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INTRODUCTION

The recognition of corruption as a problem affecting both the governance and development of countries around the world has come of age. "Low administrative efficiency, poor governance structure, political instability, and [the] underdevelopment of [a national] economy" are the primary causes of corruption.[1] The World Bank maintains that corruption is "the single greatest obstacle to economic and social development."[2] It also estimates that over one trillion U.S.

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[1] Kilkon Ko & Ananya Samajdar, *Evaluation of International Corruption Indexes: Should We Believe Them or Not?*, 47 SOC. SCI. J. 508, 508-509 (2010).

[2] Axel Dreher et al., *Corruption Around the World: Evidence from a Structural Model*, 35 J. Comp. Econ. 443, 444 (2007) (citing World Bank, www.worldbank.org/publicsector/anticorrupt/index.ctm; *see, e.g., Best Practice*

dollars are paid in bribes annually throughout the world.[3] Recently, corruption has been the subject of numerous academic writings as well as the focus of several organizations that have made combating corruption one of their top priorities.[4] As international relations and cross-national business dealings grow, corruption has become an increasing issue affecting both foreign direct investment and international aid programs.[5]

Issues involving corruption are major hurdles affecting the continued development of many countries.[6]

> In less than a half-decade, the worldwide backlash against corruption has swept like a firestorm across the global political landscapes. Governments have fallen. Longtime ruling parties have been hounded out of office. Presidents, prime ministers, parliamentarians, and once mighty corporate chieftains have been grilled by prosecutors and herded in the docket. Italy, France, Japan, South Korea, India, Mexico, Colombia, Brazil, Israel: no region and hardly any country has been immune.[7]

Due to the increasing interest in corruption over the years, social scientists have created a number of methods to measure corruption and the impact that it has on society in order to assist in corruption prevention.[8] One of the growing trends in examining corruption is through the use of mathematical and scientific models. Models are one of the principal instruments of modern science and engineering used to

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in Anti-Corruption Strategies for Development Programme, TRANSPARENCY INTERNATIONAL, http://www.transparency.org/global_priorities/poverty/corruption_aid/best_practice (last visited Jan. 28, 2012))).

[3] *Id*.

[4] Arvind K. Jain, *Corruption: A Review*, 15 J.ECON. SURV. 71, 71 (2001).

[5] Ko & Samajdar, *supra* note 1, at 509.

[6] Benjamin A. Olken, *Corruption Perceptions vs. Corruption Reality*, 93 J. PUB. ECON. 950, 950 (2009). See also William Q. Judge et al., *The Antecedents and Effects of National Corruption: A Meta-Analysis*, 46 J. WORLD BUS. 93, 93 (2011) ("[E]vidence suggests that corruption is the central economic issue facing Turkey, Russia, the African continent, China, Indonesia, and Poland." (citations omitted)).

[7] Judge, *supra* note 6 at 93 (citing H. Wang & J. Rosenau, *Transparency International and Corruption as an Issue of Global Governance*, 7 GLOBAL GOVERNANCE 25, 26 (2001)).

[8] *Id*.

give a simplified picture of a part of the real world.[9] "A model is any simplification, substitute or stand-in for what you are actually studying or trying to predict."[10] Corruption models are used to understand the prevalence of corruption and the causes and effects of corruption for the purpose of reducing corruption.[11] Corruption is primarily a social issue, and therefore, corruption models are classified as social science models. The social scientists that use corruption models have the lofty objective of building "robust [and] durable theoretical frameworks to guide practical decisions about legal design across [different] social contexts."[12]

Over the past ten years scholars have published an increasing amount of literature introducing and discussing the use of corruption models to address social issues. Models can and should inform policy-makers and legislators as to the sources of corruption, effects of corruption, and possible results of implementing anti-corruption policies in the country. If implemented, many of these models could change the laws of countries with corruption and ultimately have some impact on the citizens of these countries. Traditional legal professionals—who often do not have a background in applied mathematics, statistical analysis, or empirical methods of data collection—have been skeptical of the growing trend of analyzing legal issues using social science models.[13] Many legal professionals do not believe that enough of a consensus exists between social theories to warrant such models useful.[14] Social scientists on the other hand, believe the legal system is under-using, or altogether ignoring valid theories, research, and models.[15] Thus, while models have further improved the understanding of the causes and effects of corruption, the

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[9] *See generally* CHARLES A. LAVE & JAMES G. MARCH, AN INTRODUCTION TO MODELS IN THE SOCIAL SCIENCES 3 (1975) (exploring what a model is and how a hypothetical model might or might not be helpful to a certain end).

[10] CRAIG M. PEASE & JAMES J. BULL, SCIENTIFIC DECISION-MAKING ch. 4 para. 1 (2000), http://www.utexas.edu/courses/bio301d/Topics/Models/Text.html.

[11] Jain, *supra* note 4 at 85.

[12] J. B. Ruhl, *Law's Complexity: A Primer*, 24 GA. ST. U. L. REV. 885, 909 (2008). See generally J. B. Ruhl, *The Fitness of Law: Using Complexity Theory to Describe the Evolution of Law and Society and Its Practical Meaning for Democracy*, 49 VAND. L. REV. 1407 (1996) (noting relevance and use of models in understanding and shaping legal systems).

[13] Jeremy A. Blumenthal, *Law and Social Science in the Twenty-First Century*, 12 S. CAL. INTERDISC. L.J. 1, 2 (2002).

[14] *Id.* at 4.

[15] *Id.*

actual use of models to help combat corruption has been relatively minimal.

The overall purpose of this article is to give an overview of what corruption models are and the impact that they could possibly have in helping to shape laws meant to prevent and curb corruption. This article has four goals: provide a general understanding of corruption and its impact; describe the use of models to understand corruption; analyze the possible impact that models can have on public policy and law; and analyze the possible limitations that lawmakers might face with models. Section I of this article provides a general overview of corruption, its effects, and the most popular method currently used to measure corruption: the corruption indices used by Transparency International and the World Bank. Section II introduces models, the rationale for models, and the possible effects on a country that corruption models can have if properly utilized by governments. Section III takes a critical view of models and whether they can be properly used to address the complex issue of corruption. Lastly, Section IV studies the issue of legal acceptance of models.

I. CORRUPTION AND TRADITIONAL CORRUPTION MEASUREMENTS

A. AN OVERVIEW OF CORRUPTION

There are many definitions of corruption,[16] but one of the most commonly accepted definitions is "the misuse of entrusted power for private gain."[17] This definition applies to both financial and non-financial gains received as a result of corrupt acts.[18] Private gain at the expense of the public indicates an "absence of equal and fair treatment for all [persons] on the part of public officials."[19] The underlying assumption is that government officials will treat all persons equally and fairly, with such equal and fair representation permeating all official acts and decisions; however, the misuse of power violates the assumption. The absence of equal and fair treatment is in direct conflict with the "arm's length principle" that is traditionally applied in

[16] *See* Ko & Samajdar, *supra* note 1, app. 2.

[17] TRANSPARENCY INTERNATIONAL, GLOBAL CORRUPTION REPORT 2007 xxi (Diana Rodriguez & Linda Ehrichs eds., 2007).

[18] *Id.*

[19] VITO TANZI, CORRUPTION AND ECONOMIC ACTIVITY 4 (Sarah Broberg & Yasser Selim eds., 2006).

business transactions.[20] Under the arm's length principle, "no personal or family relationship should play any role in economic decision-making, be it by private economic agents or by government officials."[21] Once any weight is given to any non-professional relationship, the arm's length principle is violated.[22]

Within the broad definition of corruption, the manifestations of corruption fall into different levels and categories.[23] Generally, social scientists classify corruption as grand corruption or petty corruption.[24] These classifications are based on the frequency, prevalence, and spread of corruption throughout the many layers of government. Grand corruption involves the acts of high-level government officials who have the power to make economic policies.[25] Typically, grand corruption occurs when an official implements or changes government policies for selfish interest and ultimately impacts the general populace.[26] At this level, if money is involved, it is typically a substantial amount of money.[27] Grand corruption typically involves corruption by presidents, governors, senators, and heads of state departments. Petty corruption, on the other hand, is generally considered the everyday, street-level, corruption that citizens encounter and usually involves only small sums of money and low-level officials.[28] Government officials commit petty corruption, for example, when they accept offers from citizens in the forms of payments or favors to avoid having to comply with government laws or to speed the fulfillment of government requirements.[29] Petty corruption usually involves people who have daily contact with citizens, such as police

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[20] *Id.*

[21] DANIELA ZEMANOVICOVA ET AL., OBSTACLES TO OPEN AND HONEST GOVERNMENT: AN OVERVIEW OF CORRUPTION: CORRUPTION AS A PROBLEM (ETHICAL, MORAL, ECONOMIC, POLITICAL) AFFECTING THE WHOLE SOCIETY 1 (2002).

[22] TANZI, *supra* note 19, at 4.

[23] *See* MELISSA A. THOMAS & PATRICK MEAGHER, THE IRIS DISCUSSION PAPERS ON INST. & DEV. PAPER NO. 04/03,A CORRUPTION PRIMER: AN OVERVIEW OF CONCEPTS IN THE CORRUPTION LITERATURE, Box 2 at 3 (2004).

[24] *Id.* at 17.

[25] Jain, *supra* note 4, at 73.

[26] *Id.* at 73-74.

[27] THE WORLD BANK, *Module III Introduction to Corruption*, *in* YOUTH FOR GOOD GOVERNANCE: DISTANCE LEARNING PROGRAM 1, 7.

[28] *Id.*

[29] GEORGE R. G. CLARKE, THE WORLD BANK, HOW PETTY IS PETTY CORRUPTION? EVIDENCE FROM FIRM SURVEY IN AFRICA 2 (2008) *available at* http://mpra.ub.uni-muenchen.de/15073/1/MPRA_paper_15073.pdf.

officers and immigration officials.[30] The degree of corruption varies from country to country and within any given country. Although a country may have a high concentration of one type of corruption, such corruption does not necessarily indicate that the other type of corruption will be equally high.[31]

Corruption in the government generally affects the citizens of the country by increasing the transaction costs of performing business.[32] The increase in transaction costs associated with corrupt governments leads to a decrease in the amount of government funding and reduces the amount of goods that citizens in the country ultimately receive.[33] Thus, when high levels of corruption affect citizens' day-to-day living, citizens often lose confidence in their government.[34] Moreover, as citizen and country morale decline, the level of crimes committed within a country typically increases.[35]

The World Bank estimates that governments which address corruption and corruption-related conduct occurring in the system could "increase per capita incomes by a staggering 400 percent."[36] Recognizing the problems caused by corruption, international organizations and individual countries have launched anti-corruption policies.[37] For example, after the conviction of 106,000 corrupt government officials in 2009, the Chinese government issued a new corruption code in February 2010.[38] China has made its anti-corruption policy a top priority, evidencing the Chinese government's belief that if corruption is left unchecked, it could threaten the established rule of law in the country.[39] In fact, China takes corruption so seriously that a

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[30] George Moody-Stuart, *The Costs of Grand Corruption*, ECONOMIC REFORM TODAY, NUMBER FOUR, 1996, at 19, *available at* www.cipe.org/publications/ert/e22/E22_05.pdf.

[31] *Module III*, *supra* note 27, at 7. ("For example, there may be very little grand corruption in a country with a relatively clean elite, but a large amount of petty corruption in the lower offices of government.").

[32] ZEMANOVICOVA, *supra* note 21, at 3.

[33] *Id.*

[34] Dimitri Vlassis, *The United Nations Convention against Corruption, in* BUSINESS AGAINST CORRUPTION: CASE STORIES & EXAMPLES 11 (Birgit Errath of the U.N. Global Compact Office, 2006).

[35] ZEMANOVICOVA, *supra* note 21, at 4.

[36] Dreher, *supra* note 2, at 444; [what is the world bank site?]

[37] TANZI, *supra* note 19, at 22.

[38] Calum MacLeod, *China Wages War on Pervasive Corruption*, USA TODAY, March 3, 2010, http://www.usatoday.com/news/world/2010-03-09-China-corruption_N.htm.

[39] *Id.*

public official can receive the death penalty if he or she is found guilty of a corruption crime.[40] Compared to most other countries, China's anti-corruption policy and harsh penalties for violation may be considered an extreme form of anti-corruption deterrence.

The United Nations introduced the U.N. Convention Against Corruption, also known as the 10th Principle, in 2005 in an attempt to assist countries in developing anti-corruption policies of their own.[41] The Convention offers a comprehensive set of standards, measures, and rules to strengthen a country's legal and regulatory regimes to combat corruption.[42] Thus far, over one hundred thirty countries have pledged to implement and integrate the 10th Principle into their anti-corruption laws.[43]

Initially, researchers attempted to determine the amount of corruption in a country from the number of corruption-based arrests and convictions.[44] The problem with such a measurement is that each country places differing degrees of emphasis on anti-corruption. For instance, in a country with high amounts corruption but little enforcement, the level of reported corruption is relatively lower than in a country which places a high emphasis on anti-corruption.[45] Researchers have abandoned the corruption-based arrest and conviction method and have since implemented the perception-based corruption indices to measure corruption.[46]

B. CORRUPTION MEASUREMENT INDICES

In addition to the anti-corruption laws implemented by various governments, additional efforts to combat corruption have arisen over the years from non-government entities. For example, both Transparency International and the World Bank have developed corruption measurement indices.[47] Transparency International's

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[40] *See China to Keep Death Penalty for Corruption Crimes*, CHINA DAILY, September 29, 2010, www.chinadaily.com.cn/china/2010-09/29/content_11361507.htm.

[41] Vlassis, *supra* note 34, at 7.

[42] *Id.*

[43] *Id.* at 12.

[44] Mitchell A. Seligson, *The Measurement and Impact of Corruption Victimization: Survey Evidence from Latin America*, 34 WORLD DEV. No. 2, 381, 383 (2006).

[45] *Id.* at 383-84.

[46] *Id.* at 384.

[47] Judge, *supra* note 6, at 95 ("[Transparency International] is a Berlin-based international non-governmental organization established in May 1993

Corruption Perception Index [hereafter CPI] and the World Bank Control of Corruption Index [hereinafter WBCCI], both released annually, are the two most recognized corruption indices in corruption research.[48] These corruption indices attempt to "qualitatively [measure] the pervasiveness of corruption in a country."[49] The CPI results are based on corruption survey questions filled out by "multiple business executives, financial journalists, and country experts."[50] The WBCCI is based on corruption indicators including "(1) frequency of additional payments required to get things done, (2) effects of corruption on the general business environment, and (3) the tendency of elites to control the state" as assessed by "international organizations, political and business risk rating agencies, international think tanks, and relevant non-governmental organizations."[51] Both the CPI and WBCCI are popular among anti-corruption advocates and are frequently cited in scholarly books, journals, and articles.[52]

Because these indices are mainly based on survey questions, the CPI and WBCCI are deemed perception-based corruption indices.[53] Although the World Bank[54] and Transparency International have helped to further the understanding and impact of corruption with their corruption measurement indices,[55] many scholars have criticized both the CPI and WBCCI stating that they should not be used as accurate measures of corruption for any particular country.[56] The scholars who

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that has been conducting cross-national of perceived corruption since 1995. [Transparency International] aims to broaden awareness of the damage caused by corruption and to encourage governments and international organizations to adopt and implement anti-corruption laws and programs.").

[48] *Id.*

[49] Dreher, *supra* note 2, at 444.

[50] Judge, *supra* note 6, at 95.

[51] *Id.*

[52] Ko & Samajdar, *supra* note 1, at 509.

[53] *See* Fredrik Galtung, *Measuring the Immeasurable: Boundaries and Functions of (Macro) Corruption Indices*, *in* MEASURING CORRUPTION, 101-130, 103 (Charles Sampford et al. eds., 2006) *see also* Judge, *supra* note 6, § 1.3.2, at 95.

[54] Judge, *supra* note 6, at 95 ("The World Bank views good governance and anti-corruption as important to its poverty alleviation mission.").

[55] *See* Ko & Samajdar, *supra* note 1, at 510 ("Before the advent of [international corruption indices] research on corruption was mainly confined to case studies, and was characterized by imprecise operationalizations of the concept of corruption." (citation omitted)).

[56] *See, e.g.*, Galtung, *supra* note 53 (Fredik Galtung is a former Transparency International researcher. In this article he addresses several

criticize perception-based corruption indices claim that such indices do not measure actual corruption. The critics allege that the findings and country rankings are instead based on the mere opinions of non-citizen "experts" who complete the survey questions.[57] Without direct data to measure corruption, many critics have questioned how these survey respondents form their beliefs and whether or not those beliefs are accurate.[58]

The lack of direct data also means that the correlation between perceived and actual corruption may be inaccurately low or, in some cases, high.[59] Some scholars believe that perception-based corruption indices are in fact based on underlying biases about the quality of a country's institution and not actual degrees of corruption.[60] Underlying biases could have unfounded, long term, and damaging effects because if these opinions affect the indices and as a result the indices indicate a country's government is corrupt, the perception of that country may never change.[61] Indices are based on perception of corruption in the government, and therefore, scholars believe that a negative perception may cause future survey respondents to over-estimate the corruption within a particular country.[62] Additionally, these indices may also have the damaging effect of causing public officers to believe that they are allowed accept bribes and citizens to believe that they should pay bribes in order to conduct business.[63] For these reasons, perception-based, corruption-measurement indices arguably contribute to the

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criticisms of the CPI. He argues that the CPI should be radically revised and complemented by additional indicators.).

[57] *See* Ko & Samajdar, *supra* note 1, at 517-8 [What both CPI & WBCCI measure at 517] ("…most experts are not local residents…" 518).

[58] Olken, *supra* note 6, at 1.

[59] Dreher, *supra* note 2, at 444.

[60] *Id. See also* Asad Zaman & Faiz-Ur-Rahim, *Corruption: Measuring the Unmeasurable*, 25 HUMANOMICS 117, 121 (2009) (There are additional arguments for underlying biases among respondents of perception-based corruption indices. As it relates to CPI, one group of scholars argue that the index is biased because the survey group 1) is fairly closed; 2) "is not accustomed to the local customs and language (they do not know how issues are settled locally and tend to use bribery to solve problems fast)"; and 3) are businessmen.).

[61] *See* Dreher, *supra* note 2, at 444, fn. 5 (this fear is known as "artificial inertia"); *See also* Axel Dreher et al., *How Do Institutions Affect Corruption and The Shadow Economy?* (2005) *available at* http://business-school.exeter.ac.uk/documents/papers/economics/2005/0505.pdf.

[62] *Id.*

[63] Zaman & Faiz-Ur-Rahim, *supra* note 60, at 122.

cyclical problem of government corruption.[64] The criticisms of perception-based indices have largely been the cause of increases in the use of models and actual data to measure corruption.

II. MODELS OF CORRUPTION

A. AN OVERVIEW OF MODELS

As stated above, a model is generally defined as "any simplification, substitution or stand-in for what [a person] is actually trying to study or predict."[65] Models use some real world characteristics but are largely a simplified picture of the real world.[66] Whereas the real world contains a variety of complexities, models are typically characterized as simplistic compilations of real world facts.[67] Creating models, or modeling, includes the following steps:

1. Define the problem of interest;
2. Gather relevant data based on the problem;
3. Formulate a model to represent the problem;
4. Develop a procedure for deriving solutions to the problem from the model;
5. Test the model and refine it as needed (is the model valid; does it do what it is designed to do?);
6. Implement the solution; and
7. Prepare for the ongoing application of the model.[68]

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[64] *Id.*

[65] PEASE & BULL, *supra* note 10.

[66] LAVE & MARCH, *supra* note 9 (There are six traditional types of models: Physical, Scaled, Analog, Management Games, Computer Simulation, and Mathematical. Physical models are more exact, because they use actual people, while on the end mathematical models are more abstract. Corruption models, as computer simulation or mathematical models, typical fall on the abstract end of model types.) *See also* James E. Reeb & Scott Leavengood, *An Introduction to Models and Probability Concepts*, PERFORMANCE EXCELLENCE IN THE WOOD PRODUCT INDUSTRY, Or. St. Univ., Oct., 1998; Jain, *supra* note 5, at 85-91.

[67] *Id.*

[68] *See* Reeb & Leavengood, *supra* note 66, at 1; *see also* FREDERICK S. HILLIER & GERALD J. LIEBERMAN, INTRODUCTION TO OPERATIONS RESEARCH, 7 (7th ed. 2001).

Although researchers have the choice to either experiment with the real world or with models of the situation, researchers should be encouraged to use models where testing assumptions and making predictions might not otherwise be feasible.[69] Models have the ability to process a large amount of data and represent mathematically complex physical and social relationships, allowing researchers to test assumptions and make predictions in ways that may otherwise not be possible.[70] Researchers may prefer to use models instead of real world situations to test theories when the actual situation may be too complex, too expensive, or too time consuming.[71] For example, meteorologists build and use models to test theories on weather patterns since they have no control over the actual weather.[72] Similarly, corruption models have the capacity to help explain events and occurrences in the world and may provide invaluable insights for real world situations.[73]

Models may also be particularly useful to address social issues affecting a country or region. Policy makers and social engineers are turning to models to study real world issues at an increasing rate.[74] Models created to examine and study social issues are appealing to policy makers and social engineers because they represent complex real world situations.[75] These social science models are used to examine social-political issues where the fundamental underlying theory of the problem is either unknown or does not exist.[76] Corruption is a socio-political issue without any universally accepted theory, and therefore, researchers have developed a number of models to study the issue.[77]

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[69] *See* Reeb & Leavengood, *supra* note 66, at 3.

[70] James D. Fine & Dave Owen, *Technocracy and Democracy: Conflicts between Models and Participation in Environmental Law and Planning*, 56 HASTINGS L. J. 901, 904 (2005).

[71] *See* Reeb & Leavengood, *supra* note 66, at 2.

[72] *Id.* at 3.

[73] LAVE & MARCH, *supra* note 9, at 3.

[74] MARCUS A. LOUIE & KATHLEEN M. CARLEY, CARNEGIE MELLON UNIVERSITY, SCHOOL OF COMPUTER SCIENCE, THE ROLE OF DYNAMIC-NETWORK MULTI-AGENT MODELS OF SOCIO-POLITICAL SYSTEMS IN POLICY abstract (2007).

[75] *Id*.

[76] *Id*. at 3.

[77] *See* Judge, *supra* note 6, at 93 ("There is no overarching theoretical framework to explain corruption events…").

C. CORRUPTION MODELS[78]

Corruption models measure the causes and effects of corruption in order to assist in efforts to prevent corruption.[79] Specifically, these models identify and analyze the relationship between causes and effects of corruption.[80] Corruption models were first introduced in 1968 in Gary Becker's article *Crime and Punishment: An Economic Approach*.[81] Becker's article examined and ultimately concluded that "individuals weigh[ing] the relative cost and benefits of illegal [corrupt] acts to make a 'rational' choice. The cost and benefits [were] influenced by exogenous factors that include[d] the role of government and the socio-cultural environment."[82] Since then, scholars have used Becker's model to create new models to assist in the fight against corruption.[83]

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[78] *See generally* Jain, *supra* note 4, at 85 (Section 4 Models of Corruption).

[79] Judge, *supra* note 6, at 93.

[80] Interview with Dr. Eliot Motato, Professor of Engineering Science, Pontificia Universidad Javieriana, in Santiago de Cali, Colom. (Sept. 4, 2010).

[81] RAJEEV K. GOEL & MICHAEL A. NELSON, BANK OF FIN. DISCUSSION PAPERS, CAUSES OF CORRUPTION: HISTORY, GEOGRAPHY, AND GOVERNMENT 9 (2008); *See also* Gary Becker, *Crime and Punishment: An Economic Approach*, 76 J. POL. ECON. 169 (1968).

[82] GOEL & NELSON, *supra* note 81, at 9.

[83] *See* Feisal Khan, *Understanding the Spread of Systemic Corruption in the Third World*, 6 AM. REV. POL. ECON. 16, 31 (2008); *See also* GOEL & NELSON, *supra* note 81; Jain, *supra* note 4.

1. AN EXAMPLE MODEL: INSTITUTIONAL CHOICE PERSPECTIVE

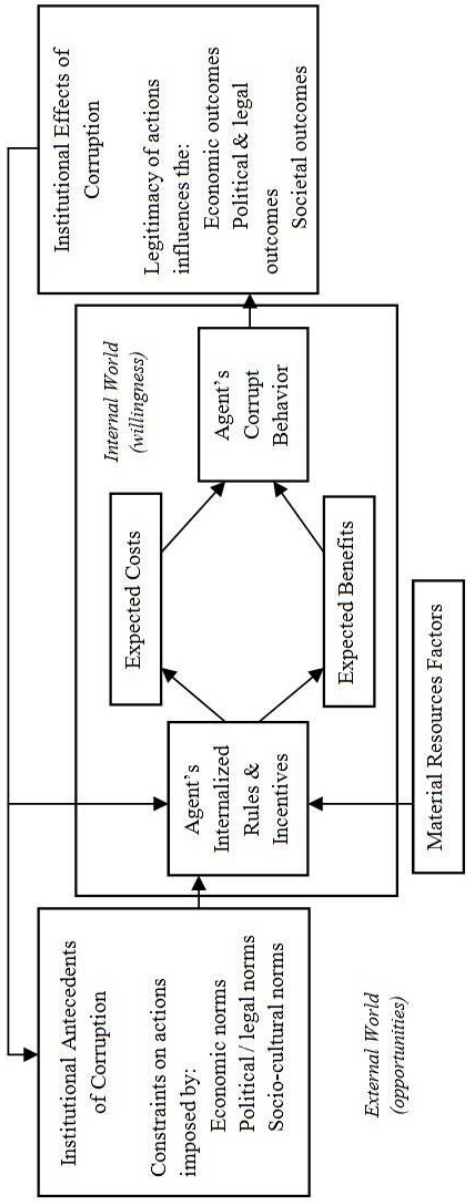

Figure 1: An adaptation of Michael W. Collier's Institutional Choice Perspective on the causes and effects of corruption

Figure 1 above is adapted from Michael W. Collier's model on the institutional choice perspective on corruption.[84] This type of model is a computer simulation model. In models such as these, a set of rules that define behavior create the agents. In this example, the behavior is titled the "Agent's Internalized Rules & Incentives." Similar to Becker's original examination, the Collier model "focuses on the internalized world of the agent who may or may not engage in corrupt behavior and the externalized world surrounding the agent which serves to constrain and/or legitimize corrupt behavior. In addition, material resource factors influence the expected benefits of corruption."[85] The internal world makes up the agent's decision-making process and his willingness to partake or not partake in corrupt actions.[86] The external world makes up the rules and opportunities that influence the agent's decision-making.[87] Based on Collier's model, researchers can adjust factors such as institutional antecedents of corruption, the agent's expected costs and benefits, and material resource factors in order to determine the outputs or effects of corruption.[88] After adjusting the model and collecting the information obtained from the adjustments, researchers can use the collected data to determine the cause and effect relationship of corruption.[89]

Once a cause and effect relationship has been determined lawmakers can use this information to determine what changes in the law, if any, need to take place in order to combat corruption.

2. REAL WORLD EXAMPLE OF THE IMPACT OF MODELS: THE REINIKKA AND SVENSSON BARGAINING MODEL[90]

A noteworthy example of how researchers can use corruption models to solve real world problems comes from the Ugandan school system. In the early 1990s, schools in Uganda were not increasing their primary enrollment despite an increase in public education funds.[91]

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[84] Michael W. Collier, *Explaining Corruption: An Institutional Choice Approach*, 38 CRIME, L. &SOC. CHANGE, no. 1, July 2002, at 1, 4.

[85] Judge, *supra* note 6, at 94.

[86] *Id.* at 4.

[87] *Id.*

[88] Motato, *supra* note 80.

[89] *Id*.

[90] Ritva Reinikka & Jakob Svensson, *Explaining Leakage of Public Funds*, 1-45 (World Bank Pol. Res., Working Paper No. 2709, Oct. 2001).

[91] Ritva Reinikka & Jakob Svensson, *Survey Techniques to Measure and Explain Corruption*, 1-21 (World Bank Pol. Res., Working Paper No. 3071, June 2003).

Adequate accounting records of actual expenditures were not available and so a Public Expenditure Tracking Survey (PETS) was conducted over a five year period (1991-1995) in order to determine where the education funds were actually going.[92] PETS also determined what percentage of the resources actually reached their intended destination.[93]

The PETS results revealed that only thirteen percent of the government funds actually reached the schools from 1991 to 1995.[94] The other eighty-seven percent was either captured for private gain or used by government officials for purposes unrelated to education.[95] In addition to the overall ability of schools to receive their funding, the PETS results also revealed large variations in leakages across the schools.[96] Most schools received very little or nothing at all.[97] The PETS analysis revealed significant occurrences of government corruption which ultimately limited the ability of children to receive a proper education.

Based on the PETS results, Ritva Reinikka and Jakob Svensson developed a model to determine what could be done to curb the corruption and have the funds reach their intended destination. The model determined that three variables explained the leakage across schools: "school size, income, and the extent to which teachers are unqualified.[98] Large schools with wealthier families and with a higher percentage of qualified teachers received more of the intended funds per student than smaller schools in low income areas with under-qualified teachers.[99] The model determined, in pertinent part:

> [a] [one] percent increase in school size . . . reduces leakage by [two] percentage points. A [one] percent increase in household income . . . increases the amount of public funding that reaches the school by 0.25 percentage points, and a similar increase in the

[92] *Id.* at 3.
[93] *Id.* at 4.
[94] *Id.*
[95] *Id.*
[96] *Id.*
[97] *Id.* (citing Anders Jeppson, *Financial Priorities Under Decentralization in Uganda*, 16 HEALTH POL. & PLAN., no. 2, 2001 at 187-192).
[98] *Id.* at 39.
[99] Reinikka & Svensson, *supra* note 91, at 7.

> share of qualified teachers reduces leakage by 0.27 percentage points.[100]

The model also determined that schools which attempted to claim their funds had little bargaining power. The lack of bargaining power mostly resulted from the high cost of obtaining information from the government regarding funding.[101]

Based on the findings of the model, the Ugandan government took action to even the playing field between schools receiving disproportionate amounts of government funding on the basis of socio-economic factors.[102] The government began publishing in newspapers and broadcasting on the radio more detailed information about the monthly transfers.[103] The government also mandated that schools publicly post all funds received.[104] The government's intention in implementing such mandates was to empower the schools by lowering the cost of information and strengthening the school's overall bargaining power.[105] The Ugandan government's actions had a tremendous impact: while most schools were still not receiving all of their funding, the amount received by all schools went from thirteen percent to over eighty percent by 2001.[106]

The most positive result of the Reinikka and Svenson Bargaining Model was the increase in funds received by the schools and the enhanced educational opportunities of the children within those schools. This example demonstrates the impact that models can have on anti-corruption policies. The laws shaped by corruption models and implemented in governments with documented corruption can ultimately impact the lives of citizens.

III. CRITICISMS AND LIMITATIONS OF MODELS

Despite the growing popularity in using models to determine the cause and effects of corruption, governments do not universally embrace corruption models as a means of combating corruption. There are a few reasons why models have yet to be fully embraced: 1) the

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[100] *Id*.
[101] Reinikka & Svensson, *supra* note 90, at 29.
[102] *Id*.
[103] Reinikka & Svensson, *supra* note 91, at 8.
[104] *Id*.
[105] Reinikka & Svensson, *supra* note 90, at 29.
[106] Reinikka & Svensson, *supra* note 91, at 4.

belief that models cannot actually measure corruption for various reasons, such as human complexity and country culture; and 2) the issue of collecting data on corrupt acts.

A. CAN MODELS ACTUALLY MEASURE CORRUPTION?

Corruption, in general, is complex.[107] Corrupt acts are most often contrived and performed in secrecy, adding to the complexity of corruption and making it more difficult for researchers to study it.[108] Despite the boom in corruption models over the past decade, there is no overarching theoretical foundation to explain corrupt acts.[109] This may be due to the belief by some scholars that overall "[c]orruption is a variable that cannot be measured directly."[110] Some scholars argue that the term corruption is too broad and vague, and therefore, cannot be measured.[111] "Corruption" as a socio-political occurrence is perhaps too complex to be measured as a collective whole because there are so many different types of actions which fall within the corruption definition.[112]

Models are simplified pictures of the real world, and therefore, are really just approximations and incomplete pictures of reality.[113] Predictions can be uncertain, especially when the outcome is based on human behavior.[114] Humans encounter many small events every day which unpredictably affect their lives and future actions.[115] Modelers try to reduce this uncertainty, but reducing it to zero is inherently impossible because a model cannot assess every variable that could possibly influence an individual's final decision.[116] Thus, because models, such as corruption models, are so complex, it is even more difficult to assess the certainty of their results.[117] In addition, model results become even more uncertain as models try to predict outcomes further into the future.[118] Models need to be continuously reevaluated throughout the testing process to take into account continuing information and diverse variables that arise in the real world.

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[107] Collier, *supra* note 84, at 2.
[108] Seligson, *supra* note 44, at 383.
[109] Judge, *supra* note 6, at 94.
[110] Dreher, *supra* note 2, at 444.
[111] Zaman & Faiz-Ur-Rahim, *supra* note 60, at 118.
[112] *See* Zaman, *supra* note 60.
[113] Fine & Owen, *supra* note 70, at 922.
[114] *Id*.
[115] Khan, *supra* note 83, at 31.
[116] Fine & Owen, *supra* note 70, at 922.
[117] *Id*. at 905.
[118] *Id*. at 923.

Scholars also argue that measurements of corruption cannot be applied universally because the culture within each country is different.[119] Culture is "the accepted norms and practices of a society."[120] For example, in most Western countries government agencies conduct business at an arm's length but in other countries, such as China, the practice of *guanxi* is considered the norm.[121] Under the principle of *guanxi*, if one does a favor for someone else, that favor is expected to be repaid in the future.[122] This practice of building long-term business and political relationships through an exchange of favors is a common practice in some East-Asian cultures but frowned upon in many Western cultures because these favors are viewed as informal bribery.[123] Thus, using a singular model to measure bribery would rank countries that follow the *guanxi* principle as more corrupt than countries that transact business at an arm's length. Any model that would attempt to place the same standards on each country without first examining a country's culture, norms, and laws, would arguably be inaccurate because established norms in one country are frowned upon in others.

Anyone attempting to measure corruption must specifically target one type of corruption in their study.[124] Corruption as an overarching concept is too vague to have a single model attempt to measure every type of corruption in one study. Furthermore, different models produce different results, some of which will be better than others at simulating or measuring corruption.[125] To improve certainty of results within the various models, researchers need to examine corruption from a micro-level. The model must focus on a particular country, in a particular area (e.g. education), and examine a specific type of corruption (e.g. bribery). The more focused a model is, the more reliable the results will be. Any strategy or model attempting to measure corruption "should fit the particular circumstances of a country, taking into account the nature of the corruption problem as well as the

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[119] *See* John Hooker, *Corruption from a Cross-cultural Perspective*, 16 EMERALD CROSS CULTURAL MGMT 251 (2009), *available at* www.emeraldinsight.com/1352-7606.htm.

[120] Khan, *supra* note 83, at 31.

[121] Hooker, *supra* note 119, at 252.

[122] *See* Frederik Balfour, *You Say Guanxi, I Say Schmoozing*, BUSINESSWEEK, Nov. 19, 2007, *available at* http://www.businessweek.com/magazine/content/07_47/b4059066.htm.

[123] Jain, *supra* note 4, at 83.

[124] Zaman & Faiz-Ur-Rahim, *supra* note 60, at 119.

[125] Fine & Owen, *supra* note 70, at 927.

opportunities and constraints for addressing it."[126] The information collected by a specific model can then be combined with other specific models addressing corruption to develop theories on how to combat particular types of corruption within that country. From these theories, lawmakers can use that information to develop laws to inhibit a particular type of corruption within the country.

Assuming that corruption can be measured, there is still the issue of whether enough data can be found to *accurately* measure corruption. A person who commits corrupt acts will most likely never report those acts for corruption measurement purposes. So the question remains: *if corrupt acts are done in secrecy, how can models properly measure corruption?*

B. THE DATA ISSUE

In modeling, once a problem has been identified the next step is data collection.[127] However, finding precise data on the problem of corruption presents a unique challenge. Corruption is difficult to measure because it is an illegal act that is done by the perpetrator in secrecy. The ability to directly and regularly observe corrupt acts is nearly impossible to do.[128] In order to have an accurate understanding of the problem and to provide the needed input for the model, a sufficient amount of data is needed.[129]

Without complete information and data inherently flawed due to the secrecy of corruption, researchers cannot construct predictable corruption model simulations, but must instead resort to using sparse and uncertain data. Limitations in data hinder modelers' ability to determine whether a model is working or is accurate.[130] Model simulations are ultimately affected by the accessibility and totality of the input data.[131] The flaws and incompleteness in available corruption data further separate model results and the real world conditions.[132] Incomplete data therefore, unfortunately results in the causes and effects of a corrupt act within a particular country to be misdiagnosed.

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[126] Hung-En Sung, *A Convergence Approach to the Analysis of Political Corruption: A Cross-National Study*, 38 CRIME, L. & SOC. CHANGE 137, 156 (2002).

[127] *See* HILLIER & LIEBERMAN, *supra* note 68.

[128] *See* Olken, *supra* note 6, at 1.

[129] HILLIER & LIEBERMAN, *supra* note 68, at 9.

[130] Fine & Owen, *supra* note 70, at 925.

[131] *Id*. at 924.

[132] *Id.* at 925.

Because of the data issues involved in identifying and assessing governmental corruption, some scholars criticize corruption models by claiming that "first-class modeling demands first-class data," which corruption models may not have.[133] However, in order for models to have an impact on society, first-class data may not actually be needed. Even the Reinikka and Svensson Bargaining Model, used to determine what could be done to prevent the siphoning of Ugandan school funds, had issues with data collection.[134] Using PETS to track the flow of funds moving through the system presented a few challenges. First, PETS was only a survey and therefore a person may have a strong incentive to misreport if that person was misusing funds.[135] Unlike other areas of research where the acts of the agent maybe legal, it is illogical to believe that a person stealing funds or committing some other type of illegal act would ever admit to those acts in a volunteer survey.[136] In addition to possible misreporting, the information given by the agent may have only partially captured what PETS intended measure.[137] To deal with these data collection issues the investigators used a "multiangular data collection strategy," collecting information from a number of different sources and identifying which respondents had incentives to misreport, focusing on data sources that were least likely to be contaminated by such incentives.[138]

Although there were issues with data collection, the ultimate results from the Reinikka and Svensson model and the implementation of the conclusions drawn from that model had a tremendous impact on Ugandan school funding. When collecting the data necessary for a model, much of the data may only be "rough estimates based only on educated guesses."[139] As shown in the Reinikka and Svensson model example, even when a team spends a considerable amount of time collecting data and trying to improve its accuracy, ultimately the team

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[133] Daniel A. Faber, *Modeling Climate Change and Its Impacts: Law, Policy, and Science,* 86 TEX. L. REV. 1654, 1660 (2007) *citing* M. Bruce Beck, *How Best to Look Forward?*, 316 SCI. 202, 202 (2007).

[134] *See generally* Reinikka & Svensson, *supra* note 91, at 6 n. 3.

[135] *Id.* at 7.

[136] *See* Seligson, *supra* note 44, at 383 (In other areas of development it is easy to have participants or outsiders list accomplishments. For example, health workers can report on the number of vaccines administered or healthy babies delivered. We cannot ask, however, for police officers to report on the number of bribes they take in a given week or for customs officials to report on how much duty goes uncollected).

[137] Reinkikka & Svensson, *supra* note 91, at 7.

[138] *Id.* at 8.

[139] HILLIER & LIEBERMAN, *supra* note 68, at 9.

will have to make do with the best data that it can obtain.[140] Since all efforts to measure corruption using data will involve some level of uncertainty,[141] the Reinikka and Svensson Bargaining Model illustrates that corruption models do not necessarily require precise data. Rather, a successful corruption model can use somewhat unreliable data and still be effective. The better the data is for a model, the more accurate the conclusions are that can be drawn from that model. The more accurate the conclusions that can be drawn from a model, the greater the impact the model can have on a country and its citizens.

However, because every model is simply an approximation, the predictability of models will unavoidably contain some errors.[142] As evinced with the Reinikka and Svensson Bargaining Model, however, the fact that a model may contain flawed data should not deter lawmakers from using models for anti-corruption purposes. Corruption models can still have an impact on countries that use them properly.

It would be a mistake to believe that corruption models could possibly ever be 100% accurate. "Model predictions cannot be taken as gospel."[143] Even if a model is the best approximation of a particular real-world situation, the model's results can never be an exact calculation due the human variables included in the model's analysis.[144] Models are used simply because human behavior cannot be measured directly.[145] A model's inability to explain every aspect of human behavior or include all the necessary variables a human must consider does not make the model invalid.[146] Models contribute to society by focusing attention on the major issues affecting society and by setting the boundaries on the likely outcomes.[147] Based on the design and data, lawmakers have the choice to either accept a corruption model and its results as sufficient or to simply disregard the model as a tool to

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[140] *Id*.

[141] *See* Daniel Kaufmann et al., *Measuring Corruption: Myths and Realities*, DEV. OUTREACH, Sept. 2006, at 37.

[142] Fine & Owen, *supra* note 70, at 922.

[143] Farber, *supra* note 132, at 1658.

[144] *See* Fine & Owen, *supra* note 70, at 905 n.10 (citing M. GRANGER MORGAN & MAX HENRION, UNCERTAINTY: A GUIDE TO DEALING WITH UNCERTAINTY IN QUANTITATIVE RISK AND POLICY ANALYSIS 68 (1990)).

[145] John Veilleux, *The Scientific Model in Law*, 75 GEO. L.J. 1967, 1990 (1987).

[146] *Id.* at 1989.

[147] John L. King & Kenneth L. Kraemer, *Models, Facts, and the Policy Process: The Political Ecology of Estimated Truth* 6 (CTR. FOR RESEARCH ON INFO. SYS. AND ORG., Working Paper #URB-006, 1993), *available at* http://escholarship.org/uc/item/1c31s58g.

help combat corruption. If lawmakers decide that models accurately measure what they purport to measure, governments must still take affirmative steps to implement policies based on the conclusions gathered from the models because models cannot have an impact on society on their own.

IV. THE LEGAL ACCEPTANCE OF MODELS

A. THE ISSUES WITH SOCIAL SCIENCE MODELS

The relationship between law and socio-political models has slowly evolved over the years.[148] Over the past five decades, models have become an important component of the policy-making process in the United States, especially as it relates to economic policies.[149] In the United States, economic theories and models began to gain prominence in the 1970s.[150] These models were the first tool to offer more than ideologies and guesswork; they offered actual numbers from the well-established processes of analysis.[151] Economic models have become so ingrained in the American policy-making process that they instrumental in most economic policy decisions.[152]

The use of social science theories and data was arguably motivated by the case *Brown v. Board of Education*.[153] In *Brown*, the attorneys for the plaintiffs introduced psychological data showing that the segregation of schoolchildren by race would make black children feel inferior and retard their educational development.[154] The introduction of this study was essential in helping the United States Supreme Court recognize the need for legal equality among the races, and reverse years of racial inequality in the American legal system.[155] Although the *Brown* decision had a lasting impact on American society, commentators and United States lower courts have been hostile to the

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[148] *See generally* Robin Feldman, *Historical Perspectives on Law & Science,* 2009 STAN. TECH. L. REV. 1, (2009), http://stlr.stanford.edu/pdf/feldman-historica-perspectives.pdf.

[149] *See generally* King * Kraemer, *supra* note 147, at 6.

[150] *See generally* Robin Feldman, *Law's Misguided Love Affair with Science,* 10(1) MINN. J.L. SCI. &TECH. 95 (2009) [hereinafter Misguided Love Affair].

[151] King & Kraemer, *supra* note 147, at 6.

[152] *Id.* at 6.

[153] Brown v. Bd. of Educ., 347 U.S. 483 (1954).

[154] *Id.* at 494 n.11.

[155] Veilleux, *supra* note 145, at 1992.

use of social science theories to address legal issues.[156] The reason for this hostility is most likely because of the complexity of social science models due to human decision-making variables. In addition, most legal scholars simply lack the scientific training and expertise to fully grasp complex models based on human behavior and thus such models are looked at in a critical light.[157]

Some scholars would argue that social science models, such as corruption models, should not be used for lawmaking purposes because of certain conflicts that exist between social science and law. Some of these conflicts include:

> (1) [S]ocial science is innovative, while law resists innovation,
>
> (2) [S]ocial science is based on data and observation, while law is based on precedent and hierarchy,
>
> (3) [S]ocial science seeks an objective answer to problems, while law seeks an adversarial victory,
>
> (4) [S]ocial science is descriptive, while law is prescriptive,
>
> (5) [S]ocial science is nomothetic, while law is idiographic,
>
> (6) [S]ocial science conclusions are probabilistic and tentative, while legal conclusions are irrevocable and must appear certain,
>
> (7) [S]ocial science is proactive, while law is reactive . . . .[158]

Another argument against the use of models to influence the law is that these models cannot "fully capture and describe subjective human behavior."[159] Because humans are complex, intelligent beings;

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[156] Blumenthal, *supra* note 13, at 2-3 (citing John H. Wigmore, *Professor Muensterberg and the Psychology of Testimony: Being a Report of the Case of Cokestone v. Muensterberg*, 3 ILL. L. REV. 399 (1909), Craig Haney, *Psychology and Legal Change: The Impact of a Decade*, 17 LAW & HUM. BEHAV. 376-78 (1993), J. Alexander Tanford, *The Limits of a Scientific Jurisprudence: The Supreme Court and Psychology*, 66 IND. L.J. 137, 144-50 (1990)).

[157] Feldman, *supra* note 148, at 110-11.

[158] Blumenthal, *supra* note 13, at 70 (citing Haney, *supra* note 155, at 159-68.).

[159] Veilleux, *supra* note 145, at 1989.

human behavior is often more than what is shown by a pattern of activity.[160] For these reasons, models should be used to help inform the policy-making process and not used to become *the* policy itself. The use of models in the legislative process simply gives researchers and policy-makers an idea of whether proposed laws and policies are likely to produce results within an acceptable range of the model.[161] The use of modeling in this way can help reduce the number of policy proposals that superficially look good but that may have some very serious negative consequences.[162]

Politicians, lawmakers, and lawyers are not scientists or engineers; therefore, the complexity of corruption models is an obstacle that must be overcome in order for these types of models to be embraced in lawmaking.[163] A process, such as modeling, based on complex technical examination makes public participation difficult.[164] A modeling expert, through dedicated studying, can comprehend the nuances of corruption models. However, persons unfamiliar with such processes, such as a politician, cannot be reasonably expected to understand the inner workings of corruption models in order to critically assess and critique the model.[165] Because corruption models are complex, lack of understanding by legislators and other lawmakers may cause some modeling issues to be overlooked and thus never explored. Unless the politician receives a coherent explanation, in lay terms, of the model and its complexities, he will only have the choice of accepting or rejecting the results of the model.[166] Hence, lawmakers need to appoint regulators who have a sufficient background to effectively explain models and their results to those who will ultimately draft and- create laws that will impact the country.

B. AN EXAMPLE OF THE LEGAL ACCEPTANCE OF MODELS: TANZANIA AND THE PRINCIPAL-AGENT-CLIENT MODEL

Tanzania's struggle with corruption and its use of models to combat corruption is a prime example of the issues that country goes

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[160] *Id.*
[161] *Id.*
[162] *Id.*
[163] Fine & Owen, *supra* note 70, at 930-31.
[164] *Id.*
[165] *Id.*
[166] *Id.*

through when using models to combat corruption.[167] Tanzania, like many other African countries, has been dealing with corruption for years. In 1996, to address the corruption issues plaguing the country, President Benjamin Mkapa set up a commission to investigate the causes of the corruption in the country.[168] The commission results showed that corruption permeated throughout all parts of the government and offered a number of recommendations to curb corruption.[169]

To help assist in curbing corruption, the Tanzanian Government used the principal-agent-client model [hereinafter PAC model]. The PAC model primarily provides,

> corruption occurs when an agent betrays the principal's interest in pursuit of his own by accepting or seeking a benefit from the service seeker, the client (C)" person seeking services (the client). The conditions for corruption present themselves when the principal (P) is in a powerful position and the agent (A), whom P has entrusted to carry out services, has an element of discretion in

[167] *See* Indira Carr, *Corruption, the Southern African Development Community Anti-corruption Protocol and the principal-agent-client Model*, 5 INT'L J.L. CONTEXT 147, 147–177 (2009).

[168] *Id*. at 165.

[169] *Id*. According to the Warioba Commission Report, the commission recommended:

(1) cleaning up existing leadership and developing ethical standards for future leaders;
(2) clear demarcation of responsibilities between the executive officer of ministries, departments and parastatals and ministers and members of boards of directors in order to enable accountability;
(3) vetting officers employed in sensitive areas such as home affairs,
(4) employment based on merit;
(5) declaration of assets and gifts received by leaders and public officials;
(6) severe punishment in the form of nationalisation and forfeiture of property of 'big givers of bribes' (i.e. persons involved in grand corruption);
(7) adopting programmes that raise awareness in the public of their rights; and
(8) a role for the media in exposing corruption and in educating the public.

> administering the services, and there is a lack of accountability.[170]

The Tanzanian government itself was the principal, members of the government were the agents, and the clients were Tanzanian citizens. Under the PAC model, three areas of improvement were found necessary in order to combat corruption issues within a country: (1) reduce the monopolistic power; (2) create an environment that allows citizens to confidently exercise discretion; and (3) improve accountability and transparency.[171] Based on the PAC model, Tanzania undertook a variety of actions and implemented a series of new laws.[172] Among such actions and policies, the Tanzanian government implemented:

> (1) [A] rule of law and legal framework 'intended to facilitate sectoral laws review and create conditions necessary for the restoration of confidence in the judiciary and law enforcement agencies';
>
> (2) Financial discipline and management in order to 'reduce and eradicate siphoning of public finds by unfaithful officials and increase revenue collection';
>
> (3) Transparency in procurement administration and procedures;
>
> (4) Education of public to harmful effects of corruption on the economy and social values and creation of awareness of rights;
>
> (5) Public service reform that recognizes [sic] the accountability of public officers and fair remuneration package for their services;
>
> (6) Protection of informers in order 'to encourage citizens to co-operate;' and
>
> (7) Support of the media so that they can report the 'corrupt elements without fear or favour [sic] and

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[170] *Id*. at 151 n. 23 (citing ROBERT E. KLITGAARD, CONTROLLING CORRUPTION (1988)).

[171] *Id*. at 152.

[172] *See id*. at 165-66.

> to publicise [sic] the harm they do to the innocent, the poor and the weak in Tanzania.[173]

The Tanzanian government implemented this seven-step strategy with the hope that these efforts would successfully reduce corruption within Tanzania.

Thus far, the changes that the Tanzanian government implemented have received mixed results. While there has been a large number of corruption cases reported, very few of those cases were actually prosecuted.[174] According to the Afro Barometer survey, there seems to be a decrease in petty corruption overall, but perception of grand corruption among top level officials remains high.[175] Despite numerous efforts by the government to fight corruption in Tanzania, Transparency Index's Corruption Perception Index still lists Tanzania as highly corrupt without any significant improvement in its corruption perception score over the past five years.[176] As previously discussed, this may be due to the belief that once a corruption perception index publishes a country as highly corrupt, that perception does not change because future survey respondents tend to overestimate the corruption within that particular country based on its past reputation.[177]

As with any major change or implementation of new laws focused on ridding a country of a problem that has plagued it for years, results will not be immediate. The real impact of newly adopted laws takes time to become apparent because the government has to do away with years of accepted practices. For example, *Brown v. Board of Education*[178] was decided in 1954 but the desegregation of schools did not really *start* until the passage of the Civil Rights Act of 1964[179] and the Elementary and Secondary Education Act of 1965.[180] It took an additional fifteen years after the passage of the federal statutes for the United States Supreme Court to be satisfied with the progress of school

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[173] *Id*. at 165-66 ("The seven priority areas of strategy").

[174] *Id*. at 167 (In 2005, the number of corruption cases being reported are in the thousands (8586) yet only around 200 cases were formally opened and less than twenty actually went to trial.).

[175] *Id*. at 168.

[176] *Id*. at 167.

[177] *See* Dreher, *supra* note 2, at 444, n. 5.

[178] *Brown*, 347 U.S. 483.

[179] Civil Rights Act of 1964, Pub. L. 88-352, 78 Stat. 241 (codified as amended at 42 U.S.C. §§ 2000a-2000h-6 (2006 & Supp. 2009).

[180] Elementary and Secondary Education Act of 1965, Pub. L. 89-10, 79 Stat. 27(codified as amended at 20 U.S.C. §§ 6301-7941 (2006 & Supp. 2009).

integration.[181] Policy-makers should not view the use of corruption models as a tool that will bring an immediate end to corruption. If a government truly desires change, then the time it takes for progress should not discourage them from embracing and experimenting with models and other new technologies that could possibly be useful in the fight against corruption.

VI. CONCLUSION

As corruption continues to be problematic around the world, governments and scholars will continue to search for ways to effectively combat its causes. The effects of corruption are widespread: "it misallocates resources, reduces economic surplus and consequently economic growth, and degrades . . . the link between effort and reward."[182] All of these negative effects of corruption ultimately affect the public's confidence in the effectiveness of the government.

Perception-based indices are not enough to inform policy-makers as to effective anti-corruption policies. The negative consequences of complete reliance on perception-based corruption indices, should encourage policy-makers and legislators to take additional steps to measure the causes and effects of corruption. Use of corruption models are most certainly a step in the right direction towards making a significant dent in the problem of corruption affecting countries worldwide.

Since this article covered a variety of issues dealing with corruption models, it may be helpful to identify some key take away points for any government or organization that may want to use corruption models to curb corruption.

1. Models can and should be used to measure the causes and effects of corruption. These models may be useful in assisting efforts to prevent corruption.[183] These models also establish and identify the relationships between the causes and effects of corruption. Such relationships can ultimately be used to make predictions on corrupt behavior and the influences of corrupt behavior.

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[181] Just prior to the passage of the Civil Rights Act of 1964, 1.2% of Black schoolchildren were attending school with whites. The integration rate rose to 32% in 1968 and to 91.3% in 1972. *See* MICHAEL J. KLARMAN, FROM JIM CROW TO CIVIL RIGHTS: THE SUPREME COURT AND THE STRUGGLE FOR RACIAL EQUALITY 380 n.77 (2004).

[182] Khan, *supra* note 83, at 32.

[183] Judge, *supra* note 6, at 93.

2. Corruption models should not be looked upon as gospel. Models provide a glimpse of what *might* be and not of what *will* be.[184] There is a considerable amount of uncertainty in corruption models due to the complexity of the human decision-making process and the lack of data available to measure corrupt acts.[185] Thus, corruption models should not be looked upon to make policies but rather help develop policies based on its findings and other information available. Model results can help decision-makers predict the outcome of a given policy or law and therefore such results should be used to develop parameters on what proposed laws should cover and touch upon.

3. Because corruption is complex and comes in many different forms, in order to increase the efficiency of models measuring corruption, the models should target (1) a specific type of corruption, (2) in a specific country, (3) take a country's culture and norms into account, and if possible (4) focus on a particular area of government (i.e., education).

4. Ultimately, due to the intentionally secretive nature of corrupt acts, any data collected on a particular corrupt act will be incomplete and possibly flawed. Therefore, any model used by a government for corruption purposes should use a multi-angular data collection strategy. In other words, data and information should be collected from as many different sources and ways as feasibly possible. A multi-angular data collection strategy will not solve all data issues but it can increase the reliability of the available data.

5. Because politicians and lawmakers typically do not have scientific or mathematical backgrounds, any government agency that attempts to use models must educate and explain to lawmakers, in lay terms, what the model is attempting to measure, how it makes its measurements, and what the results of the model findings are based on. Clearer discussions of the modeling process and improved resources for understanding models could help make model-based planning more inclusive and easier for lawmakers to decide on whether to accept or reject the model results.[186]

We hope that this discussion opens up further research into the impact that models can have on shaping anti-corruption laws. While neither science nor law is perfect and both contain some conflicting

[184] King & Kraemer, *supra* note 147, at 6.
[185] Fine & Owen, *supra* note 70, at 922.
[186] *Id.* at 979.

theories, corruption models can make an impact on corruption when the model results are used for the purposes of drafting policies and laws.

While the belief that corruption can be completely eradicated is illogical, the reduction of systemic corruption within governments should be both a feasible and overall desirable objective. Hopefully, as model accuracy improves, governments and other organizations can use corruption models as an additional means to reduce corruption within their countries. As discussed in this paper, the use of corruption models can be an alternative method to address the prevalence of corruption in foreign countries. Although corruption models have some flaws, if there is a sufficient amount of data available, anti-corruption models can inform policy-makers as to the causes and effects of corruption. The models can also point to ways in which governments can implement policies and laws to eradicate corruption throughout the system.