The case for human development: a cross-country analysis of corruption perceptions

Peyton, Kyle and Belasen, Ariel

Southern Illinois University Edwardsville

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Kyle Peyton
Department of Economics
The University of Melbourne
Victoria 3010, Australia
kpeyto1@gmail.com

Ariel Belasen
Department of Economics and Finance
Southern Illinois University Edwardsville
Edwardsville, IL 62026
abelase@siue.edu

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Abstract

Economic studies have demonstrated, both empirically and theoretically, that higher levels of human development (HD) and economic freedom (EF) are associated with lower levels of perceived corruption. This study separately examines the impact of human development and economic freedom on perceived levels of corruption across more than one hundred countries using a novel approach that greatly reduces multicollinear bias in the model. The results from this study confirm that both HD and EF are significant predictors of corruption perception levels. Furthermore, an increase in either HD or EF corresponds to a reduction in corruption perception. When evaluated separately, however, increases in human development are shown to correspond to greater reductions in corruption perception than economic freedom. This is demonstrated with an OLS regression using data collected from a single year and a number of panel estimates that utilize data from multiple years.

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Introduction

Despite increased attention, corruption, generally defined as the abuse of political office or public positions of trust for private gain, is not unique to modern systems of government.[1] According to Vito Tanzi (1998), literature on corruption has been documented as far back as 2,000 years. In all likelihood, the first discourse on corruption accompanied the emergence of the first state or institution. Although corruption is typically associated with unscrupulous behavior and dishonesty, several arguments supporting corruption in limited circumstances have appeared in economics literature. Most of these arguments rest on the claim that 'efficiency-enhancing' effects may accompany corruption and facilitate economic growth in certain circumstances (Serguey Braguinsky, 1996).[2] Support for the view that corruption has a positive impact on economic growth, however, has been replaced with the view that the effects of corruption are negative (Arthur Goldsmith, 1999).[3]

Although no objective measurement of corruption exists, various subjective measurements, the most common being the Corruption Perceptions Index (CPI), have made exploring the causes of corruption increasingly common. As a result, both empirical and theoretical studies have been undertaken, which support the consensus that the economic consequences of corruption are negative, especially for developing countries. These studies have focused on modeling the causes of corruption and suggesting potential solutions.

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[1] This definition is adopted from Goldsmith (1999). For conceptual discussions of corruption see: M. Shahid Alam (1990); Andrew Goudie & David Stasavage (1997); Michael Johnston (1997); Robert Klitgaard (1988); Joseph LaPalombara (1994); Joseph S. Nye (1967); Andrei Shleifer & Robert W. Vishny (1993); and Dionsis Spinellis (1996).

[2] Similar claims are also presented in Pranab K. Bardhan (1997); Nathaniel Leff (1964); and Samuel P. Huntington (1968).

[3] Also see: Paulo Mauro (1995); and Susan Rose-Ackerman (1999) for an overview of arguments against corruption.

Many economists share Gary Becker's view that the best solution to the corruption problem is a reduction in the size and role of government.[4] The well-being of any nation, however, will be heavily influenced by the quality of its institutions and not simply their relative size or regulatory role. On the one hand, some of the least regulated countries in the world, such as Singapore and New Zealand, are among the least corrupt according to Transparency International's Corruption Perceptions Index (CPI). On the other hand, Denmark, Finland, Sweden and the Netherlands all hold spots among the least corrupt countries according to the CPI yet they have some of the largest relative public sectors in the world.

Furthermore, these latter countries are among the most developed in the world according to the Human Development Index (HDI) created by the United Nations. While previous studies have identified a significant relationship between corruption and economic freedom (EF) only a few succeed in modeling a direct relationship between corruption and human development (HD). This study seeks to make a novel contribution to the foundation established in previous literature through the use of cross-country studies that model the impact of HD and EF on corruption perception separately. In addition, we use a number of econometric specifications to determine whether HD or EF is a better predictor of corruption in cross-country examinations. Finally, this paper attempts to determine which of the two has the greatest impact on corruption perceptions.

Although several measurements of corruption, development, and economic freedom have been used in economics literature, the most popular are Transparency International's CPI, the HDI constructed by the United Nations, and the Economic Freedom Index (EFW) developed

[4] See GS Becker, "To Root Out Corruption, Boot Out Big Government," *BusinessWeek*, January 31, 1994, p. 18. and Gary S. Becker, "If You Want to Cut Corruption, Cut Government," *Business Week*, December 11, 1995, p. 26.

by the Heritage Foundation.[5] This paper seeks to make an empirical contribution to the existing literature on corruption by examining the relationship between corruption, development, and economic freedom using these indices.

I. Background

It is almost impossible to create a complete list of the causes and consequences of corruption. Tanzi (1998) offers a comprehensive overview of the growth of corruption in modern government, many of its causes, and the associated qualitative and quantitative economic costs. This study distinguishes between direct causes, such as the financing of political parties and spending decisions; and indirect causes, such as the quality of government and public sector wages. The author ultimately concludes that, in most circumstances, corruption is an institutional problem that is best corrected with government reform.

In discussions of corruption, the assumption is that a principal-agent relationship exists between a government and its public (see Gary S. Becker and George T. Stigler, 1974; Edward Banfield, 1975; Susan Rose-Ackerman 1975, 1978; and Robert Klitgaard, 1988). In corrupt nations, those who occupy bureaucratic or political positions frequently abuse this relationship. This behavior is often classified as 'rent-seeking.' As Anne Krueger (1974) explains, the mere existence of rents provides a sufficient incentive for this behavior. Rents are expected to be present in any institutional arrangement. Nevertheless, certain rents may be easier to extract than others.

[5] Economic Freedom is essentially defined as an absence of government regulation. The methodology for computing the EFW Index consists of 10 specific components of economic freedom: business freedom, trade freedom, fiscal freedom, government size, monetary freedom, investment freedom, financial freedom, property rights, and freedom from corruption. A complete explanation of the methodology can be found at http://www.heritage.org/Index/PDF/Index09_Methodology.pdf.

According to Paulo Mauro (1997), certain industries are more susceptible to corruption than others due to the availability of rents and the barriers in place to prevent rent extraction. These findings demonstrate that corruption is associated with a misappropriation of public resources from areas such as education and health towards projects like infrastructure investment that are less productivity enhancing. One can hypothesize, for example, that the defense industry is therefore more susceptible to corruption than the health or education industries. A study conducted by Vito Tanzi and Hamid Davoodi (1997) supports this claim by showing that public funds are often diverted to areas where bribes are easier to collect. As a result, resources are pooled away from the health and education sectors in corrupt countries. In addition, regression analysis has been used to show that more corrupt countries spend less on education and healthcare than industries that provide more lucrative opportunities for rent extraction (Mauro, 1998).

Theoretical studies have drawn similar conclusions. Keith Blackburn and Rashmi Sarmah (2007), for example, used a dynamic equilibrium model to evaluate the relationship between corruption, economic development, and life expectancy. According to their study, increases in life expectancy are part of a demographic transition associated with increases in development. The model they introduce predicts that high levels of corruption are associated with low levels of economic development and life expectancy.

Many economists have explored the relationship between development and measures of well being such as public expenditures allocated to health and education. For example, Lekha Chakraborty (2003) used regression analysis to explore the relationship between scores from the HDI, social spending and per capita income. The results showed a strong relationship between public expenditures on education and health and the human development index. This is not

surprising, however; measures of health and education are key components in the calculation of the HDI. What is unique about the study is that the relationship between social spending and HD was found to be stronger than the relationship between HD and per capita income, which is also a component in the calculation of the index.

Although several studies have identified an indirect link between corruption and some of the factors used to gauge HD, an explicit relationship between corruption and the HDI has not been explored on a grand scale. Mozaffar Qizilbash (2001) theoretically examines the relationship and concludes that "when the corruption and development debate shifts to a concern with human development, the case for thinking that corruption is good for development, in terms of its overall consequences, is weakened." An empirical study published by Syed Akhter (2004) draws similar conclusions, showing that increases in economic freedom and globalization can increase human development and mitigate corruption perceptions.

Selçuk Akçay (2006) explored the direct relationship between human development, corruption, and economic freedom. The regression models used included the economic freedom index, three measurements of corruption perceptions, an urbanization measurement, a democracy index, and a vector of geographic dummies as independent variables. The dependent variable in this model was the HDI. The analysis found a significant inverse relationship between corruption and human development. The findings also showed that European Union membership has a positive effect on human development. In addition, African and Latin American dummies were shown to have a negative relationship with the HDI. Unfortunately, the analysis was limited to 63 countries and did not model the relationship across multiple time periods.

Studies have also identified a significant relationship between various measures of wealth and corruption perception. Results obtained by Daniel Triesman (2000), for example, suggest that more than 50% of the variation in corruption perceptions can be explained by variations in per capita income. Other studies have documented a significant inverse relationship between corruption and wealth using real per capita GDP growth (Mauro, 1996; Carlos Leite and Jens Weideman, 2000; Tanzi and Davoodi, 2000; and George Abed and Davoodi, 2000). Furthermore, according to a cross-country study conducted by Kathleen Getz and Roger Volkema (2001), there is a significant inverse relationship between GDP per capita and corruption. This same study also found a significant positive relationship between corruption and inflation, as measured by the Consumer Price Index. Fahim Al-Marhubi (2000) found a positive relationship between corruption and inflation as well. The study used the Business International Corruption Index and the Corruption Perceptions Index (CPI) as corruption measurements. In addition, empirical and theoretical models developed by Miguel Braun and Rafael DiTella (2004) have shown a strong relationship between corruption and inflation variability. Their results suggest that high levels of inflation variability can break down the principal-agent relationship between government and society and lead to higher levels of corruption. This study also found that high periods of inflation are associated with high levels of corruption. Likewise, Martin Paldam (2002) argues that high levels of inflation are measures of economic stability associated with corruption and economic uncertainty.

Increases in EF or reductions in the role and size of government have been shown to correlate with reductions in corruption pereption levels. Moreover, several studies support the claim that extensive regulation is associated with high levels of corruption. Exploring the pros and cons of economic liberalization in less developed countries, Goldsmith (1999) used

regression analysis to model a significant relationship between corruption perception and economic liberalization, political democratization and administrative centralization. These results also showed a negative correlation between GNP per capita and corruption across 34 low and middle-income countries. A cross-national study using the 1996 CPI dataset from Transparency International showed that corruption is higher in countries with more regulation, taxation and state intervention in economic affairs (Triesman, 2000). The same study also found a significant inverse relationship between corruption and GDP per capita.[6] Studies conducted by Alejandro Chafuen and Eugenio Guzman (2000) and Paldam (2002) also support the claim that more economic freedom is associated with lower levels of corruption. Peter Graeff and Guido Mehlkop (2003) used Transparency International's Index to demonstrate a strong relationship between EF and perceived corruption in both rich and poor countries as defined by the OECD. A recent cross-national study conducted by one of the key individuals associated with the development of the EFW Index used regression techniques to explore the relationship between economic freedom and corruption across more than 100 countries and discovered a similar relationship (James Gwartney, 2009). The results showed an inverse relationship between corruption and economic freedom across countries with diverse institutions and cultures. In addition, a correlation coefficient of 0.76 was found between EF and corruption perceptions.

II. Data

As illustrated by past studies, higher levels of corruption are associated with lower levels of human development, economic freedom, wealth, health and education. In addition, inflation,

[6] In particular, Triesman argues that a tenfold increase in 1990 per capita GDP could lead to a drop in the corruption perception rating of more than 4 points. This drop is quite significant given that the index measures corruption on a scale of one to ten.

geography, and various political variables have been incorporated into corruption regressions.[7] This study does not incorporate any political measurements as independent variables in the regression models presented. Instead, the independent variables are limited to measures of education, health, national wealth, inflation, HD and EF. In addition, dummy variables are included to identify countries located in tropical regions, those with membership in the Organization for Economic Co-operation and Development (OECD), and selected countries with a history of British rule leading into the twentieth century.

Corruption is a measure of the level of 'perceived corruption' and contains data from Transparency International's CPI. Although any measure of perceived corruption is inherently subjective, previous economic literature supports the use of these measurements.[8] The CPI is constructed from a "survey of surveys" based on 13 different expert and business surveys of perceived public-sector corruption.[9] The index ranges from 0 to 10, with a score of 0 representing a highly corrupt country. For interpretive purposes, the index has been altered in this study by subtracting country values from 10 so that higher values correspond to higher corruption perceptions.[11]

The HDI contains country-specific measures provided by the United Nations Human Development Reports. A different report has been published every year since 1990. The HDI provided by each report measures human development in five aspects: life expectancy, education, adult literacy, GDP per capita, and a gross enrollment index that measures levels of

[7] For and overview of the political factors used in corruption studies see Charles Blake and Christopher Martin (2006).
[8] For arguments supporting the use of "subjective" measurements of corruption see Triesman (2000) or Mocan (2004).
[9] Although several measures of "perceived corruption" exist, Transparency International's Index is used because it is the most widely cited in the literature and provides information on more than one hundred countries for the years selected in this study.
[11] Denmark, for example, receives a corruption perception score of 0.6 in 2007 after the adjustment and is the "least corrupt" nation in the that sample. This altercation is also used in Triesman (2000) and Akçay (2006).

educational attainment.[12] Countries are scored from zero to one, with one representing the highest level of human development.[13] Furthermore, GDP data is taken from the World Economic Outlook Database created by the International Monetary Fund.[14] GDP figures are computed at purchasing power parity per capita in U.S. dollars. Although many studies have used real per capita GDP growth in corruption regressions (Mauro, 1996; Leite and Weideman, 1999; Tanzi and Davoodi, 2000; Abed and Davoodi, 2000) a yearly measure of GDP per capita is more appropriate because of the panel studies used in this paper.[15] Inflation data in the form of the Consumer Price Index for each given country was obtained from the CIA World Factbook.[16] The Consumer Price Index is expressed as a percentage for each country. Therefore, a score of 2 represents an inflation rate of 2%. Inflation rates in our sample range from 0 to 30 in years 2005, 2006 and 2007.[17]

Life expectancy and adult literacy data were obtained from the United Nations Statistics Division.[18] Life Expectancy is measured in years. Countries with higher life expectancy scores are assumed to be healthier countries. A measurement of life expectancy is used rather than public expenditure on health due to the scarcity of reliable data available for large cross-country comparisons. The life expectancy data ranges from a minimum of 41.9 (Sierra Leone in 2000) to a maximum of 82.7 (Japan in 2007). The adult literacy rate is expressed as the percentage of

[12] A complete explanation of how the index is calculated can be found here: http://hdr.undp.org/en/statistics/indices/hdi/

[13] In this study, the scores are multiplied by one hundred for interpretive purposes. Therefore, a score of one hundred indicates maximum human development and a score of zero indicates minimum human development although no values actually reach these extremes in any of the models. Descriptive statistics indicate a mean of 73.035 and a standard deviation of 17.397. The minimum and maximum across the entire sample is 25.82 (Niger in 2000) and 97.11 (Norway in 2007) respectively.

[14] International Monetary Fund, http://www.imf.org/external/data.htm#data

[15] Furthermore, the natural logarithm is used to better capture the relationship between GDP per capita (PPP) and the other variables.

[16] CIA World Factbook, https://www.cia.gov/library/publications/the-world-factbook/.

[17] Note that inflation rates were not available for 2000 and are therefore excluded from models concerning year 2000 data.

[18] United Nations Statistics Division, http://unstats.un.org/unsd/default.htm.

literate individuals aged 15 and older.[19] A measure of adult literacy is used as opposed to a measure of public expenditure on education for the same reason life expectancy is used instead of a measure of public expenditure on health.

Finally, this study examines three categorical variables: (1) presence in the tropics; (2) membership in the Organization for Economic Co-operation and Development (OECD); and (3) colonization status. A value of 1 is assigned if more than half of the country lies between the Tropic of Cancer and Capricorn and a value of zero is assigned otherwise.[20] A value of 1 is assigned to OECD members and a value of 0 is assigned to non-OECD members.[21] A value of 1 is also given to former British colonies if they remained colonies into the 20th century.[22] This study focuses on former British colonies, because, as a previous cross-national has shown, there is something unique about British rule (Triesman 2000).[23]

The models presented in this study are based on data obtained from approximately 175 countries each for the years 2000, 2005, 2006 and 2007 for a total of 700 potential

[19] This serves as a proxy for the level of education in the countries, such that a more literate country is assumed to be a more educated country.

[20] The use of such a dummy variable appears in Triesman (2000). After controlling for other exogenous variables, he shows that distance from the equator is significantly related to levels of corruption. The use of a dummy variable for tropical climates also appears in a recent study that explores the relationship between economic freedom and corruption (Gwartney, 2009).

[21] OECD Members include: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom and United States.

[22] Note that only colonies were considered, and not World War I mandates. In addition, Australia, New Zealand and the United States are not included. Consequently, list of former colonies included is as follows: Anguilla, Bahamas, Bahrain, Bangladesh, Barbados, Belize, Botswana, Cameroon, Cyprus, Egypt, Fiji, Gambia, Ghana, Grenada, Guyana, Hong Kong, India, Jamaica, Jordan, Kenya, Kuwait, Lesotho, Malawi, Malaysia, Maldives, Malta, Mauritius, Namibia, Nigeria, Pakistan, Papua New Guinea, Qatar, Seychelles, Sierra Leone, Singapore, South Africa, Sri Lanka, St. Lucia, Sudan, Swaziland, Tanzania, Tonga, Trinidad and Tobago, Uganda, Vanuatu, Yemen, and Zambia are the relevant countries in this study.

[23] In this analysis, other colonial powers such as France, Portugal and Spain were shown to be insignificant determinants of corruption perceptions.

observations.[24] A separate data set was constructed for each year then each individual data set was integrated into a master data set of all 700 observations. A summary of the descriptive statistics is presented in Table 1 of the appendix.

IV. Econometric Model

The models presented in this study incorporate independent variables that are highly correlated with one another in some circumstances. Previous studies have demonstrated a positive correlation between longevity and development (David Bloom, David Canning, and Jaypee Sevilla, 2001; Stephen Knowles and Dorian Owen, 1995; Lant Pritchett and Lawrence Summers, 1996), so some level of multicollinearity between HD and life expectancy is expected. A positive correlation between income and various measurements of health has also been identified (Benu Bidani and Martin Ravallion, 1997; Kwabena Gyimah-Brempong and Mark Wilson, 2004). In addition, Kathleen Getz and Roger Volkema (2001) have shown that wealthier countries should, on average, have higher levels of human development. Furthermore, Getz and Volkema (2001) have argued that wealthier countries tend to have more economic freedom. Although not well documented in the literature, the adult literacy rate is expected to have a positive correlation with EF because countries with high levels of economic freedom are, on average, wealthier countries. A higher degree of economic freedom is also expected to have a positive impact on life expectancy. Furthermore, basic neoclassical economic theory suggests that many of the factors used in the calculation of the economic freedom index (e.g. property

[24] Although 175 countries are used in the OLS regression for 2005 and 700 countries are used in the GLS regressions complete data was unavailable for each variable across all countries. Consequently, some countries are dropped from the regressions. This is reflected by in the smaller sample sizes in the regression outputs.

rights, business freedom, absence of regulation etc.) will be correlated with measurements of national wealth.

Given the strong correlation between many of the independent variables, multicollinearity is of concern. Therefore, a simple regression of corruption perception levels on human development and the control variables may be problematic. As a result, a residual analysis is used to capture the unexplained relationship between HD and the control variables, as well as between EF and the control variables. Therefore, the following two equations are used, where *i* represents individual countries in the sample at time *t*:

$$EF_{it} = \alpha_0 + \alpha_1 L_{it} + \alpha_2 H_{it} + \alpha_3 Y_{it} + \alpha_4 \pi_{it} + \alpha_5 OECD_i + \alpha_6 T_i + \alpha_7 BC_i + e_{1it} \quad (1)$$

$$HD_{it} = \beta_0 + \beta_1 L_{it} + \beta_2 H_{it} + \beta_3 Y_{it} + \beta_4 \pi_{it} + \beta_5 OECD_i + \beta_6 T_i + \beta_7 BC_i + e_{2it} \quad (2)$$

L represents the adult literacy rate, *H* represents life expectancy at birth, *Y* represents the natural logarithm of GDP per capita at purchasing power parity, π represents the inflation rate, *OECD* is a dummy variable for OECD membership, *T* is a dummy variable for countries located in tropical regions, and *BC* is a dummy variable for former British Colonies.

The residuals (e_1 and e_2) from each regression are then predicted and defined as "EFhat" from equation (1) and "HDhat" from equation (2). A correlation matrix with the residuals HDhat and EFhat, obtained from OLS regressions using data from years 2005-2007, is presented below:

Table 2: Correlation Matrix (With Year 2000 Data Omitted)

	EF	HD	L	H	Y	π
EF	1.0000					
HD	0.5849	1.0000				
L	0.4227	0.8701	1.0000			
H	0.5104	0.9084	0.7000	1.0000		
Y	0.5882	0.8409	0.8409	0.7261	1.0000	
π	-0.4052	-0.3879	-0.2490	-0.3696	-0.4192	1.0000

	EFhat	HDhat	L	H	Y	π
EFhat	1.0000					
HDhat	0.1964	1.0000				
L	-0.0012	-0.0285	1.0000			
H	-0.0073	-0.0468	0.7000	1.0000		
Y	0.0102	0.0147	0.6336	0.7261	1.0000	
π	0.0110	0.0596	-0.2490	-0.3696	-0.4192	1.0000

Because the focus of this study is to separately evaluate the impact of EF and HD on corruption, two separate models are constructed using the residuals from (1) and (2). The first model attempts to capture the relationship between corruption and economic freedom using CP as the dependent variable and EFhat as the independent variable of concern. The second model attempts to capture the relationship between corruption and human development using CP as the dependent variable and HDhat as the explanatory variable of interest. The independent variables for adult literacy, wealth, health, inflation, OECD, tropics, and colonial history are included in both models as controls. In order to develop the general specifications for the human development and economic freedom regressions, the residuals from (1) and (2) are incorporated into the two separate estimation equations presented below:

$$\hat{CP}_i = \hat{\gamma}_0 + \hat{\gamma}_1 EFhat_{it} + \hat{\gamma}_2 L_{it} + \hat{\gamma}_3 H_{it} + \hat{\gamma}_4 Y_{it} + \hat{\gamma}_5 \pi_{it} + \hat{\gamma}_6 OECD_i + \hat{\gamma}_7 T_i + \hat{\gamma}_8 BC_i \quad (3)$$

$$\hat{CP}_i = \hat{\delta}_0 + \hat{\delta}_1 HDhat_{it} + \hat{\delta}_2 L_{it} + \hat{\delta}_3 H_{it} + \hat{\delta}_4 Y_{it} + \hat{\delta}_5 \pi_{it} + \hat{\delta}_6 OECD_i + \hat{\delta}_7 T_i + \hat{\delta}_8 BC_i \quad (4)$$

The dependent variable *CP* represents the corruption perception scores for individual countries. Equation (3) uses the explanatory variable *EFhat* obtained from (1) to estimate the impact of human development on corruption perception, and equation (4) uses the explanatory variable *HDhat* obtained from (2). Both use the same set of control variables as in equations (1) and (2). Equations (3) and (4) are used in an OLS regression with 2005 data and several GLS panel regressions using all available data in an attempt to isolate the effects of HD and EF on CP.

HDhat is expected to be statistically significant with a negative coefficient. In other words, human development is expected to have an inverse relationship with corruption perception. This expectation is consistent with previous literature that has documented an inverse relationship between corruption perceptions and human development (most notably in Akçay, 2006). *Y* is expected to be statistically significant with a negative coefficient; an increase in wealth should reduce corruption perception as measured by the index. *H* is expected to be statistically significant with a negative coefficient in the corruption regressions: countries with a higher life expectancy are expected to have lower levels of corruption as measured by the index. It has been demonstrated that corruption reduces government spending on education (Mauro, 1998). Since educational expenditures are assumed to be associated with higher adult literacy rates an inverse relationship between *L* and corruption is expected. In addition, as individuals become more exposed to information about their political institutions they are more inclined to hold them accountable for their actions. Countries with higher levels of π, all else equal, are expected to have higher levels of perceived corruption (see Getz and Volkema, 2001; Al-Marhubi, 2000; Braun and DiTella, 2004; and Paldam, 2000). Therefore, a positive coefficient on the inflation variable is expected.

Jeffrey Sachs (2001; 2003) showed that countries located in tropical regions have lower levels of economic development and per capita income. Although a direct relationship between geographic location and corruption probably does not exist, it has been hypothesized that physical location acts as a proxy for economic development (Triesman 2000). Since less corrupt countries have been shown to have higher levels of economic development and per capita income, on average, then underdeveloped, poor countries are expected to be more susceptible to corruption. In other words, low economic development, not geographic location, is likely the source of corruption in these tropical countries. Therefore, the coefficient on the tropics dummy is expected to be positive in corruption regressions. OECD countries are committed to principles of democracy and market economy and boast relatively high levels of income, human development and economic freedom. Given the evidence suggesting these variables are inversely related to corruption perception the coefficient on the OECD dummy is expected to be positive. Finally, countries with British colonial heritage and legal systems were found to be less corrupt according to CPI measurements. Consequently, the coefficient on the colonization dummy is expected to be negative such that 20th century British colonies are, on average, less corrupt.

V. Estimation Results

The first pair of regressions only uses year 2005 data. The purpose is to estimate the relationship between corruption, economic freedom and human development in a single year and determine the magnitude of the relationships prior to conducting the full panel studies. The results from the OLS regressions using 2005 data are presented as Models 1 and 2 in Table 3 in the appendix.

Model 1 shows the results from a regression of *CP* on *EFhat* and the controls; Model 2 shows the results from a regression of *CP* on *HDhat* and the controls. The results from Table 3 show that, with the exception of adult literacy, which is not statistically significant, all coefficients have the expected sign. Although the variable for tropical location does have the expected sign in both models it is insignificant according to the associated p-value.

Model 1 has an R^2 of 0.7695 compared to 0.6923 from Model 2. This suggests that EF explains nearly eight percent more of the variability in CP than does HD. The coefficient on human development, however, is more negative than the coefficient on economic freedom. This suggests that an increase in HD, on average, would have a greater impact on corruption perceptions than an increase of similar magnitude in EF in the year 2005. A 20-point increase in HD, from that of Bolivia to Israel, for example, implies an average drop in CP of approximately 3.12 points. This drop in CP would reduce Bolivia's corruption perception score to almost the same level as Uruguay. Such a boost would move Bolivia, one of the most corrupt countries in the sample, to a spot among the thirty least corrupt countries. The coefficient on the British Colony dummy from Model 1 suggests that, on average, countries with a recent history of British rule are less corrupt than others in the sample. Finally the dummy variable for OECD membership indicates that an OECD country, on average, has a corruption perception score approximately 2 points lower than a non-OECD country holding other factors fixed.[25]

The second set of models is associated with two panel studies using random-effects GLS regressions on EF and HD, once again using the residuals obtained in equations (1) and (2). The results from the GLS regressions are presented as Models 3, 4, 5, and 6 in Table 4 in the appendix. Because Models 3 and 5 incorporate year 2000 data the inflation variable was

[25] It should be noted that most OECD countries have low inflation and high levels of human development, economic freedom, literacy, life expectancy and national wealth.

excluded from the random-effects GLS regression; therefore, results for the inflation variable do not appear. Year 2000 data was excluded from Model 4 and 6 to incorporate the inflation variable. Therefore, Models 4 and 6 estimate the impact of economic freedom and the control variables, including inflation, on corruption perception using data from years 2005, 2006 and 2007.

Model 3 shows the results from a panel study using data from years 2000, 2005, 2006 and 2007. With the exception of adult literacy and the tropics dummy, which are both statistically insignificant, all coefficients have the expected sign. In Model 4, all coefficients have the expected sign except the coefficient for the statistically insignificant tropics dummy variable. Similar statistical results can be seen for Models 5 and 6 as well.

The R^2 from Model 3 in the EF regression is greater than the R^2 obtained from Model 5 in the HD regression. This suggests that EF explains more of the variability in CP levels than HD in the panel study using data from 2000, 2005, 2006 and 2007. Likewise, the results from the panel studies for years 2005, 2006, and 2007 suggest that EF is a better predictor of corruption than is HD. These findings are consistent with the results found in the OLS regression using only year 2005 data. However, the coefficient on HD is more than double the coefficient on economic freedom in both panel studies. The average value of economic freedom in the larger panel study (Model 3) is 60.024. If this average is multiplied by the coefficient from the corresponding regression analysis in Model 3 (-0.0455) a value of -2.731 is obtained. If the same method is applied to human development a value of -9.406 is obtained (the average value from the appropriate sample, 73.035, multiplied by the corresponding coefficient of -0.1288).

The value obtained from the human development calculation, -9.406 is more than three times the value obtained from the economic freedom calculation (-2.731). This again suggests

that human development has a stronger impact on corruption, all else equal, confirming the original OLS estimation results. Using the results obtained from Models 3 and 5, an increase of 20 points in human development is associated with a 2.58-point reduction in corruption whereas a 20-point increase in economic freedom is associated with less than a one-point reduction (0.91) in corruption perception levels.

Given the relatively weak relationship between the variables HDhat and EFhat[26], a panel study that includes both variables in the same random-effects GLS regressions is presented in Models 7 and 8 in Table 4. Model 8 presents the results from a GLS regression using only data collected for years 2005-2007. Model 7 uses GLS regression and includes data obtained for year 2000 as well; therefore, the inflation variable is excluded. The coefficients in both models have the expected signs with the exception of the adult literacy variable and the tropics dummy, which are both statistically insignificant. In addition, the R^2 from both models is greater than 0.75. This suggests that either model explains more than 75% of the variability in perceived levels of corruption.

These results imply that when measurements of human development and economic freedom are both added into a corruption perceptions regression, increases in human development have a greater impact on perceived levels of corruption. The coefficient on human development from Model 8, for example, suggests that a 20-point increase in a country's human development score corresponds to a 3.20-point drop in corruption perception levels, all else equal. The coefficient on economic freedom from the same model, however, suggests that a 20-point increase in economic freedom corresponds to a drop of only 0.732 in perceived levels of corruption. This finding is consistent with the previous OLS and GLS models in the study.

[26] The correlation between HDhat and EFhat is 0.208.

VI. Conclusion

This study examined the relationship between corruption perception and the independent variables human development and economic freedom in an attempt to determine which variable had more explanatory power using an innovative approach to isolate their independent features. The results obtained from the regression models used in this study suggest that levels of economic freedom and human development can be significant predictors of corruption perceptions in cross-country studies. Moreover, the study suggests that although economic freedom may explain more of the variability in corruption perceptions across countries, increases in human development can, on average, lead to greater reductions in corruption perception levels.

The results from Table 3 reveal a strong relationship between economic freedom, human development and corruption using data from a single year. The results presented in Table 4 demonstrate that these relationships hold when incorporated into panel studies using data from multiple years. The models indicate that economic freedom explains more of the variation in corruption perception levels if measured by R^2 values. However, the coefficients from the models presented suggest that increases in human development can have a greater impact on corruption perception levels, all else equal. As illustrated in Table 4 these implications continue to hold when expanded to panel studies and after both variables are included in the same corruption perceptions regression.

These findings also have public policy implications. First, increases in levels of human development, economic freedom, life expectancy and national wealth could potentially reduce levels of perceived corruption. In addition, low inflation may also contribute to reductions in

corruption perception levels. Although this may appear to be easier said than done, it does imply that developing nations committed to improving along these guidelines could have diminishing levels of corruption over time. Second, increases in human development levels can, on average, be attributed to greater reductions in corruption perceptions than increases in economic freedom. Since economic freedom is essentially defined as an absence of bureaucracy and regulation, these results suggest that a reduction in the size and role of government may not always be the best course of action when tackling corruption problems.

High levels of perceived corruption are the symptoms of low quality institutions. It is possible that human development scores also act as a proxy for institutional quality. This does not necessarily imply that increasing the relative size and regulatory power of the public sector will lead to decreases in corruption perception levels. Many of the countries from the sample with high EF scores are relatively low HD scores have low levels of perceived corruption. New Zealand, for example, has a very high EF score and a relatively low HD score yet it is tied with or listed as the least corrupt country for all years examined in this study.

Future research efforts could be directed at including measurements of public expenditures on health and education instead of life expectancy and adult literacy since the latter are factored into a country's HDI score. Unfortunately, complete data sets with measures of social spending are not currently available for a cross-country study committed to a large sample size. Since considerable investment in education and health is typically associated with a large public sector, including measures of social spending could offer additional insight into the relationship between human development and corruption. Finally, additional measurements of institutional quality would be useful for future studies involving corruption perceptions.

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Appendix

Table 1: Descriptive Statistics

	n	Mean	Standard Deviation
Year 2000			
Adult Literacy	156	81.269	20.837
Life Expectancy at birth	175	10.124	41.9
GDP Per Capita (PPP)	161	9417.228	462.81
Corruption Perception	88	5.213	2.402
Human Development	154	70.951	17.905
Economic Freedom	154	58.642	11.572
Year 2005			
Adult Literacy	175	83.330	19.194
Life Expectancy at birth	175	68.192	10.177
GDP Per Capita (PPP)	174	11292.04	12072.89
Consumer Price Index	157	6.037	4.717
Corruption Perception	151	5.853	2.197
Human Development	169	72.922	17.360
Economic Freedom	150	60.087	9.919
Year 2006			
Adult Literacy	175	83.580	18.918
Life Expectancy at birth	175	68.465	10.106
GDP Per Capita (PPP)	171	12333.75	13000.69
Consumer Price Index	141	6.269	4.654
Corruption Perception	157	5.882	2.161
Human Development	175	73.673	17.259
Economic Freedom	152	60.584	9.884
Year 2007			
Adult Literacy	175	83.793	18.792
Life Expectancy at birth	175	68.738	10.025
GDP Per Capita (PPP)	175	13076.58	13713.93
Consumer Price Index	167	6.083	4.150
Corruption Perception	169	5.931	2.102
Human Development	175	74.124	17.176
Economic Freedom	152	60.801	9.802
Total			
Adult Literacy	681	83.041	19.394
Life Expectancy at birth	700	68.086	10.110
GDP Per Capita (PPP)	683	11390.78	12271.56
Consumer Price Index	465	6.124	4.493
Corruption Perception	565	5.785	2.201
Human Development	655	73.035	17.397
Economic Freedom	608	60.024	10.336

Note: Inflation data for Year 2000 was unavailable.

Table 3: OLS Regression of Corruption Perception on Economic Freedom and Human Development (2005)

Coefficient:	**Model 1**	**Model 2**
Economic Freedom Index (EFhat)		
Coefficient:	-0.1117***	
P-value:	*0.000*	
Human Development (HDhat)		
Coefficient:		-0.1562***
P-value:		*0.000*
Adult Literacy (% aged 15 and older)		
Coefficient:	0.0017	0.0009
P-value:	*0.822*	*0.912*
Life Expectancy at Birth		
Coefficient:	-0.0717***	-0.0607***
P-value:	*0.000*	*0.001*
Natural Log of GDP Per Capita (PPP)		
Coefficient:	-0.3333***	-0.3029**
P-value:	*0.007*	*0.013*
Inflation		
Coefficient:	0.0670**	0.0497**
P-value:	*0.019*	*0.081*
OECD Membership		
Coefficient:	-2.3704***	-2.4773***
P-value:	*0.000*	*0.000*
Tropics		
Coefficient:	0.0488	0.2984
P-value:	*0.833*	*0.251*
British Colony		
Coefficient:	-1.0992***	-0.7674***
P-value:	*0.000*	*0.005*
R^2	**.7695**	**.6923**
F	**52.59**	**36.28**
N	135	138

Note:
*Significant at the 10% level
**Significant at the 5% level
***Significant at the 1% level

Table 4: Random Effects GLS regression of Corruption Perception on EF, HD and Controls[27]

Coefficient:	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Economic Freedom (EFhat)						
Coefficient:	-0.0455***	-0.0470***			-0.0395***	-0.0366***
P-value:	*0.000*	*0.000*			*0.000*	*0.000*
Human Development (HDhat)						
Coefficient:			-0.1288***	-0.1749***	-0.1079***	-0.1601***
P-value:			*0.000*	*0.000*	*0.000*	*0.000*
Adult Literacy (% aged 15 and older)						
Coefficient:	0.0029	-0.0044	0.0071	-0.0034	0.0036	-0.0002
P-value:	*0.577*	*0.524*	*0.185*	*0.963*	*0.470*	*0.966*
Life Expectancy at Birth						
Coefficient:	-0.0838***	-0.0868***	-0.0673***	-0.0581***	-0.0629***	-0.0565***
P-value:	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Natural Log of GDP Per Capita (PPP)						
Coefficient:	-0.1623***	-0.1084***	-0.3951***	-0.5236***	-0.4441***	-0.5442***
P-value:	*0.000*	*0.003*	*0.000*	*0.000*	*0.000*	*0.000*
Inflation						
Coefficient:		0.0213**		0.0213***		0.0332***
P-value:		*0.012*		*0.003*		*0.000*
OECD Membership						
Coefficient:	-2.2212***	-1.9505***	-1.9979***	-1.6246***	-2.1588***	-1.8199***
P-value:	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Tropics						
Coefficient:	-0.1157	-0.2923	-0.0969	-0.2673	-.1175	-0.2239
P-value:	*0.561*	*0.159*	*0.644*	*0.209*	*0.541*	*0.235*
British Colony						
Coefficient:	-0.8687***	-0.8164***	-0.5335**	-0.4128**	-0.7861***	-0.6835***
P-value:	*0.000*	*0.000*	*0.018*	*0.071*	*0.000*	*0.001*
R^2	**.7093**	**.7070**	**.6820**	**.6685**	**.7558**	**.7539**
Wald	**417.38**	**340.88**	**319.45**	**307.50**	**482.07**	**447.04**
N	524	416	552	440	512	412

Note:*Significant at the 10% level;**Significant at the 5% level;***Significant at the 1% level

[27] It should be noted that, unlike Models 4, 6 and 8 the results from Models 3, 5 and 7 are not obtained using the general specifications presented in (2) and (4). Because Models 3, 5 and 7 incorporate year-2000 data, which does not include inflation data, the inflation variable from (2) and (4) is dropped from the OLS equation used to estimate the residuals EFhat and HDhat.