better living for its own population.

References


[12] Population data are provided by [www.earthtrends.wri.com](http://www.earthtrends.wri.com).


Figure 1: Corruption level measured by Corruption Perceptions Index (CPI) versus country wealth measured by GDP per capita calculated for 2006. There is an obvious positive functional dependence, indicating that rich countries are on average less corrupt. We find the functional dependence can be fit by a power law with positive exponent. The power law fit in log-log plot has an obvious statistical explanation, representing the expected level of CPI for a country with given GDP per capita. The countries that are above the line are less corrupt than expected. We define a new index we call Honesty per Dollar (HpD) to measure relative performance of a country when CPI and GDP per capita are simultaneously considered. Defined in a log-log plot HpD is equal to the difference between actual CPI and the value expected from the power-law fit. Besides the USA, UK, Greece, and Italy, we show the countries with the extreme HpD values, Bhutan and Equatorial Guinea (oil exporter).
Figure 2: Less corrupt countries receive more foreign investments. For the period 1999-2004, we show average foreign direct investments (FDI) per capita, denoted by $I$, received by (a) World, (b) European, and (c) Asian countries from all foreign countries versus corruption level measured by CPI. For period analyzed, we find the statistically significant functional dependence between $I$ and $CPI$ that can be fit by a power law $CPI \sim I^\lambda$ with scaling exponents: for the World $\lambda = 0.19$ (11.7), Europe $\lambda = 0.23$ (7.86), Asia $\lambda = 0.21$ (7.27). In the study we exclude Indonesia as a country with total negative value for FDI and Cameroon.
Figure 3 Countries improving more corruption level generates larger GDP per capita growth rate. For the period 1999-2004, we plot (linear-linear) growth rate of GDP per capita in constant dollars versus difference of CPI. We analyze (a) World countries and (b) ten new EU members and obtain that the functional dependence can be fit by linear regression with exponent $\lambda = 0.048$ with $t - \text{test} = 2.67$. Thus, we find statistically significant dependence which indicates that — on yearly basis — increase of unit CPI is followed on average by increase of growth rate of GDP per capita equal to $\approx 1\%$. Separately, by analyzing all new developing countries which were not EU members before 2000 we find similar result: $\lambda = 0.046$ with $t - \text{test} = 2.16$. 
Figure 4: For the period 1999–2006, we plot (linear-linear) growth rate of GDP per capita based on purchasing-power parity versus change of CPI. We find a statistically significant dependence where the regression line has exponent $\lambda = 0.029$ with $t$-test = 2.94. Shown are World countries; developed, developing, and undeveloped countries ranked by Transparency International in 1999.
Figure 5: For the period 1999-2006, we plot (linear-linear) growth rate of GDP per capita based on purchasing-power parity versus difference of CPI. Shown are only developing and undeveloped countries with GDP per capita in 1999 less than 10,000$ per capita. We find that regression line is fit with exponent $\lambda = 0.04$ with $t - test = 3.1$. Larger exponent $\lambda = 0.04$ obtained in this Figure compared to the exponent obtained in Fig. 4 indicates that for developing and undeveloped countries GDP per capita growth rate is even more sensitive on improvement of CPI than for developed countries (in Fig. 4 we show undeveloped, developing and developed countries).