Corruption and its causes. A quantitative analysis of corruption using proxy datasets⁺

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ABSTRACT

The purpose of this paper is to evaluate popular academic theories believed to cause corruption through quantitative dataset proxies. In undertaking the exercise, the author examines various (and often competing) schools of thought on the topic, while showcasing the challenges that burden the objective study of corruption in a global context. The paper obtains a list of sixteen (16) variables extrapolated from academic literature; each (independent) variable is tied to a proxy dataset. The variables are first analysed through univariate statistics, before being subjected to bivariate correlation analysis against the (dependent) variable of corruption (itself tied to a proxy dataset, the Corruption Perception Index). The methodology employed in the analysis involves a standard mixture of statistical techniques—descriptive statistics & charts, logarithmic normalisation, Q-Q plotting, distribution curve overlays, etc.—as well as regression techniques aimed at the analysis of possible associations. The process uncovers data limitations for at least three variables (monitoring institutions, monotheistic religion, and campaign expenditure limits), while also revealing an unexpected (negative) relationship between corruption and national levels of debt. Several variables believed to impact corruption levels are confirmed, showing that rule of law, violence and instability, and national wealth all exert a strong impact on levels of corruption; other variables exhibit smaller-thanexpected associations (e.g. freedom of the press). The paper outlines future research avenues (multicollinearity analysis coupled with a robust stepwise regression model) that would generate valuable insights into global corruption trends that can then be scaled-down to accommodate local idiosyncrasies.

Keywords: corruption, theory, causes, variables, correlation, quantitative analysis.

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La corrupción y sus causas. Análisis cuantitativo de la corrupción utilizando *proxy datasets*

RESUMEN

El propósito de este documento es evaluar las principales teorías, así como las variables analizadas por diversos autores, detrás de los fenómenos que causan corrupción. Este ejercicio se desarrolla a través de indicadores proxy cuantitativos derivados de las principales teorías (en muchos casos opuestas) que explican la corrupción, así como una evaluación de sus principales retos en el estudio de este fenómeno como una epidemia global. Este artículo examina 16 variables asociadas a las principales causas de la corrupción mencionadas en las discusiones teóricas sobre el fenómeno. Cada variable independiente se encuentra vinculada a un conjunto de datos proxy. Estas variables se analizan primero a través de estadísticas univariadas, antes de someterse a un análisis de correlación bivariante frente a la variable de corrupción (dependiente), a su vez vinculada a un conjunto de datos proxy, el Índice de Percepción de la Corrupción. La metodología empleada en el análisis involucra una mezcla estándar de técnicas estadísticas como gráficos estadísticos y descriptivos, normalización logarítmica, gráficos Q-Q, superposición de curvas de distribución, etc., así como técnicas de regresión sobre posibles asociaciones. Los resultados son interesantes; se descubrieron posibles limitaciones de datos para al menos tres variables (instituciones de monitoreo, religión monoteísta y límites de gastos de campaña), al mismo tiempo que se reveló una relación inesperada (negativa) entre la corrupción y los niveles nacionales de deuda. Se confirmaron varias variables que, se cree, tienen un impacto en los niveles de corrupción, lo que demuestra que el estado de derecho, la violencia y la inestabilidad y la riqueza nacional ejercen un fuerte impacto en los niveles de corrupción; otras variables muestran asociaciones menores de lo esperado (por ejemplo, libertad de prensa). El documento describe futuros caminos de investigación (análisis de multicolinealidad junto con un modelo de regresión por pasos robusto) que generarían valiosos conocimientos valiosos sobre las tendencias mundiales de corrupción, que también pueden reducirse para adaptarse a la idiosincrasia o cultura local.

Palabras clave: corrupción, teoría, causas, variables, correlación, análisis cuantitativo.

Introduction

Is there a more perennial weed in the public policy garden than corruption? Year after year—discredited government by discredited government, scandal after scandal—that old chimera rears its head, alive and well. The question of what causes corruption is fruitful fodder for academia: as this paper demonstrates, there is no shortage of theories claiming to provide an answer. But how substantive are these postulations if they amount to little notable change? If policy analysts, researchers, educators, intellectuals, public sector consultants, and activists bear the burden of speaking 'truth to power', why is 'power' turning a deaf ear?

Within this context, the paper focuses on three specific research questions: What are the 'root causes' of corruption that political science research has identified? What are the possible proxy datasets that we can tie these subjectivity theories to, so that objective quantitative analysis of corruption can be conducted?, and which 'root causes' of corruption appear to be supported by data analysis and which theories appear to have less of an impact on corruption than the topic literature suggests?

To provide an answer, we follow a logical roadmap: we begin by defining corruption (Section 1) before conducting a literature review that tabulates common explanatory theories on the topic (Section 2). Section 3 introduces the descriptive statistics at the heart of this paper, along with their limitations, and directs us towards two appendices: Appendix A, which shows the proxy datasets used for quantification, and Appendix B, which contains univariate descriptive statistics for each variable. Section 4 conducts a bivariate correlation analysis, with the accompanying Appendix C¹ displaying the 'gory details'. Section 5a summates key findings while Section 5b proposes future research avenues that were outside the scope of this paper; and Section 6 concludes.

1. Corruption definition

One simple definition of the term 'corruption' is "the misuse of public office for private gain" (Persson, Rothstein & Teorrell, 2013, p. 450) or "behaviour in office that is motivated by a desire for personal material gain." (Rogow & Lasswell, 1963, p. 2). While these explanations have the benefit of brevity, they lack the comprehensiveness of a preferable definition—"behaviour which

Appendices A, B, and C can be found at www.stefangazenov.com, under the 'Publications' section of the website.

deviates from the formal duties of a public role because of private-regarding (personal, close family, private clique) pecuniary or status gains; or violates rules against the exercise of certain types of private-regarding influence. This includes such behaviour as bribery (use of a reward to pervert the judgment of a person in a position of trust); nepotism (bestowal of patronage due to ascriptive relationship rather than merit); and misappropriation (illegal appropriation of public resources for private-regarding uses)" (Nye, 1967, p. 419; Scott, 1972, pp. 4, 21).

The benefit of the expanded definition is its acknowledgment that corruption is omnipresent and can occur at any level within a government hierarchy (not just public offices). The importance of this is that it attunes us, right away, to a common issue with corruption; how we choose to define the phenomenon determines where we look for its manifestation.

2. Theory & literature review

In the process of reviewing literature from the 1960s onwards, this paper identified sixteen (16) variables commonly believed to be associated with corruption. These are:

Civil service size. The notion here is that as civil service size increases, oversight becomes more difficult (Bardhan & Mookherjee, 2006, p. 168) due to principal-agent fragmentation (Gerring & Thacker, 2004, p. 324), while the scope of bureaucratic responsibility—and room for corruption—expands (Scott, 1972, p. 9). The proposed way of mitigating this problem is through a constraint on government size (Lambsdorff, 2006, p. 4), which would reduce the possibility of contact between individuals and corrupt officials (Rose & Peiffer 2015, p. 24).

Democracy. It should come as little surprise to find the suggestion that changes in government systems produce increased or diminished levels of corruption (Kaufmann, Kraay & Mastruzzi, 2006, p. 94); of the various possible government forms (socialism, communism, dictatorships), a number of researchers contend that democracy exhibits a corruption-reducing effect once democratic practices become established within a nation (Lambsdorff, 2006, pp. 10-11 and Pellegrini & Gerlagh, 2008, p. 245); several papers debate how long democratic 'critical mass' takes to attain (Manow, 2005, p. 259 vs. Pellegrini & Gerlagh, 2008, p. 261).

Country wealth. Researchers postulate that differences in international wealth (measured in purchasing power parity as a function of GDP in this paper) are amongst the most prominent variables associated with corruption. The basis for these contentions centers on a core tenet: wealth is often taken to be a proxy for a country's development (Khan, 2006, p. 218) and thus indicative of a government's ability to respond to social demands in "open, transparent, and generalized ways" (Khan, 2006, pp. 231, 239). In other words, a nation's wealth enables it to "afford better institutions" (Pellegrini & Gerlagh, 2008, p. 250) which are more adept at combating corruption (Pellegrini & Gerlagh, 2008, p. 260). These views are not without opposition—several researchers have made a 'causality flow' counter argument claiming that it is unclear whether national wealth decreases corruption, or whether decreased corruption brings up national wealth through greater international investment, reduced capital flight, etc. (Kaufmann et al., 2006, p. 55; Lambsdorff, 2006, p. 24; Gupta, Davoodi & Alonso-Terme, 2002, p. 42; Rose-Ackerman, 2006, p. xxii).

Wealth inequality. National wealth distribution is also a determining factor in a country's level of corruption (Gupta et al., 2002, p. 30). Researchers contend that wealth disproportionality can be utilised in a variety of ways; these can range from minor attainments of advantages over and above that which is permissible to all (Scott, 1972, p. 34) to the facilitation of clandestine practices aimed at propagating and prolonging "vicious circles of inequality and corruption" (Lambsdorff, 2006, pp. 23-24). An interesting observation is made concerning the importance of land ownership, often a significant personal asset in countries lacking complex financial systems—land's ability to act as debt collateral makes it a vital form of 'currency' in parts of the world (Gupta et al., 2002, pp. 27-28).

International investment. Corruption and international investment are claimed to have an association, where the proposed relationship is of a negative nature (i.e. as corruption decreases, international funding increases and vice-versa). The supporting rhetoric is that corruption reduces the credibility of proposed government policies, which in turn forces international investors to look at other investment environments where more credible commitments are being made (Lambsdorff, 2006, p. 27). The literature further indicates that this practice is not exclusive to individual or group investors; increased importance is given to accreditation agencies (e.g. Moody's, S&P, Fitch) who rate the solvencies of nations; these ratings can then exercise significant influence over

the release or retention of foreign aid by donor countries (Kaufmann et al., 2006, p. 54).

National monitoring ability. A burgeoning body of research indicates that selfmonitoring and limits on discretionary power(s) could also play a key role in minimising corruption (Persson et al., 2013, p. 452), thus negating the fear that in "the absence of agencies that could enforce performance standards, bureaucratic factions blossom luxuriantly and each division of the apparatus becomes a virtual feudal domain that may parasitically exploit its clientele" (Scott, 1972, pp. 15, 67). Ex-post supreme auditing institutions (SAIs)² have seen widespread global popularity (INTOSAI, 2016, no pagination) along with the increasing (but latent) presence of ex-ante fiscal councils (FCs)³ (Rousso & Steves, 2006, p. 249; IMF, 2013, p. 11). At least one researcher articulates the possibility of both institutions becoming more prominent as international agreements⁴ increase in popularity and exert corruption-reducing pressures (Rousso & Steves, 2006, p. 260). Negating the optimism of these authors is a school of researchers who argue that 'catching a thief with a thief' is a policy destined for failure "if there is no way of guaranteeing the honesty of these outside agents" (Mishra, 2006, p. 212).

Dominance of hierarchical religion(s). An interesting recurrence in the literature proposes the existence of a relationship between corruption and religion; the association varies in both directions, with one school of researchers suggesting that certain denominations of Christianity are more conducive to 'rooting out' corruption (Pellegrini & Gerlagh, 2008, pp. 254-256; Treisman, 2000, p. 427), while others assert that the variable shapes perceptions of corruption without exerting any substantive impact on its actual levels (Donchev & Ujhelyi, 2014, p. 310). The argument is pressed further by at least two authors who contend that hierarchical religions (vs. isolated denominations) have a negative impact on corruption, as they "discourage 'horizontal' ties between people and hence the formation of trust" (La Porta, Lopez de Silanes, Shleifer & Vishny, 1997, pp. 333, 336; Lambsdorff, 2006, pp. 18-19).

² E.g. UK's National Audit Office.

³ E.g. UK's Office for Budget Responsibility.

E.g. Europe's 'Stability Growth Pact'.

Debt level. The growth of national debt, and resulting budget deficits, are also believed to exert an influence on the amount of corruption a nation experiences. Where there is little interest to curb self-enrichment, corrupt government officials may well surpass 'the point of no return', past which exorbitant corruption and social disintegration are uncontrollable (Scott, 1972, p. 81)⁵. Analysis of developing countries with a reputation for corruption indicates that these nations are destined for a deficit budget once "the salaries of public employees have been paid" (Khan, 2006, pp. 227-228).

Natural resource dependence. Researchers argue that natural resource dependence also impacts corruption levels. The justification behind this proposition is that the production of metals, minerals, fuels, and raw materials, items often destined for exportation, create the necessary conditions for rent-seeking behaviour(s) (Pellegrini & Gerlagh, 2008, p. 256). A critique that should be levied here is that the mechanisms through which natural resource dependence and corruption operate are left quite vague—claiming that "natural resources create opportunities for rent seeking and gives rise to corruption" (Lambsdorff, 2006, p. 21), without explaining what those opportunities entail, or how they are executed, is a finding of questionable value.

Campaign expenditure limitations. The political process, and the imposition of various limitations upon it, is another variable that receives heavy investigation from the corruption literature. One interesting finding was that countries with restrictive campaign limitations experienced higher levels of corruption; this curious discovery was explained by the argument that strict rules do not produce outright elimination of private sector pressures on the government, but rather produce "corrupt and non-transparent forms." (Lambsdorff, 2006, p. 15). The validity of one study (Stratmann, 2003) is questionable, as it was conducted on a small sample size of only fourteen (14) countries; further research does however appear to substantiate its results (Kunicová, 2006, pp. 151-152). Illicit campaign financing appears to be a problem in many countries; whether taking the form of 'grease money' or 'pork-barrel spending', there seems to be an inescapable relationship between political campaign rules, politicians, and private-sector interests (Kunicová, 2006, pp. 151-152). This problem is present in advanced economies as well, as corruption in the context

⁵ Scott uses Indonesia's 'Guided Democracy' period, under President Sukarno, as an illustrative example.

of campaign rules is a legal category, one that does not always "map perfectly onto the class of payoffs and quid pro quos" (Rose-Ackerman, 2006, p. xv).

Population. Proponents of the argument that population is correlated with corruption utilise the logic of supply and demand as the basis for their contentions. As aggregate demand for public services increases—relative to an inelastic (stable) supply—individuals (with expendable resources) become more willing to pay 'grease money' for the expedited receipt of services. One factor that would drive increased aggregate demand would therefore be a nation's population (Lambsdorff, 2006, p. 15). A nation's population could also be conducive to corruption as the rulers of large countries can "extract significant resources from the country and pay off the constituencies necessary for them to maintain power." (Hilton Root in Knack & Azfar, 2003, p. 4). A persuasive counterargument is made by the regression analysis of Knack and Azfar, who conclude that population associations with corruption disappear once less biased country sampling is conducted (Knack & Azfar, 2003, p. 12).

Freedom of the press. Media independence is often seen by researchers as an important variable in corruption mitigation. A free press can investigate the practices of (a) public officials—leading to embarrassment, credibility and reputation tarnishing, prosecution, sentencing, and even the loss of office (Lambsdorff, 2006, pp. 39-40)—and (b) public sector departments or institutions (Fisman & Gatti, 2002, p. 330). In short, freedom of the press is taken to be a key variable in the corruption literature, as the press is often seen as an impartial actor, verifying that public interests are preserved (Pellegrini & Gerlagh, 2008, pp. 252, 259). One criticism that should be considered against this variable is that 'freedom of the press' is a subjective term, one often choosing to ignore the mutually beneficial relationship enjoyed by private enterprises, government, and the media (Herman & Chomsky, 1988, pp. 301).

Rule of law. One of the most discussed variables by researchers is a country's adherence to the rule of law. 'Rule of law' is a composite notion which covers a myriad of legal duties, such as (i) the existence of a legal framework guaranteeing contractual and property right obligations (Scott, 1972, p. 50; Khan, 2006, p. 233), (ii) a system of 'checks and balances' curbing the state's abuse of power (Gupta et al., 2002, p. 32), (iii) a fair, equitable and independent judiciary capable of carrying out due process (Khan, 2006, p. 222; Lambsdorff, 2006, p. 40), and (iv) a system of law enforcement capable of enforcing

the social contract (Woodruff, 2006, p. 106). There appears to be little in the literature that argues against the believed association between the rule of law and corruption.

Small business friendliness. Another interesting argument that has been made by researchers is that corruption can be mitigated by increasing the amount of small businesses operating within a country. The rhetoric of this proposal is that local employers provide an alternative to public sector employment, thus controlling size and scope expansion of the government (Scott, 1972, p. 12). Statistical analysis of this proposition concluded that "the ease of starting a business [is] significantly better in countries with less corruption" (Kaufmann et al., 2006, pp. 79-80), with businesses choosing to investigate not only the legal framework of a country but also its propensity for corruption (Kaufmann et al., 2006, p. 93). One clear counter-argument to these contentions was already articulated by Kunicová above—as businesses grow, they will seek to exert pressure on governments for the fulfilment of their own agenda.

Violence and instability. A logical correlation is taken to exist between corruption and the variable of violence and instability. One of the most interesting arguments articulated in the literature is that corruption and violence are both forms of 'frustration venting'; corruption, however, is a 'higher' (i.e. more elitist) form of rebellion, available only to those who have the requisite means (i.e. disposable income) to use it. The bulk of the populace must therefore rely on the use of violence, often "the only strategy available" for "oppressed groups without the resources for corruption" (Scott, 1972, pp. 34-35). Corruption's relationship to violence and instability is thus a proxy for class division, i.e. "he who corrupts a system's police officers is more likely to identify with the system than he who storms the system's police stations" (Huntington, 1968, p. 64). Empirical research by Pellegrini & Gerlagh indicates that countries with political instability often experience higher levels of corruption (Pellegrini & Gerlagh, 2008, p. 259), an association that they attribute to the inability of public actors to make projections for long-term career achievements that would incentivise them away from engaging in corruptive practices (Pellegrini & Gerlagh, 2008, p. 251).

Education level. The final variable that researchers assert to be associated with corruption is the level of education that a nation enjoys. The argument proclaims that higher learning has a balancing effect, one that demystifies the world

of bureaucratic complexities for the educated—a sharp contrast to the world of the "illiterate peasants for whom government, let alone its regulations, is a mystifying and dangerous thing" (Scott, 1972, p. 15). Other benefits that researchers accrue to education include its ability to boost the income-generating potential of individuals, while preventing "the ability of the wealthy to lobby policymakers in their favour" (Gupta et al., 2002, p. 28) without fear of reprisal.

3. Descriptive statistics (See: Appendix A & B⁶)

In Appendix A, we see the 16 variables mapped against proxy datasets ("Data Set Basis") to generate the descriptive statistics in Appendix B. One problem that the data elucidates is the issue of biased sampling, as discussed in the work of Knack & Azfar (item 11 above). Examination of four (4) variables (GDP, levels of national debt, natural resource dependency, and population) demonstrates the need for logarithmic normalisation due to heavy positive skew in each variable's histogram and Q-Q plot. This is the problem of finite populations and their relation to 'super-populations'. In other words, GDP, levels of national debt, natural resource dependency, and population distribution variables represent 'point in time' data. They will not be representative of the world 10 years ago/10 years from now (see Kuha, 2015, pp. 118-120 on CLT theory).

It is easy to imagine situations where a country's GDP changes (e.g. Syria, Iraq) or where levels of national debt fluctuate (e.g. Greece, Portugal). This is a major challenge in corruption research—data often needs to be normalised for modeling purposes, but since the data has been generalised and modified for model compliance, it ceases to be representative of the world in which any solution brought forth will be forced to operate.

4. Bivariate associations (See: Appendix \mathbb{C}^7)

Appendix C focuses on the relationship between corruption and the 16 variables discussed above. Three (3) variables exhibit corruption association problems: a nation's monitoring institutions, monotheistic religion's dominance, and campaign expenditure limitations. The first variable lacks enough samples in all sub-categories to allow the drawing of any strong conclusions (n < 30 for 2/3 categories). With religion's impact on corruption, we have a similar

⁶ Appendices A, B, and C can be found at www.stefangazenov.com, under the 'Publications' section of the website.

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sample-size issue (n < 30 for 1/2 categories), coupled with a very low Spearman correlation statistic. Party expenditure limitations indicate that there is a low correlation with corruption, and the boxplots demonstrate average values that are quite close to one another. While this would suggest that there is no association between party expenditure and corruption, we are unable to draw any definitive conclusion about acceptance/rejection of the null hypothesis for these variables as the Chi-Square tests are not executable (the ordinal nature of the response variable creates categorical frequencies with fewer than 5 instances, rendering the test obsolete).

Associative strengths have been summarised in the table below—as confirmed by the work of Knack and Azfar, population appears to have the smallest association with corruption (once normalised), followed closely by wealth inequality. Debt level is a problematic variable that needs further study, as it does not have the expected (positive) sign. The size of the civil service, press freedom, natural resource dependency, and level of international investment show moderate correlations to corruption. As expected, rule of law, violence and instability, country wealth, democracy, education, and small business development all show very strong associations with corruption (0.600+), all in the expected direction.

Variable Name	Direction	Correlation
13. Rule of Law	Negative	0.924
15. Violence & Instability	Positive	0.751
3. Country Wealth	Negative	0.743
2. Democracy	Positive	0.616
16. Education Level	Negative	0.633
14. Small business friendliness	Positive	0.617
5. International Investment	Positive	0.590
9. Natural resource dependence	Positive	0.505
12. Freedom of the press	Positive	0.464
1. Civil service size	Positive	0.432
8. Debt Level	Negative	0.331
4. Wealth inequality	Positive	0.256
11. Population	Positive	0.250

5a. Key Observations

In the process of examining the literature on corruption against quantitative datasets, the following observations have been made:

- (i) Data normalisation and modeling assumptions bring into question the substantive ability of empirical testing to provide viable 'real world' solutions to corruption.
- (ii) Empirical investigations do not clarify causal direction between the respondent and explanatory variables.

5B. FUTURE RESEARCH AVENUES

- (i) It was beyond the scope of this paper to conduct a variable multicollinearity analysis and discuss it in any detail—this would be a vital next step.
- (ii) It was outside the scope of this paper to complete a full ordinal regression and discuss its results; this would further clarify if any of the variables fail to contribute to a 'corruption model' once variable-controlling is introduced.
- (iii) A crucial next step would be the creation, and careful calibration, of a stepwise regression model incorporating many of the variables discussed. This undertaking would shed additional light on how the independent variables interact with one another against the dependent variable.

6. Conclusion

In the end, the question of what causes corruption is deceptively simple. While empirical research has given us a vast body of literature on the topic, it has also brought to light the sheer complexity of the problem: corruption is an ever-changing phenomenon, comprised of multifaceted variables, shifting dynamics, and regional intricacies prone to constant flux. This very fact makes the quantitative study of corruption difficult—data normalisation is required to create accurate statistical models, but the very same process distorts all the valuable nuances and idiosyncrasies that informational 'noise' supplies, while the practice of data aggregation compounds the challenge.

This paper has shown that empirical support exists, at least for some of the beliefs articulated in the corruption literature, and yet the fact remains that an exact response to the question of what causes corruption remains elusive.

The exercise undertaken in this paper has not been trivial: its core finding is that a sweepingly reductionist—'one-size-fits-all'—approach will not provide a meaningful solution to a nation's propensity for corruption; in our increasingly interconnected world, corruption continues to exhibit strong, localised dynamics.

We can now come back and answer the question that sparked much of the above research: why is 'power' so reluctant to listen to those 'speaking truth'? It seems that the only way 'power' will listen to 'truth' is if that 'truth' is recognisably local and not a global abstraction. It is the continued work of local analysts, researchers, educators, intellectuals, public sector consultants, and activists that will supply the constant pressure required for the adoption of more transparent practices. It is this type of pinpointed knowledge and expertise—much of it contained in compendium publications such as this one—that will allow those 'speaking truth' to finally be heard.

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