INSTITUTIONAL DIMENSIONS ASSOCIATED WITH GOVERNMENT DATA OPENNESS: A TRANSNATIONAL ANALYSIS

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Abstract: Academia has investigated the benefits and barriers of adopting open government data (OGD). However, there are theoretical gaps about the influence of the institutional factors over OGD. Hence, this study aimed to analyze the relationship between institutional dimensions and the level of government data openness in different countries. For such, a quantitative approach was adopted, using secondary data and a linear regression model. It was made evident that the performance of OGD initiatives is associated with the degree of existence of a specific public policy for OGD, the existence of a law on access to information, the development of electronic government programs, the participation of the country in the Open Government Partnership, and the administrative quality of the government. Therefore, beyond the technical challenges, the characteristics of the institutional dimensions of each country cause the implementation standard and performance of national OGD initiatives to vary from case to case.

Keywords: Open Government Data; Open Government; Institutional Dimensions; Information and Communication Technologies; National Governments.

1 Introduction

The academic literature understands that open government data (OGD) are obtained from the allocation of public resources and made available for use in formats with the least possible restrictions (JANSSEN, CHARALABIDIS. ZUIDERWIJK, 2012; ALBANO; REINHARD, 2015). Their potential benefits are tied to political, social, economic, administrative, operational, and technical issues (JANSSEN; CHARALABIDIS; ZUIDERWIJK, 2012; ALTAYAR, 2018). In the international academic literature, there is growing production, with a considerable number of authors developing analyses about different issues regarding what potentializes and restricts OGD (ALBANO; REINHARD, 2015; MARTIN, 2014; JANSSEN; CHARALABIDIS; ZUIDERWIJK, 2012; YANG; LO; SHIANG, 2015). On the other hand, there is still a lack of analyses emphasizing factors of institutional nature associated with the success, or even the failure, of the OGD initiatives conducted by national governments (GONZALEZ-ZAPATA, 2017; SAFAROV, 2019).

The factors of institutional nature related to the OGD theme are represented by institutional dimensions (SAFAROV, 2019), i.e., rules, guidelines, legacies, routines, structures, and interaction patterns, among others. Institutional dimensions have served to explain, for

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example, the reason for certain government agencies to adhere or not to OGD (YANG; WU, 2016; ALTAYAR, 2018; PURON-CID, 2014; YANG; LO; SHIANG, 2015). Other approaches underscore the importance that certain types of standards, procedures, and instituted agendas have for the continuity of OGD initiatives in the long run (VAN SCHALKWYK; WILLMERS; SCHONWETTER, 2016; POSSAMAI, 2016; GONZALEZ-ZAPATA; HEEKS, 2017).

Nevertheless, there is an apparent gap regarding the relationship between institutional dimensions and the data openness level in different national governments. In other words, it is possible to consider that there is a different institutional arrangement and, consequently, an OGD initiative in each national context. On the other hand, it is also understood that, although the goals may be different in each locality, the implementation tends to follow orientations and implementation standards disseminated from the experience of developed countries (DAVIES; PERINI; ALONSO, 2013; DAVIES; PERINI, 2016).

Hence, the question that guides the study proposed here is the following: to what extent are the dimensions of institutional nature associated with the data openness levels in different national governments? The general objective of this study is to analyze the relationship between institutional dimensions and the level of government data openness in different countries. With this established, the analysis focus of the study is microstructural, i.e., it involves the OGD initiatives from a compared perspective and at a transnational level. It covers countries with different socioeconomic stages that also present disparate development stages of OGD initiatives.

Beyond this introduction, the paper is structured as follows: in the theoretical review, we sought to map the institutional dimensions associated with OGD present in the literature, also presenting the study hypotheses. Next, we describe the method used to select and analyze the data. Soon after, the results are presented, including descriptive statistics and the linear regression model used to test the hypotheses. Lastly, the final considerations of the work are established.

2 Theoretical Background

The global open government movement, the most significant turning point of which was the formation of the Open Government Partnership (OGP) in 2011, put on the agenda the need for public sector information to have more quality and availability. This type of requested information has been named open government data (OGD). Hanssen, Charalabidis, and Zuiderwijk (2012) defined OGD as non-confidential data without privacy barriers generated from public resources and made available with no restrictions on their use and redistribution, except for justifiably confidential data the publication and openness of which is inappropriate. In brief, OGD refers to any type of data that may be made available for use, reuse, and redistribution without legal, technical, or technological restrictions (KALAMPOKIS;

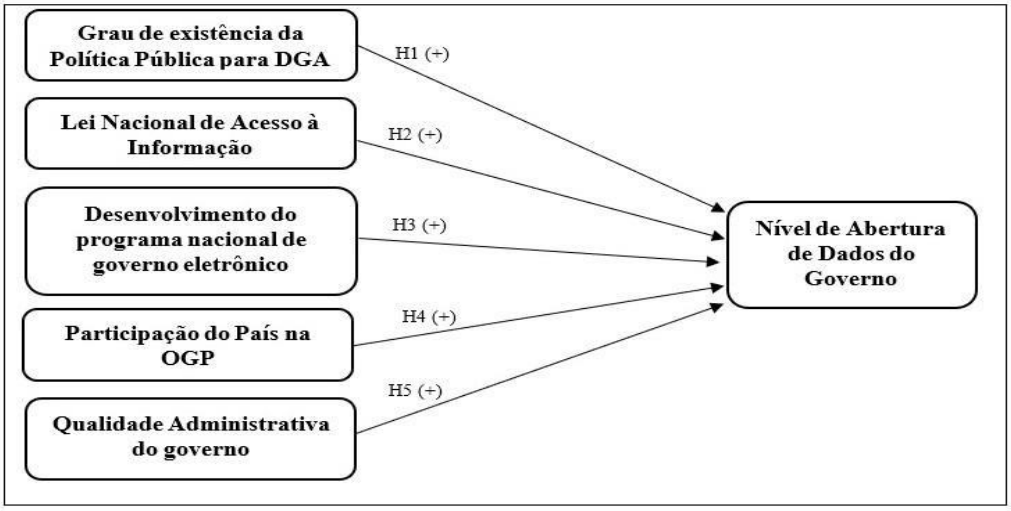
TAMBOURIS; TARABANIS, 2011; YU; ROBINSON, 2012; DAVIES; PERINI; ALONSO, 2013; SEWADEH; SISSON, 2018).

Amid these definitions, it is necessary to consider that OGD are sociotechnical innovations, with a series of relevant issues that influence the intention of government organizations to open their data or not (YANG; WU, 2016). In the face of this, various studies have attempted to understand how the institutional environment of governments has impacted the public data opening process (MARTIN, 2014; POSSAMAI, 2016; SCHALKWYK; WILLMERS; SCHONWETTER, 2016; GONZALEZ-ZAPATA; HEEKS, 2017; ALTAYAR, 2018; KASSEN, 2018).

However, the evidence found is still incipient. That is to say that, compared to other analysis approaches about OGD, the institutional issue ends up on the sidelines (SAFAROV, 2019). Thus, based on the institutionalist theory maxim that institutions matter when political processes are analyzed (MARCH; OLSEN, 1989; NORTH, 1990; PETERS, 1999), more particularly, the institutions also matter to understand how the adoption of technological innovations (such as OGD) takes place in public organizations (FOUNTAIN, 2001).

Putting into perspective the understanding of the influence that the institutions have on the national government data opening processes (GONZALEZ-ZAPATA, 2017) and, similarly, the way devised by Safarov (2019), it is possible to present at least five institutional dimensions potentially associated with more considerable OGD levels (Figure 1). They are the following: a) the degree of existence of a public policy for OGD; b) the existence of a national law on access to information; c) the development of the national electronic government program; d) the participation of the country in the OGP; e) the administrative quality of the government. Beyond the description, Figure 1 presents the analytical model followed in this study, as well as the hypotheses to be investigated, which are discussed next.

Figure 1 – Analytical model of the study



Source: Devised by the authors, 2021.

The first hypothesis addresses the specific public policies for opening government data. The absence of guidelines and coordination mechanisms for opening the data results in little-substantiated decision-making in public organizations, in which case privacy concerns may prevail instead of the public interest on the systematic publication of OGD (ZUIDERWIJK et al., 2014). Although initiatives for opening government data do not initially have a basis of specific guidelines, such initiatives end up being incorporated into a preexisting institutional arrangement related to other transparency policies (POSSAMAI, 2016; ROSNAY; JANSSEN, 2014). Nevertheless, these preexisting institutions may not be sufficiently adequate to guide the data opening processes because they do not provide detailed principles for such (ZUIDERWIJK; JANSSEN, 2014).

In turn, Safarov (2019) argued that public policy determines the success of the implementation and enables initiatives for opening government data to become more sustainable. However, the simple formulation of a public policy for opening government data does not, in itself, guarantee that the OGD initiatives and projects are maintained over time, with the possibility of the discontinuation of such initiatives being an issue that must be taken into account (MATHEUS; RIBEIRO VAZ, 2017).

Given this point, it is a considerable agenda that these public policies be legitimized by the political community and well-structured to the point of being institutionalized in government agendas. In this same line, Zuiderwijk and Janssen (2014) claimed that the primary purpose of public policies on data opening must be to develop a culture in which OGD are indeed considered the standard in the transparency aspect. Based on this understanding, the first research hypothesis is established as follows:

H1: The degree of existence of a specific public policy for open government data is positively associated with the data openness level of a national government.

The second hypothesis addresses (national) laws on access to information (LAIs). Such initiatives are important regulatory pillars to reflect on how countries have built open government policies (YU; ROBINSON, 2012; HENNINGER, 2018). The fundamental premise posed is that the availability of an LAI is a fundamental regulatory framework and even a starting point for the opening of government data (SAFAROV, 2019; GONZALEZ-ZAPATA, 2017). Nevertheless, the existence of an LAI alone may not be sufficient for the effective adoption of OGD, with the complementation and integration with other types of policy or legislation being necessary (ROSNAY; JANSSEN, 2014).

In parallel, the existence of a national LAI appears as an important condition for the success of an initiative for opening government data, especially considering that OGD are not implemented in a vacuum (PURON-CID, 2014), and that specific public policies are not

necessarily developed ex ante. Moreover, due to their focus on the rights of citizens over public data, LAIs represent a fundamental political basis, precedent for the open-government agenda and the use and adoption of open data in the public sector (GONZALEZ-ZAPATA, 2017).

Authors such as Safarov (2019) and Yang, Lo, and Shiang (2015) have indicated that LAIs are primary critical factors that government agencies take into account for opening their data or not, given the function that such normative dimensions have in restricting government actors with decision-making power. Trajectory-dependence effects are also observed when it comes to this institutional dimension. It is plausible that this type of rule may favor the introduction of new themes and elements connected to transparency and access to public data due to the establishment of a basic pro-transparency logic that enables countries that formulated their LAIs beforehand to benefit from a historical legacy of transparency produced by such regulations (GONZALEZ-ZAPATA, 2017). Based on this understanding, the second research hypothesis is established as follows:

H2: The existence of a national law on access to information is positively associated with the data openness level of a national government.

The third hypothesis addresses the development of national electronic government (e-gov) programs. E-gov and OGD are related concepts (HARRISON et al., 2012), especially for being, in general, applications of information and communication technologies to government services and procedures. However, there is a relationship little explored in the literature on the concepts when it comes to understanding them as being linked from the institutional perspective. The key argument here is that the development level of the electronic government agenda and policies of a country and their trajectories are potentially determining factors for the concretion of an initiative for opening public data.

It is assumed that the development of the national electronic government is also an institutional dimension of relevant influence on OGD. After all, an innovative concept such as that of an open government and the consequent use of OGD as openness mechanisms in governments would not be possible without the results and benefits obtained from the previous electronic government models (VELJKOVIĆ; BOGDANOVIĆ-DINIĆ; STOIMENOV, 2014). This may mean that national OGD projects tend to be favored in case the electronic government programs built over time leave a legacy when it comes to management, procedures, rules, good practices, knowledge, and experience in conducting technology-based innovations in public administration.

Electronic government is presented as a platform that emerged with the purpose of also bringing more transparency to the State and consequently rendering governments more responsive and responsible (BROWN, 2005). Thus, it is understood that an electronic

government is a fundamental precedent of OGD, especially for introducing in public administrations the notion of using digital government data (GONZALEZ-ZAPATA, 2017).

Still in this line, although it is considered that well-developed electronic government programs may have positive institutional trajectories (yet not deterministic) for OGD, on the other hand, it is necessary to recognize that, when such programs are institutionally fragile, uncoordinated, with low installed capacity, and not inserted into a broader intersectoral platform, they offer trajectories that may render infeasible the disruptive nature of OGD (GONZALEZ-ZAPATA; HEEKS, 2017). In turn, this may render the adoption of such data opening standards in government organizations merely incremental (SAYOGO; PARDO; COOK, 2014). Based on this understanding, the third research hypothesis is established as follows:

H3: The development of national electronic government programs is positively associated with the data openness level of a national government.

The fourth hypothesis addresses the integration with the global open government agenda and participation in the OGP. In a general view, the determining factors for governments to open their data may come from two different types of institutional pressure sources, with such institutional sources being internal and external (ALTAYAR, 2018). Internal sources, which typically receive more prominence in the literature, emphasize sociotechnical factors inherent to the public sector structures. In turn, external influence sources indicate the extent to which government organizations consider the influence of external actors on the initiatives for opening government data (YANG; WU, 2016).

Hence, the institutional pressure exerted by global institutions may also be considered a relevant external source (GONZALEZ-ZAPATA, 2017; ALTAYAR, 2018). Therefore, although it is identified that OGD initiatives emerge as a response to bottom-up pressures from the various sectors of civil society, it is also admissible that many of such initiatives arise more as cases of public policy transfers among elites, with governments copying the OGD concept from each other (DAVIES, 2013). Stemming from this understanding, the operation of multilateral organizations such as the UN, the World Bank, and the OECD in disseminating OGD is acknowledged as relevant. However, it is understood that the OGP is currently the leading global institution related to the subject.

Participation in the OGP might boost data opening in the case of countries at incipient stages or even guarantee the linearity of more advanced initiatives if it considered that, in democratic contexts, governments are transient. The previously presented argument is because, once a country becomes an OGP member, its governments commit to fulfilling action plans based on open government principles, with the compliance with the targets of the plans being

strictly assessed by the intersectoral committees of the partnership (OPEN GOVERNMENT PARTNERSHIP, 2011). With this, it is believed that the commitments made in the OGP produce institutional pressure or supplementary motivation that largely mold the action of national governments to concretely follow the standards disseminated in the international arena when it comes to opening public data (SAYOGO; PARDO; COOK, 2014).

Besides the pressure factor, participation in the OGP also contributes to the learning factor. After all, the OGP also stands out for being an environment in which member countries interact with other countries, companies, and social organizations in search of developing innovative solutions. Considering the mimetic characteristics (DIMAGGIO; POWELL, 1983) through which the OGD concept is disseminated in government organizations, the OGP may enable a more considerable gain in terms of idea circulation. This allows governments to find better ways to not only copy initiatives from other countries but also adapt the public data openness principles to their different contexts and realities. Based on this understanding, the fourth research hypothesis is established as follows:

H4: The participation of a country in the OGP is positively associated with the data openness level of a national government.

The fifth hypothesis addresses the administrative quality of public organizations. Among the different institutional dimensions mapped in the literature on OGD, the one that receives the least attention involves the issue of government bureaucracy quality. In general lines, when referring to the issue of the administrative quality of government agencies, three specific elements are generally underscored: the resources directed at government organizations, the support of the high government echelon, or the required technical skills (YANG; WU, 2016; SAFAROV; MEIJER; GRIMMELIKHUIJSEN, 2017; SAFAROV, 2019; GONZALEZ-ZAPATA, 2017; LUNA-REYES; NAJAFDABADI, 2009). Although such elements are important to the current debate, it is still fitting to discuss the role of the quality of government bureaucracy for the success of the national OGD platforms more appropriately.

According to Rothstein and Teorell (2008), the impartiality in public administration may, from a normative viewpoint, be the measure that best defines the administrative quality of the government bureaucracy, with an impartial bureaucracy being that which guides its operation on rules formulated *ex ante* instead of serving the clientelist, patrimonialist, and corporatist interests. Despite being an interesting alternative to measure the administrative quality of the State, the notion of impartiality in itself may sound contradictory if it is not duly deepened. Given this impasse, Fukuyama (2013) criticized the approach by Rothstein and Teorell (2008), arguing that a State may be impartial and not conduct its public policies effectively.

Taking into account that the operation of bureaucratic agents, at their different organizational levels, concretizes the action of the State and defines how the government policies are going to be implemented, the notion of public administration impartiality must be accompanied by satisfactory performance of government functions. In this sense, Fukuyama (2013) proposed that the real notion of impartiality takes place when the operation of government bureaucracy results from the synergy between two key concepts for bureaucratic performance: capacity and autonomy.

Capacity essentially involves issues such as meritocratic selective recruitment, specialization, and the establishment of long-term careers in the public sector (EVANS, 1995; FUKUYAMA, 2013; CINGOLANI; THOMSSON; DE CROMBRUGGHE, 2015). In turn, bureaucratic autonomy implicates that government bureaucracies exercise their activities and actions with the least possible political constraints, having as a reference the surrounding legal systems (FUKUYAMA, 2013).

Given these assumptions, the viewpoint of Rothstein and Teorell (2008) that impartiality in public administration is a synonym of administrative quality is resumed. However, it is believed that the impartial exercise of public power may not occur (or occur to a lesser extent) due to the absence of capacity and autonomy. Therefore, it is considered that administrative quality emerges from a desirable combination of capacity and autonomy, which will, in turn, result in a more strict and impartial exercise of public power.

It is also important to stress that technology potentially reproduces behavioral and cognitive aspects of bureaucracies when incorporated into government organizations (FOUNTAIN, 2001). Therefore, despite the formal and informal rules that will largely mold how these initiatives should take place, so highlighted in the institutionalist OGD analyses, it is the operation of bureaucracy, connected to the institutional arrangement, that ultimately converts the formulated guidelines into concrete government actions. Based on this understanding, the fifth research hypothesis is established as follows:

H5: The administrative quality of government organizations is a factor positively associated with the data openness level of a national government.

3 Method

The research method is quantitative, with an exploratory-descriptive and cross-sectional approach. The data are secondary, collected from studies conducted by organizations such as the UN, the Open Government Partnership, the Varieties of Democracy (V-Dem) Institute, and the Web Foundation. The analysis period is 2016 because it was the year when the most current comprehensive version of the Open Data Barometer (ODB) was published, a base indicator for the formation of the dependent variable in the analytical model of the study. The initial sample

for analysis contained 115 cases, covering all countries in the fourth edition of the ODB. However, due to the absence of data for the operationalization of some of the independent variables in specific cases, the sample was reduced to 111 countries. Swaziland, Santa Lucia, Palestine, and Kosovo were removed from the sample.

The dependent variable of the study (Box 1) was the aggregated openness level of the datasets made available by the national governments. This variable was measured from the use of the Implementation subindex, which, along with the Readiness and Impact subindices, composes the general indicator of the ODB. The Implementation subindex is, thus, constructed with the purpose of being an objective measurement of the openness level and quality of the datasets made available by the different national governments. The independent variables of the study are presented in Box 1, which also includes the form of measurement adopted and the data source.

Box 1 – Synthesis of the study variables

Dependent variable	**Operationalization**	**Source**
Openness level (**OPENNESS**)	Index, varying from 0 to 100	Implementation subindex, which composes the aggregated index of the fourth edition of the Open Data Barometer
Independent variable	**Operationalization**	**Source**
Public policy (**OGD_POL**)	Ordinal measure, on a scale from 0 to 10	Context data from the fourth edition of the Open Data Barometer
Electronic government development (**EGOV_DEV**)	Aggregated index, varying from 0 to 1	*UN E-Government Survey – United Nations*
Participation in the OGP (**PARTIC_OGP**)	Categorical variable. A value of 1 is assigned if the country was an OGP member in 2016 and 0 otherwise.	*Open Government Partnership – list of member countries*
Law on Access to Information (**LAW_INFO**)	Categorical variable. A value of 1 is assigned if the country had in effect, up to 2015, some legal mechanism regulating the access to information and 0 otherwise.	*Global Sustainable Development Goals Indicators Database – United Nations*
Administrative quality (**ADMIN_Q**)	Aggregated index, varying from 0 to 4	Index of strict and impartial public administration from the Varieties of Democracy (V-Dem) Project
Control variable	**Operationalization**	**Source**
GDP per capita (**GDP_CAPITA**)	Continuous variation indicator	United Nations Statistics Division

Source: Devised by the authors, 2021.

The first independent variable addresses the degree of existence of a public policy for opening government data formulated and implemented in each country (**OGD_POL**). Its operationalization took place from the use of qualitative context data present in the fourth

edition of the ODB. The second independent variable regards the development of national electronic government programs (**EGOV_DEV**). To measure the concept and operationalize the proposed variable, we sought to use, as a proxy, the e-service index contained in the UN e-Government Survey (UNITED NATIONS, 2016). As the third independent variable, we sought to identify the existence of an LAI in each of the countries in the sample (**LAW_INFO**) up to 2015, the year preceding the analysis. For such, the global database of the UN Sustainable Development Indicators (UNITED NATIONS, 2020) was consulted.

The fourth independent variable consists of the participation or not of the countries in the OGP (**PARTIC_OGP**). To operationalize, we identified, by consulting the list of OGP members, the countries that were members or not of the partnership in 2015. Lastly, the fifth independent variable covers the administrative quality of the national governments (**ADMIN_Q**). It was measured by using the strict and impartial public administration index contained in the V-Dem project (VARIETIES OF DEMOCRACY, 2016).

To test the established hypotheses, a linear regression model was used, estimated through ordinary least squares (OLS). The goal was to verify the influence of the independent variables on the variation of the data openness level. Considering the vast diversity of development among the countries in the sample, it was necessary to moderate, in the inferential analysis, the effect of the institutional dimensions on the OGD initiatives from an indicator of national wealth. For such, the control variable **GDP_CAPITA** was used, representing the GDP per capita of the countries available in the global UN database. To ensure the viability of the modeling, the assumptions of the technique were also analyzed, including verifying the collinearity among the variables. Complementarily, descriptive statistics and a correlation analysis based on the Pearson coefficient are included.

4 Results

The descriptive analysis of the study variables is the starting point in the presentation of the results. The basis of this step was the statistical measures presented in Table 1. Starting with the dependent variable, one may observe, from Panel 1, that the variable **OPENNESS** presented a mean value of 31.9 (amplitude from 0 to 100), with a standard deviation of 21.8. However, it is evident that, for the analyzed period, the public data openness pattern presented by this set of countries is generally low. This suggests that most of the initiatives from the national governments were at the embryonic stage or only partially implemented. That said, it is possible to establish that, up to 2016, the possibility of opening public data still posed a considerable challenge for most national governments.

Relative to the independent variables, one may verify that, for the variable **OGD_POL**, the mean was 3.2 points (amplitude from 0 to 10), and the standard deviation was 2.7 points. This suggests a picture of a low degree of existence of such public policies. Presumably, these

policies tend to be institutionally weakened and unstructured in most countries in the sample.

Relative to the variable **EGOV_DEV**, the index mean was 0.56 (amplitude from 0 to 1), and the standard deviation was 0.20. This suggests a context in which most of the countries in the sample perform intermediary results considering the development of their electronic government programs. Although the trajectory of the e-gov programs in the world began in the late 1990s in many nations, it is plausible to state that barriers persist in this area and that the incremental development pattern is still a reality for most countries in the sample.

Table 1 – Descriptive statistics of the study variables

Panel 1 – Metric variables						
Variables	**N**	**Mean**	**Median**	**Standard deviation**	**Minimum**	**Maximum**
OPENNESS	111	31.9	29.0	21.8	3.0	100.0
EGOV_DEV	111	0.56	0.59	0.20	0.16	0.92
ADMIN_Q	111	2.44	2.44	0.94	0.19	3.92
OGD_POL	111	3.2	3.0	2.7	0.0	9.0
GDP_CAPITA	111	15,713.24	6,860.00	19,411.46	340.00	82,110.00
Panel 2 – Categorical variables						
Variables	**Class**			**N (111)**		**%**
PARTIC_OGP	Member countries (1)			57		51.3
	Non-member countries (0)			54		48.7
LAW_INFO	Had an LAI (1)			80		72.1
	Did not have an LAI (0)			31		27.9

Source: Devised by the authors.

Relative to the variable **ADMIN_Q**, it is possible to outline a perspective of to what extent the national governments in the sample present administrative quality in their bureaucracies. The mean value obtained for the index was 2.44 (amplitude from 0 to 4), and the standard deviation was 0.94. This suggests a scenario in which the administrative quality level of the governments in these countries in the sample is more at an intermediate than a low stage, with bureaucracies operating relatively impartially.

To close the descriptive analysis, the results for the variables **PARTIC_OGP** and **LAW_INFO** are presented, contained in Panel 2 of Table 1. Considering the variable **PARTIC_OGP**, it was verified that 57 countries (51.3%) were OGP members up to 2015. In turn, relative to variable **LAW_INFO**, there was a formulated LAI up to 2015 in 80 countries (72.1%). With over half the cases in the sample being in the group of countries that have an LAI, these presented values signal, in transnational terms, an advance when it comes to disseminating this institutional dimension.

Once the descriptive analysis was developed, the following step was to verify the relationship between the independent variables and the dependent variable. For such, the first step was to identify the association between the independent metric variables (**OGD_POL**,

EGOV_DEV, **ADMIN_Q**, and **GDP_CAPITA**), since one of the prerequisites of multiple linear regression estimated via OLS is that there be no high covariation among the independent variables (GUJARATI; PORTER, 2011; HAIR et al., 2005; KELLSTEDT; WHITTEN, 2013). The technique used was the estimation of the Pearson correlation coefficient. The results presented in Table 2 indicate that the metric variables in the study present moderate correlations among them. The highest coefficient occurred between the variables **OGD_POL** and **EGOV_DEV** (r = 0.668). There was no indication of multicollinearity, given that the values were lower than the reference of 0.7 (HAIR et al., 2004).

Table 2 – Correlation matrix of the independent metric variables

-	OPENNESS	OGD_POL	EGOV_DEV	ADMIN_Q	GDP_CAPITA
OPENNESS	1				
OGD_POL	0.780**	1			
EGOV_DEV	0.789**	0.668**	1		
ADMIN_Q	0.654**	0.523**	0.604**	1	
GDP_CAPITA	0.678**	0.574**	0.620**	0.644**	1

Source: Devised by the authors, 2021.

Additionally, the variable **OPENNESS** was also included to preliminarily verify the intensity and direction of the association (positive or negative) between the independent metric variables and the dependent variable of the study. For an operational issue, the categorical variables **PARTIC_OGP** and **LAW_INFO** were not included in the correlation matrix because they are measured in different ways and, thus, are not fit for this type of statistical technique. The results presented in Table 2 allow verifying that the relationship of the dependent variable **OPENNESS** with the other independent metric variables is positive and statistically significant ($p < 0.05$), with a correlation measure deemed strong or moderate (HAIR et al., 2005).

Table 3 shows the results of the estimation of the multiple linear regression model of the study, presenting information on the quality of the model fitness and the estimated values for the coefficients and other verification measures. According to the results in Table 3, the estimated regression model meets the statistical assumption of residual normality (error estimators), as observed through the statistical significance of the Kolmogorov-Smirnov normality test ($p = 0.200$). The adjusted R^2 value was 0.773, which signals a considerable explanatory quality of the dependent variable by the independent variables of the model. Beyond this, there were no multicollinearity issues since all values for the variance inflation factors (VIFs) were below the reference level of 5 (HAIR et al., 2005; ALLISON, 1998). Based on this, it was possible to advance in the verification of the established hypotheses.

The first research hypothesis that the degree of existence of a specific public policy for OGD is positively associated with the data openness level of a national government was not

rejected ($p < 0.05$). The variable **OGD_POL** had the most considerable influence ($\beta p = 0.308$) among the others in explaining the dependent variable variation. This suggests that the formulation and institutional design of the national public policies matter to explain the transnational variation of the government openness levels. That said, such a result also favors the argument from part of the literature (ZUIDERWIJK; JANSSEN, 2014; ZUIDERWIJK; JANSSEN, 2014; ROSNAY; JANSSEN, 2014; SAFAROV, 2019) that the more the public policy for OGD in the country is institutionalized, the better the results of the initiatives for opening public data tend to be, given that they become less uncertain, less ambiguous, and (possibly) less conflicting in their forms of implementation.

Table 3 – Multiple linear regression model

Predictors	β	Standardized β	95% Confidence interval		t	p-value	VIF
			LI	LS			
(Constant)	-9.343	-	-16.829	-1.856	-2.475	0.015	-
OGD_POL	2.513	0.308	1.394	3.631	4.455	0.000	2.319
LAW_INFO	5.175	0.107	0.206	10.143	2.065	0.041	1.288
EGOV_DEV	25.174	0.275	12.930	37.418	4.077	0.000	2.198
PARTIC_OGP	6.226	0.142	1.604	10.849	2.671	0.009	1.371
ADMIN_Q	3.066	0.132	0.091	6.041	2.043	0.044	2.014
GDP_CAPITA	0.000	0.208	0.000	0.000	2.996	0.003	2.334
Model Fitness							
F-Test (df 6, 104) (p-value)					63.332 (0.000)		
Kolmogorov-Smirnov normality test (p-value)					0.058 (0.200)		
R^2					0.785		
Adjusted R^2					0.773		

Source: Devised by the authors, 2021.

The second research hypothesis that the existence of a national law on access to information is positively associated with the data openness level of a national government was not rejected ($\beta p = 0.107$; $p < 0.05$). This suggests, in the same direction as authors such as Yu and Robinson (2012), Gonzalez-Zapata (2017), and Safarov (2019), that, beyond the regulation of transparency and the right to information, such national legislations have the potential to pave the way to an open government, providing more significant institutional legitimacy to the mobilizations of actors and organizations from civil society who are government openness enthusiasts. Moreover, the LAIs institutionalize transparency and may render more costly possible stands against the opening of public data by part of political agents, considering that it is also the legal role of the government to guarantee access to public data to groups that are not in power and eventually generate contestations.

The third research hypothesis that the development of national electronic government programs is positively associated with the data openness level of a national government was not rejected ($\beta p = 0.275$; p-value < 0.05). These results go in the same direction as the arguments

presented by authors such as Gonzalez-Zapata and Heeks (2017), Veljković, Bogdanović-dinić, and Stoimenov (2014), and Harrison et al. (2012). That is to say that the trajectory of the national electronic government programs tends to be followed by the OGD initiatives, thus being another institutional dimension determining the success or failure of such initiatives in most countries in the short and middle terms.

The fourth research hypothesis that the participation of a country in the OGP is positively associated with the data openness level of a national government was not rejected ($\beta p = 0.142$; p-value < 0.05). This suggests that the commitments that the countries make in the partnership tend to produce direct effects on the way government organizations mobilize efforts to open their data, given the external institutional pressure exerted, as Sayogo, Pardo, and Cook (2004), Yang and Wu (2016), and Altayar (2018) emphasized. Additionally, the results for the variable **PARTIC_OGP** also provide evidence that the interaction with various global actors within the OGP may allow learning for national managements to innovate in their local initiatives.

The fifth and last research hypothesis that the administrative quality of the government organizations is a factor positively associated with the data openness level of a national government was not rejected ($\beta p = 0.132$; p-value = 0.044). This result indicates, in general, that the quality of the bureaucracy has a fundamental role in the implementation of the OGD and that opening public data at the national level may be an extremely challenging task in contexts in which public organizations do not have duly specialized bureaucracies or when such bureaucracies operate under political constraints.

Lastly, the linear regression model also presented a positive and statistically significant association ($\beta p = 0.208$; p-value = 0.003) between the national data openness level and national wealth, measured by the control variable **GDP_CAPITA**. In other words, this means that, besides the implication of the institutional dimensions, the diffusion of OGD occurs unequally between the economically developed countries and the more impoverished ones. Beyond this, the results obtained for the mentioned control variable also suggest that the wealthier countries tend to be more adherent to OGD due to the growing popularity of the data-based business models adopted by private sector organizations.

The general reading regarding the results obtained is that the institutional dimensions analyzed herein largely mold the implementation standards of the OGD initiatives in the different countries. The study results agree with the qualitative results of various other studies (GONZALEZ-ZAPATA, 2017; GONZALEZ-ZAPATA; HEEKS, 2017; DAVIES, 2013; YANG; WU, 2016; ZUIDERWIJK; JANSSEN, 2014; ALTAYAR, 2018; SAFAROV, 2019). In short, the way they are described in this study, these institutional dimensions that proved relevant in the analysis matter to explain the variation in the performance of national governments when they implement actions to open their data.

5 Final Considerations

This paper sought to analyze the relationship between institutional dimensions and the level of government data openness in different countries. Through the literature review, it was possible to map institutional dimensions and formulate the research hypotheses. None of the five were rejected. Hence, the most appropriate response to the research issue is that yes, for being, in comparative terms, associated with the level of government data openness in a broad set of countries, the institutional dimensions are also factors that matter to explain the success of the OGD initiatives conducted by national governments.

In general, the results indicate the need for specific attributes for governments to handle better initiatives aiming at OGD. Within this scope, the countries that demonstrated more significant possibilities of reaching more concrete results when it comes to opening their public data were those that presented higher degrees of existence of public policies formulated for the OGD, already had LAIs in effect, were OGP members, had national electronic government programs in advanced stages, and had considerable administrative quality in their government bureaucracy.

Two main conclusions may be established. Firstly, it is viable to claim that, allied to the technical and managerial challenges, the initiatives for opening public data pose significant institutional challenges for national public organizations to handle if they seek greater performance in their transparency actions. Secondly, it is concluded, in the same line as Safarov (2019), that the institutional dimensions cause the implementation standard of the OGD initiatives to vary from case to case and that the performance of such national initiatives is reflected by the settings of the institutional dimensions present in each country.

Lastly, considering that there are limitations to the research design, it is necessary to propose future studies that may bridge some of the gaps left in this paper. The first suggestion is for more institutional dimensions to be mapped, complementing the thematic discussion presented. Despite the high explanation level obtained in the proposed model, other dimensions and moderating or mediating variables may be included to amplify the understanding of the studied phenomenon, i.e., to verify if factors that differentiate the national context (e.g., political regime, social indicators, and digital inequalities) have some influence on the opening of government data.

As a second suggestion, it is possible to propose a qualitative investigation of the dimensions mapped herein, i.e., the documentary investigation about the institutional processes that led to data opening in the analyzed countries or the formal stage at which countries outside the sample are. Moreover, it is possible to contemplate interviews with actors who participated in the formalization of the data opening process, considering particularities, specific interest levels per region, or out-of-standard observations.

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