

IMPACT OF SUPREME AUDIT INSTITUTIONS ON THE PHENOMENON OF CORRUPTION: AN INTERNATIONAL EMPIRICAL ANALYSIS

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ABSTRACT

This paper identifies the type of incidence of the Supreme Audit Institutions on the phenomenon of corruption, through statistical analysis for a sample of 78 countries. Statistical methodology for panel data is used. The results demonstrate that is statistical evidence of positive effects. Fixed effects across countries are different, which demonstrate that there are, for each unit of study differential effects of control on corruption. It cannot be interpreted the degree of impact, nonetheless the results are robust and significant.

KEY WORDS: supreme audit, strength of audit, corruption, panel data.

INTRODUCTION

This paper is concerned with the incidence that Supreme Audit Institutions has in the corruption phenomenon. Consequently an empiric analysis that covers 78 countries will be performed, based in statistic methodology for panel data. Variables of the International Budget Partnership (IBP), Transparency International (TI), World Bank (WB) and World Economic Forum (WEF) are used.

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We argue that the strength of the Supreme Audit Institutions has a positive impact in reducing corruption however; it is likely that the degree of impact differ among countries. The Open Budget Index Sub-score for the SAI Strength (SAIs index) is used to measure the level of strength of the Supreme Audit Institutions (SAI); we used other sources (TI, WB, WEF) to gather information that measure the perception of corruption in different countries.

The first section of the paper briefly reviews the purposes the Supreme Audit Institutions, as well as the characteristic elements of strength of the SAI that are considered to measure this aspect in the SAIs index. The second section offers some conceptual and theoretical elements of the corruption phenomenon; these elements are linked to the group of variables that are the independent variables in the statistic model. Subsequently the statistical elements of the methodology for data panel are observed briefly. The last section describes the models applied, and reports the statistic results that prove the degree of incidence that Supreme Audit Institutions have in the corruption phenomenon for the 78 countries; as well, conclusions are presented.

I. SUPREME AUDIT INSTITUTIONS

Most countries, no matter the level of development, have external control structures and systems that monitor government action. The Supreme Audit Institutions (SAIs) constitute the main accountability instrument. Furthermore, the SAIs in many cases are used to prevent corruption.

The literature on SAIs has traditionally categorize the basic models in three types: a. - Westminster, b. - Judicial or Napoleonic, and c. - committee or council.¹ The Supreme Audit Institution is a control element that legislatures or parliaments exert on the so-called government action that is exercised within the executive branch. Gutierrez and Puente (2015, p.393) indicates that the "legislators then have the discretion as regards parliamentary control over the federal civil service".

In order to supervise the executive, legislatures have to their disposal many different tools and the most common are the hearing committees, hearings in plenary sessions, investigation committees, questions, interpellations, ombudsman, the government auditing of public accounts, committees (in general) and public accounts committees (Pelizzo and Stapenhurst, 2004, p.4). The audit tools mentioned are set in two different dimensions: opportunity of audit activity (ex ante or ex post) and if the activity is internal or external to the legislature. However, within academia it has noted that the presence of audit tools is

¹ See OECD Good Practices for Support Audit Institutions (SAI), 2012, pp. 15-21.

a necessary condition but not sufficient for effective control (Pelizzo, 2009, p.27).

Sartori (1992) mentioned, "an effective auditing depends on the parliament capacity or potential to regulate government activities". According to, INTOSAI,² it has considered that auditing must have a positive effect on society's confidence in public institutions, position in which guarantors of public funds might act differently if they knew they could be inspected. This would take to adopt values of accountability and a better performance within government. Supreme Audit Institutions supports the parliamentary function of auditing public expenses of government; this action is overseeing what is commonly called Supreme Audit and may have different purposes and be used for:

- a) *Accountability;*
- b) *A type of external control of the auditees;*
- c) *Improving governance considering the administrative aspects;*
- d) *Evaluate the use of public resources;*
- e) *Verify the efficiency of governance action, through policies and public programs implementation;*
- f) *Verify compliance with law;*
- g) *Prevent corruption.*

I.1. ELEMENTS OF STRENGTH OF SUPREME AUDIT

In this study, we identify the Supreme Audit Institutions strength based in three characteristic elements:

²International Organization of Supreme Audit Institutions.

- I. Supreme Audit Institutions independence,*
- II. Institutional capacity, and*
- III. Usefulness of information.*

The SAI independence allows supervision without political pressures and contains conflicts of interest. Therefore, this value gives a greater dose of efficiency and effectiveness of the control action.³ Institutional capacities refers to legal and technical characteristic that SIAs must have and adopt for the proper exercise of the audit function, ie, the sum of legal capacities by mandate and technical capacities for good implementation of the supervisory action. The third element corresponds to the usefulness of information, analyzes the timing of audit reports, reviewing reports by the legislature, and reports of the recommendations adopted.

The characteristic strength elements of the Supreme Audit Institutions are measured in the SIAs index built by the International Budget Partnership (IBP), and it is the explanatory variable to our empirical analysis.

II. CONCEPTUAL REVIEW AND THEORY OF CORRUPTION

In the last decades, the concept of corruption is often associated to Public Administration. The accounts have their foundation in the government system, it can be related with the holder of these procedures as the "public official", as the key figure. Nevertheless, corrupt behavior also invade private sphere, introduces among private organizations, seeking mutual agreements to influence markets and business decisions, and interacts with public organizations.

In an act of corruption (whose concept for Rose-Ackerman approaches to the concept of "putrefaction"), involves two actors who are in charge of the operation, the corruptor and the corrupted. As it is mentioned by Sánchez González (2012, p.53) "one performs the task and the other requests the

³ This is provided within the framework of Professional Standards INTOSAI Lima Declaration particularly marked in 1977 and the Mexico Declaration on SAI Independence 2006.

service, which is equivalent to a remuneration between them".

Corruption has its legal implication, when public officials abuse their power, and it is reflected in several instances, those generated within the bureaucratic structures of a low profile and on the other hand, the one associated to systematic corruption in which bureaucratic hierarchy is involved (Rose-Ackerman 2011, pp.21-23). The literature highlight that corruption is a generalized, cross-border and own evil of the contemporary world, that combines global, national and local, a pandemic inside government areas, where resources are illegally transformed into private profits.⁴

The above is confirmed in several studies and analysis about corruption. Some of them with an economic perspective, both theoretical and applied, that it is regularly focus on the operation of Public Administrations, where characteristic acts of corruption are made. These studies focus their attention on estimating the expenses generated by acts of corruption in economic activity and identify the loss of efficiency and effectiveness inside the economic system as a whole. In addition, several recent studies have been presented, about the corruption phenomena in the private sector, like public corruption incurs high costs for economic activity and increasingly permeating most in the markets (Alonso y Garcimartín, 2011).

Further empiric studies, have revealed that presidential systems are generally more corrupt than parliamentary democracies; and proportional representation systems are more corrupt than relative majority systems. The more vulnerable systems are those who combine strong presidencies with proportional representation, where a powerful executive negotiates with a group of powerful party leaders to share power privileges. Likewise, is has been evidence that federal system countries tend to be more corrupt than those with a centralist system (Rose-Ackerman, 2011, pp.25-33).

Furthermore, studies find a strong positive correlation between federalism and corruption, other find

4 Among those who find Diego Bautista (2006), Pozas Horcasitas (2009), Alonso and Garcimartín (2011) and Sánchez González (2013).

a strong negative correlation between fiscal decentralization spending and corruption, even this result is conditioned with the decentralization of tax collection.⁵

Del Castillo and recently Sánchez González (2012, pp.70-74), identify three types of corruption:

1. *Political corruption*
2. *Administrative corruption*
3. *Judicial corruption*

⁵ Within these types of studies that try to explain the causal relationship federalism-corruption, we can mention Treisma, D. (2000), *The causes of corruption: a cross national study*, *Journal of Public Economics*, vol. 76, pp 399-457 and Fisman R., and R. Gatti (1999), *Decentralization and corruption: cross-country and cross-state evidence*, World Bank.

⁶ A proper review of the phenomenon of judicial corruption see: Malem Seña, J.F., corruption in the judiciary, in: M. Carbonell and R. Vázquez (coordinators), *Power, law and corruption*, p. 174.

⁷ See in Cardenas, J., and M. Mijangos, about the theoretical framework of corruption, legal studies in honor of Martha Morineau. *Contemporary legal systems. Comparative law. Various topics*, Mexico, Legal Research Institute-UNAM p. 176, 2006.

Political corruption occurs when politicians divert public funds, extort individuals and companies to obtain incomes, take bribes and buy votes in elections. Political corruption undermines the core of democracy by buying public decisions. This type of corruption it is also called "governmental crime".

According to Transparency International (2000, p.6), we can find two distinct categories of administrative corruption. The first occurs when services or contracts "in accordance with the rules" are awarded, and the second when transactions are "against the rules"; in the first case, the public official receives an illegal private benefit for doing what corresponds according to their functions and in the second circumstances, the public official extorts and gets a bribe to grant improper service.

The third type of corruption takes place in a judicial branch. Judicial corruption refers to buy and sell justice to the highest bidder; this act generates effects and negative impacts to the Rule of Law. It is considered that judges hold unlawfully near-monopoly of judicial power, but also have great discretion of their functions,⁶ strong incentives that are related even with the practice of influence peddling.

Heidenhammer (p.176) references that corruption can refer to three principal domains:⁷

- i. *a legal domain (as a crime or offence by a public official),*

- ii. *a market domain (corruption as an economic decision taken by a public official) and;*
- iii. *a political domain (corruption and subversion of public interest by personal interests).*

Schacter and Shah (2004) enumerate three types of corruption:

- a) *bureaucratic or minor corruption, where a wide number of public officials abuse of their public office to frequently ask for small favors or bribes.*
- b) *larger corruption, that implies a robbery or abuse of a larger amount of public funds to a relatively small officials number.*
- c) *state or regulatory capture, which occurs when there is collusion between public and private agents in order to increase the private benefits, through manipulation of creation processes and law implementations, regulations and public policies to be unfairly favored, normally, excluding competitors.*

The concept of "State capture" is linked to the characterization of what some authors called economic corruption, where the State is used to benefit some business sectors through the process of elaboration of political and economic reforms, and the regulating creation of specific markets.⁸

A control analysis of corruption has been developed in economic theory, through the "model of principal-agent" (also called agency theory), here includes the Robert Klitgaard (1998, pp.3-5) contribution, that analyze the conditions that generate incentives for individual's corrupt behavior (agent-principal), considers a system by the following equation:

$$C = M + D - A$$

Corruption equals monopoly power (M), plus discretion (D), minus accountability (A). The fight against

⁸ Oscar Ugarteche (2011) illustrates some cases of state capture in countries like Perú, where he describes the privatization of the airline AeroPerú area and its assault mechanism on the institutions to benefit a specific private group.

corruption, therefore, starts with better systems. In this way, the smaller the group of actors who take decisions on the matter in question (monopoly), the greater the margin of discretion of such actors to make decisions and, finally, the fewer controls on agents who take decisions are, there will always be greater possibilities for corruption to arise.

According to the agency theory, the problems of the relationship between "agent and principal"⁹ are concentrated in two areas. On the one hand, it is rare that "principal-agent" share exactly the same interests. Normally their interests are divergent, which becomes an incentive for the "agent" to act in defense of their interests before doing so in defense of the "principal". On the other hand, the "principal" rarely has a perfect and full information of the "agent" performance. That is often an asymmetry of information between "principal-agent" occurs. These situations provide opportunities for the "agent" decided to act against the demands and interests of the "principal".

For Martinez-Cousinou and Andersson (2009, pp.1-2), the problem of information asymmetry is an obstacle to the effective control of the "agent" by the "main" emerging problem of monitoring, which in turn creates incentives for political corruption outbreak.

Furthermore, the "structural corruption approach" proposed by Sandoval- Ballesteros (2013, pp.9-23), describes the specific form of social dominance characterized by abuse of power, simulation and misappropriation of resources, as a result of a sharp difference in the structural power. Structural equation where corruption is equal to the abuse of power (AP), plus impunity (I), minus citizen participation (CP):

$$C = AP + I - CP.$$

Emphasizes three elements are important: a) the abuse of public power by creating a situation of domination, b) the lack of punishment and impunity for private and public actors who perform acts of corruption, and c) the loss of power citizen who reflects a rift with the political class. These elements

⁹ In the "agency theory" we would have to place citizens as the Principal, who delegate the implementation of its interests in an Agent, the president, who acts on behalf of the Principal. Both actors are self-interested and act rationally according to their preferences, which are different and sometimes opposite.

lead to the conclusion that a double structural fraud appears in society in electoral-political and financial aspects" (Sandoval-Ballesteros, 2013).

Therefore, in a situation of structural corruption, the State is required to take special measures to disrupt the operation of the power groups underlying structural corruption. The consequences are intertwined between impunity and lack of fair trial. Generally are closely linked to discrimination and constitute an obstacle to human rights of individuals, either because it diverts public resources that could be devoted to the recognition and guarantee of rights, or because it imposes additional requirements such as bribery or extortion.

Furthermore, transparency and access to public information, is an element that aids prevent corruption, to reduce the problems of asymmetric information and, therefore, allows better monitoring politicians and public officials. Concealment of public information in order to favor private interests over the public interests is a form to corrupt what is called the "public space".¹⁰ The importance of access to public information, conceives the United Nations Convention against Corruption, as a transversal tool to combat the phenomenon of corruption.¹¹

III. IMPACT OF STRENGTH OF SUPREME AUDIT INSTITUTIONS IN CORRUPTION

This section presents a statistical model that provides information about the degree of impact that the strength of the Supreme Audit Institutions has on the perception of corruption. Our hypothesis is that the strength of the Supreme Audit Institutions has a positive impact in reducing the perception of corruption, same to be explained by statistical analysis method for data panel.

¹⁰ The concept of "recognition of public space" is raised by Mauricio Merino, as an ethical value that should be considered in public policies of transparency, among which are the "principle of kantian advertising, the principle of greater social efficiency and the value refers to the ethic of responsibility of public officials" see Merino, M., transparency and public Policy at: Ackerman, JM (Coord.) Beyond access to information: Transparency, accountability and rule of law, pp. 240-262.

¹¹ Art.10. United Nations Convention Against Corruption, ONU 2013.

A. STATISTIC ANALYSIS METHOD

The statistical analysis is formalized by applying the method for data panel models. The specifications and the general framework of these models are presented and the assumptions required for validation and allow us to identify the statistical weight of the respective explanatory variable on the dependent variable are set.¹²

A regression model with data panel includes a data sample of agents of interest (individuals, companies, organizations and countries) along the time; there is no limit to the heterogeneity of these social agents, by allowing the existence of individual specific variables and temporary effects. It combines data types with temporal and structural dimension.

The classic regression model, considers the example in which it is a linear function of K are explicative variables where $k = 1, 2, 3, \dots, K$:

$$(1) \quad y_{it} = \alpha_{it} + \beta_1 x_{1it} + \beta_2 x_{2it} + \dots + \beta_k x_{kit} + u_{it}$$

In this analysis, $i = 1, \dots, N$ social units (78 countries) and $t = 1, \dots, T$ observations in time (4 years accounted biannually, 2006, 2008, 2010 and 2012).

β is a vector of parameters K

X is the i -th observation at time t for the explanatory K

The total sample observation models is given to specify the set of $N \times T$ (312) observations. Besides the u_{it} is the error term that represents the effects of all other variables omitted from the model, ie it is the variation observed in the k independent variables.

There are assumptions that allow us to estimate the panel by ordinary least squares (OLS) as the classic regression model-standard. These assumptions are based on the premise that the term of error follows a normal distribution with zero mean and constant variance, the hypothesis says that the variable in the

¹² A must for mathematics and statistics specifications can be found at: Greene, W.H. (2006) Chapter 14, D. N. Gujarati (2004) Chapter 16 and Wooldridge (2010).

variance of the error term is the same for each of the observations (homoscedasticity assumption).¹³

Besides in these error terms are not related for different time lapses, neither are they correlated for different studies units. In order to fulfill these conditions, we can assure that the resulting stimulators by the stimulation method are reliable and consistent to carry out indifference statistics.

It is common to interpret data models panel through its error components. The term u_{it} error listed in the equation (1) can be decomposed as follows:

$$(2) \quad u_{it} = \alpha_i + \gamma_t + w_{it}$$

In which:

α_i represents unobservable effects differ among units of study, but not in time. Identifies γ_t unquantifiable effects that vary over time, but not between the study units.

w_{it} refers only to a random error term.

The joint analysis of $N \times T$ observations can present correlation in the error terms in different ways so they must comply with the assumptions of homoscedasticity and no serial correlation.

From the general model (1), and according to Johnston and DiNardo (1997) we can order various types of specifications in a taxonomy on panel data models, however, three of them are the most traditionally used.

I. - panel models with constant coefficients

$$(3) \quad y_{it} = \beta_0 + \sum_{k=1}^K \beta_k x_{kit} + u_{it}$$

It is assumed that the coefficients of K parameters are the same for each of the study units in the sample, and also that are constant over time.

II. - models fixed effects panels

$$(4) \quad y_{it} = \beta_0 + \sum_{i=1}^{N-1} \alpha_i d_i + \sum_{t=1}^{T-1} \phi_t t_t + \sum_{k=1}^K \beta_k x_{kit} + u_{it} + \varepsilon_{it}$$

Captures the variation in the sample due to the presence of different units of study with the inclusion of a set of dichotomous variables d_i . It is assumed that the coefficients (constant or

¹³ It is used to make the necessary estimates statistical software E-Views 9 which automatically incorporates several methods of estimation and for better specification of the models used.

independent term model) vary depending on the unit of study or moment in time.

III. - model random effect panels

$$(5) y_{it} = \beta_0 + \sum_{k=1}^K \beta_k x_{kit} + u_{it}$$

Where u_{it} mistake has the structure of equation (2).¹⁴

Individual coefficients α_i and / or temporary γ_t coefficients are no longer fixed effects regression constant term but are allowed to vary randomly over time and through study units. It is assumed that the variation across the study units (and / or over time) is random and therefore is captured and explicitly specified in the error term.

B. ANALYSIS VARIABLE DESCRIPTION

The explanatory variable that represents the strength of the supreme audit institutions, is the one built by the International Budget Partnership (IBP)¹⁵ through Methodology of the Open Budget Survey, which measures the budget transparency, participation and surveillance in countries around the world. In order to allow comparisons between different countries and at different times, through the results of the survey based on a questionnaire of 125 questions.

The International Budget Partnership (2012, pp.2-6) through the survey, has estimated the Open Budget Index (OBI) based on a simple average of the responses to 95 survey questions related to budget transparency. This index assigns a score ranging from 0 to 100. The Open Budget Survey also includes a section that assesses the opportunities for public participation in the budget process, the monitoring capacity of legislatures and the strength of Supreme Audit Institutions (SAI);¹⁶ in relation to this last section of the survey, we focus on the results of SAIs index.

The IBP builds the SAI_OBI index by applying surveys through a collaborative process in which the IBP

¹⁴ OLS method is not applicable because the assumptions that allow consistent estimator are not met. So it is preferable in this case use the method of generalized least squares (GLS) whose estimates are higher than the OLS, if not met the traditional assumptions.

¹⁵ International Budget Partnership.- www.internationalbudget.org.

¹⁶ The element of "assessment of public participation in the budget process" is new from the survey for 2012, which measures the presence of citizens throughout the budgeting process.

works with civil society partners in 100 countries,¹⁷ so as to be representative in different regions and for different income levels.¹⁸ The survey is made in a bi-annual base, and has included the 2006, 2008, 2010 and 2012 cycles. By 2012 the IBP to measure the SAIs index made some adjustments for the methodology, however, in our investigation process, the homologation was conducted to integrate the index based in previous years. The information for the construction of SIAs, contemplates the three main elements of strength of the Supreme Audit Institutions mentioned above.

The SAIs index reveal that for 2012 an average score of 69 to 100, ie, most of the countries surveyed was working relatively well in terms of strength on their SAIs. The IBP demonstrate a classification that includes three categories to identify the degree of SIAs among the countries, weak, moderate and strong. In **table 1**, we can identify those who got values according to our selected sample of 78 countries.

The report of the IBP of the Open Budget Survey for 2012 exhibits the results on the strength of SAIs and reveals that audit entities are strong in countries that belong to each of the different categories on different legal systems (British, French, German, Scandinavian and Socialist). There are no evidence (based on the mix of countries with high scores), that the constitutional system of a country determines the strength of Supreme Audit Institutions.

¹⁷ According to IBP, the results of the survey for the 2012 edition are based on the questionnaire of 125 questions a complete group of researchers within an organization in the country. Most researchers responsible for completing the questionnaire belong to academic institutions or civil society organizations.

¹⁸ It is important to state that, according to information from the IBP for the process in 2012, 95 governments contacted, only 41 agreed to send comments on the results of the Survey on his country, despite efforts to encourage governments to provide comments, it was not possible to obtain greater participation; this prove an indifference in most countries in participating in these exercises transparency, considering it a value yet unadopted. Information concerning the methodology and guidelines for answering questions can be found at:

<http://internationalbudget.org/what-we-do/open-budget-survey/research-resources/guides-questionnaires/> and to consult the relevant comments of governments: <http://internationalbudget.org/what-we-do/open-budget-survey/country-info/>.

TABLE 1. STRENGTH OF SUPREME AUDIT INSTITUTIONS (2012)

Strenght	Number of countries	Countries
Strong (Index value 67-100)	25	Albania, Bosnia and Herzegovina, Bostwana, Brazil, Colombia, Czech Republic, France, Georgia, Germany, India, Indonesia, Malaysia, Mexico, New Zeland, Worway, Poland, Slovakia, Slovenia, South Korea, Sweden, United Kingdom, United States, Vietnam.
Moderate (Index value 34-66)	36	Argentina, Bangladesh, Bolivia, Bulgaria, China, Costa Rica, Croatia, Dominican Republic, El Salvador, Guatemala, Honduras, Italy, Kazakhstan, Kenya, Kyrgyz Republic, Macedonia, Mall, Mongolia, Namibia, Nepal, Pakistan, Peru, Philippines, Portugal, Romania, Rwanda, Serbia, South Africa, Spain, Sri Lanka, Tanzania, Thailand, Trinidad and Tobago, Uganda, Ukraine, Venezuela.
Weak (Index value 0-33)	17	Algeria, Azerbaijan, Burkina Faso, Cambodia, Cameroon, Chad, Ecuador, Egypt, Jordan, Malawi, Morocco, Mozambique, Nicaragua, Nigeria, Senegal, Turkey, Zambia.

Source: International Budget Partnership

The SAIs index is used as an independent variable to explain the degree and type impact that it has on *reducing the perception of corruption*, therefore is required the use of independent variables in the respective analysis. Same that has been selected, given the statistical robustness in their integration and progressing.

In **table 2**, the variables to be explained based on the SAIs index are detailed, as the type of expected impact accordingly to our hypothesis. They are grouped by measuring type that is attended to be addressed. The table describe the six variables that measure the corruption perception level; these are variables from the WEF, TI and WB. The relevant variable is the Corruption Perceptions Index (CIP) of Transparency International.

TABLE 2. INDEPENDENT VARIABLES (CORRUPTION) PERCEPTION)

No.	Variable	Description	Measuring	Expected impact	Source
1	D of Pfounds	Diversion of public funds	corruption perception	Positive	WEF
2	Pt in P	Public trust in politicians	corruption perception	Positive	WEF
3	F in DGO	Favoritism in decisions of government officials	corruption perception	Positive	WEF
4	T of GP	Transparency of government policymaking	corruption perception	Positive	WEF
5	CPI	Corruption perceptions index	corruption perception	Positive	IBP - Transparency International (TI)
6	WBGL CORR	Control for corruption	corruption perception	Positive	WB

Source: WEF.- <http://www.weforum.org/reports/global-competitiveness-report-2014-2015>; IBP-WB.- <http://survey.internationalbudget.org/#download>.

C. CORRUPTION PERCEPTION (CIP)

The relevant variable analysis is given by the Corruption Perceptions Index (CIP) Transparency International (TI). The index is presented in a scale of 0 (highly corrupt) to 10 (very transparent). The CIP classifies countries according to the level of corruption perceived in public sector. It is a composite index, a combination of surveys. The data about corruption is obtained from various surveys applies to experts and companies conducted by several independent prestigious companies. The index reflects opinions around the world, including those experts who live and work in the evaluated countries.

The CIP focuses in public sector corruption, ie, the one that involves public officials, public employees and politicians. The surveys used to elaborate index include questions about abuse of public power and specifically related to public officials bribery, bribes in public procure-

¹⁹ For further reference on the methodology of integration Perceptions Index by Transparency International, we recommend visiting the following website: http://www.transparency.org/cpi2014/in_detail#top.

ment, misappropriation of public funds and other questions that probe the strength and effectiveness of anti-corruption initiatives in the public sector. Thus, it addresses the administrative and political aspects of corruption.¹⁹

Therefore, we take the CIP as an index that evaluates the perception of political and administrative corruption for the sample of countries used corresponding to 78, of which in 2012 only 14 countries have achieved a rating greater than 5, the rest can be considered that perception is still negative (see **table 3**).

TABLE 3. CORRUPTION PERCEPTION FROM 78 COUNTRIES (2012)

Kind of perception of corruption	Countries
Positive (CPI between 5 to 10)	Botswana, France, Germany, New Zealand, Norway, Poland, Rwanda, Slovenia, South Korea, Spain, Sweden, United Kingdom, United States
Positive (CPI between 0-4.9)	Albania, Algeria, Argentina, Azerbaijan, Bangladesh, Bolivia, Bosnia and Herzegovina, Brazil, Bulgaria, Burkina Faso, Cambodia, Cameroon, Chad, China, Colombia, Costa Rica, Croatia, Czech Republic, Dominican Republic, Ecuador, Egypt, El Salvador, Georgia, Ghana, Guatemala, Honduras, India, Indonesia, Italy, Jordan, Kazakhstan, Kenya, Kyrgyz Republic, Macedonia, Malawi, Malaysia, Mali, Mexico, Mongolia, Morocco, Mozambique, Namibia, Nepal, Nicaragua, Nigeria, Pakistan, Peru, Philippines, Romania, Russia, Senegal, Serbia, Slovakia, South Africa, Sri Lanka, Tanzania, Thailand, Trinidad and Tobago, Turkey, Uganda, Ukraine, Venezuela, Vietnam, Zambia

Source: Based on data of Transparency International.

Other variables that approximate measure the level of perceived corruption, are also used in this work. Sources of information and methodology for integrating indexes are desegregated into specific topics, for those with sources WEF have indexes that measure the diversion of public resources, public trust in politicians, favoritism in government officials decisions, and transparency in government policies²⁰ and for variable information originates with WB measures the control of corruption.

IV. RESULTS OF DEGREE STATISTICAL ANALYSIS AND INCIDENCE OF SAIS

In this section statistics specifications are presented based on the methodology for data panel models, those derived the strengths of SAIs audit impact positively on the reducing corruption. It is noteworthy that the sample selected countries, is based on those who could be identified with information on each variable to explain and explanatory. The tests required for panel data models to find the best fit specification and can explain the relationship between the variables in analysis will be conducted.

Some tests were made to see if equality are presented in mean and variance in each of the variables for the countries studied, and the transformations that some variables are logarithmic type (see Annex 3) were performed; the different test results showed that the equal status in mean and variance are rejected in all cases, this allows us to explain in the first instance, the dependent variables respond to different effects in each of the countries. This statistic condition allows us to propose specifications based on the method of data panel models.

The set of estimated models vary in their specification in original level, semi- logarithmic and logarithmic. In annexes 2, the descriptive statistics of the variables used in the empirical analysis are presented.

20. For indexes with information provided by the WEF, it is the answer to a question where opinions of business leaders worldwide on different themes, among which, level of corruption, degree of competitiveness, being collected other economic aspects.

IV.1. SAIS IMPACT-CORRUPTION PERCEPTION

In **table 4**, the results of the estimates for variables that measure and represent the level of perceived corruption for countries of the sample analysis can be observed.

The results prove that in general, the **SAIs index** impact positively in a group of variables that are close to measure the level of perceived corruption. Particularly, the relevant variable in this group is defined by Transparency International; this index is represented by a scale of 0 (highly corrupt) to 10 (very transparent), which allow us to accept in a statistical and theoretical way the approach through the strengths of the SAIs impacts in a positive in reducing perception of corruption. In which, by giving greater power to the Supreme Audit Institutions, that reflects capacity and autonomy to impose and enforce sanctions, reduce the perception of corruption in public sector.

TABLE 4. DATA PANEL MODELS (CORRUPTION PERCEPTION)

No	Variable	Model	Constant	Coefficient SAI	R ²	DW	Cross-section
1	CPI	Fixed effects methods	1.1492 (0.0000)	0.0262 (0.0000)	0.9561	1.99	78
2	T of GP	Fixed effects methods	1.1127 (0.0000)	0.0716 (0.0108)	0.7629	2.03	78
3	Pt in P	Fixed effects methods	1.5641 (0.0000)	0.0886 (0.0116)	0.8557	2.05	78
4	WBGI_CORR	Fixed effects methods	1.2304 (0.0000)	0.0011 (0.2615)	0.9853	1.95	78
5	D of Pfound	Fixed effects methods	1.2401 (0.0000)	-0.0223 (0.4398)	0.9021	2.19	78
6	F in DGO	Fixed effects methods	1.8579 (0.0000)	0.00237 (0.5059)	0.7594	1.97	78

Source: own estimates with data from WEF, IBP, WB –TI

Note: the estimation method for robust to heteroskedasticity and autocorrelation panel was used.

As can be seen in **table 4**, the first line refers to the CIP demonstrate appropriate statistical specification, where the coefficient for the SAIs is positive and significant to level trust of at least 99%,²¹ even though coefficient value is small and hard to interpret, we can find a positive and direct relation between both variables. This means, to a greater strength in the supreme audit, the corruption inside the public sector tends to be reduced.

The fixed effects model meets the statistical assumptions for validity, therefore, the explanatory variable (SAIs) is a good approximation to explain the variability of CIP. Appropriate given the result of the statistical R2 fit is obtained.

In the data panel models, we observed if regression coefficients are different to each study unit, (in this case we are talking about the 78 countries analyzed) or vary in time, it is assumed that the coefficients (constant model) vary depending in study units or moment in time.

The "constant" variables that **table 4** collects represent the average of the coefficients of the dichotomous variables (di) in each country, which in the model represents fixed effects; therefore, the independent parameter is modeled, reflects heterogeneity among them and non-specific observable factors for each country, which make their behavior to be different from other countries.²² Estimation of fixed or individual effects (country effects), explain us that are different for each country, ie, the explanatory variable rate determined by **SAIs index** impacts in different ways for each country.²³

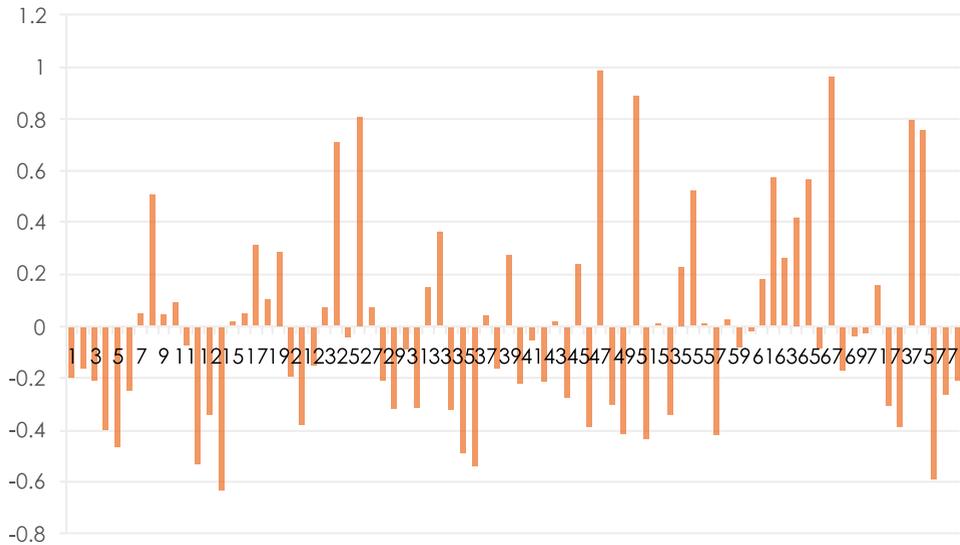
As can be observed in **figure 1**, reveal that the explanatory variable impacts more in countries like New Zealand, Norway, Sweden, Germany, United Kingdom and United States. Countries with less impact in the SIAs corruption index variable is Chad, Venezuela, Kyrgyz Republic, Kenya, Cambodia, Pakistan, Russia and Senegal; in a better situation based on the latter countries we find Mexico (41).

21 In this paper, we have considered that the coefficients resulting from the explanatory variable and constant of each of the proposed models are significant at a confidence level of 99, 95 and 90 percent following a statistical t-Student.

22 To find the fixed effects, the value of each coefficient of the dichotomous variables (di) by country the value of the constant term is subtracted. In this research, as mentioned the E-views software is used for this type of estimates.

23 To reach this conclusion, the statistical test was performed to test whether the fixed effects of each country may or may not be considered equal, for this we use the "maximum likelihood test for the redundancy of the fixed effects". Based on a probability of Chi-square (χ^2) less than p-value < 0.05 . Therefore, we can say that the model of fixed effects panel provides consistent result (see **Annex 3**).

FIGURE 1. FIXED CROSSING EFFECTS (CIP - SAIS)



This result would lead us to make a thorough analysis of the legal and consensual requirements established in each country to know the different types of effects and impact of public programs intended at mitigating problems of corruption. Same that is outside the scope the study and that is proposed as one of the challenges to consider in future approaches.

In the second row of **Table 4**, the results for the variable T of GP, the coefficient of SIAs index demonstrate a direct positive relationship to levels of transparency and access to government information. The indicator represent the level of transparency in government policies. We can infer that the greater strength in the audit is a positive effect in the field of government transparency.

This is confirmed by the results of the statistical specification to determine the type of influence of SIAs on the variable Pt in P representing the level of ethics and public trust in politicians, the estimated positive coefficient and a level of statistical significance at 95 percent. In these cases, grant greater autonomy and strength Supreme Audit Institutions, improving the perception of government transparency, ethics and trust in politicians.

The fixed effects determine the effects and impacts of SIAs index variables representing the level of transparency in government policies (T of GP) and, ethics and public trust in politicians (Pt in P) are differentiated analysis unit, according to the statistical evidence presented in **Annex 3**.

According to the results for the coefficient of SIAs index as an explanatory variable of the variable representing the level of Control of Corruption (WBGI_CORR) determined by the World Bank (WB) and the level of Favoritism in decisions of government officials (F in DGO) are positive. Nevertheless, does not meet the acceptable level of statistical significance; the signs of the coefficients of SIAs index are expected, however it is not possible inference about it, not having a consistent specification.

The incidence of SIAs index in the variable representing the diversion of public resources (D of P funds), does not show statistical significance and consistency, resulting coupled with the opposite sign than expected. Therefore, for purposes of this paper there is no possibility of making inferences about the type of incident that has the SIAs index in this line for 78 selected countries.

CONCLUSION

We can infer that the strength of the Supreme Audit Institutions impact in reducing corruption perception in public sector, in which can be inferred, the SIAs index improvement the corruption has lessened. This can be explained by having Supreme Audit Institutions with greater sanctioning powers and legal force to compel compliance with them, as well as, the implementation of legal imperatives as results and recommendations of the audit action.

However, it is not possible to determine the degree of impact, given the magnitude of the estimated statistical coefficients, although having the interpretation of the sign of the coefficients, demonstrate the type of incident that may represent jointly, for the sample of countries analyzed.

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ANNEX 1. COUNTRIES ID

ID	Countries	ID	Countries
1	Albania	40	Mali
2	Algeria	41	Mexico
3	Argentina	42	Mongolia
4	Azerbaijan	43	Moroco
5	Bangladesh	44	Mozambique
6	Bolivia	45	Namibia
7	Bosnia and Herzegovina	46	Nepal
8	Botswana	47	New Zealand
9	Brazil	48	Nicaragua
10	Bulgaria	49	Nigeria
11	Burkina Faso	50	Norway
12	Cambodia	51	Pakistan
13	Cameroon	52	Peru
14	Chad	53	Philippines
15	China	54	Poland
16	Colombia	55	Portugal
17	Costa Rica	56	Romania
18	Croatia	57	Russia
19	Czech Republic	58	Rwanda
20	Dominican Republic	59	Senegal
21	Ecuador	60	Serbia
22	Egypt	61	Slovakia
23	El Salvador	62	Slovenia
24	France	63	South Africa
25	Georgia	64	South Korea
26	Germany	65	Spain
27	Ghana	66	Sri Lanka
28	Guatemala	67	Sweden
29	Honduras	68	Tanzania
30	India	69	Thailand
31	Indonesia	70	Trinidad and Tobago
32	Italy	71	Turkey
33	Jordan	72	Uganda
34	Kazakhstan	73	Ukraine
35	Kenya	74	United Kingdom
36	Kyrgyz Republic	75	United States
37	Macedonia	76	Venezuela
38	Malawi	77	Vietnam
39	Malaysia	78	Zambia

ANNEX 2. DESCRIPTIVE STATISTICS INDEPENDENT VARIABLE (SUPREME AUDIT INSTITUTIONS STRENGTH)

	SAIs
Mean	51.49272
Median	53.30000
Maximum	100.0000
Minimun	0.000000
Std. Dev.	22.68234

DEPENDENT VARIABLES (CORRUPTION PERCEPTION)

	D_OF_PFO UNDS	PT_IN_P	F_IN_DGO	T_OF_GP	CPI	WBGI_ CORR
Mean	3.287199	2.572537	2.978490	4.010793	3.789474	-0.173411
Median	3.075945	2.296709	2.832435	4.055529	3.300000	-0.386906
Maximum	6.596183	5.818509	5.967782	6.040287	9.600000	2.431642
Minimum	0.000000	0.000000	0.000000	0.000000	1.600000	-1.345829
Std Dev	1.100935	0.988513	0.833982	0.798057	1.792225	0.838057

Source: own estimates with data from WEF, IBP, WB-TI.

ANNEX 3. MAXIMUM LIKELIHOOD TEST FOR REDUNDANCY OF FIXED EFFECTS

Independent variable: index SAIs

Chi-square (χ^2) lower than the p-value < 0.05

No	Dependent variable	Model	Static	P-Value	Interpretation
1	CPI	Fixed effects methods	790.78	0.0000	It is observed p-values less than 0.05 which eads us to affirm that fixed / individual effects are different
2	T of GP	Fixed effects methods	384.63	0.000	
3	Pt in P	Fixed effects methods	524.14	0.000	

Source: own estimates with data from WEF, IBP, WB-TI.