Proposal for a corruption indicator in Brazil based on data from the Federal Court of Accounts

Proposta de um indicador de corrupção no Brasil baseado em dados do Tribunal de Contas da União

Propuesta de indicador de corrupción en Brasil con base en datos del Tribunal Federal de Cuentas

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https://doi.org/10.36428/revistadacgu.v14i25.401

Abstract: The objective of this work is to propose and build a Brazilian, objective and regional corruption indicator based on the register of accounts judged irregular by the Federal Court of Accounts (TCU). To this end, a literature review on corruption indicatores is initially made. The study is qualitative and quantitative, and uses Jurimetrics, which is Statistics applied to Law. The research uses documentary technique, and the electronic documents were collected on the website of TCU and the Brazilian Institute of Geography and Statistics (IBGE). The work is justified insofar as it is necessary to have a Brazilian, regional and objective indicator to allow comparisons between states and over time, to plan, analyze and control public policies to combat corruption. In the end, CIPM (irregular accounts per million inhabitants) is proposed as an indicator of corruption that meets the desired characteristics.

Keywords: Corruption indicator. Federal Court of Accounts. Jurimetrics. Accounts Judged Irregular. TCU.

Resumo: O objetivo deste trabalho é propor e construir um indicador brasileiro, objetivo e regional de corrupção com base no cadastro de contas julgadas irregulares do Tribunal de Contas da União (TCU). Para isto, inicialmente é feita uma revisão da literatura sobre indicadores de corrupção. O estudo é qualitativo e quantitativo, e utiliza a Jurimetria, que é a Estatística aplicada ao Direito. A pesquisa usa técnica documental, sendo que os documentos eletrônicos foram coletados no sítio do TCU e do Instituto Brasileiro de Geografia e Estatística (IBGE). O trabalho se justifica na medida em que é necessário ter um indicador brasileiro, regional e objetivo para permitir comparações entre estados e ao longo do tempo, para planejar, analisar e controlar políticas públicas de combate à corrupção. Ao final é proposto o CIPM (contas irregulares por milhão de habitantes) como indicador de corrução que atende as características almejadas.

Palavras Chave: Indicador de corrupção. Tribunal de Contas da União. Jurimetria. Contas Julgadas Irregulares. TCU.

Resumen: El objetivo de este trabajo es proponer y construir un indicador de corrupción brasileño, objetivo y regional basado en el registro de cuentas juzgadas irregulares por el Tribunal Federal de Cuentas (TCU). Para ello, se realiza inicialmente una revisión de la literatura sobre indicadores de corrupción. El estudio es cualitativo y cuantitativo, y utiliza la Jurimetría, que es la Estadística aplicada al Derecho. La investigación utiliza técnica documental y los documentos electrónicos fueron recolectados en el sitio web del TCU y el Instituto Brasileño de Geografía y Estadística (IBGE). El trabajo se justifica en la medida en que es necesario contar con un indicador brasileño, regional y objetivo que permita comparaciones entre estados y en el tiempo, para

planificar, analizar y controlar políticas públicas de combate a la corrupción. Al final, se propone el CIPM (cuentas irregulares por millón de habitantes) como indicador de corrupción que cumple con las características deseadas.

Palabras clave: Indicador de corrupción. Tribunal Federal de Cuentas, Jurimetría. Cuentas juzgadas irregulares. TCU.

INTRODUCTION

Corruption is one of the most serious contemporary problems. Studies show that it reduces public investment, causes misallocation of resources and has a negative impact on education, health and income. Controlling it requires planning, implementation, analysis and monitoring of public policies to fight corruption. It is not possible to run a cycle of public policies without adequate indicators. For this reason, we need a regional corruption indicator in Brazil that is objective, valid and reliable, among other desirable properties in an indicator. Transparency International's Corruption Perceptions Index (CPI) is the most widely known corruption indicator in the world. Published since 1995, the CPI has had the extraordinary merit of putting the problem of corruption high on the international agenda. The CPI, however, is not suitable to monitor regional public policies to fight corruption. Annually, this device provides a single value for Brazil, as well as other countries, therefore it does not allow comparisons between states, or comparisons for the same state over time, which makes it unsuitable for planning and controlling regional public policies to fight corruption.

To overcome this problem, several studies have proposed regional objective corruption indices, based, for example, on experiments, public contract prices and data from control departments. In Brazil, several corruption indicators have been proposed based mainly on data from comptroller general's offices and accounting courts. Unfortunately, however, none of them were successful in being used continually, probably due to problems in their design. In fact, none of the Brazilian studies cited discusses the desirable properties for public policy indicators, or the suitability of the proposed indicators to these properties. For this reason, there were supposed limitations that resulted in those indicators being discontinued. This paper proposes an objective regional Brazilian corruption indicator that seeks to overcome the limitations of previous proposals. To this end, the methodological choices necessary to develop the indicator are detailed and justified in order to achieve a corruption indicator with the highest number of desirable properties for a public policy indicator.

LITERATURE REVIEW: CORRUPTION INDICATORS BASED ON REGISTERS IN ACCOUNTING COURTS

Table 1 shows the desirable properties of public policy indicators (JANNUZZI, 2017, p.34).

TABLE 1 - PROPERTIES OF PUBLIC POLICY INDICATORS

PROPERTY
Political and social relevance
Validity of concept representation
Reliability of measurement
Spatial coverage
Sensitivity to planned actions
Specificity to the program
Intelligibility of design
Communicability to the public
Operational feasibility for design
Periodical updates
Territorial disaggregation
Comparability of historical series

Source: adapted from Jannuzzi (2017)

According to Jannuzzi (2017) one of the basic classifications of indicators is the division between objective and subjective indicators. Objective indicators refer to concrete facts of reality and are created with raw data collected from public statistics or available administrative records. Subjective indicators, on the other hand, are created by measuring the perception of experts or ordinary people regarding different aspects of reality, usually with data produced by opinion polls. Another classification of indicators concerns the methodological complexity with which they are created, or the amount of information that they embed. On this criterion, they are divided into primary and composite. Primary indicators are calculated from a public sample statistic, administrative record or specific opinion poll regarding one chosen dimension of the concept to be measured. Composite indicators, also known as indices, are created from an agglutination of two or more primary indicators regarding different dimensions of the concept, usually calculated from their weighted mean. The Corruption Perceptions Index (CPI), for example, is a composite subjective indicator.

All the indicators presented below are objective and regional (state or municipal) corruption indicators, although there are different kinds among them. Some are absolute (e.g., number of irregular accounts) and others are relative (number of irregular accounts per million inhabitants, for example). Some are primary and others are compound, following the classification explained in the previous item. Finally, there are non-transformed indicators, when they are presented on the original scale, or transformed indicators, when there is a change of scale. Some transformed indicators from the following studies were normalized, that is, the original scale was transformed proportionally to a scale ranging between zero and one, with the value zero for the minimum and the value one for the maximum.

Boll (2010) develops an indicator to measure corruption in Brazilian states using as the main source of data the Irregular Accounts Register of the Fe-

deral Court of Accounts (Cadirreg), the Indicator of Government Corruption by States (ICG). To develop the indicator, data were also collected from the Annual Budget Law (LOA), the population of the states and the state Gross Domestic Product (GDP). When the accounts are judged irregular, the most common penalties applied by the TCU are fines and the collection of the debit assessed, in the case of loss to the Treasury. If there is more than one person responsible for the debit, they respond jointly and severally. To determine the amount of the debit of the accounts judged irregular by the state, the amounts of the fines and the multiplicity of the joint and several debits were excluded. The composite indicators were calculated from four primary indicators, by state and by year: the value in the Cadirreg/population; the value in Cadirreg/GDP; the value in Cadirreg/LOA; and the number of cases in Cadirreg/total number of cases in Cadirreg. Once calculated, the primary indicators were normalized. The indicators were calculated according to the following formulas:

State Government Corruption indicator (GCI) =

0.33 * {[(normalized Cadirreg/population value) +

(Cadirreg value/GDP) normalized] / 2} +

0.33* (normalized Cadirreg/LOA value) +

0.33* (annual number of irregular cases in the Cadirreg by state/total annual number of irregular cases in the normalized Cadirreg)

This last factor, by relating the number of cases per state to the total number of cases, instead of dividing by a variable that represents the size of the state (such as population, for example), inappropriately penalizes larger states and causes the indicator to have a validity problem. The fact that it is a complex indicator, resulting from arbitrary weights being assigned to simple indicators, causes the indicator to have a problem of communicability with the public. It would be better to have used a system of simple non-normalized indicators (Cadirreg value/GDP and annual number of irregular cases in Cadirreg per state/state population). Still, using the case year and not the adjudication year as the base year for the index causes the entire historical series of indices to have to be updated at each plenary meeting of the TCU, which causes problems for periodical updates and in the comparability of the historical series.

Cinelli (2011), when correlating corruption and voluntary transfers from the National Treasury to Brazilian states, uses the values and numbers of cases in Cadirreg presented by Boll (2010), but does not use the GCI. These indicators have the same problems as the Boll indicator, with the exception of communicability with the public, since it is a simple indicator system.

Carraro et al. (2015) propose a new version for the GCI corruption indicator (Boll, 2010). The new indicator is created with the method of the main components of multivariate analysis and uses the same database of Cadirreg (amount of debits and number of cases) and the LOA for the same period (1998 to 2008) as Boll's study (2010). This indicator has the same shortcomings as the indicator proposed by Boll, as described above.

Sousa (2018) proposes a composite indicator to measure corruption in the towns of Ceará State from 2002 to 2011. The study was similar to Boll's research (2010), with adaptations made. The data on the adjudications of irregular accounts and applied debits were made available by the Accounting Court of Ceará State (TCE/CE). There was difficulty with data on municipal budgets:

> The study was applied in 180 municipalities in Ceará State, with the municipalities of Alcântaras, Chaval, Fortaleza and Reriutaba being removed from the survey because the amounts of the budget paid, respectively, in the years 2002 to 2004, 2004, 2003 and 2004 were not available. (SOUSA, 2018, P. 5).

There was also a problem in one of the primary indicators that make up the composite indicator, the applied debts/GDP indicator:

> We have found [...] exorbitant amounts of debits applied compared to municipal GDP in all the years analyzed, with emphasis on the municipality of Mombaça in 2011, where the debits applied amounted to 8,000% of the town's GDP in the year in question. (SOUSA, 2018, p.28)..

This indicator has the same disadvantages as the one proposed by Boll, in addition to lacking spatial coverage because it is limited to Ceará State. It also presents difficulties in the operational feasibility in its construction due to the problems described above.

Costa et al. (2020) analyze the relationship between corruption and public transparency in Brazilian states in 2016. A primary corruption indicator was proposed based on a modification of the indicators proposed by Boll (2010):

> One of the indicators elaborated used the annual number of irregular account cases registered in CADIRREG per state, indicating the percentage corresponding to the number of irregular cases in CADIRREG per state.
>
> [...]
>
> To make the resulting indicator more balanced, adapting it to the effects of the difference between the sizes of Brazilian states, after obtaining the number of cases per year and state, the result obtained was multiplied by the decimal logarithm of the estimated population of each state. [...]
>
> The data were filtered according to the case year, selecting the period from 2013 to 2019 [...] (COSTA et al., P. 9).

The irregularity indicator (IREG) was then normalized and calculated for the years 2013 to 2019. This indicator presents the same problems as the one proposed by Boll, with the exception of validity, since the author identified and corrected the negative effect of not taking into account the difference between the sizes of the states.

Table 2 shows a summary of objective regional corruption indicators based on records of Brazil's Accounting Courts.

TABLE 2 – CORRUPTION INDICATORS BASED ON DATA FROM ACCOUNTING COURTS

AUTHOR (DATE)	DATA	TYPE	TERRITORY	PROPERTIES (TABLE 1)
BOLL (2010)	CADIRREG (TCU), LOA, GDP, POPULATION	RELATIVE COMPOUND STANDARD	STATE	VALIDITY COMMUNICABILITY TO THE PUBLIC PERIODICAL UPDATES COMPARABILITY OF HISTORICAL SERIES
CINELLI (2011)	CADIRREG (TCU)	2 ABSOLUTE INDICATORS PRIMARY NON-TRANSFORMED	STATE	VALIDITY PERIODICAL UPDATES COMPARABILITY OF HISTORICAL SERIES
CARRARO (2015)	CADIRREG (TCU), LOA	RELATIVE COMPOUND STANDARD	STATE	VALIDITY COMMUNICABILITY TO THE PUBLIC PERIODICAL UPDATES COMPARABILITY OF HISTORICAL SERIES

AUTHOR (DATE)	DATA	TYPE	TERRITORY	PROPERTIES (TABLE 1)
SOUSA (2018)	CADIRREG (TEC-EC), LOA, GDP, POPULATION	RELATIVE COMPOUND STANDARD	MUNICIPAL (CE)	VALIDITY SPATIAL COVERAGE COMMUNICABILITY TO THE PUBLIC OPERATIONAL FEASIBILITY FOR ITS DESIGN PERIODICAL UPDATES COMPARABILITY OF HISTORICAL SERIES
COSTA ET AL. (2020)	CADIRREG (TCU)	RELATIVE PRIMARY STANDARD	STATE	COMMUNICABILITY TO THE PUBLIC PERIODICAL UPDATES COMPARABILITY OF HISTORICAL SERIES

Source: prepared by the author

THE CONCEPT OF CORRUPTION

According to the World Bank (WORLD BANK, 1997) corruption is "the abuse of public office for personal gain". Transparency International (TRANSPARENCY INTERNATIONAL, 2021) defines corruption similarly: "We define corruption as the abuse of entrusted power for personal gain". Bobbio, Mateucci and Pasquino (1991, p.292) define corruption as follows: "This is the phenomenon by which a public official is led to act differently from the normative standards of the system, favoring private interests in exchange for rewards". For the authors, the concept of corruption does not cover moral considerations: "Corruption is considered in terms of legality and illegality, not morality and immorality". Also, it only covers public officials and does not apply to the private sector. "Corruption means a transaction or exchange between those who corrupt and those who allow themselves to be corrupted."

In the concept of corruption used in this paper, a public agent must participate in the act. Hence, acts in which only private agents participate are excluded. For corruption to be characterized, it is also necessary that a legal norm be broken. Although there are approaches that characterize corruption as a breach of moral norms or deviations from the public interest, they do not suit this study because they are little operational. There is an inconvenient element of subjectivity when defining what is the moral norm to be used, and the definition of public interest is also very controversial. Although one can argue that legal norms do not cover all types of corruption, or that they may have been produced by those who were not fit for such, the legalistic approach is the most objective for the concept of corruption. Finally, the public official must obtain undue gain or benefit as a result of deviating from the norm. Therefore, for this paper, the concept of corruption is the deviation from the legal norm committed by a public official to obtain undue gain or benefit.

METHODOLOGY

To try to overcome the weaknesses of the proposed indicators mentioned, an objective regional Brazilian corruption indicator is proposed in this study, the CIPM (irregular accounts per million inhabitants), which is the result of dividing the state's number of accounts judged irregular by the TCU by the population of the state. According to Jannuzzi (2005, P.138), "in the applied field of public policy, social indicators are measures used to allow the operationalization of an abstract concept or a demand of programmatic interest". Considering that the concept of corruption used in this paper is the deviation from the legal norm committed by a public agent to obtain undue gain or benefit, the public statistics that are closest to this concept are the registers of irregular accounts of the Federal Court of Auditors (TCU).

The TCU has the competent jurisdiction to judge the accounts of public officials according to Article 71, item II, of the Federal Constitution (CF). The Or-

ganic Law of the TCU (LOTCU) determines that the accounts of the administrators will be submitted to annual adjudication and will be judged irregular when one of the following situations is proven (Article 16):

> (a) omission of duty to submit accounts;
>
> (b) illegal, illegitimate, uneconomical management action, or violation of the legal or regulatory norm of an accounting, financial, budgetary, operational or patrimonial nature;
>
> (c) damage to the Treasury resulting from an illegitimate or uneconomical management action;
>
> (d) embezzlement or misappropriation of public money, assets or values. (Brazil, 1992).

From Article 71, II of the CF and Article 16 of the LOTCU, it is possible to assert that the accounts judged irregular by the TCU are an excellent approximation of the concept of corruption used in this paper. It could be questioned whether, in addition to corruption, the accounts should also be judged irregular due to negligence. However, the TCU does not judge these accounts irregular as expressed in Article 16 of the LOTCU: "The accounts will be judged: [...] II - regular with reservation when they show evidence of impropriety or any other lack of a formal nature that does not result in damage to the Treasury;" (BRASIL, 1992).

The number of accounts judged irregular by the TCU, by state or municipality and year, is easy to obtain from the list of responsible persons with accounts judged irregular that can be collected on the TCU website (BRASIL, 2021). For this reason, the choice was made to create a simple indicator based on the number of accounts judged irregular per state. Since the Organic Law of the TCU is from 1992 and the Procurement and Contract Law is from 1993, for the sake of consistency, the data for the construction of the indicator were collected from 1994 onwards. The TCU database on accounts judged irregular has the year in which cases were opened and the year of the final adjudication. Although the year in which cases were opened is closer to the act of corruption, adopting it as the base year for the corruption indicator presents a major drawback. As each year the TCU judges cases from several previous years, if the opening year of cases were adopted for the indicator, this indicator could be modified at each meeting of the TCU for several years, as pointed out by Souza and Araújo (2017), which rules out the possibility of using it. Another possibility to try to reach the year in which the act of corruption was committed would be to subtract an average number of years (for example, 4 years) from the year of the final adjudication, but this procedure, in addition to being arbitrary, would delay the publication of the index for the same number of years. For this reason, it was decided that the best solution is to adopt the year of final adjudication as the base year of the corruption indicator.

The absolute number of accounts judged irregular is not a good regional indicator of corruption because the states have different sizes and, obviously, larger are expected to have more irregular accounts, which does not necessarily mean that they have higher corruption levels. It would be better to have a relative indicator. Therefore, the choice was made to divide the numbers of irregular accounts by the population of the state, a statistic that represents the size of the state, is easy to find on the website of the Brazilian Institute of Geography and Statistics (IBGE, 2021), and the estimates have annual periodicity, validity, consistency and security of continued publication. This study has a quantitative approach and uses Jurimetrics, which is Statistics applied to Law. An example of the application of Jurimetrics to Accouting Courts can be seen in Garcia et al. (2021). Thus, this paper proposes, as an objective regional Brazilian indicator of corruption, the CIPM, which is the number of accounts judged irregular by the TCU per million inhabitants.

RESULTS: THE CIPM

Tables 1, 2 and 3 show the CIPM for the states from 1994 to 2020.

TABLE 1 – CIPM FROM 1994 TO 2000

STATE	1994	1995	1996	1997	1998	1999	2000
AC	2,2	2,2	6,2	10,0	7,8	0,0	3,6
AL	6,8	3,0	11,0	16,9	10,4	8,8	14,9
AM	5,3	6,0	7,1	9,3	19,8	13,6	22,8
AP	22,0	36,8	31,6	19,9	2,4	9,1	18,9
BA	6,9	5,4	10,4	10,5	11,3	7,0	13,2
CE	4,2	4,0	6,3	2,9	2,4	2,7	7,9
DF	66,8	9,8	6,6	18,6	19,8	14,2	16,1
ES	2,6	3,2	0,7	3,2	3,8	5,1	1,3
GO	10,6	3,7	7,1	11,9	17,9	12,0	11,4
MA	4,1	7,1	4,6	7,6	4,9	4,6	7,8
MG	1,5	1,8	3,0	2,1	0,6	2,0	3,9
MS	11,7	5,2	3,6	7,1	2,0	6,9	12,0
MT	1,8	3,5	4,5	5,2	3,4	8,4	6,4
PA	6,2	8,1	12,5	7,6	8,5	7,5	8,1
PB	6,7	6,0	10,0	9,0	4,2	7,1	29,6
PE	1,8	0,8	1,1	2,3	3,5	2,9	6,4
PI	4,1	2,9	4,1	6,3	2,9	5,5	8,8
PR	5,1	0,9	2,9	2,2	1,8	0,6	2,9
RJ	1,2	0,8	1,3	2,1	1,1	4,9	10,6
RN	4,7	1,5	7,4	5,4	5,7	3,8	8,3
RO	2,3	2,2	1,6	10,4	0,8	5,4	2,2
RR	0,0	22,9	12,1	19,6	3,8	11,2	15,4
RS	4,9	1,0	1,8	3,6	2,4	1,6	2,9
SC	6,5	9,1	3,1	2,2	2,2	1,2	3,2
SE	10,8	10,0	11,1	7,2	5,9	8,8	8,4
SP	1,7	0,7	0,4	1,8	0,5	0,8	1,5
TO	9,1	2,0	8,6	11,1	9,0	12,3	23,3
BRAZIL	**4,6**	**3,0**	**4,0**	**4,7**	**4,0**	**3,9**	**6,9**

Source: prepared by the author.

TABLE 2 – CIPM FROM 2001 TO 2010

STATE	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
AC	0,0	0,0	15,0	20,6	28,4	32,0	27,5	19,1	15,9	43,6
AL	15,1	13,9	11,7	14,1	7,0	11,5	8,2	15,7	6,7	9,9
AM	21,4	18,9	13,5	17,2	13,0	19,6	14,0	14,4	17,1	19,5
AP	14,0	31,0	48,6	62,1	55,5	74,7	34,1	37,5	49,5	86,6
BA	10,1	10,1	6,5	9,1	9,8	11,8	6,7	7,0	8,1	9,1
CE	8,2	8,2	5,8	6,8	6,8	7,7	7,0	5,8	3,5	6,6
DF	20,5	29,4	20,1	13,1	18,9	18,5	15,9	19,9	18,8	46,3
ES	4,8	5,9	7,4	9,2	7,0	6,1	8,1	6,1	4,0	10,5
GO	6,4	10,7	7,9	6,4	5,7	9,2	7,6	5,0	7,1	11,0
MA	8,4	8,4	11,6	10,5	17,2	26,2	13,1	21,1	32,4	35,7
MG	4,9	5,3	2,8	4,8	4,7	5,2	6,0	7,2	6,7	8,4
MS	30,8	17,8	11,1	6,7	6,6	9,6	8,8	5,6	15,3	9,4
MT	7,0	8,8	21,9	10,5	11,4	12,3	17,5	20,6	14,0	16,1
PA	5,7	6,7	7,1	11,2	9,8	8,9	9,9	10,7	8,5	11,9
PB	21,3	20,3	25,3	14,3	13,9	15,2	13,5	6,7	14,6	14,1
PE	9,2	7,7	8,3	5,4	7,3	7,5	10,8	7,4	6,6	8,5
PI	17,4	30,0	23,6	19,5	17,3	12,8	18,1	12,5	21,0	17,0
PR	3,3	2,4	2,5	2,7	4,9	5,3	5,6	3,9	4,7	4,7
RJ	15,1	6,1	10,9	7,6	3,4	5,1	4,3	7,4	5,1	7,1
RN	13,9	8,4	9,7	8,8	12,3	17,4	20,6	22,9	22,3	25,6
RO	7,1	9,1	1,4	9,6	9,1	19,2	18,6	15,4	21,9	13,4
RR	29,7	14,4	39,2	39,3	25,6	7,4	25,3	43,6	49,8	77,7
RS	2,3	2,6	3,4	2,1	3,0	2,2	2,2	2,2	1,8	3,6
SC	2,8	1,4	3,4	2,8	3,2	2,2	3,4	1,5	2,0	1,8
SE	6,6	3,3	2,7	9,3	19,3	20,0	17,0	27,5	13,4	19,3
SP	1,8	2,2	1,9	1,1	2,6	4,1	8,3	3,8	3,3	3,2
TO	18,6	18,2	15,4	23,0	33,7	31,5	28,1	25,0	25,5	54,2
BRAZIL	**7,6**	**7,0**	**6,8**	**6,5**	**7,0**	**8,4**	**8,5**	**7,8**	**7,9**	**10,1**

Source: prepared by the author.

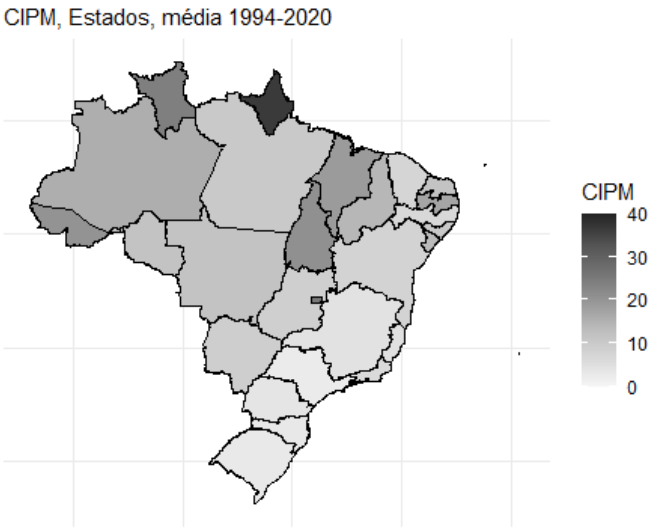
TABLE 3 – CIPM FROM 2011 TO 2020 AND THE MEAN FROM 1994 TO 2010 (27 YEARS)

STATE	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	MEAN
AC	41,5	43,5	45,1	30,4	32,4	24,5	28,9	39,1	15,9	19,0	20,5
AL	7,0	5,4	6,1	6,0	6,6	15,2	16,6	18,7	12,0	12,2	10,8
AM	18,9	14,5	9,5	17,0	16,3	33,2	19,2	15,4	19,3	13,3	15,9
AP	38,0	50,1	34,0	32,0	48,3	35,8	30,1	36,2	27,2	26,7	36,8
BA	8,8	5,7	5,5	5,0	8,8	8,1	6,5	7,1	6,3	6,2	8,2
CE	8,6	4,5	7,2	10,6	13,8	11,9	14,0	16,7	11,9	11,3	7,7
DF	37,9	25,3	18,3	26,3	25,0	25,9	32,2	41,0	53,1	34,7	25,7
ES	12,1	8,7	3,6	5,9	1,5	4,5	3,7	2,8	3,7	2,5	5,1
GO	9,5	4,5	5,1	5,5	7,3	10,2	9,3	10,8	13,8	13,9	8,9
MA	28,0	15,9	21,3	32,1	45,8	22,0	32,4	45,2	26,1	23,2	19,2
MG	6,0	3,9	4,2	3,9	6,6	7,5	5,5	4,6	5,2	5,0	4,6
MS	16,1	9,2	7,7	5,0	9,4	5,6	8,8	4,7	8,7	2,8	9,2
MT	25,7	20,9	21,7	17,7	13,5	18,2	8,4	9,0	7,7	5,4	11,9
PA	7,7	9,3	11,2	9,8	11,5	19,3	17,6	16,9	13,4	14,3	10,4
PB	15,0	14,7	13,0	15,2	17,6	29,8	28,3	36,8	38,1	27,5	17,3
PE	10,0	7,6	9,9	6,9	7,7	10,9	10,3	8,8	9,1	9,6	7,0
PI	14,7	10,2	13,2	23,9	15,6	13,1	17,1	22,4	14,1	20,4	14,4
PR	4,9	5,4	6,3	3,4	4,0	3,6	5,5	3,7	9,0	7,1	4,0
RJ	8,7	5,7	6,2	10,0	13,1	9,8	9,2	6,2	4,0	5,4	6,4
RN	22,5	16,4	7,1	7,9	11,9	15,8	12,0	10,3	12,5	8,8	12,0
RO	19,0	24,5	13,3	19,4	19,8	26,9	18,8	12,5	9,6	10,6	12,0
RR	89,1	91,6	75,8	52,3	71,2	81,7	97,6	46,8	39,6	14,3	40,6
RS	3,2	2,9	1,3	4,6	3,6	5,0	5,0	5,2	3,3	3,9	3,0
SC	3,8	2,7	3,2	1,8	6,0	3,6	4,1	3,3	4,1	4,7	3,3
SE	17,2	18,9	23,7	11,7	14,3	22,5	15,3	19,8	13,9	11,6	13,7
SP	3,4	1,9	1,8	2,3	3,0	4,1	4,0	4,1	4,4	5,2	2,7
TO	25,7	14,8	18,3	22,0	16,5	29,4	33,5	24,4	22,9	15,7	21,2
BRAZIL	**9,5**	**7,0**	**7,0**	**7,9**	**9,7**	**10,4**	**10,1**	**10,3**	**9,4**	**8,7**	**7,4**

Source: prepared by the author.

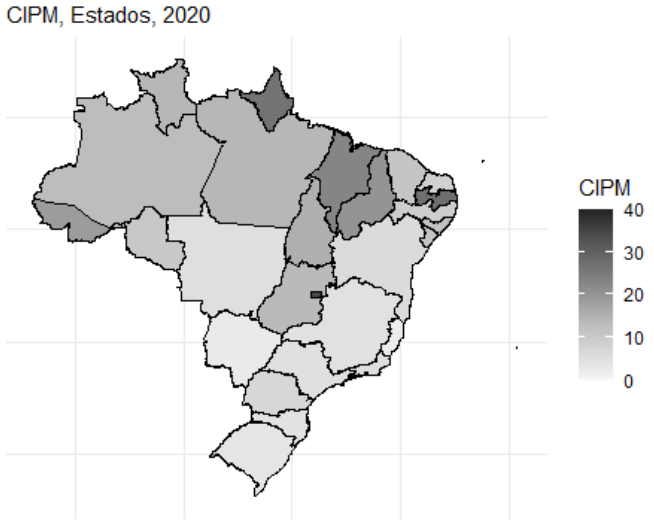
Figure 1 shows the corruption map for the mean CIPM from 1994 to 2020 (27 years). The higher the mean CIPM, the higher the level of corruption. Figure 2 shows the corruption map for 2020.

FIGURE 1 – MAP OF CORRUPTION BETWEEN 1994 AND 2020



Source: prepared by the author.

FIGURE 2 – CORRUPTION MAP FOR 2020



Source: prepared by the author.

ANALYSIS OF RESULTS AND DISCUSSION: CIPM PROPERTIES

Jannuzi (2017, p.34) lists the desirable properties for a public policy indicator: political and social relevance, validity of representation of the concept, reliability of measurement, operational coverage, sensitivity to planned actions, specificity to the program, intelligibility of design, communicability to the public, operational feasibility for its design, periodical updates, territorial disaggregation and comparability of the historical series. Next, we analyze the adherence of the CIPM to each of these properties.

Considering the space that the issue of corruption has occupied in the national agenda, it can be argued that the construction of an objective regional indicator to measure corruption is highly relevant. Validity refers to the proximity between the indicator and the abstract concept that it measures. The accounts judged irregular by the TCU are very close to the concept of corruption defined for this paper, which is why the indicator can be said to be valid. Reliability is the ability of an indicator to make consistent measurements through space and time. Because the TCU uses the same criteria (Organic Law and other federal laws) to judge the different states and in different years, it can be said that the CIPM is reliable to make comparisons between states or over time.

Spatial coverage refers to the indicator's ability to cover all spaces where the phenomenon may occur. The CIPM has good spatial coverage since the TCU judges accounts of all Brazilian states and municipalities. Sensitivity is the indicator's ability to change in response to public policies. For example, the effects of anti-corruption actions and campaigns carried out in a particular state and year, in which high values of the indicator were achieved, can be monitored through the evolution of the indicators over time and comparison with other states. However, such monitoring requires taking into account the time lapse between the occurrence of corruption and the final court decision, which, for the indicators presented, is 4 years on average. It is very likely that the number of accounts judged irregular by the TCU will decrease due to repressive and educational actions to fight corruption.

Specificity is the ability to detect only the analyzed phenomenon. It could be questioned whether, in addition to corruption, the accounts also should be judged irregular due to negligence. However, the TCU does not judge these accounts irregular as expressed in Article 16 of the LOTCU: "The accounts will be judged: [...] II - regular with reservation, when they show evidence of impropriety or any other lack of a formal nature that does not result in damage to the Treasury;" (BRASIL, 1992). Therefore, the CIPM has good specificity.

Intelligibility means transparency in the methodology used to create the indicator. The CIPM is intelligible because its design methodology has been explained in detail in this paper, and the methodological choices have been sufficiently justified. Communicability means that the indicator is easy to understand for the population, for societal control councils and other public agents. It aims to ensure the transparency of technical decisions. The CIPM indicator, accounts judged irregular per million inhabitants, is easy to understand for society in general. Feasibility means that the indicator is easy to obtain at modest costs and within a reasonable time. The statistics for the design of the CIPM, the Irregular Accounts Register, collected on the TCU website and the population of the states, available on the IBGE website, as previously discussed, are very easy to obtain.

Regarding periodicity, the CIPM is an annual indicator. The Irregular Accounts Register of the TCU is updated weekly, at each plenary meeting, and the IBGE publishes population estimates annually. The CIPM has good territorial disaggregation because it can be calculated for states and municipalities. The CIPM allows the comparison of present values with historical series in a reliable way since the adjudications of the TCU use the same standard over time and for all the states. Chart 3 shows the adherence of the CIPM to the 12 desirable properties listed by Jannuzzi (2017, p.34).

TABLE 3 – CIPM PROPERTIES

PROPERTY	YES	NO
Political and social relevance	x	
Validity of concept representation	x	
Reliability of measurement	x	
Spatial coverage	x	
Sensitivity to planned actions	x	
Specificity to the program	x	
Intelligibility of design	x	
Communicability to the public	x	
Operational feasibility for design	x	
Periodical updates	x	
Territorial disaggregation	x	
Comparability of historical series	x	

Source: prepared by the author.

FINAL CONSIDERATIONS

The objective of the paper was achieved with the proposal of the CIPM, accounts judged irregular by the TCU per million inhabitants. The properties of the indicator were analyzed and it was concluded that the CIPM has a good set of desirable properties. All methodological choices were considered and explained in detail to avoid the weaknesses of previous proposals. The choice was made for a simple indicator, instead of composite indicators, predominant in both subjective and objective indicators of corruption. A simple indicator, or a system of indicators, as advocated by Jannuzi (2005), is more suitable for public policies because it is more easily understood by all than composite indicators, such as the Corruption Perceptions Index (CPI). This leads to the first suggestion for future studies, namely the development of another corruption indicator based on the amount of the debit of the accounts judged irregular, the VDPM (amount of the debit of the accounts judged irregular by the TCU per million reais of GDP), to thus create, with the CIPM, a system of indicators that can be used to plan and control public policies to fight corruption.

In this study, CIPM values were calculated only for states. Further studies will be able to calculate the CIPM values for municipalities also based on the number of accounts judged irregular by the TCU, as the database allows it, which leads to the second suggestion for further studies. Finally, the CIPM can be used to test hypotheses about the causes and consequences of corruption, by relating it to indicators, for example, of education (IDEB) or human development (HDI), which leads to the third and final suggestion for future studies.

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