The Sustainability of Corruption

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A growing body of scholars and policy makers have become increasingly concerned with the danger that corruption can pose to sustainability efforts as a lack of proper enforcement of the environmental legislation can produce the conditions under which environmental initiatives can easy flounder as the rules and regulations are ignored. This study devises an empirical test of this proposition, using data from the World Bank's World Development Indicators and the World Governance Indicators datasets. The analysis uses a time-series to evaluate the effect of various forms of corruption on sustainability of the nation state and includes an analysis of 121 countries from 1996 to 2010. It finds that states suffering from high levels of corruption in aggregate tend to have lower levels of sustainability. Of the sub-varia on corruption it finds that the rule of law and control of corruption have the strongest effect on sustainability. However, the effect on control of corruption is more troubling as the sign is negative contrary to expectations, presenting an avenue for future research into the effect of corruption on sustainability.

The concepts of democracy, corruption, and sustainability are in many ways deeply intertwined. The connections between democracy and sustainability are best understood by following the Green Democracy literature. Similarly the connection between democracy and corruption has been well studied. However, despite the developing understanding of these connections, the relationship between corruption and sustainability, as of yet, remains largely unexplored. Yet, it is this relationship that in itself demands greater exploration. The increasing importance of sustainability is readily apparent on the international stage with many governments devoting increasing amounts of resources towards increasing sustainability and the recent news of the collapse of the Antarctic ice shelf. Such an event serves as a greater portent to the extreme effects of climate change caused by the Anthropocene. Similarly, corruption due its perceived deleterious effect on many norms, corruption serves an important role in success of global environmental policy. The expected deleterious effect of corruption is further shaped due to its nature of diverting resources from the public good towards private benefit and the resultant societal losses. It is this intrinsic nature of corruption that have led to scholars such as Doig and McIvor (1999) arguing that corruption distorts development priorities, flight of human and

financial capital, and disrupts social and political stability, damaging the political and social fabric of nations.

In light of increased environmental awareness, nations have focused on sustainable development to "provide for the fundamental needs of humankind in an equitable way without doing violence to the natural systems of life on earth" (Kemp and Martens p. 5). Yet corruption threatens to undermine policy put in place to guard against and mitigate the most extreme effects of climate change. This connection has been primarily approached from an economic perspective (Lopez and Mitra 2000; Damania et al. 2003; Welsch 2004). However, corruption has been generally found not to negatively affect the environment in general sense (Robbins 2000), through poor governance, bad policy formation, management, and enforcement harm environmental sustainability (Damania et al. 2003).

The importance of these factors merits a closer study of the relationship between corruption and sustainability, particularly given the political and social implications that such a finding would have in the realm of national and international environmental policy. Furthermore, the existing body of literature is based primarily in the realm of cases studies or is extremely limited temporarily and is concentrated in environmental journals. These case studies tend to be extremely narrow as in Carter (2007) which examines the interactions of organized crime and the wastes industry of New York. Similarly, there are some broad attempts to examine this relationship, though these studies are primarily focused on the economic aspects (Mauro 1995; Hall and Jones 1999). This leads to the guiding question: *Do greater levels of corruption lead to decreased levels of sustainability?*

Defining Sustainability

Sustainability is relatively unambiguous in its definition, however, there are divergent views in how it is best measured and implemented. Sustainable development implies the positive socio-

economic change that is geared not only towards present, yet doing so without impairing the ability of future generations to provide for themselves (Mason 1999; Kemp and Martens 2007; Rennings and Wiggering 1997). The costs of development are clearly in a quote from Mahatma Gandhi, when he was asked following Indian independence if India would attain British standards of living: "It took Britain half the resources of the planet to attain this prosperity. How many planets will a country like India require?" The principle goal of sustainability can thus be considered as the need for the sustainable development of the developing world in the light of the increasingly untenable resource requirements of conventional development (Raven 2002).

The concept of sustainability is one that is deeply intertwined with the conceptions and priorities of society, particularly when viewed from an anthropocentric viewpoint. It is from this understanding of sustainability that sustainability science and help shape the decision making process though the knowledge of social problems, desirability of new systems, as well as the long term effects of ones actions (Kemp and Martens 2007). This conception of sustainability also allows for two distinct branches of sustainability when linked to ecology, that there is strong sustainability, where factors cannot be substituted, eg extinction of a species, and weak sustainability in which other factors can be substituted, eg trading wind power for solar power (Rennings and Wiggering 1997).

The greatest challenge regarding sustainability however lies in the problem of defining sustainability indicators (SIs). Because SIs attempt to capture complex and diverse processes, there are relatively few simple measures, which in turn decreases the effectiveness of these measures due to oversimplification (Bell and Morse 2008). It is also recommended that critical loads and levels should form the core indicators for sustainable development and that ecological and environmental sustainability indicators be used in tandem, to deliver a more nuanced understanding of the impact of humanity on the environment (Rennings and Wiggering 1997). The study of sustainability also highlights

the need to measure not only the presences of a variable, a State SI, but also the process through which a variable changes, a Pressure SI (Bell and Morse 2008).

In reviewing the literature it becomes clear that proper specification of the sustainability variable is of primary importance. Of particular concern is the common "spin" or out-right rejection of sustainability indicators by policymakers using them for decision making, and how this can color data (Bell and Morse 2008). My paper will concentrate on the state SIs, which are better suited for the capturing of long term trends.

Defining Corruption

Similarly, the effects of corruption are a fairly well studied phenomena. Yet the study of corruption is a science that is fraught with potential error given the very nature of the object of study. It is thus that most studies of corruption focus on the perceptions of corruption due its illicit nature. For the purposes of this study, I will use the World Bank's definition of corruption: "the abuse of public power for private gain" (1997). Corruption is also a matter that "has distorted development priorities, led to massive human and financial capital flight, and undermined social and political stability ... corruption is deeply damaging to the social and political fabric, to investment, and to economic growth" (Doig and McIvor 1999).

The motives of corruption are many but they fall into three broad categories. The opportunity to gain from corruption, be it through a lack of transparency (Zemanovicova 2002, Mauro 1998), where there excessive profits available through government intervention (Hisamatsu 2003; Mauro 1998; Kreuger 1974; Rose-Ackerman 1978) is the first category. A second category is motive, something that is enhanced when officials are poorly paid and trained (World Bank 1997; You and Khagram 2005; Mishler and Rose 2008; Sandholtz and Koetzle 2000). The third category is the probability of being caught and punished, as if it low than corruption is more likely to occur (Lederman, Loayza and Soares 2001).

There are also differences between measures of perceived corruption and measures of corruption itself. Early efforts to measure corruption used official court and police records, yet these measurements more closely reflected aggressiveness or laxity of enforcement and the truthfulness of these measures (Seligson 2005). As such many popular measures of corruption use the *perception* of corruption rather than corruption itself. However perceptions can be influenced by the media, anti-corruption campaigns, selective memory (Mishler and Rose 2008), politically motived accusations (Treisman 2007) and public opinion (Morris 2008; Seligson 2005). Furthermore, perceptions of corruption are deeply colored by particular institutions rather than experience (Mishler and Rose 2008). Additionally, cross-national comparisons suffer from differences in social and cultural perceptions of corruption (Treisman 2007). However, measuring actual corruption is difficult as surveys only capture petty corruption as this is the only level the average citizen experiences, while grand corruption only occurring through the abuse of high power, is unlikely to be reported as politicians are unlikely to report themselves (Morris 2008). However, perceptions do matter, as the perception itself can deter investment (Treisman 2007). This coupled with the fact that participation surveys by their own admission, suffer from the reluctance of individuals to report their involvement in illicit transactions. (Mishler and Rose 2008).

In reviewing the literature of corruption, the proper specification of corruption is of great importance for the construction of my study. Due to the problems with the measurement of corruption, I will make use of perceptions data for my measurement.

Connecting Corruption and Sustainability

Corruption has been linked to social and economic development and environmental sustainability (Lopez and Mitra 2000, Damania et al. 2003, Welsch 2004). Though not destructive in a

general sense (Robbins 2000), though the poor governance that is a hallmark of corruption, environmental sustainability can be damaged (Damania et al. 2003). Unfortunately, in the current body of literature, there have been relatively few empirical analyses. Those conducted thus far are primarily case studies, as in the case of Carter's (1997) examination of the New York waste industry and organized crime. Others have connected environmental sustainability and corruption though through an economic lens (Mauro 1995, Hall and Jones 1999). However there have been several attempts to connect the issues in the popular media (Morse 2004, Morse and Fraser 2005).

However, those studies examining the issue empirically has revealed connections between corruption and sustainability. In particular Welsch (2004) found a connection between air and water pollution and corruption. Similarly, it has been found that corruption correlates with increases in pollution in general (Esty et al. 2005). It has also been found that increases in GDP exhibit a Kuznet's style relationship with pollution (Grossman and Krueger 1995). Thus the effect of corruption on sustainability is perceived to be magnified in low income countries (Welsch 2004).

These research thus appears indicate that the perception that corruption decreases sustainability largely holds in the form of pollution. However, the current body of research leaves the topic of sustainability, in the form of the efficient use of resources largely untouched.

Methods

In order to answer the question posed by my hypothesis, I examine the relationship between corruption and sustainability. The variables were selected based on the literature covering both corruption and sustainability. The variables can be divided into two distinct categories, those measuring corruption and sustainability. The corruption variables will be formed from the World Bank's World Governance Indicators (WGI) dataset and include rule of law, voice and accountability, government effectiveness, regulatory quality and control of corruption indicators. These variables are gathered

through survey instruments distributed to “well informed” individuals, primarily businessmen based in the global North, with higher scores indicating lower levels of corruption. The dataset is available for the years between 1996 and 2012.

The data used for the creation of our sustainability index will be drawn from the World Bank's World Development Indicators, as the World Bank provides an unbiased source of information about the nature of a country's sustainability. Most of our variables can be collected directly from data provided by the World Bank. However, per capita water consumption and rail density are not included among its indicators. Fortunately, these variables can be constructed from the data provided by the World Bank. As the World Bank tracks both water consumption at the national level and national populations, water consumption per capita can be calculated by dividing water consumption by population. Similarly, rail density can be calculated by using the data the bank provides both total rail length at the national level and the nations' landmass. Rail length is then divided by landmass to create our statistic.

The first of our constituent variables will concern electricity consumption per capita, measured in terms of the natural logarithm of kilowatt-hours per capita. Energy consumption is a fundamental concern for sustainability advocates, who stress reduced waste and the more efficient use of energy. Halsæs and Verhagen note the importance of energy to society through increased educational and economic opportunities and access to healthcare (2007). Less consumption per capita can also produce health dividends for both the environment and people (Halsæs and Verhagen 2007). In Nansai et al. electricity consumption is used as a measurement of eco-velocity, which measures both the immediate and future impacts of present consumption (2007). “Sustainability: necessity for a prosperous society” examines the need for increased energy efficiency as well as its role in creating a sustainable society (Fokkema et al. 2005). Ronchi et al. use energy consumption per capita as one of their sustainability

indicators for Italy, because of its importance in modern society and how wasteful use harms the environment and contributes to global warming (2002).

Water consumption per capita, another important variable in our study, will be measured in the natural logarithm of liters per capita. Water is and always will be essential for human survival. The need, in both the present and the future, for unpolluted water to both quench people's thirst and provide food for their plates is undeniable. Ronchi et al. use water as one of their resource-based indicators due to the historic problem of the lack of water in southern Italy and the pollution of water sources in the north (2002). The consequences of current consumption place a critical strain on this most important of resources (Ronchi et al. 2002). Spangenberg uses water as one of his categories of material flow due to its great importance across economic and social spheres (2002). Spangenberg and Lorek use water consumption as one of their household sustainability variables due to the influence of individual choice in the amount of water used during both the construction and residence periods of household structures (2001). Veleva and Ellenbecker, noting the impact of water shortages on lives, businesses, the environment, and societal function, use water consumption as one of their measures of sustainability (2001).

The third of our constituent variables is CO_2 emissions per capita, measured in the natural logarithm of carbon in tons. CO_2 emissions per capita is an important indicator for overall sustainability due its nature as a greenhouse gas and ability to serve as a proxy for atmospheric pollution in general. Bossel uses CO_2 as one of his sustainability variables, citing the negative effects of CO_2 on human and environmental health (1999). Beg et al. also use CO_2 as an important indicator for climate change when presenting the steps necessary to reduce the likelihood of catastrophic climate change (2002).

The last of our constituent variables is railroad density, measured in total track length divided by the nation's landmass. Railroad density is an important indicator as it serves as an indicator of a

country's infrastructure and the availability of mass transportation. Richardson examines the effects of carbon taxes on reducing the use of personal automobiles and reducing reliance on trucks for transporting goods (2005). Kwok and Yeh's examine the role of well-planned mass transportation on reducing the use of private vehicles in their assessment of sustainable transportation in several East Asian cities (2004). Conversely, they find poorly planned and/or carried out mass transportation infrastructure increased reliance on private vehicles (Kwok and Yeh 2004). Lorek and Spangenburg examined Germany, where efficient rail travel is available, specifically the high level of private car ownership, bringing the cost factor to closer scrutiny (2001). Federici et al. compared the transport efficiencies of rail and road transportation in Siena, Italy and found that although roads transported 3.26 times the amount of material that the railroads did, 25.28 times the amount of fuel was consumed, further demonstrating the far greater efficiency of rail (2003).

The previous four sub-variables are then be combined into our aggregate sustainability index. First, each of the sub-variables will be converted to a 1 to 100 index, with 100 representing the lowest value (or most sustainable value) for that variable observed over the entire period for power and water consumption as well as CO_2 emissions. For rail density the greatest value will be assigned a value 100 on the 1 to 100 scale, though this value will be excluded for island nations due to the nature of their topography. The values created using these scales will then be added and divided by four, or three in the case of islands, yielding our sustainability index. This index will thus give equal weight to each of the sub-categories, such that each is worth 25% in the index. For island countries, the rail density category will be dropped and each category will be weighed at 33% and will be designated within the data as an island nation.

Unfortunately, simply analyzing our corruption and sustainability indices will not provide accurate information about the linkage between corruption and sustainability due to the large and important effect that affluence has on the measures that we employ to measure sustainability. The

impact of affluence on sustainability thus calls for a control variable, GDP per capita. Fischer-Kowalski and Amann found that increases in GDP are related to increases in both domestic output and consumption even in the wealthiest of nations, although such increases did not occur on a one to one basis (2001). Rosa et al. support the finding that increased affluence (measured in GDP per capita) would in turn cause increased CO_2 emissions (2004) However, they found that this trend was somewhat reversed with decreasing CO_2 in high income countries (Rosa et al. p. 2004). York et al. provide further support for the importance of affluence (GDP per capita) and its close interrelationship with CO2 emissions, representing an increasing ecological footprint (2003). Rosa et al. similarly use GDP per capita as a method of tracking affluence (2004). The findings of these studies indicate that the role of affluence in affecting nation's sustainability cannot be ignored; therefore the inclusion of affluence as a control variable is a must.

Results

A cursory examination of reveals that of our corruption variables only perceptions of rule of law and control of corruption are significant. The control variables of island country and GDP per capita are significant and signed as one would expect given our expectations. As the economies of island countries typical concentrate on tourism and fishing – which are typically lower impact that heavy industry. Similarly, consumption rises as GDP per capita rises and thus expected living conditions increase. Though many of my sub-varia in the corruption indicators are not significant they are largely properly signed, with the exception of voice and accountability.

Table 1: Corruption and sustainability

	Coefficient	**Standard Error**	**P>t**
Island Country	9.04	0.61	0

Rule of Law	0.35	0.14	0.013
Voice and Accountability	-0.11	0.11	0.3
Political Stability - No Violence	0.08	0.06	0.213
Government Effectiveness	0.06	0.13	0.626
Regulatory Quality	0.14	0.10	0.153
Control of Corruption	-0.23	0.11	0.033
Full Index Lag	0.69	0.02	0
Ln GDP per capita	-0.50	0.08	0
Constant	18.57	1.26	0

Note: Country level dummies are excluded from this table.

The significance of rule of law falls within my expectations being both significant and properly signed. This result was expected as higher levels of rule, indicative of lower levels of corruption means that the laws of a nation are maintained and adhered to. It also indicates that corporations and individuals are more likely to be held responsible for breaking the law and in the case of environmental laws damaging the environment. Also closely related to the rule of the law, is the idea of civic society which might also color this relationship and drive societies to be more sustainable.

The significance of control of corruption however runs counter to expectations. However, as the WGI measures the *perception* of control of corruption this might not be caused by efforts to police corruption. Indeed societies that are less corrupt are less likely to stage large scale anti-corruption campaigns than those where corruption is endemic. Thus perceived control of corruption in some cases might indicate instead that there are higher levels of corruption that are being fought, or at least perceived to be fought.

Conclusion and Future Research

The analysis of this data set proves instructive on many counts. First, it confirms the importance of rule of law and its impact on sustainability primarily that greater levels of rule of law result in higher levels of sustainability. Second, it reveals that perceived efforts to combat corruption lead to lower levers of sustainability than would be otherwise expected. It is this inversion of expectations that is

perhaps the most interesting, given the very nature of corruption. It suggest that deeper understanding of efforts to combat corruption and its effect on sustainability are warranted.

This study also offers multiple opportunities for further refinement such as the inclusion of a control for government type and religion, two controls commonly found in research on corruption. Similarly, further refinement of the model is likely warranted.[1]

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[1] Note: I will likely have completely overhauled the model by the time of the conference.

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Appendix 1: Data

Water data is interpolated from data for unmeasured years, as this measure only occurs every five years. Similarly, years for which other data was missing was interpolated. Countries are coded as island nations if most of the nation's population centers on the coast. The rail density score is then

calculated by dividing each country-year's rail track length by the country-year's land area. The consumption characteristics (water and electric consumption and CO_2 emissions) are calculated by taking the natural logarithm of the country-year's consumption statistic. These values are then converted into a 1-100 index. The natural logarithm of the GDP per capita statistic is then taken. The corruption indicators also require interpolation, but only during the odd years between 1996 and 2002.