Is Transparency the Best Disinfectant?
A Meta-Analysis of the Effect of Transparency on Government Corruption

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Abstract

Transparency is widely recognized as an anti-corruption strategy. Research on the link between transparency and corruption has burgeoned since the 1990s. We conducted a meta-analysis of 56 empirical studies to estimate the overall effect size of transparency on corruption. The analysis shows that that transparency has a significant, though small, overall effect size in reducing government corruption. While legal transparency with freedom of information laws are important, the effect size is substantially larger with fiscal transparency and e-transparency.

Public administration scholars and practitioners consider government transparency as a fundamental ingredient of good governance. Overall, transparency implies the accessibility of information about government operations and procedures to the public. When government information is available to citizens, the government actions are held in open limelight. People can examine the government actions and know how the actions and decisions were taken. When information about government activities and resultant outcomes are transparent and accessible, citizens and legislators can better monitor how their government functions. Many government agencies have moved from reactive transparency (e.g. providing documents on demand) to proactive transparency (e.g. publishing their data) (Oliver, 2004).

The movement for greater transparency has gained much traction in recent years, especially in democratic societies. Multilateral international development donors such as the Asian Development Bank, Inter-American Development Bank, and World Bank have undertaken transparency initiatives across the world in the past three decades. The International Monetary Fund's *Fiscal Transparency Code and Evaluation* and the Organization for Economic Co-operation and Development's *Global Forum on Transparency* aim to promote fiscal transparency among the countries. Many non-governmental organizations have emerged around the world to monitor government transparency internationally. The Open Government Partnership (OGP) and Global Initiative for Fiscal Transparency (GIFT), both created in 2011, are among the recent global efforts to make governments more open, accountable, and responsive to citizens.

The main impetus for scholars, practitioners and development agencies to focus on government transparency is to reduce corruption, increase government accountability and public trust, and increase citizen satisfaction. The argument is that as a government agency becomes more transparent, it is less likely to be corrupt. As the agency's decision making procedures become clear and are available to public inspection, deviations from the procedures can be identified. Public administrators can then be held accountable to the procedural processes. Critiques argue that the transparency may not, by itself, reduce corruption. Contextual factors, such as citizen characteristics, fiscal and safety concerns, and the culture of openness matter for reducing corruption and increasing accountability (Etzioni, 2010; Ferry and Eckersley, 2014; Heald, 2003; Piotrowski and van Ryzin, 2007). Indeed, the empirical literature on transparency and corruption over the last three decades show mixed results. Given the divergence of the findings and the importance ascribed to transparency as an anti-corruption strategy, it is an opportune time for us to synthesize the findings to estimate the impact of transparency on corruption.

It is in the above context that we conduct a meta-analysis of the effect of transparency on corruption in this paper. Public administration scholars have increasingly used meta-analysis as a rigorous method for synthesizing impacts quantitatively from a set of empirical studies. Perry (2012) called for using meta-analysis as a tool for assessing the current state of knowledge in public administration. Recent meta-analyses in public administration journals have included synthesizing studies on job satisfaction, performance management, and public service motivation (Gerrish, 2016; Homberg, McCarthy and Tabvuma, 2015; Harari et al., 2017). Although transparency and corruption are well researched topics across several disciplines, including public administration and policy, political science, economics, sociology, etc., we have not seen a meta-analysis of the studies to summarize the relationship between the two aspects of governance. Judge, McNutt and Wu (2011) conducted a meta-analysis of antecedents and effects of corruption. One meta-analysis on corruption focused on its relationship with economic growth (Ugur, 2010). Recently, Cucciniello, Porumbescu, Grimmelikhuijsen (2016) conducted a systematic review of the past 25 years of research on government transparency. de Renzio and Wehner (2017) provide an excellent qualitative literature review of existing studies on fiscal

openness. Unlike the systematic and literature reviews which focus on theoretical and empirical articles, the meta-analysis focuses on empirical articles in order to quantitatively synthesize the effect size of the relationship between transparency and corruption. The value of our meta-analysis lies in providing an overall effect size of transparency on corruption across different contexts. It explains the extent to which transparency efforts are significant for reducing corruption.

Overall, we find that the transparency has a significant, though small, effect on decreasing corruption. The paper is structured as follows. The next section outlines the literature on transparency, corruption, and their relationship. Then, we describe the meta-analysis method and our data collection process. After this, we present the results of our analysis. We conclude with a nuanced view of how transparency affects corruption, including on the role of intermediate moderator variables.

Corruption and Transparency: A Literature Review

Corruption. Corruption is frequently defined as the abuse of a public office for private gain of the officeholder (Mauro, 1995). Bribes and kickbacks are common examples of corruption. It is considered to be harmful for democratic decision making process since the decisions are then aligned to the office holder's private interests rather that the public interest. Powerful decision makers could use the public money (raised through taxes, fees, and other means) to fund own activities for their own benefit, thus draining valuable public resources that could otherwise be used for collective benefits. Corruption violates good governance practices as it results in socially sub-optimal allocation. Poor people in developing countries end up paying more share of their earnings than the rich in order to get legitimate services that they are otherwise entitled to. Corruption is also a drain in the economy as funds are used for illicit gains rather than productive use. Corruption could thus impede economic growth (Ugur, 2014).

In the public sector, there could be two forms of corruption: political and bureaucratic. Political corruption refers to abuse of an elected policymaker to formulate the laws and regulations to favor a few that may politically benefit the official. Bureaucratic corruption relates to implementation of public policy, often violating the policy to benefit a few for financial or other personal gains of the official. In either case, the extent of the corruption is hard to know as the activities could be conducted behind closed doors.

Measures of Corruption. As corruption is a clandestine activity, it is hard to measure directly. In their review of corruption measures, Heywood and Rose (2014) argue that we still have a relatively weak understanding of measuring corruption. Existing international methods of measuring corruption are perception-based. There are no internationally recognized objective corruption measures per se, although there are various attempts to obtain non-perceptual measures. We must also recognize the limitations of both perceptual and non-perceptual measures. Perceptual measures do not reflect the reality or experience of corruption, and does not differentiate between different types. Non-perceptual measures cannot be easily standardized across different jurisdictions. Studies using non-perceptual measures are thus focused on specific regions or countries. The U.S. Department of Justice's Public Integrity Section, for example, oversees the federal effort to combat corruption through the prosecution of elected and appointed public officials at all levels of government. It submits an annual report to the U.S. Congress on the charges and convictions of public officials. Such objective data are, however, not available uniformly internationally.

There are three commonly used measures of perceptual corruption that are internationally recognized. These corruption measures are mainly subjective in nature, drawing on surveys. The first is the Transparency International (TI), which publishes the widely used

Corruption Perceptions Index (CPI). The value of CPI ranges from 0 (highly corrupt) to 100 (very clean). The values are derived from surveys that ask questions about bribery of public officials, kickbacks in public procurement, and embezzlement of public funds. The surveys are administered to business people and country experts. The second measure is the World Bank's Control of Corruption Index (CCI) which is also widely used. The index varies from -2.5 to +2.5, with higher scores reflecting less corruption. It is a perceptual measure of country experts, reflecting the extent to which public power is exercised for private gain. It comprises of "both petty and grand forms of corruption, as well as 'capture' of the state by elites and private interests" (Kaufmann, Kraay, and Mastruzzi 2009, 6). The third measure is from International Country Risk Country Guide (ICRG), which is commercial venture for country risk analysis and ratings. The ICRG's Corruption Risk Index (CRI) is constructed to capture the perceptions of business people with regard to actual or potential corruption in the form of excessive patronage, nepotism, job reservations, favor for favor, secret party funding, and suspiciously close ties between politics and business.

Transparency. Piotrowski (2007, p. 10) argues, "Governmental transparency equates to open government through avenues such as access to government records, open meetings, and whistleblower protections." Government transparency has several dimensions, all of which are important concerns for open and democratic government. The first and very basic dimension of government transparency is the freedom of information access, whereby government is legally bound to divulge public information, i.e. the public has a legal right to request and have access to government information. Freedom of Information Access laws ensure that no matter who is in power, public agencies are legally required to provide information upon request. Sunshine laws require that public meetings and decision making processes are made in the public domain which are accessible to all citizens.

The second dimension is the fiscal transparency, which relates to openness of government budgets, expenditures, and taxes. It is the "openness toward the public at large about government structure and functions, fiscal policy intentions, public sector accounts, and budget projections" (Kopits and Craig, 1998, 1). As taxpayers, citizens are stakeholders in the government decision making process. Information about budgets and expenditures should be available to citizens so that the agencies can be held accountable. Fiscal transparency could result in efficiency gains as unnecessary and wasteful spending can be avoided. Whereas greater transparency reduces the scope of governments to manipulate budget information and use fiscal gimmickry (Alt et al., 2014), poor fiscal transparency provides space for governments to engage in deceptive fiscal practices through creative accounting (Weber, 2012).

The third dimension is political, which refers to the political openness of public decision making processes. At one level, the political transparency relates to the openness of the elected representatives; on another level, the political also relates to managerial transparency of the appointed leaders in public organizations. In either case, as representatives of the public, the leaders are accountable to the public in democratic societies. In this vein, the leaders are subject to disclosures, such as conflict of interest, asset ownership, interest group affiliation, legibility in spending public money, and other ethical requirements in order to avoid biased decision making. Independent and free press are critical to maintaining the political transparency, in order to expose governmental activities that are not above board. The news media are often referred to as the fourth state, shedding light on government activities that would otherwise be opaque to the public.

The fourth dimension is e-transparency, which cuts across other dimensions also as a tool for information dissemination and to mobilize collective action. Electronic government has evolved rapidly over the last three decades with the advent of Internet technologies.

Government agencies are large repositories of public data. With electronic government, large amounts of the information can be made available to citizens over the Internet. The technology has enabled greater channels of communications among government officials, politicians, policymakers, and their constituents by allowing easier access to information. The Web 2.0 technologies, such as wikis, twitter, blogs, social networks, and other forms of social media can also arguably increase transparency and accountability (Noveck, 2010; O'Reilly, 2009; Nam, 2012). Scholars and practitioners have broadly celebrated these technologies as being helpful in enhancing trust and confidence in government processes (Cohen, 2006; Tolbert and Mossberger, 2006; Ahn and Bretschneider, 2011). In the United States, President Obama's Open Government Initiative explicitly aimed to take advantage of the Internet technologies to enhance transparency and open government.

The fifth dimension is concerned with the natural resource management. Natural resources like oil, gas, ores, and minerals are crucial to economic development of a country, but the revenues from these resources are also susceptible to corruption and conflict (the so called resource curse) (Havranek, Horvath, and Zeynalov, 2016). Transparency of revenues from the natural resource extraction provides the line of sight into who benefits. The Extractive Industries Transparency Initiative (EITI, begun in 2003) is a nonprofit organization that aims to provide a *global standard to promote transparent and accountable management of natural resources*. Countries that are EITI compliant publish reports of the revenues from the extraction of the country's natural resources; companies involved in the extraction report payments to government. The reports are audited independently and are made available to citizens for public debate on use and management of the resources. The transparency of payments arguably reduces the scope for corruption as the payments are publicly known.

Corruption and Transparency. Openness and legal requirement to disclose government agencies' information could arguably reduce corruption because all the government activities are subject to public scrutiny. Transparency puts government operations under public scrutiny, potentially exposing corrupt practices. Freedom of information requirements impel the lawmakers and bureaucrats to reveal information about their affinities with special interests. Political disclosure requirements relating to conflict of interest and assets provide a public view of how the decisions were made. Making data openly available exposes the public sector performance. Strîmbu and González (2017) argue that more transparency lowers the prevalence of corruption, but the average bribe could rise as corruptors would bid more aggressively for the public official's favor.

More broadly, critics argue that transparency, by itself, may be not enough to curb government corruption. It should be accompanied by the favorable conditions to expose and spread the information and the accountable institutions to sanction corrupt actions (Lindstedt and Naurin, 2010; Vadlamannati and Cooray, 2017). In a similar vein, research on EITI's effectiveness shows that it has little effect on corruption and to address the resource curse issue so far (Kolstad and Wiig, 2009; Corrigan, 2014). Although much information could be accessible and available through public records, the information may never reach a broader audience of citizens. There are three plausible reasons for why this may happen: (1) citizens may be unaware about the information, or even lack the willingness to request public information, (2) citizens may be faced with high cost burdens of obtaining information, and (3) citizens may have limited capacity to process the information even when the costs are low. Budgeting, for example, is a technically complicated field. Without basic knowledge and skills, citizens may find it hard to comprehend the disclosed budget and fiscal information. So, the higher the level of education, the stronger the information processing capacity of people, and the greater the chances for citizens to use the weapon of information to monitor public officials (publicity).

Often, instead of citizens obtaining the public records and documents themselves, they rely on mass media (e.g., newspapers, TVs, radio, social media) to obtain relevant information about government. Lack of independent and credible media may hinder transparent information from becoming subject to publicity, particularly in countries with authoritarian regimes. Free press is therefore crucial intermediary for government transparency. Publicity is very important, but it is an insufficient condition towards curbing government corruption. In order for the open government programs to be successful, Williamson and Eisen (2016) argue that the efforts must benefit specific principals (segments of the public, civil society, media, and other stakeholders) and must be important to these principals, in addition to information accessibility and publicity. The principal beneficiaries should be in a position to respond meaningfully and take actions, or government agencies should support the open government reforms, or the principals should be able to come together to form coalitions and take collective action in order to impel the agencies to undertake reforms. Adequate accountability mechanisms are also required to reinforce good governance through effective sanctioning, e.g. by punishing public officials for corrupt behaviors and misconducts. The two most important sanctioning mechanisms for citizens to hold government accountable are political accountability via free election and legal accountability through rule of law.

Research Methodology and Data

Rationale for Meta-Analysis

Meta-analysis is the "statistical analysis of a large collection of analysis results from individual studies for the purpose of integrating the empirical findings" (Glass, 1976, 3). In essence, meta-analysis is a technique of synthesizing existing empirical studies using quantitative methods. Unlike conventional narrative literature reviews or systematic studies, meta-analysis applies statistical methods and criteria to summarize empirical studies. It enables the extraction of generalizable conclusions from contradictory studies (Stanley, 2001). Statistically, meta-analysis relies on the calculation of effect sizes (e.g., measures of effect that can be compared between and within studies) to compute an average effect size or overall effect size. Meta regression analysis is used to explain the variability in effect sizes across studies. It is often used in medical research as a tool for pooling samples for a more robust evidence based medicine.

There are four reasons for conducting a meta-analysis in this research—two are substantive and two are methodological. Substantively, first, there is wide variation in existing estimates of the impact of transparency on government corruption. Second, the studies emphasize distinctive dimensions of transparency alluded to earlier (e.g., legal, political, fiscal, and e-government). For example, some empirical studies identify public corruption to be negatively and significantly related to the adoption of freedom of information laws (e.g. Islam, 2006), the improvement of fiscal and budgetary transparency (e.g., Hameed, 2005), the disclosure of public officials' assets and incomes (e.g., Vargas and Schlutz, 2016), the implementation of Extractive Industries Transparency Initiatives (EITI) (e.g., Kasekende et al., 2016), and the development of e-transparency (e.g., Zhao and Xu, 2015). While these findings are promising, other studies reveal no significant effects (Relly, 2012) or positive effects due to an increase in detection of corrupt acts (e.g., Vadlamannati and Cooray, 2017). Meta-analysis helps in summarizing these effects across various contexts. For policy analysis purposes, the method helps in to teasing out context specific results using independent variables in meta-regressions (Gerrish, 2016).

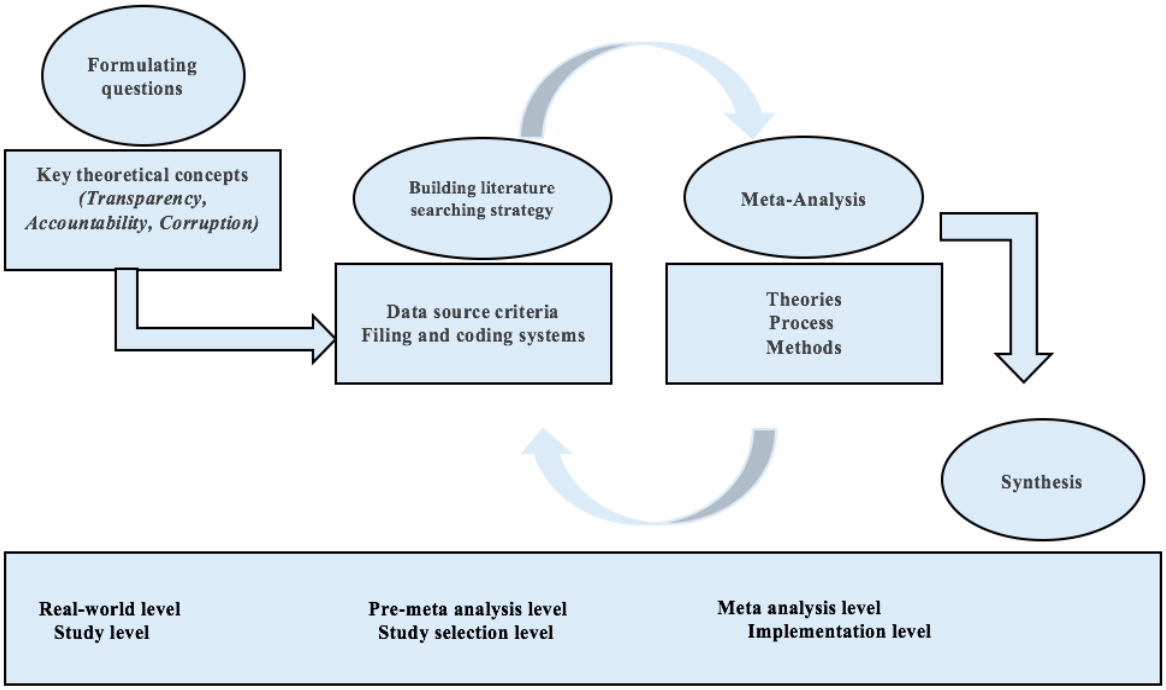
Meta-analysis is advantageous methodologically. First, meta-analysis provides a more objective, reliable, and transparent synthesis than traditional narrative review (Stanley, 2001). Unlike narrative reviews that focus on patterns of arguments and findings in conceptual (i.e. theoretically rich) and empirical (i.e. with measurable quantitative effect sizes) studies, meta-analysis combines statistical findings across empirical studies for point estimates. Second, meta regression analysis helps us estimate the variability in the factors that lead to different conclusions about the impact of transparency on government corruption. Meta-analysis is helpful to test moderator variables, even though the selected study may not have analyzed such variables.

Data Collection

We complied with the standard protocols of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (http://prisma-statement.org/) in conducting the analysis and reporting the results. PRISMA is an industry standard that prescribes a minimum set of items for reporting in systematic reviews and meta-analyses. The PRISMA follows a standard framework of setting the research question, searching and identifying articles, coding the selected studies and to report the results (Figure 1). In our case, our principal research question is: Does transparency significantly impact corruption (either reducing or increasing it)? Hence, our focus is restricted to empirically grounded articles on the relationship between transparency and corruption. Meta-analysis requires that the articles provide a statistical relationship between a measure of transparency and a measure of corruption. Hence, we set out to search with transparency and corruption as keywords. At the first level of search with Google Scholar, the search result with Transparency OR Corruption in the title between 1990 and 2017 yielded about 27,000 results. The Google Scholar search engine is useful for providing an overall count of publications, and particularly to identify unpublished manuscripts (working papers from think tanks and development agencies).

We chose 1990 as the beginning year for three reasons. First, the background work of most international organizations' transparency or corruption initiatives were laid out in the 1990s. The International Monetary Fund's Fiscal Transparency Code and Evaluation was first published in 1998; the Organization for Economic Co-operation and Development's Global Forum on Transparency for Tax was formed in 2000; Transparency International began to formulate corruption index in 1995; World Bank formulated the formal framework for addressing corruption and increasing transparency in 1997. Second, Internet became commercially available in the mid 1990s. Since transparency is increasingly an important aspect of open e-government, which implies the use of Internet technologies to disseminate data, we considered 1990 would be a good start-off year for including in the meta-analysis. Third, transparency and corruption studies increased considerably since the 1990s. Google Scholar search for studies between 1970-1979, 1980-1989, 1990-1999, 2000-2009, and 2009-2017 show remarkable acceleration of articles since 1990. There were 488, 950, 3110, 12500, and 16,700 articles during each of the time period respectively (the cumulative sum exceeds the figure for 1990-2017 presumably because of some duplication in the results during successive periods).

Figure 1. Framework for Meta-Analysis



In the next step, to narrow on articles dealing with transparency and corruption, we searched academic databases. At the same time, we aimed to obtain all publications that relate to these topics broadly. We used ten databases that are common for social sciences in general: EBSCOhost, Ingenta, JSTOR, Proquest, Sage Journals, Science Direct, Springer, Taylor & Francis Online, Web of Science (Core Collection), and Wiley Online Library. We aimed to cast a wider net than public administration journals since transparency and corruption are of sustained interest in economics, political sciences, and sociology. Journals in these fields also carry articles on transparency and corruption. We made a Boolean search with six search phrases. While corruption was the common search term for all the phrases, the other terms were: transparency, freedom of information, rule of law, openness, accountability, and e-government. We selected these search terms in order to reflect transparency's dimensions alluded to earlier.

The databases differed in the document fields that can be searched. Wherever feasible, we applied the search terms to the abstracts to obtain relevant documents; if not, we used the broadest fields available in each database (e.g. topic, keywords, title, or combinations of these terms). We looked for published articles in peer reviewed journals (proprietary or open source), dissertations, conference papers, working papers, and so on. The search results from these databases are given in Table 1. As the table shows, the search yielded 14,097 articles from the academic databases. In addition to these databases, we searched the research publication databases of international development agencies (Asian Development Bank, Inter-American Development Bank, International Monetary Fund, and World Bank). We obtained 99 articles from such sites. Since the databases cover overlapping journals, we had many duplicate articles in the list. We imported the articles in Mendeley desktop, which allowed us to identify the duplicate articles. When we removed the duplicates and sundry unrelated results (e.g. book reviews, letters, anonymous authors, etc.), we had a total of 4,329 articles in the Mendeley database. We manually scanned the articles' titles to identify if they were related to the topic of corruption and transparency. We shortlisted 106 articles that were empirically related to the topic. Finally, we

read the abstracts and the papers to select 56 papers (Figure 2 summarizes the PRISMA flow chart of selecting the articles). These articles had to meet one principal search criterion. They all should be empirical articles that report a quantitative relationship between transparency and corruption. We excluded articles that did not have a regression model with corruption as dependent variable and some form of transparency as the independent or control variable. The search process was carried out between August 2017 and November 2017.

Figure 2. PRISMA Flow Diagram

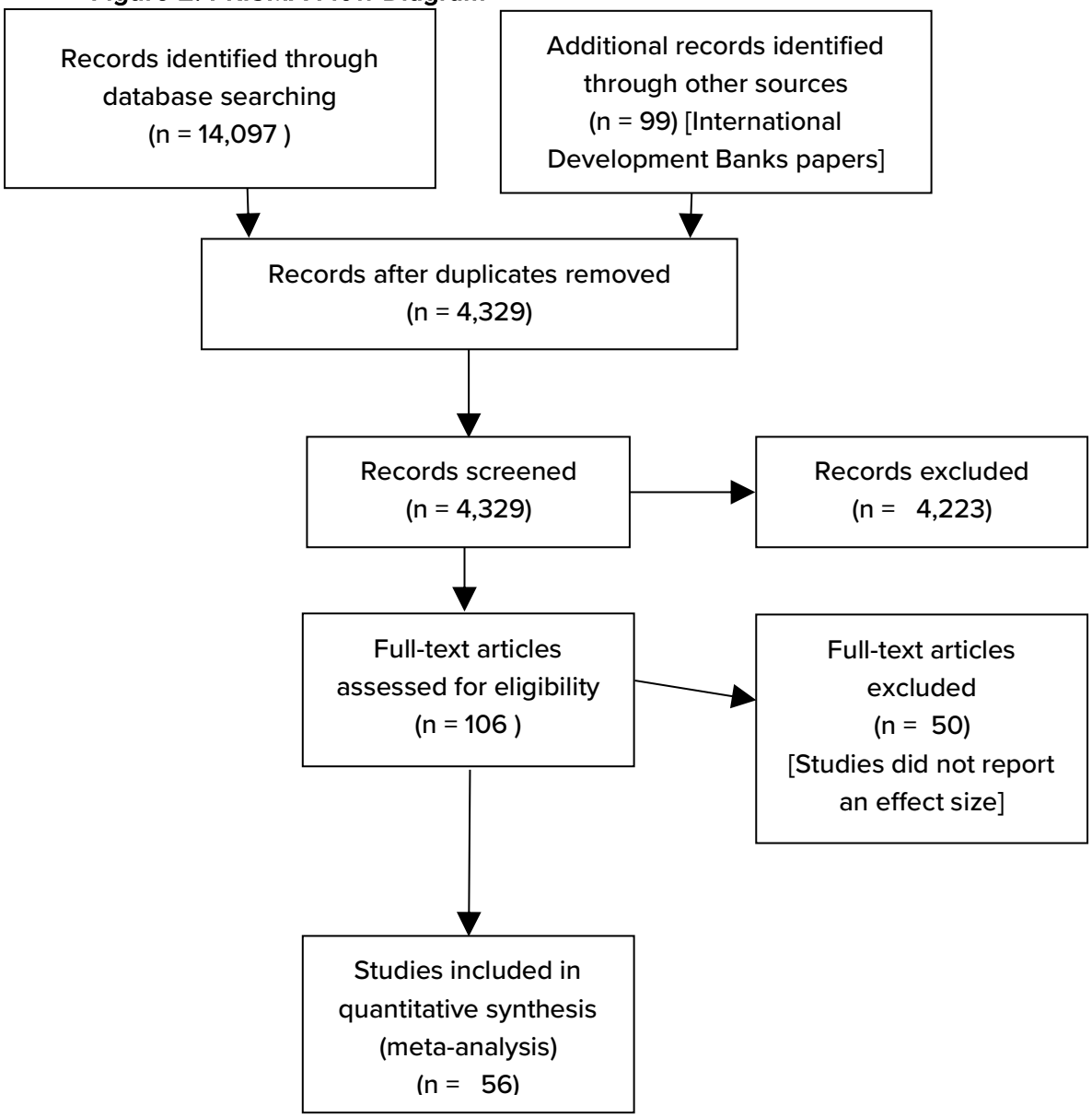


Table 1. Number of Articles from Search Engines

Search Term	*Web of Science*	*Proquest*	*Sage Online*	*Wiley*	*Science Direct*	*JSTOR*	*EBSCO Host*	*Ingenta*	*Taylor & Francis*	*Springer*	*Total*
Corruption AND "Freedom of Information"	26	51	6	9	6	3	7	14	1	47	170
Corruption AND Transparency	748	2067	82	76	121	14	233	374	8	700	4,423
Corruption AND Openness	166	391	53	23	34	2	179	251	4	381	1,484
Corruption AND Accountability	774	1981	93	87	121	11	252	633	36	803	4,791
Corruption AND "Rule of Law"	311	1244	28	61	64	4	197	174	14	668	2,765
Corruption AND E-government	98	136	44	33	58	0	16	31	9	39	464
Gross	2,123	5,870	306	289	404	34	884	1,477	72	2638	14,097

Search conducted for the period 1990-2017.

Variable Coding

After identifying the acceptable studies, they were coded as per PRISMA protocols. The core part of the meta-analysis is to code the effect size and the variables. Every selected study should have an effect, i.e. it should report an association between the independent (transparency) and dependent (corruption) variables. The effects are coded from the studies in order to arrive at the mean effect size, which summarizes the overall relationship between transparency and corruption. These effects form the independent variable and analytical units for the meta-analysis. The variables in the studies form the moderator variables for the meta-analysis. The coding of the effect size and moderator variables are described below.

Effect size (ES). Effect in each study is a measure of association between the explanatory variable (transparency) and the dependent variable (government corruption). A study could report multiple effects because of several model specifications or sampling restrictions. Hence, the values of the effects are coded separately for each model. Since each effect is estimated from different samples, we need to convert the estimates into a standardized measure for arriving at the mean effect size. As the variables of our interest are ratio measures, we use the r-based effects, following Ringquist (2013) and Homberg, McCarthy, and Tabvuma (2015).

The r-based effects draw on the distributions of Pearson's r and Fisher's Z_r in order to standardize the effect measures. Pearson's r is first calculated for each effect, which is given by $r = t^2/(t^2 + df)$, where *t* is the t-statistic and *df* is degrees of freedom. Although Pearson's r is comparable across studies, it is not directly used for synthesis because of three reasons (Ringquist 2013). First, Pearson's r is bounded between -1 and 1, which means that it is truncated. Second, Pearson's r is heteroskedastic and its variance depends on the correlation value. Third, Pearson's r has a small downward bias of the population parameter. Instead of directly using Pearson's r, therefore, it is transformed to Fisher's Z_r which is given by $Z_r = 0.5ln\,[(1 + r)/(1 - r)]$. The variance of Fisher's $Z_r\ is\ V[Z_r]$ = 1/(n-3). The resulting Fisher's *Z* scale is used for synthesizing the mean effect size. The difference in value between *r* and *Z* is small for *Z* values less than |0.40| (it is less than 0.02); hence, the difference does not affect interpretation of the coefficients meaningfully when the values are small.

Moderating variables (Moderators). The moderating variables are the factors that could systematically influence the magnitude of the effect size. Some variables (e.g. subjective and objective corruption indicator, peer-reviewed publication or not) have binary values (0 or 1); in these instances, these variables are indicated by one dummy variable. Most of the other variables have more than one value. In these cases, one value is considered as the base and the others are coded as dummy variables. The dummy variables would reflect the difference between the category and the base. The descriptive statistics of the moderating variables are given in Table 2.

The first set of moderating variables relate to how corruption is measured. We used two types of corruption indicators—subjective (perceptual measure) and objective (non-perceptual measure). If a study used subjective corruption measure, the effect sizes were coded as 1; if the study used an objective corruption measure, the effect sizes were coded as 0. Furthermore, the subjective corruption indicators used in cross-country comparative studies are typically from Transparency International (CPI), World Bank (CCI), and ICRG (CRI). Hence, we coded these three subjective measures as three dummy variables, indicating which measure was used in the study. As the Table 2 shows, 83% of the selected studies' effect sizes were subjective in nature. About one-third used the CPI and slightly less share used CCI. Only four studies used objective measures. Etter (2012) used the bribe payment experiences of firms collected through World

Bank Enterprise Surveys (WBES). Cordis and Warren (2014) used criminal convictions in Federal District Courts of federal, state, and local public employees for official misconduct or misuse of office. Olken (2007) utilized the missing expenditures in Indonesian villages' road construction projects. Azfar and Nelson (2007) used the number of valuable tiles that an executive steals as an objective corruption measure.

The second set of moderating variables is transparency itself, which may be used as an explanatory or control variable in the study. As the empirical studies emphasize different dimensions of transparency reforms and initiatives, there is no singular conception of transparency. We identified five dimensions of transparency for coding from the studies. The first is the legal transparency, which refers to adoption and implementation of freedom of information acts (FOIA). The second is the fiscal transparency, which focuses on the public access to information on budgets and expenditures. The third is the political transparency, which generally pertains to disclosure of public officials' assets and campaign finances. The fourth is the e-transparency, which pertains to the use of e-government to promote government transparency. The fifth is the natural resource transparency by being a member of the Extractive Industries Transparency Initiative (EITI), which aims to promote the open and accountable management of oil, gas and mineral resources. We used the legal transparency as the base and used dummy variables for the other four dimensions. Legal transparency was used most often (29% of the effect sizes), followed closely by e-transparency (about 26%).

Table 2. Descriptive Statistics for Moderator Variables

Moderator	*N*	*Share*	*Min*	*Max*
Measurement of Corruption				
Subjective Indicator	372	83%	0	1
Corruption Perception Index (CPI)	150	33%	0	1
Control of Corruption Index (CCI)	139	31%	0	1
Corruption Risk Index (CRI)	61	14%	0	1
Form of Transparency				
Legal Transparency (FOIA Law)	126	29%	0	1
Fiscal Transparency	80	18%	0	1
Political Transparency	49	11%	0	1
E-Transparency	117	26%	0	1
Natural Resource Transparency	57	13%	0	1
Good Governance for Transparency				
Publicity	22	5%	0	1
Accountability	14	3%	0	1
Research Design				
Experimental Design	49	11%	0	1
Addressed Endogeneity	74	17%	0	1
Time Period (>= 5 years)	51	12%	0	1
Data Structure (Used Panel Data)	108	24%	0	1
Publication quality (Peer-Reviewed)	320	71%	0	1
Study Context				

Country-Level Study	360	80%	0	1
High-Income Country	131	30%	0	1
Total Number of Observations (Effect Sizes)	450			

The third set of moderating variables are the mechanisms to reinforce good governance. Free press is crucial intermediary for publicity of government information; accountability mechanisms are required for effectively sanctioning corrupt behavior. Publicity and accountability are measured as dummy variables. However, these moderators were not very often used by the studies. Publicity was included in only 5% of the effect sizes, and accountability was included in only 3% of the effect sizes.

The fourth set of moderating variables are related to the research method and publication characteristics of the study. They include the research design, concern for endogeneity, time period, data structure, and quality of publication. Each of these is coded as a dummy variable. For *research design*, experimental design is coded as 1 and 0 otherwise. Experimental design generally involves randomized control and experimental groups; outcomes are observed before and after the treatment variable (i.e. transparency). It has the strongest potential to detect causal inference. However, only 11% of the effect sizes were based on experimental design. *Endogeneity* is a concern because the causality directions could be reverse (i.e. existence of corruption could impel higher need for transparency). The dummy variable is coded as 1 if the study includes an endogeneity concern; it is coded as 0 if it is otherwise. About 17% of the effect sizes took endogeneity into consideration. The methods for tackling endogeneity included such means as the instrumental estimation of Two-Stage Least Squares (2SLS), Generalized Moment of Method (GMM), and Matching design. The *time period* is important since the effect of transparency policy on corruption can evolve over time. As Vadlamannati and Cooray (2017) contend, transparency has dual effect on corruption: the detection effect of identifying more corrupt behaviors and the deterrence effect of preventing corrupt misconduct. In the short-term, the magnitude of the detection effect is greater than that of the deterrence effect. However, in the long run (more than 5 years), transparency is significantly associated with less corruption because the deterrence effect outweighs the detection effect. So, the dummy variable is coded as 1 if the effect size is based on a long time period (5 years and above); 0 if it is otherwise. With respect to *data structure*, use of panel data is coded as 1 and use of cross-sectional data is coded as 0. In comparison with cross-sectional data, panel data has the advantage of using the fixed-effect method to account for unobserved heterogeneity. About a quarter of the studies used panel data. With respect to *publication quality*, effect sizes in peer-reviewed studies is coded as 1; if it is non-peer reviewed (e.g. book chapter, thesis, or working paper), the study is coded as 0. Peer-reviewed journal publications are arguably of better quality than others since they go through double-blind scrutiny before getting published. Nearly 70% of the effect sizes are from peer reviewed studies.

The final set of moderating variables relate to the study's context. The first dummy variable indicates whether the effect size is estimated at cross-country level as opposed to subnational level (state and local governments). This variable is to detect if transparency policies are more significant at the national or sub-national level. About 80% of the effect sizes are at the national level. The second variable is whether the effect-size estimate is based on data from high-income countries as opposed to lower-middle, upper-middle, and low-income countries. We used the World Bank classification, which groups countries into four income groups: low, lower-middle, upper-middle, and high based on gross national income (GNI) per capita in U.S. dollars. We coded the variable as 1 if the size effect included high income countries, 0 if not. This

variable is intended to see if income levels are significant for transparency policies to be more effective. About 30% of the effect sizes are from high income countries.

Meta-Regression

Meta regression is the main tool for meta-analysis. When there is significant variation in effects between and within studies, an interesting question is why these selected studies reach different conclusions concerning the impact of transparency on government corruption. The meta-regression analysis answers this question by including the moderating variables that could help us explain the systematic variability in effect sizes both within and across studies (Stanley and Jarrel, 1989).

Two methodological issues need to be addressed in the estimation of the meta-regression model (Ringquist, 2013). The first issue is heteroskedasticity. This concern arises because the effect sizes are calculated from the selected studies with varying sample sizes. As sample size increases, variability of effect sizes decreases because of reduced sampling error. The second one is non-independent observations. In general, a single study could report effect sizes from multiple models that include different moderator variables. It is useful to retain the multiple effect sizes from a single study for estimating the effects of the moderator variables (Ringquist, 2013; Thompson and Higgins, 2002). However, by doing so, effect sizes from selected studies may not be independent; they could be correlated due to similarity in data sources and estimation procedures.

To solve the above two challenges, we rely on two regression techniques. First, a weighted least squares regression (WLS) with clustered robust standard errors is employed. The WLS tackles the heteroscedasticity problem by weighting each estimate with the inverse of the sample size. The multiple effect sizes are clustered within selected studies, so that clustered robust standard errors address the non-independence of effect sizes in meta-regression (Sterne et al., 2002). Second, as suggested by Ringquist (2013), we use the generalized estimating equations (GEE) as a way to correct the non-independence. GEE assumes that effect sizes from within-studies produce less information than those from different studies (between studies), and thus adjusts the model estimation by placing less weight on effect sizes from studies with multiple effect sizes (Burton, Gurrin, and Sly, 1998; Zorn, 2006). Comparing meta regression analysis with cluster-robust variance estimation and GEE estimation provides greater confidence in our research findings.

Publication Bias

One salient issue that threatens the validity of meta-analysis is publication bias. If studies are systematically excluded from our selection, the average effect size estimated could be inaccurate. Whereas published articles are included in the meta-analysis, systematic publication bias may arise if the unpublished articles are not included. Two reasons often contribute to publication bias (Stanley, 2008). First, journal editors and reviewers are favorably oriented toward publishing studies with results that are statistically significant, and they reject studies with results that are either not significant or are contrary to expectations (positive publication bias). Second, researchers do not submit studies that are not statistically significant or run counter to the expectations of the literature (the file drawer problem). The publication bias could result in overestimating the average effect size in meta-analysis (Sutton, 2009).

In this analysis, we use multiple ways to detect publication bias: funnel plot (Stanley and Doucouliagos, 2012), the Begg's and Egger's tests (Begg and Mazumdar, 1994; Egger et al., 1997), and the inclusion of a moderator in the meta-regression to test whether the effect size in

the published studies are systematically different from those in the unpublished ones. *Funnel plot* is a visual aid for detecting bias. It is a scatter plot of the effect sizes against a method of precision (typically their standard errors) for studying of association. A full set of unbiased studies would produce a symmetric funnel shape, with the scatter increasing as the precision decreases. An asymmetric funnel indicates a correlation between effect size and precision, which is most likely to be due to heterogeneity or publication bias. The Begg's test is a rank correlation test, assessing the relationship among the effect sizes and their variances. It uses the Kendall's tau, a statistical test commonly used for rank correlation. The Egger's test is a linear regression-based test, which detects asymmetry by determining whether the intercept deviates significantly from zero in a regression of the effect sizes estimates versus their precision. The intercept should be close to zero. If either of the two tests turn out to be statistically significant, there is likely to be publication bias.

Empirical Results

Effect Size Analysis

We coded a total of 450 effect sizes from the 56 selected studies. Table 3 presents the number of effect sizes from each study and the overall effect size. The effect sizes range from -0.829 reported in Oge (2016) to 0.306 reported in Cordis and Warren (2014). Among them, 349 effect sizes are negative, 44 effect sizes are positive, and 57 effect sizes are null associations. Negative association implies that increase in transparency reduces corruption. Positive association implies that increase in transparency increases corruption. Null association means that transparency did not have a statistically significant effect on corruption.

The effect sizes could be combined using a fixed-effects or a random-effects model. The fixed-effect model assumes that all selected studies share a true effect size and differences in observed effects are due to sampling error; the random-effects model relaxes the assumption to allow that the true effect size could vary between the studies. We need to assess the effect size heterogeneity to choose between a fixed-effects and random-effects model. The Q test is a chi-square statistic used to test the null hypothesis that the variation among the effect sizes is explained by sampling error alone. Our Q-test shows that the null hypothesis could be rejected ($Q=6744.31$; $p<0.0000$). Complementary to the Q-test, the I^2 statistic is calculated to further identify the proportion of the variability in effect sizes that cannot be attributed to sampling error (Higgins and Thompson, 2002). Our I^2 value is 99.2%, implying very high proportion of heterogeneity in observed effects among the studies due to variation in true effects. The high degree of heterogeneity suggests that we use the random effects model, which provides more conservative estimate of the effect size than the fixed effects model.

Recent articles on meta-analysis methods provide a caution against the improper use of Q-test and I^2 to test heterogeneity and using them as the sole basis for choosing between fixed-effects and random-effects models (Borenstein et al., 2016; Hoaglin, 2016). Hoaglin (2017) calls for careful analysis: "Researchers who use them in assessing heterogeneity in a meta-analysis should carefully examine a forest plot of the studies' observed effects, to ensure that they notice any apparent outliers and distinct clusters of effects" (Hoaglin, 2017, p. 504). The forest plot is a graphical representation of all the effect sizes from the selected studies (Figure 3). The mean effect size of each study is indicated by a black dot, and the 95 percent confidence interval is indicated by a black horizontal line. The vertical dashed line gives the overall effect size from all the studies. The rightmost column gives the relative weight of each selected study (i.e. how

much the mean relies on the individual study).[1] The forest plot shows that there is significant heterogeneity, which implies that the context is important for the results of the selected studies. There is one outlier (Oge, 2016), and some are clustered around the average.

Overall, the unconditional weighted average effect size in Fisher's z is -0.022 (z=12.54, p<0.0000), with a 95% confidence interval of [-0.026, -0.019]. The effect size is unconditional because it is not contingent on the other independent variables (considered later in the meta-regression). This unconditional average effect size is statistically significant, and the negative association implies that transparency is correlated with lowering government corruption. However, the magnitude of the association is only -0.022, which is very small.[2] A 100% increase in average transparency would be correlated with a 2.2% decrease in average corruption (the decrease could range between 2.6% and 1.9%). The small degree of effect size is not unusual, and is in good company with some of the other meta-analytic studies in public policy and management. Mean effect sizes are typically small: Gerrish (2016) found that the mean effect size was 0.03 in his meta-analysis of impact of performance management on performance in public organizations; Anderson, Guzman, and Ringquist (2013) found the effect size of education vouchers on student performance to be 0.009; Bolinger and Xu (2013) found the effect size of poverty deconcentration to be -0.01 on economic well-being and 0.003 on negative behaviors; Ugur (2013) found the effect size of corruption on per-capita GDP growth to be −0.072. The mean effect size also denotes the average change, and the context matters for the extent of the change. The contingent contextual factors are further explored with the meta regression analysis.

[1] In meta-analysis, the weights are the precision with which the effect size is estimated. More precisely estimated effect sizes have larger weights (Ringquist 2013). Precision is defined as the inverse of the effect size variance. Recall that Fisher's Zr is given by Zr=0.5ln[(1+r)/(1-r)]. The variance of Fisher's Zr is V[Zr] = 1/(n-3). So, the weight, which is the inverse of the effect size variance is calculated as 1/ V[Zr] = 1/1/(n-3)=(n-3). So, it can be seen that meta-analysis gives greater weight to effect size estimated from large samples because more precise effect sizes come from studies with larger sample size.

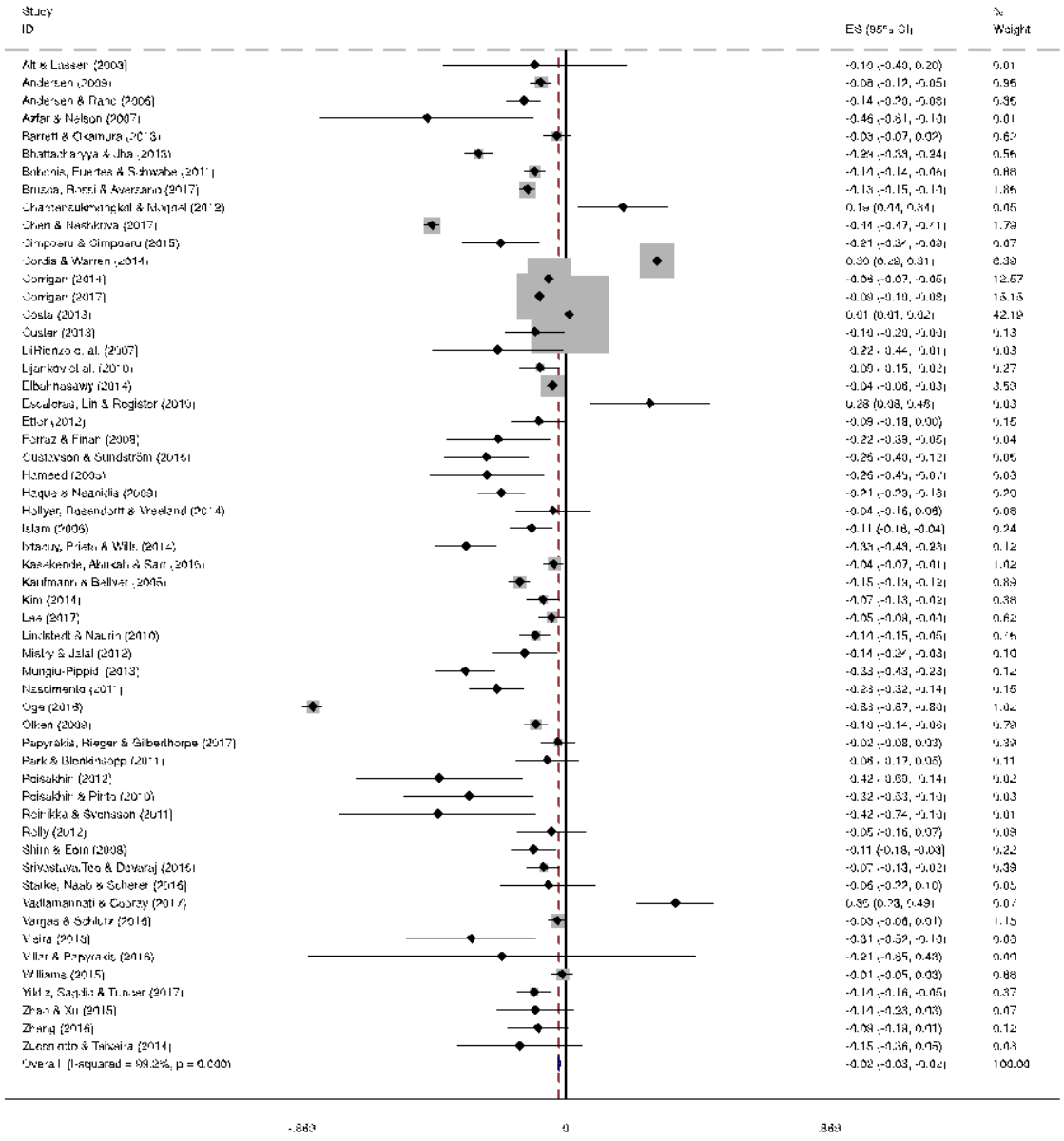
[2] The Costa study gets the largest weight of 42%. As a robustness check, we excluded the Costa study and recalculated the average effect size with 55 studies. The new average effect size is -0.048, with 95 confidence level of [-0.052, -0.043]. There is no huge difference between our original result of -0.022 and this new result of -0.048.

Table 3. Effect Sizes of the Studies (N=56)

#	Study ID	# of Effect Size	Average Effect Size	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound	% Weight
1	Alt & Lassen (2003)	1	-0.102	-0.405	0.2	0.01
2	Andersen (2009)	25	-0.083	-0.118	-0.047	0.96
3	Andersen & Rand (2006)	8	-0.138	-0.196	-0.08	0.36
4	Azfar & Nelson (2007)	4	-0.456	-0.492	-0.401	0.01
5	Barrett & Okamura (2013)	2	-0.029	-0.073	0.015	0.62
6	Bhattacharyya & Jha (2013)	48	-0.287	-0.333	-0.24	0.56
7	Bobonis, Fuertes & Schwabe (2011)	10	-0.102	-0.139	-0.065	0.88
8	Brusca, Rossi & Aversano (2017)	3	-0.126	-0.167	-0.011	1.86
9	Charoensukmongkol & Moqbel (2012)	4	0.189	0.221	0.167	0.05
10	Chen & Neshkova (2017)	16	-0.441	-0.07	-0.018	1.79
11	Cimpoeru & Cimpoeru (2015)	1	-0.213	-0.342	-0.085	0.07
12	Cordis & Warren (2014)	24	0.301	0.334	0.287	8.39
13	Corrigan (2014)	8	-0.057	-0.076	-0.042	12.57
14	Corrigan (2017)	10	-0.087	-0.018	0	15.15
15	Costa (2013)	22	0.013	-0.018	-0.007	42.19
16	Custer (2013)	5	-0.1	-0.198	-0.003	0.13
17	DiRienzo et al. (2007)	1	-0.223	-0.44	-0.007	0.03
18	Djankov et al. (2010)	7	-0.085	-0.152	-0.018	0.27
19	Elbahnasawy (2014)	16	-0.044	-0.062	-0.026	3.59
20	Escaleras, Lin & Register (2010)	45	0.278	2.982	2.555	0.03
21	Etter (2012)	6	-0.089	-0.178	0.001	0.15
22	Ferraz & Finan (2008)	2	-0.222	-0.2	-0.236	0.04
23	Gustavson & Sundström (2016)	2	-0.26	-0.398	-0.123	0.06
24	Hameed (2005)	2	-0.26	-0.449	-0.072	0.03
25	Haque & Neanidis (2009)	13	-0.211	-0.29	-0.133	0.2
26	Hollyer, Rosendorff & Vreeland (2014)	1	-0.04	-0.162	0.082	0.08

27	Islam (2006)	8	-0.113	-0.184	-0.042	0.24
28	Ixtacuy, Prieto & Wills (2014)	4	-0.328	-0.43	-0.227	0.12
29	Kasekende, Abukab & Sarr (2016)	6	-0.04	-0.074	-0.005	1.02
30	Kaufmann & Bellver (2005)	21	-0.152	-0.189	-0.115	0.89
31	Kim (2014)	4	-0.074	-0.13	-0.018	0.38
32	Lee (2017)	4	-0.046	-0.09	-0.002	0.62
33	Lindstedt & Naurin (2010)	15	-0.1	-0.151	-0.049	0.46
34	Mistry & Jalal (2012)	4	-0.135	-0.244	-0.026	0.1
35	Mungiu-Pippidi (2013)	3	-0.33	-0.429	-0.232	0.12
36	Nascimento (2011)	6	-0.226	-0.316	-0.136	0.15
37	Oge (2016)	6	-0.834	-0.869	-0.799	1.02
38	Olken (2009)	5	-0.098	-0.101	-0.086	0.79
39	Papyrakis, Rieger & Gilberthorpe (2017)	1	-0.025	-0.081	0.031	0.39
40	Park & Blenkinsopp (2011)	1	-0.06	-0.166	0.045	0.11
41	Peisakhin (2012)	6	-0.416	-0.299	-0.333	0.02
42	Peisakhin & Pinto (2010)	2	-0.319	-0.356	-0.289	0.03
43	Reinikka & Svensson (2011)	6	-0.421	-0.451	-0.401	0.01
44	Relly (2012)	2	-0.048	-0.162	0.067	0.09
45	Shim & Eom (2008)	8	-0.106	-0.18	-0.031	0.22
46	Srivastava,Teo & Devaraj (2016)	5	-0.072	-0.063	0.048	0.39
47	Starke, Naab & Scherer (2016)	1	-0.057	-0.215	0.101	0.05
48	Vadlamannati & Cooray (2017)	15	0.3614	0.233	0.489	0.07
49	Vargas & Schlutz (2016)	3	-0.026	-0.059	0.006	1.15
50	Vieira (2013)	4	-0.311	-0.356	-0.257	0.03
51	Villar & Papyrakis (2016)	8	-0.21	-0.347	-0.301	0.004
52	Williams (2015)	6	-0.011	-0.048	0.026	0.88
53	Yildiz, Sagdic & Tuncer (2017)	5	-0.103	-0.161	-0.046	0.37
54	Zhao & Xu (2015)	3	-0.099	-0.228	0.03	0.07
55	Zheng (2016)	1	-0.09	-0.191	0.011	0.12
56	Zuccolotto & Teixeira (2014)	1	-0.151	-0.356	0.055	0.03
	Overall (Study-level, Random Effects)	450	-0.022	-0.026	-0.029	100

Figure 3. Forest Plot of Effect Sizes and Confidence Intervals



Meta-Regression Analysis: Effect Size Moderators

As described earlier, we used two meta-regression models: Model 1 with weighted least squares regression (WLS) with clustered robust standard errors (which controls for heteroscedasticity) and Model 2 generalized estimating equations (GEE) (which controls for non-independence). Using both models provides greater confidence in our research findings. Overall, both models produce similar parameter estimates and mostly show the same variables as statistically significant (Table 4). The Model 1 shows that the R-squared value is 0.74, which is high and implies that the model captures 74% of the moderating variables that explain the differences between the studies. The Wald chi-square statistics in Model 2 indicate that the moderator variables are the jointly significant (different from zero). The intercept value is also of

interest in both models. In meta-regression, the intercept shows the conditional baseline effect size which is the average effect size when all the moderator variables have zero value. The baseline effect is significant and negative in both models, but small (0.02). It implies that baseline transparency efforts (which includes Freedom of Information Access laws in our case) is significant and correlated with reducing corruption, even though the impact is small.

Measurement of corruption. The moderating variable of corruption measures is used to test how the measurement of corruption is taken into account in the selected studies. The meta-regression models show that the subjective measures are negative and significant. That is, the transparency efforts have a stronger effect in curbing government corruption when the effect sizes are related to the subjective perception as opposed to objective indicators of corruption. We further broke down the subjective corruption indicators into the three common ways in which corruption is perceptually measured—the Transparency International (TI)'s Corruption Perceptions Index (CPI), the World Bank's Control of Corruption Index (CCI), and the International Country Risk Country Guide (ICRG) Corruption Risk Index (CRI). We find that only CPI is significant and negative; CCI and CRI are not. That is, the effects of transparency efforts in curbing government corruption is stronger when the effect sizes of the selected studies use CPI, but not so with CCI and CRI. These results confirm that the model by which corruption is measured matters for the effect size of transparency.

Form of transparency. The meta-regression models test the effects of the five types of transparency: adopting Freedom of Information Act (FOIA), Fiscal Transparency, Political Transparency, E-Transparency, and Natural Resource Transparency. As we used FOIA adoption as the base, its impact is already reflected in the baseline effect size (the intercept). The results of both meta-regression models show that two moderators—Fiscal Transparency and E-Transparency—are negative and statistically significant. These findings indicate that transparency efforts play a larger role in reducing government corruption when the effect sizes of the selected studies include fiscal transparency and e-transparency. Disclosing information about government's fiscal and budgetary activities and the use of e-government processes to promote transparency reinforce the passing the freedom of information laws in curbing corruption. However, the results indicate that the effects of political and natural resource transparency in reducing government corruption are not significantly stronger than those of the base of FOIA adoption.

Publicity and accountability. The meta-regression models test whether the two good governance practices, namely publicity and accountability, make transparency more effective in reducing corruption. A caution to note is that these two variables are considered by only 5% and 3% of the effect sizes. We find that in both models, the dummy variable of accountability condition is negative and statistically significant. The finding implies that transparency efforts are more effective in reducing government corruption when the effect sizes of the selected studies take accountability (i.e. electoral democracy and well-functioning rule of law) into consideration. Interestingly, the GEE meta-regression model shows that publicity is significant, but the WLS regression model does not. This implies that free press could enable citizens to better use the power of information to monitor the conduct of public officials and therefore make transparency more effective in reducing corruption (Lindstedt and Naurin 2010; Vadlamannati and Cooray 2017)

Research design. Five moderators related to research design are tested in the meta-regression. The moderators are whether the study used experimental design, addressed endogeneity, considered long time period (5 years or more), used panel data, and underwent peer-review. We find that the first three factors are significant and negative, the fourth factor is significant but positive, and the last is not significant in both meta-regression models. The finding implies that

the effect sizes of transparency in curbing government corruption are stronger when the studies use a rigorous experimental design, addressing the problem of endogeneity, and using a long time period. The positive sign with respect to panel data implies that the use of cross-sectional data may overstate the impact of transparency. The rationale for such overstatement could be that the cross-sectional studies do not control for unobserved heterogeneity that might contribute to the variation of corruption. Lastly, whether or not a study was peer reviewed did not really affect the study findings.

Table 4. Meta-Regression: Impact of Moderators on Government Corruption

Moderator	*Model 1*	*Model 2*
	Weighted Least Square	Generalized Estimating Equations
Measurement of Corruption		
Subjective Indicator	-0.025**	-0.014**
	(0.011)	(0.007)
Corruption Perception Index (CPI)	-0.0214**	-0.0233**
	(0.010)	(0.011)
Control of Corruption Index (CCI)	0.033	0.035
	(0.026)	(0.026)
Corruption Risk Index (CRI)	0.028	0.030
	(0.028)	(0.028)
Form of Transparency [Base: Legal Transparency (FOIA law)]		
Fiscal Transparency	-0.071**	-0.071*
	(0.041)	(0.039)
Political Transparency	-0.009	-0.010
	(0.021)	(0.021)
E-Transparency	-0.041**	-0.045**
	(0.019)	(0.020)
Natural Resource Transparency	0.040	0.030
	(0.027)	(0.022)
Good Governance for Transparency		
Publicity	-0.029	-0.036**
	(0.017)	(0.014)
Accountability	-0.036***	-0.039*
	(0.011)	(0.022)
Research Design		
Experimental Design	-0.041***	-0.041***
	(0.002)	(0.002)
Addressed Endogeneity	-0.089***	-0.092***
	(0.028)	(0.027)
Time Period (>=5 years)	-0.025**	-0.039*
	(0.011)	(0.022)
Data Structure (Used Panel Data)	0.068***	0.022*
	(0.024)	(0.012)
Peer-Reviewed (Peer-Reviewed)	-0.011	-0.018

	(0.028)	(0.025)
Study Context		
Country-Level Study	-0.0243**	-0.052*
	(0.012)	(0.028)
High-Income Country	-0.022*	-0.022
	(0.011)	(0.016)
Constant (Baseline Effect Size)	-0.024*	-0.022*
	(0.010)	(0.012)
Observations	450	450
F-statistics	42.85***	-
Wald chi-square	-	238.15***
R-squared	0.742	-
Number of Studies	56	56

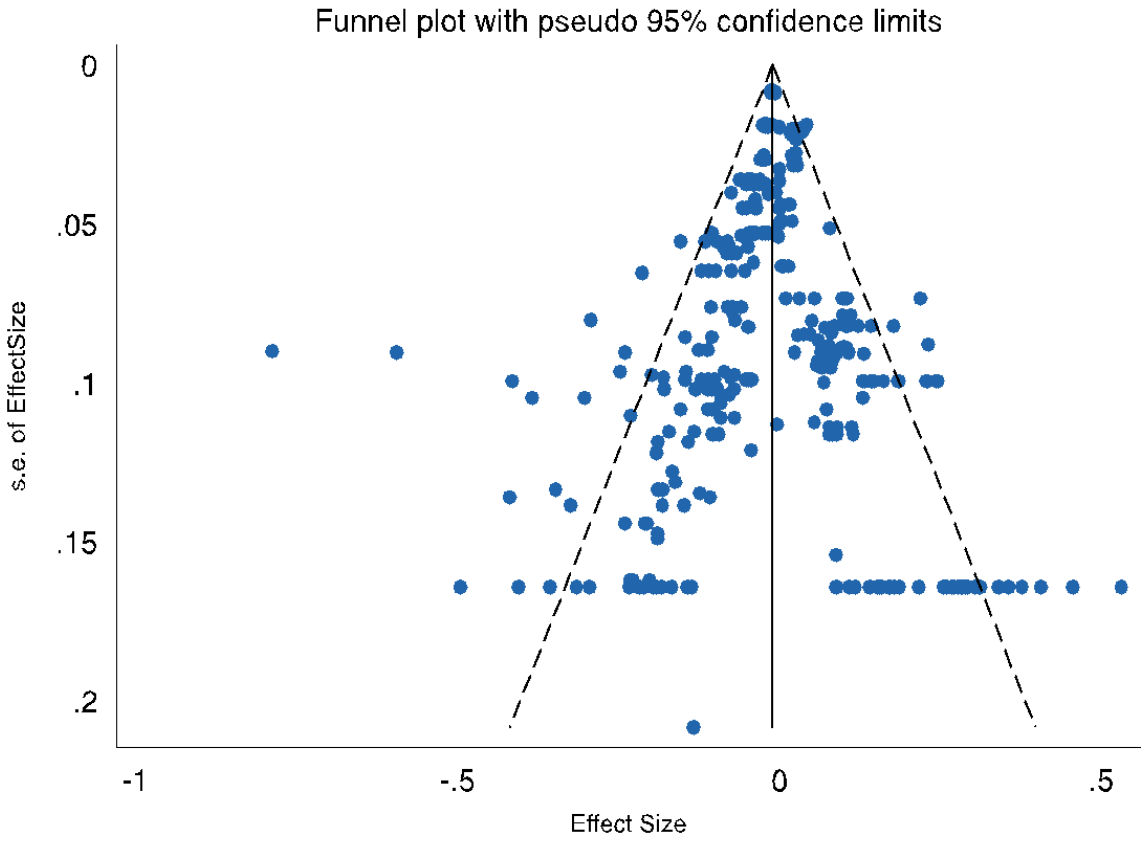
Note: Robust standard errors in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

Study context. The final set of moderating variables take the study context into account in the meta-regression models. There are two aspects of the study context—whether or not the study deals with the national (country) level, and whether or not the study deals with high income countries. We find that the country level is significant and negative in both models. That is, the effect of transparency in curbing government corruption is stronger when the effect sizes of the selected studies focus at the country level, than it is at the state and local government levels. In addition, the WLS model shows that the high income countries are weakly significant and negative. That is, transparency plays a greater role in reducing government corruption when the selected studies focus on high-income countries. This may be due to high-income countries usually are associated higher levels of electoral democracy and rule of law, which may be conducive to making transparency more effective in sanctioning and deterring corrupt misconducts.

Publication Bias

Publication bias arises if there is systematic difference between published journal articles and unpublished articles in terms of their findings on the relationship between transparency and corruption. We checked for the potential of publication bias in three ways. First, we used the funnel plot for a graphical examination of the effect sizes. The funnel plot is a scatter plot of the effect sizes estimate against their standard errors (Figure 4). An asymmetric plot would reflect publication bias. The funnel plot is close to being symmetric, although there are a few more negative effects in the lower-right quadrants. Second, we conduct the Egger's and Begg's tests. Both these tests show that the correlations are not significant (Egger's test is t=-1.35, p>0.1; and the Begg's test is Z=-0.20, p>0.1). There is no publication bias. Third, as explained before, we included a moderator called peer review publication in the research design. It tested whether the effect size in the published studies are systematically different from those in the unpublished ones. Both meta-regression models' results show that there is moderator is not significant. Thus, all three methods consistently show that there is no evidence of publication bias. In sum, we conclude that our meta-regression analysis is not skewed by publication bias.

Figure 4. Funnel plot



Conclusion

High-level political leaders need clear, consistent, and credible evidence-based rationales to champion government transparency policies. This meta-analysis synthesized 56 studies with 450 effect sizes to arrive at the overall impact of transparency. We find that transparency has a statistically significant, even if small, impact on reducing government corruption. A 100% increase in the transparency efforts would, on average, be correlated with reducing government corruption by 2.2% (with a 95% confidence interval of reduction between 2.6% and 1.9%). However, as our study shows, there is significant heterogeneity in the studies. Other moderating factors matter for how transparency impacts corruption.

To account for the variation about the effect size of corruption in curbing government corruption, our two meta-regression models tested the other moderating factors that influence the impact of transparency on corruption. Several moderators contribute significantly to increasing the effect size. First, the way in which corruption is measured matters: effect sizes that consider the subjective measures are larger than objective measures. In particular, effect sizes using Transparency International's Corruptions Perception Index are greater than using the other subjective corruption indicators.

Second, with respect to the form of transparency, both meta-regression models show that fiscal transparency and e-transparency are statistically significant. This infers that fiscal and e-transparency efforts play a larger role in reducing government corruption than the legal transparency (the adoption of FOIA laws). Disclosing information about government's fiscal and budgetary activities and the use of e-government processes to promote transparency reinforce

the passing the freedom of information laws in curbing corruption. In contrast, political and natural resource transparency are not statistically significant in both meta-regression models. This means that the effects of these two forms of transparency in reducing government corruption are not different from those of the legal transparency.

Third, with respect to the good governance factors that reinforce transparency, accountability is significant in both meta-regression models and publicity is significant in one of the models. While these two aspects of good governance could be significant, we must strike a cautionary note that very small percentage of the effect sizes took these factors into consideration.

Fourth, with respect to research design, studies using rigorous experimental design, addressing the problem of endogeneity, and using a long time period show that the effects of transparency in reducing government corruption are stronger. The positive sign with respect to panel data implies that the use of cross-sectional data may overstate the impact of transparency in the short run.

Fifth, transparency play a greater role in reducing corruption when the effect sizes focus on the country level, than at the state and local government levels. We also find evidence that transparency efforts are more effective in reducing government corruption in high-income countries.

We highlight five studies here to show their heterogenous approaches. First, the study by Vargas and Schlutz (2016) used a panel data of 91 countries from 1996 to 2012. They found that there is a positive and significant relationship between a country's capacity to control for corruption and the expansion of financial disclosure legislation on public officials for the years following the enactment. Second, Shim and Eom (2008) used a cross-sectional data of 127 countries in 2004; they found that e-government has a consistently positive impact on reducing corruption. Third, focusing on a single country of Zambia from 2002-2014, Villara and Papyrakis (2016) contend that the implementation of EITI led to a significant decrease in corruption in Zambia. Fourth, Brusca, Rossi, and Aversano (2015) employed a cross-sectional data of 75 countries in 2015 to examine the impact of fiscal transparency on government corruption. They found that transparency reduces the perception of corruption and enhancing transparency is an effective measure against corruption. Lastly, Vadlamannati and Cooray (2016) explored the impact of FOIA law adoption on government corruption based on a panel data of 132 countries from 1990 to 2011. They found that adopting FOI laws are initially associated with an increase in perceived government corruption driven by an increase in detection of corrupt acts.

Policy Implications and Future Research

This research has practical policy relevance. First, high-level political leaders need evidence-based rationale to justify and guide decisions at all stages of the policy process. This research informs policymakers through scientifically rigorous evaluations of the impact of transparency on preventing public corruption. Our meta-analysis results present the stronger evidence that transparency matters for curbing corruption. Policymakers can use this hard evidence to champion transparency policy. Second, while freedom of information laws are important, fiscal transparency and e-transparency are found to play a relatively larger role in fighting government corruption. Translated into practice, this finding suggests that anti-corruption strategies should prioritize fiscal transparency and e-transparency. Third, the study suggests that the improvement of government transparency should be accompanied by reforms to strengthen citizens' capacity to act upon the available information as well as to establish an effective sanctioning mechanisms to punish corrupt behaviors and misconducts.

The present research also informs future venues of exploration. First, the choice of corruption indicators moderates the statistical effects of transparency on curbing government corruption. Instead of relying on one single subjective or objective corruption measurement, scholars are suggested to use multiple subjective and objective corruption measurements as a triangulation strategy to test the validity and reliability of research findings. Second, it is hard to identify causal effects when employing observational data that is subject to endogeneity bias. An experimental design allows researchers to address both the measurement and endogeneity problems constraining the results obtained by previous corruption studies. Public administration scholars could use experimental methods to study the linkage between transparency and corruption. Third, transparency itself may be not enough to curb government corruption when it is not accompanied by the favorable conditions and the accountable institutions. Future studies should identify the contextual factors that make transparency efforts more effective in reducing government corruption. Fourth, most of the current research relies on cross-sectional data in order to examine the impact of transparency in a short time frame (less than 5 years). However, cross-sectional data fails to control for the impact of omitted variables. Furthermore, transparency has dual effect on corruption: the detection effect and and the deterrence effect (Vadlamannati and Cooray 2017). The net effect of transparency may depend on the time frame. Scholars could do well to use a long-panel data set which enables to identify the true effect of transparency on preventing corrupt behaviors in the long-run.

Although we follow the best practices in conducting meta-analysis, we acknowledge that a few limitations exit. First, we decide to consider studies only that are written in the English language. However, corruption is a global issue and exists everywhere. In this sense, our meta-analysis results are not able to generalize findings to non-English written literature. Second, we did not include an indicator to distinguish the quality of journal publications. The main reason is that the quality indicator such as journal impact factor changes every year. We recognize that this is a valuable avenue for future research. Third, while this meta-analysis focuses on the link between transparency and government corruption, future research may need to consider other impacts of transparency such as citizen trust, government performance, financial management.

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*indicates that the study is a part of the meta-analysis

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