

Government Data Openness and Coverage. How do They Affect Trust in European Countries?

Nicolás González-Gallego[†], Laura Nieto-Torrejón

San Antonio Catholic University of Murcia, Faculty of Law and Business Administration,
Avda. de los Jerónimos, 135, Murcia 30107, Spain

Abstract

Purpose: This paper aims to assess if the extent of openness and the coverage of data sets released by European governments have a significant impact on citizen trust in public institutions.

Design/methodology/approach: Data for openness and coverage have been collected from the Open Data Inventory 2018 (ODIN), by Open Data Watch; institutional trust is built up as a formative construct based on the European Social Survey (ESS), Round 9. The relations between the open government data features and trust have been tested on the basis of structural equation modelling (SEM).

Findings: The paper reveals that as European governments improve data openness, disaggregation, and time coverage, people tend to trust them more. However, the size of the effect is still small and, comparatively, data coverage effect on citizens' confidence is more than twice than the impact of openness.

Research limitations: This paper analyzes the causal effect of Open Government Data (OGD) features captured in a certain moment of time. In upcoming years, as OGD is implemented and a more consistent effect on people is expected, time series analysis will provide with a deeper insight.

Practical implications: Public officers should continue working in the development of a technological framework that contributes to make OGD truly open. They should improve the added value of the increasing amount of open data currently available in order to boost internal and external innovations valuable both for public agencies and citizens.

Originality/value: In a field of knowledge with little quantitative empirical evidence, this paper provides updated support for the positive effect of OGD strategies and it also points out areas of improvement in terms of the value that citizens can get from OGD coverage and openness.

Keywords Open government data; Open data; Trust; Public policy

[†] Corresponding author: Nicolás González-Gallego (E-mail: ngonzalvez@ucam.edu).

Citation: González-Gallego, N., & Nieto-Torrejón, L. (2021). Government data openness and coverage. How do they affect trust in European countries?. *Journal of Data and Information Science*, 6(1), 139–153. <https://doi.org/10.2478/jdis-2021-0010>

Received: Aug. 12, 2020

Revised: Oct. 21, 2020

Accepted: Nov. 19, 2020



1 Introduction

The disclosure of open and freely accessible data by governments has been extensively addressed by scholars, mainly focused on technical and technological features. Beyond this approach, it is necessary to study whether those open data policies led by public institutions affect citizenship, as the most critical stakeholders for governments. Indeed, open data is the basis of open government, an innovative governance method based on openness, transparency, and interaction between government and citizens to promote the latter's involvement in public issues (Thorhildur, 2013; Wirtz & Birkmeyer, 2015). Using open government data (OGD), as well as some other ways of digitalization, has a positive effect in improving some benefits that are expected to create public value (Harrison et al., 2012), such as transparency (Parycek, Hocht, & Ginner, 2014), participation and collaboration (Moss & Coleman, 2014), efficiency (Janssen & Kuk, 2016; Pereira et al., 2017) and trust (O'Hara, 2012). In this paper we will stay focused on the last one. Specifically, this paper addresses if there is a causal effect between two main features of OGD, which are openness and coverage, and trust. For the purpose of this paper, we consider that openness comprises the following OGD characteristics: machine-readable non-proprietary, download options, metadata available, and terms of use (Open Data Watch, 2019). Coverage takes different criteria into consideration: indicator disaggregation; data available for the last 5 and 10 years; data availability at the first administrative level (national); and data availability at the second administrative level (subnational/regional) (Open Data Watch, 2019).

As mentioned above, trust is one of the foreseen outcomes of the release of public data. Indeed, trust in national institutions has been a critical aspect of the legitimacy of democratic governments, and the importance of assessing trust and its antecedents is not new, considering that a systemic level of trust is required to keep democratic institutions working (Berelson, 1952). Trust in institutions is a critical indicator since it is generally agreed that it is an accurate measure to evaluate the relationship between public institutions and citizens (Van der Meer, 2018). However, during the last decades, there is a general downturn in trust that is specifically affecting liberal democracies, a political system that allows democratic rule and political liberties (Bollen & Paxton, 2000). This is the case of the European Union (EU) member states since the sovereign debt crisis started in 2008 (Euro Area Business Cycle Dating Committee, 2020; Guiso, Sapienza, & Zingales, 2016), which may result in a threat to the EU governance system (Hix, 2013). The first dimension of what constitutes a liberal democracy, democratic rule, is critical to this paper, for it is closely linked to citizens' accountability of elites, as defined by Schumpeter (1950). Making institutions more accountable is, indeed, one of the main purposes of OGD and transparency initiatives.



However, trust can be a diffuse concept not easy to be operationalized, since democracy relies on several political and public institutions. Then, trust in the most relevant political institutions should be measured jointly (Muller & Jukam 1983). Consistently with this perspective, and following previous studies, we chose different institutions, such as national parliament, legal system and European Parliament because of their interplay with current frameworks of trust (Mishler & Rose, 2005). The latter institution was added, not only because all the countries in this study belong to the EU and it is interesting to catch the potential effect of a multi-level government, but also because citizens are confused when assigning responsibility for different outcomes between national and European institutions (Drakos, Kallandranis, & Karidis, 2019). There is no agreement on how this multi-level trust works, with findings that suggest that trust in national and European institutions are closely connected (Muñoz, Torcal, & Bonet, 2011), while some others authors got mixed results. Finally, we also included trust in political parties and politicians, due to their interlinks with the above institutions and in order to capture a more complex understanding and measure of political trust (Hooghe & Marien, 2013).

After an overview of OGD and trust and the theoretical link between both, a question arises: can OGD help to revert European citizens' trust erosion in public institutions? Although limited, there is evidence that supports that making government data open and accessible is expected to have a positive effect on citizens' institutional trust, as one of the prominent good governance results of open data (Meijer, 2014). European national governments, encouraged by the EU, are implementing open data policies. The first relevant piece of legislation in this area is dated back to 2003 (European Parliament and Council, 2003). That Directive on the re-use of public sector information was subsequently amended and recently, in 2019, it was recast "in the interest of clarity." Now, its title explicitly includes open data and recognizes the importance of an open government data environment in order to promote accountability and transparency (European Parliament and Council, 2019). OGD is then critical for transparency which, as stated by Grimmelikhuijsen (2012), "allows external actors to monitor the internal workings or performance of an organization." Those OGD policies allow citizens to be better informed of how the government is performing in different areas of interest and, consequently, they are expected to trust more in their government (Meijer, 2009). Recently, González-Gallego, Nieto-Torrejón, and Pérez-Cárceles (2020) found that the implementation of open data strategies boosts citizen confidence in a set of institutions, both directly and when this relationship is mediated by satisfaction. Altayar (2018) posed that when government discloses open data, it encourages citizens' engagement, which increases trust in institutions, so that this result becomes a motivation for the adoption of openness. Also, when open data can be re-used by external stakeholders



and results can be replicated, confidence in institutions improves (Meijer, 2014). Moreover, it is important that citizens perceive that their government is adopting an open culture, since this is expected to promote institutional trust (Hood, 2006).

Regarding OGD coverage, it is worth mentioning that several policies and strategies based on the use of information systems (IS), such as e-government, lead to a large amount of data that, thanks to OGD policies are now started to being disclosed to citizens (McDermott, 2010; Yu & Robinson, 2011). Then, as more information is available to the public, both transparency and accountability are enhanced. The EU aligns with this perspective, so that for the purpose of the Directive 2019/1024 introduced above, public sector means “*the State, regional or local authorities, bodies governed by public law or associations formed by one or more such authorities or one or more such bodies governed by public law*” (European Parliament and Council, 2019).

Despite the relevance of this topic, little research is yet available, with a low share of quantitative studies capturing both technical and socioeconomic aspects related to open data (Hossain, Dwivedi, & Rana, 2016) or addressing the impact of OGD on citizens confidence in public institutions (Safarov, Meijer, & Grimmelikhuijsen, 2017). In order to bridge this gap, in this paper we shed light on the link between technical features of OGD (coverage and openness) and citizens’ trust in institutions. Specifically, the aims of this study are: (i) to analyze if European countries efforts in making public data freely available and re-usable are boosting their citizens’ confidence; (ii) assess if the availability of an increasing number of data sets, covering past periods and provided by different administrative levels also improves institutional trust.

Therefore, we formulate our two hypotheses:

Hypothesis 1: OGD openness will positively impact citizen trust in public institutions.

Hypothesis 2: The greater the OGD coverage is, the higher institutional trust will be.

Following this introduction to the contextualization and aims of this paper, data collection and methodology are explained in Section 2. Section 3 offers the results from data analysis. Discussion and conclusion are addressed in Section 4.



2 Methodology and data

2.1 Methods

To test the hypotheses, we developed a conceptual model that measures the direct effect of openness and coverage on trust. To build this model, we applied the methodology of structural equation modelling (SEM) using the IBM SPSS 24 Amos Graphic software. Through several statistical techniques, SEM allows to translate

the hypothesized set of relationships of the proposed conceptual model into equations, and it enables the assessment of its goodness of fit (Williams, Edwards, & Vandenberg, 2003).

To conduct SEM, we applied a path analysis. It allows finding the causal relationships among variables by creating a path diagram (Wright, 1921). To perform the path analysis we have followed four steps:

The first step is about model specification. It consists of the definition of the hypothesized relationships among constructs.

Model identification is the second step. An identified model is one for which each of the estimated parameters has a unique solution. To determine whether the model is identified or not, the number of data points (the number of variances and covariances of the sample variance/covariance matrix) is compared to the number of parameters to be estimated. The optimal result, is an over-identified model, where more than one set of parameter estimates is possible.

The third step is the one in which coefficients are estimated through an iterative procedure that minimizes the differences between the sample variance/covariance matrix and the estimated population variance matrix. This is possible when the model is just or over-identified. The estimation method applied in SEM analysis was Maximum Likelihood. The standardized regression weights obtained indicate the amount of variance of the latent that is explained by the model variables.

In the fourth step, we ran the model evaluation to assess overall goodness of fit. The overall evaluation determines to what extent the model adequately reproduces the existing relationships in the covariance matrix of the data. Then, model fit determines the degree to which the proposed structural equation model fits the sample data. There is no single statistical significance test that allows identifying a correct model given the sample data; it is needed to take into account various criteria in order to assess the model fit on the basis of multiple measures simultaneously (Schermelleh-Engel, Moosbrugger, & Müller, 2003). It is common the use of chi-squared test, however, given the sample size of this study it is not appropriate. Larger sample sizes lead to higher chi-square values. Thus, for more than 200 observations χ^2 tends to be significant at the risk of rejecting a model in which the discrepancy with the observed data is actually irrelevant (Bentler & Bonett, 1980; Hu & Bentler, 1999; Joreskog & Sorbom, 1993). In order to get around this inconvenient, in this paper other fit indexes are used: Normed Fit Index (NFI) (Bentler & Bonnet, 1980); Tucker-Lewis Index (TLI) (Bentler, 1990); Comparative Fit Index (CFI) (Bentler, 1990) and Goodness of Fit Index (GFI) (MacCallum & Hong, 1997). In addition, we use the Root Mean Square Error of Approximation (RMSEA) statistic. It adds consistency to the analysis of the goodness of fit since



it is an indicator that is more insensitive to the sample size, especially when the number of observations exceeds 500, as in our study (Cangur & Ercan, 2015; Rigdon, 1996). Thereby, the analysis derived from the aforementioned indices is reinforced.

The usability of model fit indexes appears flexible in literature. Nonetheless, it is important to gather as many fit indexes as possible in its appropriated boundary to validate the model specification.

2.2 Data

The proposed conceptual model is made up of two exogenous variables (openness and coverage) and five endogenous variables that enable to build the formative construct for citizens' institutional trust. Table 1 describes each of the six variables.

Table 1 Conceptual model. Variables.

Variable	Definition	Source
Data Coverage (D_COV)	The score is based on the availability of key indicators and appropriate disaggregation over time and for geographic subdivisions.	Open Data Inventory (ODIN)
Data Openness (D_OPEN)	Its score is based on whether data can be downloaded in machine-readable and non-proprietary formats, are accompanied by metadata and download options exist such as bulk download and user-selection or APIs, and have an open terms of use.	
Trust in Parliament (TRSTPRL)	How much a citizen personally trust in countries' parliament	European Social Survey (ESS)
Trust in politicians (TRSTPLT)	How much a citizen personally trust in the politicians	
Trust in political parties (TRSTPRT)	How much a citizen personally trust in political parties	
Trust in European Parliament (TRSTEP)	How much a citizen personally trust in the European parliament	
Trust in legal system (TRSTLGL)	How much a citizen personally trust in the legal system?	

The European Social Survey (ESS) is a cross-national survey conducted across the European Union every two years. The survey involves strict random probability sampling, a minimum target response rate of 70% and rigorous translation protocols. For this paper, data on trust indicators have been collected from ESS Round 9, the latest available, that covers 23 EU countries for the year 2018.

The Open Data Inventory (ODIN) is released by Open Data Watch, an international, non-profit organization of data experts whose aim is to bring change to organizations that produce and manage official data. ODIN is an evaluation of the coverage and openness of data provided by national statistical offices from 173 countries through the assessment of three large categories: social, economic and financial, and environmental statistics. The concept of openness that ODIN applies is that data



should be machine-readable in non-proprietary formats, accompanied by descriptive metadata and export options that allow customization and bulk download, and free to be used and reused for any purpose without limitations other than acknowledgement of the original source. Coverage is measured based on the disaggregation and geographical dimensions explained in Section 1. Accordingly, one sub-index is offered per each of the OGD features. We used the corresponding values of those indicators from ODIN 2018, the latest version available.

The overlap of ODIN and data from ESS resulted in a final sample of 31,069 individuals from 18 EU countries: Austria, Belgium, Czech Republic, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Lithuania, the Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, and the United Kingdom.

3 Results

This section is organized as follows: first, we address the descriptive statistics of the variables. Then, results obtained from SEM analysis are presented and commented following the steps described in Section 2.

3.1 Descriptive statistics

Table 2 shows the descriptive statistics for the variables. Regarding data openness and data coverage, it is remarkable that the scope for improvement is wider for the latter than for the former. In relation to the variables that outline citizens' trust in institutions, the lowest mean is reached by trust in political parties, followed by trust in politicians. On the other hand, trust in the national legal system is the variable with the highest average score, but it also shows the highest standard deviation, which reveals a notable heterogeneity among respondents.

Table 2 Descriptive statistics.

	Mean	Minimum	Maximum	Std. Dev.	Range
Open Data Coverage	62.041	46	79	8.725	0-100
Open Data Openness	76.915	52	96	10.908	0-100
Trust in Parliament	4.511	0	10	2.488	0-10
Trust in politicians	3.590	0	10	2.376	0-10
Trust in political parties	3.582	0	10	2.339	0-10
Trust in European Parliament	4.381	0	10	2.465	0-10
Trust in legal system	5.371	0	10	2.555	0-10

Note about scales: Trust variables: 0 = no trust at all, 10 = complete trust; OD Coverage and OD Openness: 0 = No efforts; 100 = Highest efforts.

3.2 Model specification

To ensure that the variables related to trust build a formative construct, it is run a confirmatory factor analysis (CFA) following the Maximum Likelihood extraction



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method Likelihood and VARIMAX factor rotation procedure (Table 3). As observed, all the loads are above 0.600 and we can enter this construct as a latent variable for the subsequent SEM analysis.

Table 3 Factor matrix.

Variable	Trust in parliament	Trust in politicians	Trust in political parties	Trust in parliament	Trust in legal system
Factor load	0.794	0.941	0.922	0.661	0.655

3.3 Model identification

Given a total of 14 variables (endogenous, exogenous, and error terms) and having to estimate 17 parameters, the degrees of freedom amount to 88. Since the number of degrees of freedom is greater than 0, the model is over-identified.

3.4 Model estimation

Figure 1 represents the conceptual model and details the construction of the latent from the trust observed variables. It also shows the standardized regression weights of each estimated parameter. There is a positive and significant relationship between data openness and institutional trust ($\beta=0.027$; $p\text{-value}<0.01$), which confirms Hypothesis 1. Coverage also has a positive impact on trust ($\beta=0.071$; $p\text{-value}<0.01$), so that Hypothesis 2 is accepted too. However, the size of the effects are notably different, being the one associated to coverage more than twice the openness' effect.

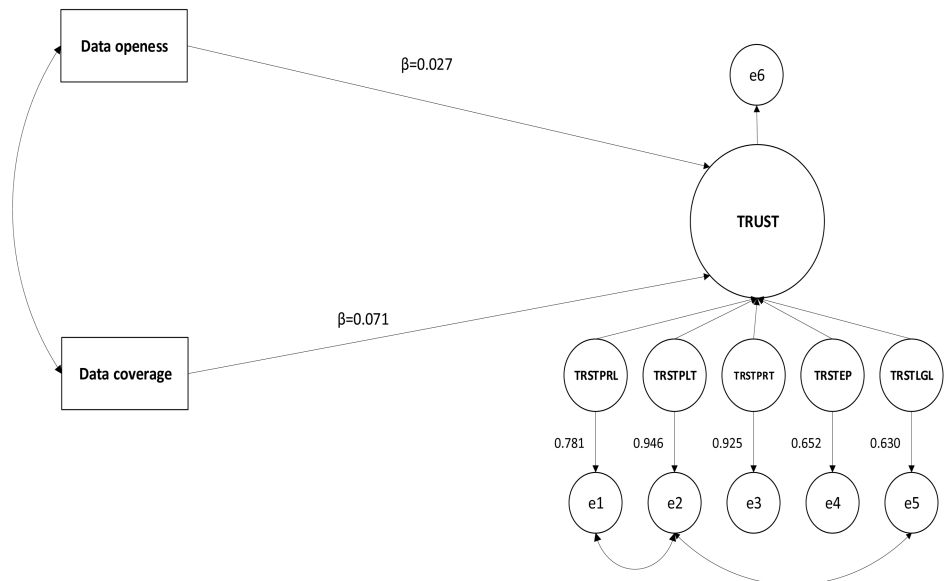


Figure 1. Relational model.

3.5 Model evaluation

As shown in Table 4, all the indexes that measure the model goodness of fit are above their theoretical thresholds and we can conclude that the proposed relational model has an adequate fit.

Table 4 Model fit indexes.

Index	NFI	TLI	CFI	GFI	AGFI	RMSEA
Threshold	>0.9	>0.9	>0.95	>0.9	>0.85	<0.08
Model's values	0.993	0.987	0.993	0.992	0.979	0.051

4 Discussion and conclusion

In this paper, we explored the impact of OGD on trust, one of its ultimate goals, through a set of its main technical features and the amount of information available in terms of disaggregation, time and administrative coverage. To achieve this, we developed a conceptual and relational model based on SEM methodology. In order to test the proposed relationships, we collected the most updated data from the ESS, regarding citizens' trust, and ODIN, for OGD openness and coverage. Then, we developed and ran a relational model for a sample of 31,069 individuals from 18 EU countries. The use of SEM allowed us to hypothesize and confirm a direct causal relationship between OGD openness/OGD coverage and a latent variable that comprises different dimensions of trust, going beyond mere correlations (Ullman & Betler, 2013).

Our results show that when the government releases data sets following the standards of re-usability and accessibility, citizens tend to trust more in their public and political institutions. That means that OGD policies and strategies are starting to be fruitful and that there is an alignment between their initial motivations to implement this kind of strategies and the actual results, at least in terms of the sign of the effect. At the same time, during last years, governments and other public agencies have been collecting and generating information thanks to the deployment of IS-based solutions, such as e-government and other managerial systems. Also, both the EU and its member states are encouraging the adoption of OGD approaches by sub-national administrative levels, in order to generate a global OGD ecosystem that allows value creation, not only at European or national level, but also locally. According to our findings, this has a positive and significant impact on the confidence citizens feel towards public institutions. Indeed, disaggregation and time coverage are found to have a higher effect on trust than the set of features included within openness.

However, our results revealed that the effect of OGD on trust is still small. In general, we can explain this because the effects of innovations are not immediate



and OGD is not mature yet, although some common guidelines are starting to be adopted, being the EU an example. Specifically, OGD as one of the areas of smart government, which involves collecting, connecting and analysing large volumes of data, is still in its early stages (Schedler, Guenduez, & Frischknecht, 2019). Our results are consistent with previous contributions that state that OGD has little intrinsic value and that value creation is derived from its use. Accordingly, public officers should be aware of the fact that releasing OGD itself does not automatically result in benefits for the stakeholders (Janssen, Charalabidis, & Zuiderwijk, 2012) or will involve a little transformation of the government (Zuiderwijk & Janssen, 2014).

Different factors can explain those limited benefits of OGD. Without attempting to be exhaustive, they are briefly discussed now. The first one is about management difficulties. Implementing open data policies implies the creation of a collaborative networking that involves that public system, traditionally closed, is being increasingly opened (Chun et al., 2010), and closed systems are easier to manage than open ones (Jackson, 2016). Second, institutional barriers may disincentive the adoption of innovative initiatives like OGD: public officers' risk-averse culture (Bozeman & Kingsley, 1998); non-standardized policies for realising data; or lack of technical resources (Janssen, Charalabidis, & Zuiderwijk, 2012). Third, there are some concerns regarding information quality, lack of data or missed information (Gilbert, Balestrini, & Littleboy, 2004; Janssen, Charalabidis, & Zuiderwijk, 2012). Fourth, there are also economic constraints for the adoption of smart initiatives (Savoldelli, Codagnone, & Misuraca, 2014).

Besides those factors, it is also necessary to highlight that OGD value-creation process goes beyond the publication of data and making them accessible and reusable for the general public. Making large amounts of data available is not enough to generate a notable impact on citizens. Open data policies are also about engaging other stakeholders, such as innovative firms, in order to reuse open data and develop innovative services that can promote OGD usefulness among citizens and, consequently, making governments more accountable and trustable. OGD must be conceived as a breakthrough that should include open data into daily governmental practices and the widespread creation of public value that relies not only on publicizing data, but on the use of OGD by different stakeholders. Public institutions are therefore encouraged to approach OGD from a multi-level perspective that includes both the supply and demand of data (Smith, Voß, & Grin, 2010).

Although OGD is starting to have a positive effect on confidence, there are other determinants of trust European governments should focus on. One of them is the provision of services and previous citizens' experience with them, which are expected to positively impact confidence in institutions, since individuals are tend to trust if they are used to be fairly treated (Alesina & La Ferrara, 2000).



Macroeconomics also matter, as European citizens assess economic performance and they build trust in institutions accordingly, based on that evaluation (Van der Meer, 2018). The way Europeans perceive those economic indicators, as well as other performance measures, also affects individual level of trust in institutions (Schafheitle et al., 2020). Then, public officers must pay attention to these objective and subjective drivers of trust. Concerning OGD, they should explore if open data policies can boost the effect of those determinants and how they interact among them in order to promote citizens' level of trust. Also they should study if open data and transparency can counterbalance negative episodes or events that lead to a decrease of institutional trust, such as an economic downturn.

Finally, although our study contributes with notable findings to the academic and practical discussion, there are some limitations that further researchers should address. Firstly, SEM is a consistent and reliable methodology to test relational models, but in the future longitudinal analysis will be required in order to measure its sustainable effect and to clarify if certain conditions may affect the relationships explored in this paper. Secondly, we approach OGD considering a group of developed countries within the umbrella of the same supranational institution at the time of data collection, the EU. Comparative studies that include developing countries are encouraged in order to improve the understanding of OGD under different technological, social, and economic conditions.

Author contributions

Nicolás González-Gallego (ngonzalvez@ucam.edu): outlined the research proposal and wrote the manuscript. Laura Nieto-Torrejón (lnieto@ucam.edu): carried out data collection and analysis, and contributed to the writing.

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