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Corruption and inefficiency in local government procurement and human development: new reflections

Corrupção e ineficiência em licitações de governos locais e desenvolvimento humano: novas reflexões

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Keywords
Corruption.
Inefficiency.
Government Procurement.
Human development.
Municipalities.
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Abstract

Corruption and inefficiency in public procurement, and the association with human development level has been coming up in various countries and governments. This article analyzes the association of identified irregularities in health sector bidding processes in Brazilian municipalities from 2010 to 2012. The presence of irregularities is mainly due to a low human development in the observed locations. The reflection done here shows that, although it is not possible through methodology to affirm causality between corruption and human development, it is believed that the existence of such practice may be related to low HDI. As a practical implication, the increase of public transparency and broader actuation for controlling institutions are suggested, since the local social environment might ease clientelism practices that create favorable opportunities for corruption.

Palavras-chave
Corrupção.
Ineficiência.
Licitações.
Desenvolvimento humano.
Municípios.
Saúde pública.

Resumo

Corrupção e ineficiência em contratações públicas e a associação com nível de desenvolvimento humano têm sido evidenciados em diversos países e governos. O presente artigo analisa a associação de irregularidades identificadas em licitações na função saúde em municípios brasileiros nos anos de 2010 a 2012. A presença de irregularidade está associada a um baixo desenvolvimento humano dos municípios considerados. A reflexão feita aqui é que, apesar de não ser possível pela metodologia afirmar causalidade entre corrupção e baixo desenvolvimento humano, há indícios de que a existência de tais práticas pode estar justamente associada ao baixo índice de desenvolvimento humano existente. Como implicação prática sugere-se o aumento da transparência dos processos e da atuação dos órgãos de controle, dado que o ambiente social local pode facilitar práticas clientelistas que criam oportunidades favoráveis à corrupção.

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1 INTRODUCTION

Thirty-eight billion reais is the amount, including fines, which the Federal Public Prosecutor's Office (MPF) is claiming as compensation related to the processes of Operation Car Wash, initiated back in March 2014 (MPF, 2017). The criminal scheme related to Petrobras' resources misapplication evidenced by the task force shows a close relationship between bidding processes and corruption. It was proved the operationalization of resources misapplication occurred by means of organization of cartels among large contractors, which payed bribe from 1% to 5% of the number of overpriced contracts for execution of works. Such contracts were obtained through apparently legal biddings processes (MFP, 2017).

Against this public resources' waste due to corruption, inserted in a political economic crisis, Brazil's financial situation is critical in 2017. The government reached the point of suggesting a reduction of R$ 10.00 in the initial proposal of the 2018 minimal wage, which will cause the government to save three billion reais [1].

[1]Information Source: *Governo propõe salário mínimo de R$10 menor em 2018, de R$969 [Government proposes a minimum wage with R$ 10,00 less in 2018, of R$ 969.00. G1 Economia. Available from: <http://g1.globo.com/economia/noticia/governo-baixa-em-r-10-para-r-969-proposta-para-salario-minimo-em-2018-e-economiza-r-3-bilhoes.ghtml>*.

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But, it would be a little percentage compared with the misapplication amounts identified by Operation Car Wash. This is an example, among so many others, of resources misapplication caused by corruption, which is frequently approached as one of the main issues for public management. Public resources waste is conceptualized by Bandiera, Prat and Valletti (2009) as all unnecessary spending incurred by public administration, classifying it as corruption and inefficiency.

Corruption and inefficiency are associated, but distinct phenomena. On the one hand, corruption is a clear breaking of living, administrative and moral rules, generating losses to the public treasury as counterpart for the performance of the wrongful act (Jain, 2001; Tanzi, 1998). Inefficiency is related to the wrong use of resources, which generates unnecessary spending, financial or not, for the public power (Bandiera et al., 2009).

Despite inefficiency does not draw the same attention than corruption, some studies show that it may cause even more impact. As example, inefficiency in Italy can be mentioned, which reaches 83% unnecessary spending in procurement of goods (Bandiera et al., 2009).

Corruption is present in several countries, although at distinct levels. Corruption in contracts with the government, which involves bribe to public agents and income collection by private bodies, occurs also in developed countries (Hessami, 2014). It has been shown that there is an inverse relationship both with economic development (Treisman, 2000) and with human development (Akçay, 2006). This result was validated in Brazil; Ferraz, Finan and Moreira (2008; 2012) show the effect of corruption on education, and Gupta, Davoodi and Tiongson (2000) and Dias (2016) show its association with health policies.

In general, literature that approaches corruption and human development discusses central governments and national impacts (ex Abed and Davoodi, 2000; Mo, 2001; Benfratello, Del Monte and Pennacchio, 2017). Still, corruption is discussed as cause of a low human development index (HDI). In turn, local governments are little discussed, and eventually HDI is rather a context for corruption than an effect. This article brings a reflection of this association (corruption and HDI) in Brazilian governments, in addition to the discussion on inefficiency of public management, which has been relevant in the context (Bandiera et al., 2009). For this purpose, it is focused specifically on a government's function, health.

As education and health gather 10% of Brazilian GDP, they are areas with greater amount of public resources invested in Brazil (Ferraz, Finan & Moreira, 2008; 2012). There is no news, as far as we know, of existence of empirical studies between MDHI and corruption and efficiency in health bidding processes in Brazilian local governments. The health sector involves resources employed in government procurements as a whole, estimated between 10% and 15% Brazilian GDP (Silva & Barki, 2012), being an attractive factor for rent-seeking activities, as observed in the study of Hermann (1999). Being mandatory that Brazilian municipalities invest at least 15% of its own-source revenue in health in order to meet Constitutional Amendment 29/2000 assures a continuous flow of resources for the associated contracts, being a constant source of inefficiency and potential corruption.

Corruption and Inefficiency are focus of analysis of the Program for Inspection through Public Lotteries (PFSP) of Ministry of Transparency (former CGU). The program was employed from 2003 to 2015 and the results of auditing indicate that the cases involving corruption and/or inefficiency are present in most municipalities audited. In this research, data collected from PFSP program are used as proxies of corruption and inefficiency in bidding processes for health sector. It is emphasized that PFSP data, even being frequently used in research on the theme in Brazil, – as proxy of corruption and inefficiency – do not focus exclusively on biddings (as that of Dias, Matias-Pereira, Farias & Pamplona, 2013). The 2010-2012 period was used to test the association with the Municipal Human Development Index – MHDI (2010) of 281 Brazilian municipalities.

The text below presents it is common the occurrence of cases of corruption, also showing that there are especially inefficiency cases in the country's bidding processes related to public health sector (what might occur in other sectors). Thus, it is evident the urgency of improvement of institutional, social and public transparency controls so that to monitor resources invested in government procurements, which will interfere with the population's quality of life and municipal human development.

2 LITERATURE ON CORRUPTION, INEFFICIENCY AND HUMAN DEVELOPMENT

Corruption is not a phenomenon exclusive of developing countries and with recent contact with democracy; instead, it has manifested g in several societies over time (Treisman, 2000; Klitgaard, 1994). Public management in social areas (health, education and assistance) is influenced both by such corruption practices and by the simple inefficiency, and their elimination will bring increased economic well-being (Reinikka & Svensson, 2005; Pereira & Campos, 2016).

Authors as Ferraz and Finan (2007), Shleifer and Vishny (1993), Tanzi and Davoodi (1997) and Mauro (1995) affirm that corruption impairs economic growth and distorts resources allocation, directing them to areas where they can be more easily collected. This fact affects the State's efficiency, because in addition to the loss due to waste, there is the displacement of values to other areas regardless of the true demand, favoring spending connected with incurring in expenditures that demand a greater volume of resources in detriment of the real population's need, affecting areas that have close relationship with the human development, as health and education (Gupta, Davoodi & Tiongson, 2000).

The concept of human development was understood entirely as connected with economic growth; however, this vision started changing in the 1970's, founded on the hypothesis that evolution of a country or municipality cannot be measured only by each individual's income, but it is necessary to consider other relevant facts, such as: health, education and quality of services. (Scarpin & Slomski, 2007).

One of the most used metrics to capture the concept of human development is the Human Development Index (HDI), which gathers, in the long term, the evolution of three basic dimensions: income, education and health. For HDI being multidimensional, it allows analyzing the practice of social policies of different countries (Sant'Ana, 2008). At local level, the MHDI is influenced by life expectation at birth, schooling indexes and average income per capita, and cannot be compared with the Global Human Development Index due to construction methodological differences (Atlas, 2017).

Previous literature already presented relationships between corruption and economic growth (Mauro, 1996; Leite & Weideman, 1999; Mo, 2001; Tanzi & Davoodi, 2000; and Abed & Davoodi, 2000; Gupta, Davoodi, and AlonsoTerme, 1998). Starting from the fact that economic growth, measured by GDP, is one of the factors that compound the HDI, it is possible to establish a relationship between it and corruption.

Despite the studies do not approach the issue of causality in the relationship between economic growth and economic development, the factors associated with human development are directly impacted by corruption (Mauro, 1998; Gupta et al., 2000; Kaufmann, Kraay & Zoido-Lobatón, 1999). Nevertheless, it is not known if economic growth influences corruption or vice-versa, point that can be hardly solved (Mauro, 1995).

Literature has evidenced managers do not want spend more in education and health because these spending programs offer less opportunity for rent-seeking. By rent-seeking logic, organizations would search for extraordinary profits not connected to their operational activities, which would come from corruption practices. The seminal studies of Tullock (1967), Krueger (1974), Posner (1975) show that rent-seeking appears when companies allocated resources to capture public administration, creating artificial barriers that impede competition. At that moment, rent-seeking would transform the monopolist profits into social costs by capturing the income coming from the obtainment of privileges and/or monopolies (Tullock, 1967), what can be observed in Petrobras case, aforementioned.

Table 1 presents the literature summary on the corruption impact occurring in different countries.

Table 1. Literature summary on corruption impact

Author(s)	Association proposed between corruption and:	Relationship found	Government scope
Mauro (1996)	Real GDP/capita growth	Negative	Central government, 103 countries
Leite e Weideman (1999)	Real GDP/capita growth	Negative	Central government, 72 countries
Abed and Davoodi (2000)	Real GDP/capita growth	Negative	Central government, 25 countries
Mo (2001)	Real GDP/capita growth	Negative	Central government, 45 countries
Benfratello, Del Monte and Pennacchio (2017)	Public debt and real GDP/capita growth (Relativized by the reduction of states' debt)	Positive between corruption and public debt; and negative between corruption and the real GDP/capita growth	Central government, 166 countries
Mauro (1996)	Private investment and GDP	Negative	Central government, 103 countries
Tanzi and Davoodi (1997)	Public investment (relativized by GDP)	Positive	Central government, 42 a 95 countries
Tanzi and Davoodi (1997)	Government revenues	Negative	Central government, 42 a 95 countries
Tanzi and Davoodi (1997)	Percentage of paved roads in good conditions	Negative	Central government, 42 a 95 countries
Mauro (1998)	Relationship between spending in public education and GDP	Negative	Central government, 103 countries
Gupta, Davoodi and Tiongson (2000)	Primary school abandon rate	Positive	Central government, 117 countries
Mauro (1998)	Relationship between spending in public education and GDP	Negative	Central government, 103 countries
Gupta, de Mello and Sharan (2001)	Government revenue (relativized by GDP)	Positive	Central government, 120 countries
Ghura (1998)	Fiscal revenue and GDP	Negative	Central government, 39 countries
Tanzi and Davoodi (2000)	Government revenue* (relativized by GDP)	Negative	Central government, 90 countries
Gupta, Davoodi, e Alonso-Terme (1998)	Inequality of income and poors' income growth (Gini coefficient)	Positive relationship with income inequality; and negative with poor's' income growth	Central government, 38 a 87 countries
Gupta, Davoodi and Tiongson (2000)	Indicators of health and education	Negative	Central government, 81 a 117 countries
Akçay (2006)	Human development	Negative	Central government, 63 countries
Ferraz, Finan and Moreira (2008; 2012)	Performance of primary school students	Negative	Local governments, 365 municipalities, Brazil

Source: *Transparência Internacional* (2001, p.56) and literature review

Note: The studies here presented performed on central government refer to cross-country study.* Obtained through tributary revenue (tax on income, taxes on capital gains and profits, social security tax, payroll tax), national taxes on goods and services, commercial taxes (imports and exports) and non-tributary revenue.

3 METHODOLOGY

To test the association between corruption, inefficiency and human development, the study used the reports of PFSP for construction of proxies of corruption and inefficiency. For human development proxy, MHDI was used. MHDI employs in its calculations the geometric mean of dimensions: long and health life (health); access to knowledge (education); and life standard (income). These dimensions have as respective indicators, life expectancy at birth, adult population schooling, school flow of young population and per capita monthly income.

The facts verified referred to health sector bidding processes present in reports were classified according to Table 2.

Table 2. Classification of corruption and inefficiency in health sector bidding processes

TYPES	DESCRIPTION (how the occurrence can be characterized)
WASTE DUE TO CORRUPTION	
Bidding processes bias	There is evidence that the service/product tendered and payed for was not provided/ delivered.
Overpricing	Prices above the market are used; or the most economically advantageous proposal is not used; or the prices already accorded are not followed or the prices are not in line with SUS pricing.
Organization, arrangement and bidding simulation	Companies and public servants joint to fraud the bidding process
Bidding targeting	There is favoring of any company
Participation in inexistent companies	Bidding process has participation of inexistent companies (such as shell or ghost companies)
Contracts and other documents falsified	The bidding process has falsified contracts and documents
Bidding with straw men	The mayor, in the bidding, uses relatives or third parties in his own benefit
WASTE DUE TO INEFFICIENCY	
Irregular bidding process	Irregularities, improprieties, faults or errors in documentation were identified
Other issues of the bidding process	Any other irregularity in the bidding process that is not related to the above variables
No performance of bidding process	The bidding process should have been performed but has not
Bidding irregularities related to works	The work was delivered unfinished or out of contract specifications/conditions
Bidding process with lack of competitors or restriction to the competitive character	The competitive character of the process is violated
Lack of disclosure	There is no observance of publicity principle.
Fractioning biddings	Spending is fractioned aiming at avoiding the bidding process or alteration of bidding modality.
Inappropriate type of bidding process	The appropriate modality of bidding is not used.

Source: Adapted from CEPESP-FGV *apud* Lopes (2011, p. 106) and Ferraz et al. (2008, p. 13).

PFSP reports indicate problems identified regarding resources application or execution of government's programs financed by the Union and executed by the municipalities. In the PFSP, the municipalities to be audited were selected through lottery (system similar to Caixa Econômica Federal [bank] lottery). The municipalities that had up to 500,000 inhabitants (except capitals) participated, amounting to 5,521 municipalities able to receive the auditing, representing 99.2% Brazilian municipalities (CGU, 2016). Auditing occurred by means of visits on site, performance of inspection of accounts, documents, physical inspection of works and services, besides direct contact with population (CGU, 2016).

The analysis unit refers to auditing performed from 2010 to 2012, which represents a concluded term of municipal power; auditing occurred in 2009 was not considered for being related to the new managers' first term. This cut is due to the fact that what was identified in this auditing is, as a rule, attributed to the previous manager. Therefore, it does not belong to the term selected for analysis.

Of 324 auditing events performed in the period, 21 were excluded because those governments in that year did not receive funds from the central government, and 22 for indicating no irregularities in bidding processes. The final sampling includes 281 auditing events, performed due to at least one issue in health sector bidding process, amounting to R$ 631 million in audited values (information collected from reports analyzed) in municipalities of all states of the federation. The cases are illustrated in Table 3.

Table 3. Sample description

Region	Total of auditing events performed in the 2010-2012 period	Initial sampling (Audited municipalities with transfers to health sector)	Final sampling (Municipalities with at least one issue in health sector bidding process(1))	% audited municipalities that received transfer to health sector and present at least one issue in bidding process of this sector
North	39	36	36	100.00%
Northeast	131	124	118	90.08%
Southeast	76	69	61	80.26%
Mid-West	27	26	24	88.89%
South	51	48	42	82.35%
Total	**324**	**303**	**281**	**86.73%**

Note: (1) It includes cases of corruption and inefficiency, identified according to auditing of the Program for Inspection through Public Lotteries (PFSP) of Ministry of Transparency (former CGU)..

It is worth mentioning that the municipalities chosen by lotteries may be chosen again in the next cycle (lottery with reposition). However, for the final study sampling, 281 auditing events represented 281 municipalities, once they do not repeat in the same period of analysis, corresponding to 165 audited municipalities in 2010, 97 in 2011, and 19 in 2012.

Table 4 presents the result of descriptive relative statistics for each one of types of waste due to corruption and inefficiency, totaling 1,655 occurrences related to some type of issue in health sector bidding process, of which 23.93% correspond to evidence of corruption, and 76.07% correspond to inefficiency, what ratifies Bandiera et al. (2009), Ferraz et al. (2008) and Dias et al.. (2013), which emphasize in their research the importance to pay attention to inefficiency when it occurs in greater frequency than corruption, causing losses to the public treasury.

Table 4. Descriptive statistics of evidence of waste (2010-2012)

Types	Median	Máx.	Standard deviation	Number of events	% occurrence per type of waste	% occurrence among the total waste
Bidding deviation	1.66	5	0.91	**141**	35.61%	8.52%
Overpricing	1.59	13	1.10	**140**	35.35%	8.46%
Organization, arrangement and bidding simulation	2.02	11	0.98	**85**	21.46%	5.14%
Bidding targeting	1.4	4	0.37	**21**	5.30%	1.27%
Participation in inexistent companies	1.33	2	0.15	**4**	1.01%	0.24%
Contracts and other documents falsified	1	1	0.10	**3**	0.76%	0.18%
Bidding with straw men	2	2	0	**2**	0.51%	0.12%
Total waste due to corruption	**1.41**	**15**	**2.10**	**396**	**100%**	**23.93%**
Irregular bidding process	2.46	11	2.00	**408**	32.41%	24.65%
Other issues of the bidding process	2.57	10	1.90	**355**	28.20%	21.45%
No performance of bidding process	1.44	5	0.86	**167**	13.26%	10.09%
Biding irregularities related to works	1.79	6	1.95	**129**	10.25%	7.79%
Bidding process with lack of competitors or restriction to the competitive character	1.45	5	0.70	**80**	6.35%	4.83%
Lack of disclosure	1.47	5	0.59	**53**	4.21%	3.20%
Fractioning biddings	1.2	3	0.40	**36**	2.86%	2.18%
Inappropriate type of bidding process	1.48	5	0.46	**31**	2.46%	1.87%
Total waste due to inefficiency	**4.48**	**26**	**4.42**	**1,259**	**100%**	**76.07%**

Source: Elaborated by the authors

Among the evidence regarding corruption in health sector bidding processes, the types "Overpricing" and "Bidding deviation" were the ones that occurred the most (around 140 times for each). Together they totaled a little more than 70% occurrences related to waste due to corruption in health sector bidding processes.

With regard to inefficiency of health sector bidding process, the type "Irregular bidding process" was the most frequent, representing 24.65% of the total of waste due to corruption and inefficiency identified, followed by the variable "Other issues of the bidding process", with 21.45% related to other not specified categories, evidencing how the inefficiency confirmations in bidding processes are diversified. Both types mentioned, when analyzed only from inefficiency perspective, represent 60.61% of these confirmations.

One point to be emphasized, which may be a stimulator for occurrence of inefficiency in bidding process related to "fractioning bidding", refers to the lack of updating of values limits, established in the modalities of Law of Tendering, dated 1993, and which are not adjusted since May 1998. In this period, the Extended National Consumer Price Index (IPCA) varied by 230.16%, which motivated a movement in the state of Mato Grosso aiming at updating, by decree, the limits established in Law 8,666/93, based on IGP/FGV Index. It had approval from the Court of Accounts of Mato Grosso (TCE-MT) and, posteriorly, from the State Prosecutor's Office. Later, it was used as part of a justification of a CGU Technical Note to Federal Executive Power, presenting proposal of alteration of bidding modalities limits set forth by Law 8,666/93 (TCE-MT, 2017).

To investigate the association of public health resources waste present in bidding processes, as corruption and inefficiency, and its relationship with the human development, the Multivariate Multiple Linear Regression technique was used.

Table 5 shows the variables present in the model, as well as their description, theoretical base, source and expected sign.

Table 5. Variables used in the study

Theoretical base	Variable	Description	Source	Sign Expected
Dependent variable				
Akçay (2006), Ferraz et al. (2008; 2012), Mauro (1998), Gupta, Davoodi and Tiongson (2000)	MHDI	Index that variates from 0 to 1; the closer to one it is, the greater the human development of the municipality(1)	IBGE	
Independent variables				
Akçay (2006), Ferraz *et al.* (2008; 2012); Mauro (1998), Gupta, Davoodi and Tiongson (2000), Tullock (1967), Svensson (2005)	Corruption indexes	Index calculated by the division of the number of confirmations classified as corruption by the number of Work Services, parametrized on a scale from 0 (best) to 1 (worst)	CGU and authors	Negative
	Inefficiency indexes	Index calculated by the division of the number of confirmations classified as inefficiency by the number of Work Services, parametrized on a scale from 0 (best) to 1 (worst)(2)	CGU and authors	Negative
Control variables				
Mauro (1998), Gupta, Davoodi, and Alonso-Terme (1998)	Spending on health sector/ Transfer from the Union (%)	Percentage of the resources transferred from the Union to the municipality for the health sector in relation to transfers from the Union to the municipality in the period audited by CGU(3)(3)	CGU	Positive
Mauro (1998), Gupta et al. (1998)	Spending on health sector/ Proper Revenue (%)	Percentage of own-source municipal revenue invested in health sector to meet Amendment 29/2000 (minimum of 15%)(4)	SIOPS	Positive
Jain (2001); Wu (2005); Mauro (1996) Abed and Davoodi (2000)	GDP/capita	GDP per capita(1)	IBGE	Positive
Gupta, Davoodi, and Alonso-Terme (1998)	Equality of income	Indicator calculated by the inverse of Gini (Gini 1), varying on a scale from 0 (worst) to 1 (best)(1)	IBGE	Positive
Akçay (2006); Ferraz and Finan (2008), Ferraz, Finan and Moreira (2008; 2012)	Urbanization rate	Percentage of urban population of the municipality(1)	IPEA	Positive
Akçay (2006), Ferraz and Finan (2008); Ferraz, Finan and Moreria (2012)	Population	Population of the municipality in logarithm(1)	IBGE	Positive

Source: Elaborated by the authors
Notes: (1) Base year 2010 (2) For the study, one used the auditing events occurred from 2010 to 2012, which do not represent a temporal series, since the municipalities were audited only one time in the period. (3) Calculated based on the value informed in CGU auditing reports of years 2010 to 2012, referring to the amount of resources audited in each inspection conducted. (4) Data referred to the year of performance of auditing in the municipality (2010 to 2012).

Table 6 presents the descriptive statistics of the variables used in the model. It is verified that, on average, the public health sector is responsible for 25.7% of the transfers of resources from the Union, and the average value of own-source resources invested in the area corresponds to 19.5%, which justifies the materiality of the study of the area. Regarding the revenue, the sample encompasses municipalities whose GDP per capita varies between R$ 2.2 and R$ 79.6 thousand, with average population of 17,000 inhabitants and average urbanization of 61.2%.

Table 6. Descriptive statistics of the variables of the model

Variable	Median	Minimum	Maximum	Standard Deviation
MHDI (2010)	0.639	0.453	0.790	0.071
Corruption index	0.135	0.000	1.000	0.175
Inefficiency index	0.176	0.000	1.000	0.155
Spending on health sector/ Transfers from the Union (%)	0.257	0.006	0.883	0.166
Spending on health sector/ Own-source Revenue (%)	0.195	0.000	0.364	0.045
GDP/capita	9,980	2,272	79,600	8,154
Equality of income	0.499	0.22	0.66	0.068
Urbanization rate	0.612	0.091	1.000	0.201
Population (thousand inhabitants)	17.0	1.6	174.5	20.9

Source: Elaborated by the authors

4 RESULTS AND DISCUSSION

With regard to the limitation of the research, it is important to highlight that theory suggests a relationship of causality between human development (effect) and waste of resources due to corruption and inefficiency (cause), which may be studied empirically with use of simultaneous equations. For this, it would be necessary a temporal series for proxies of corruption and inefficiency, besides the MHDI itself, which is not possible because: i) for the construction of corruption and inefficiency indexes, the PFSP reports were used, which do not allow the construction of a temporal series; (ii) the HDI is calculated every 10 years; and (iii) the causality study is not common for cross-section data since, in this case, it would be necessary the time variable existence.

Thus, such as Akçay (2006), the tests were performed considering the association between the variables, and to minimize this issue, the GDP per capita was used as control variable and also, as in the study of Akçay (2006), urbanization rate. It is also worth noticing that the sample refers to a period prior to Operation Car Wash, which signals a new scenario where there is perception of increased inspection and eventual reduction of impunity. The results of the model of regression can be observed in Table 7.

The three models presented in Table 7 evidence the relationship expected between MHDI, corruption and inefficiency. The MHDI, as might be expected, is largely due to the own previous conditions of the municipality. In Akçay (2006, p. 34), corruption could have an “immediate” effect on the HDI reduction, but the HDI present in the municipality also comes from a history of public policy implementation, level and efficiency of investments made during previous administrations. Thus, following the example of Akçay (2006), who controlled the previous context of 63 countries in his analysis, GDP per capita and urbanization rate of each municipality were controlled in the present model. The population logarithm was also used as a control variable (aiming at capturing the size of the municipality, which was not done by other variables of the model) and the equality of income (to verify the existence of environment favorable to clientelism).

The population and HDI ration is not something obvious. In Brazil, some populous municipalities have less social development. The result of the relationship between income equality and HDI showed the expected, a better distributed income reflected on a population with more resources for access to services (education, health etc.), which influences the HDI. A better educated population has a higher level of political-social understanding capable of charging the government with actions that lead to the development of the community and improvement of the quality of life, being less favorable to clientelism actions.

Table 7. Effect on Development Index in municipalities, regarding corruption and inefficiency

Variable	Coefficients and p-value (corrected by White's matrix)		
	Model 1	Model 2	Model 3
Dependent variable	MHDI	Corruption	Inefficiency
MHDI	-	-0.48453**	-0.79124***
Corruption index	-0.03050**	-	0.13695**
Inefficiency index	-0.06788***	0.18662**	-
Spending on health sector/ Transfers from the Union (%)	0.09817***	0.01007	0.14098**
Spending on health sector/ Own-source Revenue (%)	0.11092 **	-0.40005**	0.07849
GDP per capita (R$/inhab.)	0.00000***	0.00000	0.00000***
Equality of income	0.18951 ***	0.07720	-0.28650
Urbanization rate (% urban pop.)	0.11072***	-0.07130	0.02527
Population Logarithm	-0.00498*	0.00959	-0.00632
Const	0.45928***	0.38759**	0.73416***
n	281	281	281
FIV	1.243	1.594	1.551
P-valor (F)	0.000***	0.000***	0.001***
R2	0.661	0.107	0.166

Source: Elaborated by the authors

Notes: Three models with different dependent variables were run, MHDI in model 1, corruption index in model 2; and inefficiency index in model 3. For all three models, the other variables of the study were considered as independent variables, with the same control variables remaining. A fourth model was tested, equal to model 1 but with the inclusion of the variable "income equality x GDP per capita" as control variable which aimed to show the real distribution of GDP, which can be distorted by income concentration; however the VIF of the model was 23.51, presenting strong correlation in GDP per capita, so it was not considered in the study. As for the understanding of the table, the numerical values in the first part of the table represent the coefficients and the asterisks the p-value. The validation of the assumptions, adopted by the regression models, was done through the application of tests regarding the independence of the residues, homoscedasticity, normality of residues and absence of multicollinearity. Statistic F presented a significant 1% for the 3 models, that is, globally, the regressions are significant and representative. The heteroskedacity test was shown to be significant, that is, the three models presented a heteroskedasticy problem, but it was corrected by running the models with White's robust matrix correction. The independent variables used in the models do not present a high correlation with each other, which eliminates the problem of multicollinearity, which was confirmed by the Variance Inflation Factor test. * Significant at 10% **, Significant at 5%, *** Significant at 1%.

The lowest HDI, as was expected, is also associated with greater income inequality. Controlled such effects, the results confirm previous studies, showing that the existence of corruption and inefficiency is associated with a lower HDI. This can be due to two effects: (i) these cases occur in municipalities with less economic and social development, due to a greater presence of possible clientelism practices, or (ii) in more traditional analysis approach both corruption and inefficiency reduce the HMDI itself over time, due to greater waste of resources.

By performing control using urbanization rate and GDP per capita, the effect of the level of local development generated over the last few years has been isolated. When establishing urbanization rate and GDP per capita, the starting conditions of the municipality are controlled, due to history of efficiency or inefficiency of investments and public policies, or to historical, social and economic factors. The logic is, for municipalities of similar urbanization and family income (captured by GDP per capita), the largest or the smallest current MHDI would be associated (by one of the two causal directions presented, i or ii) with the inefficiencies or practices of corruption in the present or near past.

The results of Table 7 ratify previous studies of Gupta et al. (2000) and Ferraz et al. (2008; 2012), regarding the dimensions of human development. And they confirm, for local governments in Brazil, what Akçay (2006) has shown for central governments in 63 countries. It should be noted that, in this case, specifically health sector contracts were analyzed. Thus, because MHDI involves other dimensions besides health, it cannot be said that poor application of health resources is the only cause of a low local MHDI.

Among the municipalities that presented irregularities, a higher percentage of resources invested in health sector, arising from the transfer of the Union or from own-source revenue applications, is associated with a higher MHDI. Such resource is not significantly captured by rent-seeking activity, as would be expected in the general context of the presence of irregularities. Mauro (1998) had already identified that health spending generates this behavior, different from that presented in the logic of rent-seeking, which, in general, does not deal with how much would be captured with how much would generate social value. This signalizes to some effectiveness of the budgetary resources invested in public health, reflected in a higher MHDI, even in the presence of irregularities.

That said, an alternative interpretation is suggested here to that generally treated in literature. While the literature normally considers HDI as a dependent variable, another way of analyzing HDI is as a local context. It is suggested that the low MHDI is an environment favorable to practices of corruption and inefficiency.

This result is observed in models 2 and 3, the increase in corruption associated with increased inefficiency, both influenced by a low MHDI. That is, a low MHDI is proper to the occurrence of corruption and inefficiency. Localities with a low MHDI have greater dependence on the state in people's daily living, regarding both provision of public services and employment issues.

This creates an environment proper to the tolerance of small acts of corruption arising from clientelism practices regarding the search for advantages with the public power (Filgueiras, 2009), in addition to perpetuating the inefficiency of the state, since people are often assign to functions for which they do not have technical qualification. This fact distances the population from its supervisory function, for creating a relationship of dependence between mass and political elite (Gay, 1998), necessary for effective control environment to be installed, which would lead to the reduction of waste due to corruption and inefficiency. Corruption must be combative in the scope of its small occurrences, in the common citizen's daily living, so that a change of formal institutions can be achieved (Filgueiras, 2009).

It should be emphasized that because the data are of the same period, the causality was not tested. Thus, the results of Table 7 cannot be associated with whether a unidirectional or reverse causality between corruption, inefficiency and MHDI. The relationships that involve corruption are blurred because it is not known if it is the corruption that influences or is influenced by variables such as HDI, issue that, according to Mauro (1995), will never be totally solved.

Finally, because the program auditing is through lottery, a question to be analyzed is regarding other local restrictions that would suggest greater or lesser propensity for management inefficiency and corruption. In addition to the clientelism context coming from social factors such as poverty and income distribution, factors associated with control could mitigate such practices. Among them, existence of Internal Control, Municipal Councils performance, proactivity of the Courts of Accounts and local Legislative should also be considered.

5 FINAL CONSIDERATIONS

The research brings the relationship between waste in public procurement and human development, specifically in the health function in Brazilian municipalities from 2010 to 2012. Such waste present in the bidding processes occurs as corruption and inefficiency. A higher level of corruption and/or inefficiency is associated with a lower level of human development.

The results are in line with that identified in the literature. The data obtained confirm studies by Akçay (2006), Ferraz et al. (2008, 2012), Mauro (1998), Gupta et al. (2000), and such study involves dimensions of the HDI. By showing the negative association between corruption and human development, they expand the findings of Akçay (2006) in central governments to local governments. Moreover, corruption is included in the general inefficiencies in procurement for the health function discussed. Additionally, it offers an inverse reflection of causality – not tested – normally discussed. The results show that lower HDI environments are more favorable to illicit and inefficient practices.

The results suggest two paths to be investigated and targets of institutional reform proposals. The reduction of these practices would require formal and social control. Formal control coming from changing bidding regulations or from better enforcement by the monitor control bodies could reduce levels of corruption and inefficiency.

In this case, the increase in the effectiveness of such public policies, a greater provision of public goods and services and a tendency to improve municipal human development would be observed over time. The regulation would also involve public transparency actions to monitor bidding processes. This transparency would act as stimulator factor for the improvement of public management. Social control, subsequently with the greatest human development, could be seen in the future a less propensity to a clientelism environment, with everybody having access to health, the offer of privileges related to access of health services to "those who rely on the protection of an alderman, or a municipal servant" would disappear.

A practical contribution of the results presented here, of special interest for control bodies, would be the use of low HDI as a criterion to be incorporated into the auditing risk matrix. In order for their audit efforts to be better allocated, the Courts of Accounts could consider that low HDI is an environment favorable to the use of favoritism and clientelism exchanges.

Further studies on the impact of corruption and inefficiency on bidding processes in other governmental spheres (such as the Union and States), as well as other government functions (such as education and social assistance) are suggested. However, always emphasizing that causality tests would ask for evaluations of the long-term impact of the resources used in the specific public policies.

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