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Factors in the adoption of open government initiatives in Spanish local governments

Laura Alcaide Muñoz^{*}, Manuel Pedro Rodríguez Bolívar, Cinthia L. Villamayor Arellano

Department of Accounting and Finance (Faculty of Business Studies), University of Granada, C/ Campus Universitario de Cartuja S/N, Post Code (Box): 18071, Granada, Spain

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ABSTRACT

The Open Government Data (OGD) projects have spread rapidly in recent years, given that they involve a great transformative potential, whose aims to guarantee transparent government and stimulate the participation and citizenry engagement. It seems that there is a lack of studies analysing factors regarding both the access to OG projects and the volume and format of data published into OGD projects. Therefore, this paper seeks to identify main factors affecting both the way of accessing the OG projects and the volume and format of data published into OGD projects in larger Spanish municipalities (with >50,000 inhabitants and a sample of 145 municipalities). Our main findings seem to point out the intention of sample governments to increase their information disclosure as a way for enhancing their reputation or government's image introducing OGDs initiatives. Also, it reveals differences among analysed municipalities regarding the context in which the information is disclosed.

1. Introduction

Governments have implemented new governance models over the last decade, so as to create more participative and collaborative governments. These initiatives imply that governments are more open, which, in turn, means that citizens have greater accessibility to more information, and that governments are more able to cope with new demands and needs (OECD, 2014). Open Government Data (OGD) projects, and in particular the development of OGD portals, as part of Open Government (OG) policies in general (Ubaldi, 2013; Wirtz, Weyerer, and Rösch, 2018), have proliferated since the mid-2000s (Ubaldi, 2013), and especially in recent years (Nikiforova and McBride, 2021).

The OGD phenomenon involves a cultural change, with great transformative potential, and aims to guarantee transparent government and to stimulate the participation and engagement of citizens (Janssen, Charalabidis, and Zuidervijk, 2012). There are also high hopes that these initiatives will forge democratic processes by improving transparency, participation, and collaboration, and providing opportunities for the design and co-creation of public services (Yuan and Gascó-Hernández, 2021).

OGD projects have recently become relevant due to the introduction of emerging technologies (Gao and Janssen, 2020). For example, governments can take advantage of the potential that artificial intelligence

(AI) offers to analyse data which could help to make decision-making processes more efficient, creating public value (Harrison & Luna-Reyes, 2022). The Internet of Things (IoT) is also creating a large amount of data which is collected by sensors (Gao, Janssen, and Zhang, 2021), given that these technologies could open data in real time and provide IoT-based tools for citizens to analyse them (Haibe-Kains, Adam, Hosny, and a., 2020). The implementation of these emerging technologies could thus allow citizens to access both a greater amount of information and the tools for its management and manipulation, favouring citizen participation in public affairs.

Despite the emerging technologies and their potential for the management and analysis of OGD, previous research has shown that their impact could be relatively limited (Wang and Lo, 2016). The only academic studies until now have been case studies about the potential of emerging technologies to achieve the goal of OGD (Tai, 2021), and, as far as we know, there has been little analysis of factors involving both access to OG projects and the information content and format of data published as OGD projects in a local government context (Sandoval-Almazán, Criado, and Ruvalcaba-Gómez, 2021).

The academic literature offers empirical studies on transparency (Sáez-Martín, López-Hernández, and Caba-Pérez, 2021; Tejedero-Romero and Araujo, 2020), however our study takes the Organisation for Economic Co-operation and Development (OECD) OGD concept (htt

^{*} Corresponding author.

E-mail addresses: lauraam@ugr.es (L.A. Muñoz), manuel@ugr.es (M.P.R. Bolívar), lorevillamayor@gmail.com (C.L. Villamayor Arellano).

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ps://www.oecd.org/gov/digital-government/open-government-data.htm) as its basis, seeing OGD as datasets available to be used, reused and freely distributed, which favours citizen participation, and promotes business creation and innovative citizen-centric services. We thus analysed the information content and format of data published by local governments and tested the factors that could be affected at this level of OG initiative development. This research is therefore especially relevant for academics, public managers, and politicians, in helping to understand how OGD initiatives could be promoted to implement new governance models and achieve higher levels of citizen engagement in the democratic process.

Moreover, empirical evidence about actions, initiatives, good practices, and public policies could favour the development of OGD initiatives. This paper seeks to identify the main factors affecting both how OG projects on official municipal websites are accessed, and the information content and format of the data published in OGD projects. The study involves empirical research into large Spanish local governments (SLG) (with >50,000 inhabitants and a sample of 145 municipalities) and the smart initiatives implemented in these municipalities regarding the implementation of OGD projects.

2. The analysis of OGD projects and their determinant factors

2.1. Background to the analysis of OGD portals

There has been increased interest in establishing OG strategies in recent years (Nikiforova and McBride, 2021). Local governments have been more motivated to undertake reforms in their organisations involving the implementation of these projects (Nikiforova and McBride, 2021; Sandoval-Almazán et al., 2021), mainly because they are more accessible to citizens, there is greater demand for them, and in the belief that creating a more transparent (Yuan and Gascó-Hernández, 2021) and participatory environment favours economic growth in their regions, which then increase the quality of life of citizens (Rodríguez-Bolívar, 2019).

OG strategies have been especially focused on OGD projects (Wirtz et al., 2018), particularly with the development of OGD portals (Lourenço, 2016) for promoting transparency, accountability, and value creation by making government data available to all (Emaldi, Zabaleta, Guillén, and López-de-Ipiña, 2020). Perceptions of public managers (Sandoval-Almazán et al., 2021), civil society organisations and public officials involved in open government actions (Ruvalcaba-Gomez and Renteria, 2020) differ greatly, not only among the different groups of stakeholders but also within them, with the result that different OGD strategies.

The academic literature includes empirical studies which analyse both different aspects of OGD portals -regulatory issues, technical challenges, etc.- (Gascó-Hernández, Martín, Reggi, Pyo, and Luna-Reyes, 2018; Ruvalcaba-Gomez and Renteria, 2020; Sandoval-Almazán et al., 2021;), and different approaches related to the data disclosed -usability evaluation, structure and data organisation, features and information content or data catalogues (Ansari, Barati, and Martín, 2021; Lourenço, 2015; Nikiforova and McBride, 2021; Thorsby, Stowers, Wolslegel, and Tumbuan, 2017; Wang, Richards, Bilgin, and Chen, 2021).

We identified studies which analysed the usability of OGD portals, on the basis that OGD portals contribute positively towards public sector reforms. These include studies undertaken by Nikiforova and McBride (2021) and Wang et al. (2021), which found that the help functions of OGD portals were insufficient. Máchová, Hub, and Lnenicka (2018) and Ansari et al. (2021) also found weaknesses in their analyses of OGD portals and suggested that they have not yet reached their full potential due to their limited use. They indicated the need to supplement OGD with visualisations to make the data more engaging, useful, and understandable, their findings suggested that the opinions of citizens (bottom-up strategic initiatives with more citizen participation) should

be considered in the design and development of these OGD portals (Máchová et al., 2018; Nikiforova and McBride, 2021), which represent a change in the role of citizens as coproducers of public services and users of open data (Moon, 2020). The use of advanced OGD portals with embedded visualisations and analytics tools, and collaboration with research centres in user studies to improve these portals is also necessary (Ansari et al., 2021).

There are studies that analyse structure and data organisation from the perspective of transparency (Klein, Klein, and Luciano, 2018; Lourenço, 2015), and the features and information content of OGD portals -i.e. data catalogue- (Corrêa, Paula, Corrêa, and Silva, 2017; Lněnička et al., 2021; Thorsby et al., 2017). Klein et al. (2018) noted that OGD portals need to address several mechanisms so that society can effectively discover, extract, and utilise the data, and Lourenço (2015) concluded that OGD portals do not possess key elements needed to support citizen engagement. Corrêa et al. (2017) and Thorsby et al. (2017) found that OGD portals were still in an incipient stage (they did not comply with the basic requirements stated), and that there was a large variation in the capabilities of OGD portal services (data format variety, analytics tools, and data modelling available) according to the public policy and investment followed, which requires hard work to develop and analyse the features to improve the way that citizens understand the data, with the support of graphs and analysis tools (Lněnička et al., 2021; Thorsby et al., 2017).

Although valuable, research has until now focused on evaluation studies that have tried to describe the state or situation of OGD portals (Matheus and Janssen, 2020). These studies provided recommendations on how to design and develop OGD portals (best practices for their design and information content), but they do not identify the possible factors or drivers that could explain the different levels of development of these initiatives. There is thus a research gap in identifying the factors that could affect both access to OG projects and OGD information content (data catalogue), and the data format that is published, which are crucial in order to work with and improve transparency through OGD. This analysis of OGD initiatives will therefore help us to suggest critical recommendations about actions, initiatives, good practices, and public policies that could favour their development.

2.2. Determinant factors of OGD. Hypothesis formulation

As noted previously, many authors indicate that the creation of OGD Portals (OGDPs) focused on improving governmental transparency and accountability is a fundamental OG strategy, by making a large catalogue of information available to all (Emaldi et al., 2020) in the formats required for creating public value (Linders and Wilson, 2011). Based on a solid theoretical framework (stakeholder theory, institutional theory, legitimacy theory, the goal setting theory, and partisan politics matters thesis), this paper analyses how the demographic, economic, political and city profile factors affect ways to access OG projects, as well as the information disclosed in OGDPs or municipal official websites (see Table 1).

2.2.1. Demographic factors

2.2.1.1. *Size of local government (POP).* According to stakeholder theory (Jensen and Meckling, 1976), policymakers and public managers do not have the same interests as citizens, which means they need to be held accountable for their actions to demonstrate that they have acted according to their responsibilities. Local governments with a large population are under increased pressure regarding their political decisions and the management of public resources, with citizens and taxpayers demanding high transparency in order to monitor their actions and management (Rodríguez-Bolívar, Alcaide-Muñoz, and López Hernández, 2013; Tejedero-Romero and Araujo, 2018), and to increase trust in politicians and public managers through transparent behaviour. The size

Table 1
Analysed variables, tested hypothesis and descriptive results.

| | Variables | Sign | Acronym | Description | Calculation | Mean | Median | Std. Dev. | Min. | Max. |
|--|---|------|-------------------|--|---|-----------|-----------|-----------|--------|-----------|
| | Access the OG section Item | | OGS | Access the Open Government sections Disclosed Open | Items described in Table 3 | 0.22 | 0.00 | 0.31 | 0 | 1 |
| | Open Government Data Item | | OGD | Government Data via ODP or municipal official Web sites | Items described in Table 4 | 0.54 | 0.47 | 0.08 | 0.22 | 0.98 |
| Independent Variables | | | | | | | | | | |
| Demographic Factors | Ln_population | + | POP | ¹ Population residing in the Region | Neperian logarithm of the population | 11.62 | 11.16 | 0.72 | 10.83 | 14.97 |
| | <i>H_{1.1}.The population size of municipality has a positive relationship with the way to access of OG projects</i> | | | | | | | | | |
| | <i>H_{1.2}.The population size of municipality has a positive relationship with the disclosed information in the OGDs or municipal official web sites.</i> | | | | | | | | | |
| | Population density | + | PDEN | ¹ Population residing in the municipality per km ² | Population divided by km ² | 2455.73 | 1126.52 | 3114.58 | 54.80 | 18,894.93 |
| <i>H_{2.1}.The population density has a positive relationship with the way to access the OG projects</i> | | | | | | | | | | |
| <i>H_{2.2}.The population density has a positive relationship with the disclosed information in the OGDs or municipal official web sites.</i> | | | | | | | | | | |
| Economic Factors | Municipal wealth | + | GDP _{pc} | ¹ GDP per capita | GDP/inhabitants | 21,725.83 | 20,542,00 | 5047.83 | 14,989 | 51,002 |
| | <i>H_{3.1}.The municipal wealth has a positive relationship with the way to access the OG projects</i> | | | | | | | | | |
| | <i>H_{3.2}.The municipal wealth has a positive relationship with the disclosed information in the OGDs or municipal official web sites.</i> | | | | | | | | | |
| | Fiscal pressure | + | PRE | ³ Percentage of taxes pay by citizens | Percentage of taxes in relation to DGP | 0.02 | 0.02 | 0.01 | 0.009 | 0.064 |
| <i>H_{4.1}.The fiscal pressure has a positive relationship with the way to access the OG projects</i> | | | | | | | | | | |
| <i>H_{4.2}.The fiscal pressure has a positive relationship with the disclosed information in the OGDs or municipal official web sites.</i> | | | | | | | | | | |
| Political Factors | Political ideology | + | POL | ² Indicator of ideology in political party | 0 = Progressive 1 = Conservative | 0.36 | 0.00 | 0.48 | 0 | 1 |
| | <i>H_{5.1}.The political ideology of the governing body of the municipality has a positive relationship with the way to access the OG projects.</i> | | | | | | | | | |
| | <i>H_{5.2}.The political ideology of the governing body of the municipality has a positive relationship with the disclosed information in the OGDs or municipal official web sites.</i> | | | | | | | | | |
| | Political Fragmentation | - | FRG | ² Indicator of political fragmentation | Number of political parties with seats/ total councillors | 33.19 | 40.00 | 11.61 | 12.50 | 69.56 |
| | <i>H_{6.1}.The political fragmentation has a negative relationship with the way to access the OG projects.</i> | | | | | | | | | |
| | <i>H_{6.2}.The political fragmentation has a negative relationship with the disclosed information in the OGDs or municipal official web sites.</i> | | | | | | | | | |
| City Profile | Political stability | + | STA | ² Number of consecutive years in power | Number of years | 6.28 | 4.00 | 4.61 | 3 | 15 |
| | <i>H_{7.1}.The political stability has a positive relationship with the way to access the OG projects.</i> | | | | | | | | | |
| | <i>H_{8.2}.The political stability has a positive relationship with the disclosed information in the OGDs or municipal official web sites.</i> | | | | | | | | | |
| | Smart City | + | SC | ⁴ Municipalities that are Smart Cities | 0 = No Smart City 1 = Smart City | 0.05 | 0.00 | 0.21 | 0 | 1 |
| <i>H_{8.1}.The consideration of a municipality as a Smart city positively favours the way to access of OG projects.</i> | | | | | | | | | | |
| <i>H_{8.2}.The consideration of a municipality as a Smart City positively favours the disclosed information in the OGDs or municipal official web sites.</i> | | | | | | | | | | |

Source: Own elaboration.

¹INE (Statistic Institute of Spain) www.ine.es; ² Ministry of Interior (<http://www.infoelectoral.mir.es/>); ³Finance and Public Administration (www.minhap.gob.es);

⁴IESE Business School (<http://citiesinmotion.iese.edu/indicecim/>). We have collected all variables in November and December 2020.

of local government has thus been one of the most analysed factors in prior research (Alcaide-Muñoz, Rodríguez-Bolívar, and López Hernández, 2017), arguing that large SLGs have greater human, technical, technological, and financial resources to undertake innovative initiatives favouring access and information disclosure, and improving transparency in public management. Previous empirical studies have demonstrated the existence of a positive and significant relationship between the size of governments and information transparency (Alcaide-Muñoz et al., 2017; Sáez-Martín, Caba-Pérez, and López-Hernández, 2017). We will therefore test hypotheses *H_{1.1}*. and *H_{1.2}*. as summarised in Table 1.

2.2.1.2. Population density (DEN). Population density is other important factor to be analysed within the framework of stakeholder theory (Jensen and Meckling, 1976) and institutional theory pronouncements (Powell and DiMaggio, 2012). Institution theory holds that the design of organisations is not considered a rational process but, rather, a process conditioned by internal and external factors that lead organisations to resemble each other more closely over time (Powell and DiMaggio, 2012): organisations respond to external pressures by adopting structures and practices that are considered legitimate and socially acceptable, thus producing homogeneous practices and structures. Municipalities with similar population densities could have similar characteristics that will lead them to undertake similar initiatives,

provide services under similar conditions, and manage the organisation in a similar way.

Dense cities facilitate social interactions by flowing both knowledge and innovative ideas (Glaeser and Gottlieb, 2006), and it makes them potentially more interested in introducing Information and Communication Technology (ICT)-based initiatives (smart city initiatives) (Neir-otti, De Marco, Cagliano, Mangano, and Scorrano, 2014). Prior research indicates that public managers and governors of municipalities with a high population density could be more pressured by citizens to be more transparent (Homsy and Warner, 2015), provide better and more efficient public services, or management available resources more efficiently (Arcelus, Arocena, Cabasés, and Pascual, 2015), and being more obliged to meet their demands. Both these theories and prior research support the idea that higher population density could lead to increasing stakeholder pressure on local governments and the need to develop smart city initiatives. Under these theoretical lenses, organisations must be managed in a sustainable manner and attend to citizens' interests and needs, which would require the greater commitment and dissemination of public information.

Studies have found that internet access and availability increase in urban areas where the population density is higher (Gandía and Archidona, 2008). In the case of public information disclosure, Lowatcharin and Menifield (2015), explained that population density positively affects the level of governmental transparency. We will test hypotheses

$H_{2.1}$ and $H_{2.2}$ as summarised in Table 1.

2.2.2. Economic factors

2.2.2.1. Municipal wealth (GDPpc). Studies (Rodríguez-Bolívar et al., 2013; Sáez-Martín et al., 2021) have found that the economic status of citizens positively affects the disclosure of public financial information, and thus transparency. Alcaide-Muñoz et al. (2017) and Gandía and Archidona (2008) demonstrated that municipalities with high-income citizens pay more taxes, and that they therefore demand more information to monitor political decisions and the investment of public resources.

Legitimacy theory (Weber, 2018) argues that the legitimacy of an organisation's actions is affected by the dissemination of information to stakeholders (Archel, Husillos, Larrinaga, and Spence, 2009). In particular, the greater the chances of a public policy having a negative impact, the greater the need to try to influence the process through information disclosure. On the basis of institutional theory (Powell and DiMaggio, 2012) and Weber's legitimacy theory (Weber, 2018) policymakers thus respond to pressure from their environments and adopt structures and legitimate and socially acceptable practices in the disclosure of financial statements, with the aim of being financial accountable to citizens.

Research (Alcaide-Muñoz et al., 2017; García-Tabuyo, Saez-Martin, and Caba-Perez, 2017; Sáez-Martín et al., 2017) has showed that there is a positive relationship between municipal wealth and the online disclosure of public information and transparency. We will test hypotheses $H_{3.1}$ and $H_{3.2}$ as summarised in Table 1.

2.2.2.2. Fiscal pressure (PRE). Based on the principal-agent model, Ferejohn (1999) showed that payment of the highest taxes is associated with a higher level of fiscal transparency. Citizens thus demand greater transparency in the exercise of public functions by politicians to accountable for the management of public resources (Araujo and Tejedero-Romero, 2018). According to the pillars of agency theory (Jensen and Meckling, 1976), policymakers and public managers do not have the same interests as citizens, and hence, in a context of asymmetric information, external users (citizens) employ public governmental financial statements to inform themselves of the actions of policymakers and public managers. This premise has been tested in prior research, and fiscal pressure has been found to be one of the most significant economic determinants for its positive relationship with transparency (Alcaide-Muñoz et al., 2017; Rodríguez-Bolívar et al., 2013).

Studies have also found that citizens have an incentive to assess local financial conditions when they paid high taxes (Alcaide-Muñoz et al., 2017) When citizens pay a high level of taxes, they expect to receive more and higher quality public services. I they perceive that the quantity and quality of public services received are not balanced with the amount of taxes paid, they will demand greater information transparency from public managers to monitor how they manage their financial resources. We will test hypothesis $H_{4.1}$ and $H_{4.2}$ as summarised in Table 1.

2.2.3. Political factors

2.2.3.1. Political ideology (POL). According to institutional theory, and specifically considering the mimetic isomorphism stream, political parties with the same ideology will tend to respond to pressure from their environments and adopt structures and practices that are considered legitimate and socially acceptable by their ideological followers (Powell and DiMaggio, 2012). Indeed, it has been demonstrated that the political ideology of a governmental party significantly affects the style of public administration management. The partisan politics matters thesis argues that left-wing parties tend to adopt social policies and carry out initiatives which increase public spending and public investments (Ashworth, Geys, and Heyndels, 2005).

Tejedero-Romero and Araujo (2020, 2018) found that left-wing parties are more prone to carry out projects that promote transparency and information disclosure than right-wing political parties. Ya Ni and Bretschneider (2007), however, found that governments with a conservative ideology tend to implement programs and activities of an economic nature, while progressive politicians are more likely to focus on social policies and citizen engagement. There are also empirical studies that have not found significant evidence in this regard (García-Tabuyo et al., 2017). We thus propose to test hypotheses $H_{5.1}$ and $H_{5.2}$ as summarised in Table 1.

2.2.3.2. Political fragmentation (FRA). According to Roubini and Sachs (1989), weak governments may be tempted to overestimate tax revenues to increase their spending levels. Goal setting theory (Locke and Latham, 2002) suggests that weak governments may not establish clear goals and may try to satisfy all demands with the aim of winning the next electoral campaign. It is also more difficult to reach consensus in a coalition government, and performance usually decreases. By contrast, if public managers and politicians know what they are aiming for, they are motivated to exert more effort, which increases performance. In other words, people with specific and challenging goals perform better than those with vague goals (Locke and Latham, 2002).

According to prior research (Volkerink and de Haan, 2001), the number of parties in the cabinet is positively correlated with higher deficits due to their link with indecision and depends to a larger extent on taxation (Geys and Revelli, 2011). Fragmented governments also demonstrate problems with coordination and seem to be less effective in undertaking reforms and policies, which can affect the implementation of OG initiatives and projects (Puron-Cid, 2014).

Empirical studies (Alcaide-Muñoz et al., 2017; Rodríguez-Bolívar et al., 2013) have shown that the more fragmentation there is, the more incentive to offer information transparency, because politicians who are seeking more votes try to meet the needs of voters as far as possible. According to this theoretical lens and these prior findings, we will test hypotheses $H_{6.1}$ and $H_{6.2}$ as summarised in Table 1.

2.2.3.3. Political stability (STA). Jochimsen and Thomasius (2014) used goal setting theory to suggest that a politician with more years in power has more experience of setting specific and viable objectives. As the implementation of ICTs and adoption of OGD initiatives in a government tend to require political support for both the assignment of adequate resources and the establishment of strategic objectives in a scheduled time horizon (Puron-Cid, 2014), the political stability of a local government could fit well with the implementation of OGD initiatives.

Although there are no empirical studies that analyse the relationship between political stability and the online disclosure of public information, Rodríguez-Bolívar (2017) found a significant positive relationship between financial sustainability and the number of years that a political party has been in power, which suggests that experienced politicians have more knowledge with which to establish rational objectives and achieve goals. We will therefore test hypotheses $H_{7.1}$ and $H_{7.2}$ as summarised in Table 1.

2.2.4. City profile

2.2.4.1. Smart city (SC). The framework of smart cities has favoured technological development and innovation, creating a participative and collaborative environment among governments and citizens in order to increase the quality of life of citizens (Rodríguez-Bolívar, 2019). In this context, sharing data on public services, even dating back to the 2000s, has become very relevant considering the need for information transparency and public participatory governance in decision making (Open Knowledge Foundation, 2015). Indeed, in a smart city context, open data initiatives seek to promote greater citizen engagement in public decisions, implementing collaborative and participative city governance

(Pereira, Macadar, Luciano, and Testa, 2017), fostering co-creation and collective intelligence, and supporting innovation, and can also be useful in providing solutions to many socio-economic and environmental problems (Ubalde, 2013).

One of the main derivatives of the open data initiatives is the provision of government data portals (Weerakkody, Irani, Kapoor, Sivarajah, and Dwivedi, 2017), especially in a smart city context, where open data initiatives can be shaped. According to Burns and Andrucki (2021), open data platforms in smart cities can increasingly serve as a core strategy for achieving “smartness” (Barns, 2016), because it assumes a singular individuated process of subjectivation as the origin of the smart city and its governance models (Burns and Andrucki, 2021). In practical terms, open data government platforms can help governments to learn from other organisations and agencies in delivering better services (Agrawal, Kettinger, and Zhang, 2014), and also help citizens to get involved in the processes of the government and create value for both (Agrawal et al., 2014). Indeed, according to Pereira et al. (2017), open data initiatives improve the delivery of public value in smart city contexts. It would thus be interesting to determine the expected effect that Smart cities could have on both information transparency and the implementation of OGD initiatives. We will therefore test hypotheses $H_{8.1}$ and $H_{8.2}$ as summarised in Table 1.

3. Empirical research

3.1. Sample selection

Navarro-Galera, Alcaide-Muñoz, López-Subires, and Rodríguez-Bolívar (2021) found that Spanish regional and local governments have had difficulty controlling the public deficit and suffered a deterioration in their financial positions. This led to a marked worsening of public finances, jeopardising the financial sustainability of public services, and also led to hard management cutbacks, which favoured the implementation, evolution and maturity of technological initiatives and projects. Indeed, SLG implemented new technological advances (Criado and Ruvalcaba-Gomez, 2018), with the aim of improving the delivery of online public services (Rodríguez-Bolívar, 2017), favouring citizen participation in public policies, by disclosing a greater amount of information (Alcaide-Muñoz et al., 2017).

The central government of Spain launched an ambitious OG strategy, adopting the OG Partnership philosophy in 2011, following the Recommendations of OECD on the Digital Strategies of the Government (OECD, 2014). This OG strategy has been implemented in several staggered phases and involves four OG plans (www.transparencia.gob.es). All previous above comments make SLGs a good basis for our research, and the empirical evidence collected could also be useful and interesting for governments in other countries around the world.

This research focuses on SLGs because they are the closest level of government to citizens and manage the largest number of services (*Law 7/1985, Regulation of Bases of Local Regimes*). They also represent the highest level of debt in the Spanish public sector, and in recent years, have suffered huge management cuts and financial difficulties (Navarro-Galera et al., 2021), which has prompted citizens to demand more public information. Our sample selection includes SLGs with a population over 50,000 inhabitants, which assumes a series of competencies and responsibilities which are supposed to deliver complex and efficient public services (Rodríguez-Bolívar, 2017). They also manage a high level of activity that is more suitable for innovation in public policy (Criado and Ruvalcaba-Gomez, 2018), and pushes them to be early adopters of new technologies.

The sample data for this research was collected in two stages (during May and June 2021). Firstly, we searched local governments of areas with >50,000 inhabitants in the Spanish National Institute of Statistics (INE) database. This search provided 145 local governments, which represent >50% of the Spanish population (<https://www.ine.es/>). These municipalities have large populations, and have assumed a series of

responsibilities and competences, in addition to adopting leadership behaviours regarding new technologies (as noted previously), but they are a heterogeneous group. We thus split these municipalities into three groups (using population density as indicator, based on institutional theory) in order to gain an idea of the defining characteristics in the municipalities of our sample (see Table 2).

There are two clearly differentiated groups (from the three existing groups), municipalities with low and high population density. In the first group, we find municipalities characterised by a population size below the median (88,096 inhabitants), inhabitants with an average age over 35 years (a population somewhat older than the two remaining groups), and an unemployment rate above the median with a poorly developed business fabric. In contrast, the second group is characterised by municipalities with population sizes above the median, and younger inhabitants with a high unemployment rate, although it has a more developed business fabric.

We collected data regarding Spanish smart cities. Considering that the definition of SCs is still evolving and there is no “best formula” for transforming every city into an SC (Mozūriūnaitė and Sabaitytė, 2021), our sample selection process included Spanish cities recognised as SCs in two widely accepted world rankings according to the characteristics required by these rankings: 1) a European project sponsored by Asset One Immobilienentwicklungs AG (<http://www.smart-cities.eu>) - we collected seven municipalities from this ranking with a large population classified as SCs; and 2) the EURO CITIES network (<http://www.euro-cities.eu>) - we collected five municipalities from this ranking with a large population classified as SCs). The sample SCs are municipalities with large populations, where the inhabitants are young people and there is a low unemployment rate (see Table 2). These cities have a GDP per capita over the median with high business activity, although their levels of indebtedness are high; also over the median. In brief, our sample selection is composed of a total of 145 SLGs - twelve of which are considered SCs.

3.2. Dependent variables

We analysed the SLGs’ official websites using two items (see Tables 3 and 4). The first item (Open Government Sections “OGS”) allowed us to analyse the ways that local governments offer access to OG so that citizens can see and use their content: we analysed the means of accessing the OG section. We accessed the municipalities’ official websites (all URLs are found in Table 4), and then we observed the type of access each municipality offered to the OG section (Table 3 Subitem 1 weighted 0.25). When the municipality had a specific OG section that, if clicked, took us to a specific OG website, it was assigned a score of 1; if this click sent us to a specific section of the official webpage of the municipality, and not to a specific OG portal, a score of 0.5 was assigned; finally, if the municipality had a differentiated OG portal that could not be accessed from the official web page of the municipality, then a score of 0.25 was assigned, and where there was no OG section or portal, a score of 0 was assigned.

Next, we proceeded to determine whether the OG web page allowed us to make an advanced search of the published databases (Table 3 Subitem 2 weighted 0.25), if it offered this tool, it would be assigned a score of 1, and otherwise it would receive a score of 0. We also determined whether the OG web page offered information on the municipality strategic plan (Table 3 Subitem 3 weighted 0.25), assigning a score of 1 for information, and otherwise a score of 0. Finally, if this website had a news section (Table 3 Subitem 4 weighted 0.25-), then it was assigned a score of 1, and otherwise it was assigned a score of 0. These three subitems (Subitems 2, 3 and 4) had a weight of 0.25 each. The first item (OGS) was therefore scored as follows:

How the municipalities offer access to the OG sections (Item 1)(Max. punctuation 1)
 Subitem 1–0.25 x (1/0.5/0.25/0) + Subitem 2–0.25 x (0/1) + Subitem 3–0.25 x (0/1) + Subitem 4–0.25 x (0/1)

Table 2
Characteristics of the Local Governments in study's analysed sample.

| | Low density | Medium density | High density |
|--|--|--|--|
| <i>145 Spanish local governments</i> | | | |
| Municipalities | Albacete, Alcalá de Guadaíra, Alcoy, Almería, Aranjuez, Arganda del Rey, Ávila, Badajoz, Cáceres, Cartagena, Chiclana de la Frontera, Ciudad Real, Córdoba, Cuenca, El Ejido, El Puerto, Santamaría, Elche, Estepona, Ferrol, Guadalajara, Huesca, Jaén, Jerez de la Frontera, Linares, Lleida, Lorca, Lugo, Mérida, Mijas, Molina del Segura, Motril, Murcia, Orihuela, Pinto, Ponferrada, Pontevedra, Sagunto, San Bartolomé de Tíjarana, Sanlúcar de Barrameda, Santiago, Compostela, Segovia, Siero, Talavera de la Reina, Toledo, Utrera, Velez, Málaga, Zamora, Zaragoza | Alcalá de Henares, Algeciras, Alicante, Arona, Benidorm, Boadilla del Monte, Burgos, Castellón de la Plana, Cerdanyola del Vallés, Collado Villalba, Dos Hermanas, Elda, Gandía, Getafe, Gijón, Huelva, Irún, La Rozas, Logroño, Majadahonda, Málaga, Manresa, Marbella, Ourense, Oviedo, Palencia, Palma de Mallorca, Paterna, Pozuelo de Alarcón, El Prat de Llobregat, Reus, Rivas-Madrid, Roquetas de Mar, San Cristobal de la Laguna, San Sebastián de los Reyes, San Vicente del Raspeig, San Cugat del Valles, Santa Cruz de Tenerife, Santa Lucía de Tíjarana, Telde, Torrelavega, Torrent, Torreveja, Valdemoro, Valladolid, Vilanova I La Geltrú, Vila-real, Vitoria | Alcobendas, Alcorcón, Arrecife, Avilés, Badalona, Barakaldo, Barcelona, Benalmadena, Bilbao, Cádiz, Castelldefels, Ceuta, Cornellá del Llobregat, Coruña, Coslada, Donostia/San Sebastián, Fuengirola, Fuenlabrada, Getxo, Girona, Granada, Granollers, Las Palmas, Leganés, León, L'Hospitalet del Llobregat, Línea de la Concepción, Madrid, Mataró, Melilla, Mollet del Vallés, Mostoles, Pamplona, Parla, Rubí, Sabadell, Salamanca, San Fernando, Sant Boi de Llobregat, Santa Coloma de Gramenet, Santander, Sevilla, Tarragona, Terrassa, Torrejón de Ardoz, Torremolinos, Valencia, Vigo, Viladecans |
| Population | | | |
| Over the median | 33.33% | 50.00% | 65.31% |
| Under the median | 66.67% | 50.00% | 34.69% |
| Young population 15 to 35 years | | | |
| Over the median | 29.71% | 52.08% | 67.35% |
| Under the median | 70.83% | 47.92% | 32.65% |
| GDP per capita | | | |
| Over the median | 29.17% | 58.33% | 61.22% |
| Under the median | 70.83% | 41.67% | 38.78% |
| Unemployment rate | | | |
| Over the median | 64.58% | 50.00% | 65.31% |
| Under the median | 35.42% | 50.00% | 34.69% |
| Debt per capita | | | |
| Over the median | 47.92% | 43.75% | 57.14% |
| Under the median | 52.08% | 56.25% | 42.86% |
| Number of companies | | | |
| Over the median | 33.33% | 56.25% | 59.18% |
| Under the median | 66.67% | 43.75% | 40.82% |
| Political Ideology | | | |
| Conservatives | 25.00% | 45.83% | 30.61% |
| Progressives | 75.00% | 54.17% | 63.39% |

Table 2 (continued)

| | Low density | Medium density | High density |
|--|------------------|---|---|
| <i>145 Spanish local governments</i> | | | |
| Spanish smart cities Municipalities | Murcia, Zaragoza | Gijón, Málaga, San Sebastian de los Reyes, Valladolid | Barcelona, Bilbao, Fuenlabrada, Madrid, Sevilla, Terrassa |
| Population | | | |
| Over the median | 100% | 100% | 100% |
| Young population 15 to 35 years | | | |
| Over the median | 100% | 100% | 100% |
| GDP per capita | | | |
| Over the median | 50.00% | 66.67% | 100% |
| Under the median | 50.00% | 33.33% | – |
| Unemployment Rate | | | |
| Over the median | – | 33.33% | 14.29% |
| Under the median | 100% | 66.67% | 85.71% |
| Debt per capita | | | |
| Over the median | 100% | 66.67% | 71.43% |
| Under the median | – | 33.33% | 28.57% |
| Number of companies | | | |
| Over the median | 100% | 100% | 100% |
| Political Ideology | | | |
| Conservatives | 100% | 25.00% | 50.00% |
| Progressives | – | 75.00% | 50.00% |

Source: Statistics National Institute (<https://www.ine.es/>).

Notes: We calculated tertiles of cities using population density: Low density 54.80 to 822.32 inhabitants/Km²; Medium density 822.33 to 2343.72 inhabitants/Km² and high density 2343.73 to 18,094.93 inhabitants/Km². We try to homogenize cities according to the inhabitants that provide public services for each km² (Arcelus et al., 2015).

The second item (OGD) allows us to recollect the disclosed information content (data catalogue or types of information) and formats used by local governments to disclose the OGD via OGDs or municipal official web pages (see Table 4). We examined the different sections of the data catalogue or types of information (*Subitem 1 weighted 0.5*), into which the information is divided, each type of information offered is scored with a 1 and otherwise with a 0. Given that there are eighteen different types of information, the score obtained in this first subitem is divided by eighteen and then weighted by 0.5.

We continue with the formats in which information is disclosed (*Subitem 2 weighted 0.5*). We found three different categories of data format: easy-processing data, less easy-processing data, and difficult-processing data. We listed twelve types of data formats in easy-processing data (*1. easy-processing data weighted 0.6*), assigning a score of 1 for each if available and 0 otherwise. The total score is the sum of the score obtained in the 12 formats divided by 12 and weighted by 0.6. In the second category (less easy-processing data) (*2. Less easy-processing data weighted 0.3*) we found eight different types of data formats, and assigned a score of 1 for each if available and 0 otherwise. The total score is the sum of the score obtained in the eight formats divide by 8 and weighted by 0.3. Finally, in difficult-processing data (*3. difficult-processing data 0.1*), we only listed one type of data format (.pdf format), assigning a score of 1 if the municipality had information disclosed in pdf format and 0 otherwise. We summed each punctuation obtained in each different categories of data format to reweigh it by the score of 0.5 assigned to Subitem 2 in Table 4. The second item (OGD)

Table 3
Characteristics between innovators in OGD and non-innovators.

| Variables | Innovators in OGD | | | | | Non-innovator in OGD | | | | |
|-----------|-------------------|-----------|-----------|--------|-----------|----------------------|-----------|-----------|--------|-----------|
| | Mean | Median | Std. Dev. | Min. | Max | Mean | Median | Std. Dev. | Min. | Max |
| OGS | 0.73 | 0.81 | 0.32 | 0.13 | 1.00 | 0.19 | 0.00 | 0.28 | 0.00 | 1.00 |
| OGD | 0.46 | 0.46 | 0.03 | 0.42 | 0.50 | 0.46 | 0.47 | 0.05 | 0.17 | 0.50 |
| POP | 13.20 | 13.01 | 1.05 | 12.05 | 14.97 | 11.55 | 11.36 | 0.57 | 10.83 | 13.44 |
| PDEN | 5478.86 | 5010,80 | 5103.07 | 682.84 | 16,503.50 | 2328.42 | 1440.04 | 2911.88 | 54.80 | 18,894.93 |
| GDPpc | 24,699.38 | 22,831.00 | 3434.15 | 21.581 | 29.807 | 21,592.75 | 20,710,00 | 5126.14 | 14,989 | 51,002 |
| PRE | 0.02 | 0.03 | 0.01 | 0.01 | 0.03 | 0.02 | 0.02 | 0.01 | 0.009 | 0.064 |
| POL | 0.50 | 0.50 | 0.53 | 0.00 | 1.00 | 0.33 | 0.00 | 0.47 | 0.00 | 1.00 |
| FRG | 34.63 | 35.50 | 8.97 | 24.40 | 48.10 | 39.77 | 40.00 | 12.58 | 12.00 | 84.00 |
| STA | 4.00 | 2.50 | 5.07 | 1.00 | 16.00 | 4.91 | 4.00 | 5.05 | 1.00 | 16.00 |
| SC | 0.63 | 1.00 | 0.52 | 0.00 | 1.00 | 0.05 | 0.00 | 0.22 | 0.00 | 1.00 |

Source: Own elaboration.

Note: Innovators (early adopters) in OGD: Barcelona, Gijón, Madrid, Pamplona, Santander, Valencia, Valladolid and Zaragoza (Orange Foundation available at: https://www.proyectosfundacionorange.es/docs/eE2014/Datos_Abiertos_2014_resumen_ejecutivo.pdf).

Table 4
Item 1 on how the municipalities offer to access the Open Government sections.

| Questions | Score | Weighting | Percentage |
|---|-----------------|-----------|------------|
| SUBITEM 1.- On the Local Government Website, is there a specific section of Open Government? | $\sum d$ a to d | 0.25 | |
| a. There is a section which link a different page of Open Government | 1 | | 21.38% |
| b. There is an Open Government tab, but it is inside the official Local Government Website | 0.5 | | 19.31% |
| c. There is an independent Web site without a link in the official website of the Local Government | 0.25 | | 0.00% |
| d. There is no Open Government page/ section | 0 | | 59.31% |
| SUBITEM 2.- Does the Web page allow an advanced search of Open Government databases? | 0/1 | 0.25 | 18.62% |
| SUBITEM 3.- Does the Local Government offer information on the Open Government Action Plan? | 0/1 | 0.25 | 12.41% |
| SUBITEM 4.- Is there a news section? | 0/1 | 0.25 | 22.76% |
| Total Access the OG sections (max. punctuation) | | 1 | |
| OTHER INFORMATION ABOUT OG (NOT INCLUDED IN PREVIOUS ITEM) | | | |
| Local Governments have Open Government Data Portals | | | 46.21% |

Source: Own elaboration.

was therefore scored as follows:

| OGD (data catalogue and format) (Item 2)(Max. punctuation 1) |
|--|
| Subitem 1–0.50 x (0/1 with total 18 type of information/18) + Subitem 2–0.50 x [1. Easy-processing data 0.6 x (0/1 with total 12 easy-processing formats/12) + 2. Less easy-processing data 0.3 x (0/1 with total 8 less easy-processing formats/8) + 3. Difficult-processing data 0.1 x (0/1 with total 1 difficult-processing format)] |

3.3. Independent variables and method

We selected eight variables as factors linked with the hypotheses defined in the previous section. All information about the variable acronyms, hypothesis, their descriptions, and calculation is detailed in Table 1.

In order to identify the factors that affect the two indexes (OGS and OGD), six regression models were used to predict the effect of all independent variables, considered simultaneously. The National Statistical Institute in Spain uses three groups to stratify the municipalities according to their population: municipalities between 20,000 and 50,000 inhabitants (small municipalities, not analysed in this study);

municipalities between 50,000 and 100,000 inhabitants (medium municipalities); and over 100,000 inhabitants (large municipalities).

Considering this stratification (www.ine.es) and prior research (Royo, Yetano, and García-Lacalle, 2020; weber), we separated the 145 local government into two groups based on their population size: municipalities of 50,000 to 100,000 inhabitants and municipalities over 100,000 inhabitants. We thus offer the following regression analysis: 1) with all local governments (all sample selection) (EQ1); 2) local governments with a population over 100,000 inhabitants (EQ2), and 3) local governments with a population between 50,000 and 100,000 inhabitants (EQ3) (see Table 6).

At this point of study we have two variables to which we have paid special attention: population density and population size. Table 2 gives us indications that population density could be a relevant attribute for characterising different aspects of municipalities. Previous studies (Arcelus et al., 2015; Homsy and Warner, 2015) have demonstrated that population density affects governors in both undertaking transparency strategies and in the management of public services. Finally, population size is also a variable that has been widely analysed in prior studies on transparency (Alcaide-Muñoz et al., 2017; Rodríguez-Bolívar et al., 2013), finding that the highest-populated municipalities exert greater pressure on public managers to be transparent in the management of public resources.

Considering the structure presented by the dependent variables (OGS and OGD), the associations between the dependent and independent variables were tested using OLS regression analysis (STATA v.16), which produced the equations shown in Table 6.

4. Analysis of the results

4.1. Descriptive analysis

Table 1 shows that although there is a great dispersion in the design of OG websites by SLGs, the public information disclosed is very similar (low standard deviation). It should be noted that sample municipalities show different population density, municipal wealth, and political fragmentation and stability (all have high values of standard deviation). This high level of dispersion reflects the different municipalities included in the sample selection, from highly populated cities (like Madrid or Barcelona), to large cities with higher area but less industry and generation of wealth. By contrast, the political ideology, the fiscal pressure, and the smart city profile are remarkably similar among sample local governments (see the median and standard deviation).

Similarly, in Table 5 we can see that the governments that were innovators in OGD show a higher level of development in OG sections (mean 0.81), although the level of transparency is very similar to the non-innovators or laggards (mean 0.46 versus 0.47), the minimum score of the most innovative is higher than 0.42. The innovators are

governalia.es/); Ourense (<https://www.ourense.gal/es/>; NA); Oviedo (<https://www.oviedo.es/>; <https://transparencia.oviedo.es/opendata/>); Palencia (<https://www.aytopalencia.es/>; NA); Palma de Mallorca (<https://www.palma.cat/portal/PALMA/home.jsp?codResi=1&language=es>; NA); Pamplona (<https://www.pamplona.es/>; <https://opendata.pamplona.es/>); Parla (<https://www.ayuntamientoparla.es/>; NA); Paterna (<https://www.paterna.es/es/>; NA); Pinto (<https://www.ayto-pinto.es/>; <https://gobiernoabierto.ayto-pinto.es/inicio>; <http://portalestadistico.com/municipiocifras/?pn=ayto-pinto&pc=LZG75&idp=1&idpl=100&idioma=>); Ponferrada (<https://www.ponferrada.org/es/>; <https://opendata.ponferrada.org/?language=en>); Pozuelo de Alarcón (<https://www.pozuelodealarcon.org/>; NA); Prat de Llobregat (<https://www.elp rat.cat/>; <https://seu-e.cat/ca/web/elpratdellobregat/dades-obertes>); Reus (<https://www.reus.cat/>; <https://opendata.reus.cat/>); Rivas-Madrid (<https://www.rivasciudad.es/>; <https://datosabiertos.rivasciudad.es/>); Roquetas de Mar (<https://www.roquetasdemar.es/>; NA); Rubí (<https://www.rubi.cat/>; <https://www.seu-e.cat/es/web/rubi/dades-obertes>); Sabadell (<https://web.sabadell.cat/>; <https://opendata.sabadell.cat/ca/>); Sagunto (<http://www.aytosagunto.es/es-es/Paginas/inicio.aspx>; <http://datosabiertos.sagunto.es/>); Salamanca (<http://www.aytosalamanca.es/es/index.html>; NA); San Bartolomé de Tirajana (<https://www.maspalomas.com/index.php>; <https://eadmin.maspalomas.com/transparencia/datos/catalogo>); San Cristóbal de la Laguna (<https://www.aytolalaguna.es/>; <https://datos.aytolalaguna.es/>); San Fernando (<http://www.sanfernando.es/ayto/>; NA); San Sebastián de los Reyes (<https://www.sreyes.org/es/portal.do?sessionid=4430B28ACF746E5F2868F358580F11F0>; <https://www.sreyes.org/transparencia/portal.do?IDR=901&TR=8>); San Vicente del Raspeig (<https://www.raspeig.es/>; NA); Sanlúcar de Barrameda (<https://www.sanlucardebarrameda.es/>; NA); San Boi del Llobregat (<http://www.santboi.cat/>; <https://observatori.santboi.cat/indicadors/>); Santa Coloma del Gramenet (<https://www.gramenet.cat/es/>; <https://www.seu-e.cat/es/web/santacolomadegramenet/dades-obertes>); Santa Cruz de Tenerife (<https://www.santacruzdetenerife.es/web/inicio>; <https://www.santacruzdetenerife.es/web/go bierno-abierto/opendata>); Santa Lucía de Tirajana (<http://www.santaluciagc.com/modules.php?mod=portal&file=index&pag=0>; NA); Santander (<http://www.santander.es/>; <http://datos.santander.es/>); Santiago de Compostela (<http://santiagodecompostela.gal/>; <https://datos.santiagodecompostela.gal/gl>); Segovia (<http://www.segovia.es/>; <https://opendata.segovia.es/>); Sevilla (<https://www.sevilla.org/>; <http://datosabiertos.sevilla.org/data/>); Siero (<https://www.ayto-siero.es/>; NA); Talavera de la Reina (<https://www.talavera.es/>; NA); Tarragona (<https://www.tarragona.cat/>; <https://www.seu-e.cat/es/web/tarragona/dades-obertes>); Telde (<http://www.telde.es/opencms/opencms>; NA); Terrassa (<https://www.terrassa.cat/>; <https://opendata.terrassa.cat/>); Toledo (<https://www.toledo.es/>; NA); Torrejón de Ardoz (<https://www.ayto-torreon.es/>; NA); Torrelavega (<http://www.torrelavega.es/L> NA); Torremolinos (<https://www.torremolinos.es/>; NA); Torrent (<https://www.torrent.es/torrentPublic/inicio.html>; <http://datosabiertos.torrent.es/>); Torre Vieja (<https://torrevieja.es/es/>; NA); Utrera (<https://www.utrera.org/>; NA); Valdemoro (<https://www.valdemoro.es/>; NA); Valencia (<https://www.valencia.es/>; <https://www.valencia.es/dadesobertes/es/>); Valladolid (<https://www.valladolid.es/es/>; <https://www.valladolid.es/es/temas/hacemos/open-data-datos-abiertos>); Vélez-Málaga (<https://www.velezmalaga.es/>; NA); Vigo (<https://hoxe.vigo.org/>; <https://datos.vigo.org/es/?l>); Viladecans (<https://www.viladecans.cat/ca/>; <https://www.seu-e.cat/es/web/viladecans/dades-obertes>); Villanova i la Geltrú (<https://www.vilanova.cat/>; <https://www.seu-e.cat/es/web/vilanovailageltru/dades-obertes>); Vila-real (https://www.vila-real.es/portal/p_1_principal1.jsp?codResi=1&language=ca; NA); Vitoria (<https://www.vitoria-gasteiz.org/we001/was/we001Action.do?accionWe001=ficha&accion=home>; <https://www.vitoria-gasteiz.org/j34-01w/catalogo/portada?idioma=es>); Zamora (<http://www.zamora.es/>; NA); Zaragoza (<https://www.zaragoza.es/de/>; <https://www.zaragoza.es/sede/portal/datos-abiertos/>)

Source: Own Elaboration.

municipalities with a higher population density, and municipal wealth, and six of them are considered SCs (50.00%).

Table 4 confirms previous results regarding how the municipalities offer access to the OG sections, because only 19.31% of local governments often have an OG section on their websites, using a link to an OG tab inside the official local government website. Most of the websites do not allow an advanced search of OG databases, and do not offer information about the OG Action Plan (see Table 3). These results indicate that the initiatives are in an infancy stage in SLGs, which means that there is much room for future improvement if local governments want

citizen engagement via both monitoring their activities and involving them in public decisions.

On the other hand, 46.21% of local governments have open data portals, which shows the potential for future improvement. The data in Table 4 indicates that, in general, sample local governments disclose information about all areas analysed in this research. Most information disclosed in the sample local governments was information about urban planning, municipal taxes (including payments) and about culture and leisure. Finally, most of sample governments use the .pdf format (non-easily processing data) which does not allow citizens to make their own reports easily. CSV and GEOJSON are also used as formats but not at a high level in our sample.

4.2. Empirical results from models

Findings indicate that there is a positive and significant relationship ($\beta = 0.229$; $\beta < 0.050$) between the population and ways to access the OG section for all sample local governments (see Table 6). This seems to confirm the basis in stakeholder theory (Jensen and Meckling, 1976), according to which public managers and governors are more motivated to implement OG initiatives in large municipalities to demonstrate that they have acted according to their responsibilities (we cannot reject $H_{1.1}$). Similarly, the population density has a positive and significant relationship ($\beta = 0.191$; $\beta < 0.005$; $\beta = 0.206$; $\beta < 0.010$; $\beta = 0.028$; $\beta < 0.005$) to the different ways of accessing the OG sections in all tested models. According to the stakeholder and institutions theories (Jensen and Meckling, 1976; Powell and DiMaggio, 2012), public managers and policymakers may feel more pressure to implement OG projects when the municipality has a high population density (we cannot reject $H_{2.1}$), in all models.

Municipal wealth has a positive and significant relationship with the ways to access OG projects ($\beta = 0.134$; $\beta < 0.010$), and this relationship is higher and more significant when we analysed large municipalities (over 100,000 inhabitants) ($\beta = 0.316$; $\beta < 0.005$). According to the legitimacy and institutional theories (Powell and DiMaggio, 2012; Weber, 2018), politicians and public managers must respond to pressures from their citizenship and adopt OG initiatives to improve transparency (we cannot reject $H_{3.1}$). This relationship is not significant in municipalities with a population between 50,000 to 100,000 inhabitants, however, so it seems that when we analyse medium-sized municipalities the pressure is reduced, and the public managers are less motivated to undertake this type of initiative (legitimacy and institution theories).

Political stability is the only political factor that has a negative and significant relationship with how citizens can access OG projects, as when we considered all local governments (Model 1) ($\beta = -0.159$; $\beta < 0.010$) in the rest of models it had no significance (we reject $H_{5.1}$ and $H_{6.1}$, but support $H_{7.1}$). This evidence is contrary to goal setting theory (Jochimsen and Thomasius, 2014). It seems that when politicians and governors win elections and come to lead the municipality, they are more prone to implement OG initiatives.

The fiscal pressure borne by citizens has a positive and significant effect on how the local government offers access to OG projects in large municipalities ($\beta = 0.323$; $\beta < 0.001$). When the citizens pay high taxes, they demand greater access to municipal issues (we cannot reject $H_{4.1}$), which is in accordance with agency theory (Jensen and Meckling, 1976). The fact that a municipality is surrounded by technological SC facilities makes it more likely that municipalities will undertake OG projects ($\beta = 0.281$; $\beta < 0.050$; we cannot reject $H_{8.1}$).

Table 7 shows that there is a positive and significant relationship ($\beta = 0.241$; $\beta < 0.050$; $\beta = 0.294$; $\beta < 0.050$) between population density and public information disclosure, so public managers are more prone to disclose information when there is a high level of population density (we cannot reject $H_{2.2}$), which confirms stakeholder and institutional theories (Jensen and Meckling, 1976; Powell and DiMaggio, 2012). There is no significance in municipalities with a population between 50,000 to

Table 6

Estimation results of the model of how municipalities offer to access OG projects.

| Variables | Acronym | EQ ₁ | | EQ ₂ | | EQ ₃ | |
|-------------------------|-------------------|--------------------|--------------|--------------------|--------------|-----------------|--------------|
| | | Coefficients | t-Statistics | Coefficients | t-Statistics | Coefficients | t-Statistics |
| Ln_population | POP | 0.229 | 2.411** | – | – | – | – |
| Population density | PDEN | 0.191 | 2.385** | 0.206 | 1.706* | 0.280 | 2.584** |
| Municipal wealth | GDP _{pc} | 0.134 | 1.653* | 0.316 | 2.605** | 0.027 | 0.978 |
| Political ideology | POL | 0.073 | 0.842 | –0.037 | –0.264 | 1.187 | 0.239 |
| Political fragmentation | FRG | –0.053 | –0.579 | –0.191 | –1.239 | 0.355 | 0.724 |
| Political stability | STA | –0.159 | –1.693* | –0.055 | –0.314 | –1.231 | 0.701 |
| Fiscal pressure | PRE | 0.115 | 1.483 | 0.323 | 2.844*** | –0.385 | 0.222 |
| Smart city | SC | 0.158 | 1.721* | 0.281 | 2.375** | – | – |
| R ² | | 0.265 ⁺ | | 0.381 ⁺ | | 0.106* | |

EQ₁ (all local governments) – OGS or OGD = β₀ + β₁POP_i + β₂PDEN_i + β₃DPC_{pci} + β₄POL_i + β₅FGR_i + β₆STA_i + β₇PRE_i + β₈SC_i.

EQ₂ (more over 100,000 inhab.) – OGS or OGD = β₀ + β₁PDEN_i + β₂DPC_{pci} + β₃POL_i + β₄FGR_i + β₅STA_i + β₆PRE_i + β₇SC_i.

EQ₃ (50,000 to 100,000 inhab.) – OGS or OGD = β₀ + β₁PDEN_i + β₂DPC_{pci} + β₃POL_i + β₄FGR_i + β₅STA_i + β₆PRE_i.

Source: Own elaboration.

Significant at the 0.001⁺; Significant at the 0.01***; Significant at the 0.05**; Significant at the 0.1*.

Table 7

Estimation results of the model of disclosed information in the OGDs or municipal official web sites.

| Variables | Acronym | EQ ₁ | | EQ ₂ | | EQ ₃ | |
|-------------------------|-------------------|--------------------|--------------|-----------------|--------------|-----------------|--------------|
| | | Coefficients | t-Statistics | Coefficients | t-Statistics | Coefficients | t-Statistics |
| Ln_population | POP | 0.092 | 1.019 | – | – | – | – |
| Population density | PDEN | 0.241 | 3.136** | 0.294 | 2.290** | 0.138 | 1.298 |
| Municipal wealth | GDP _{pc} | 0.266 | 3.446*** | 0.231 | 1.790* | 0.282 | 2.340** |
| Political ideology | POL | 0.036 | 0.435 | 0.026 | 0.175 | 0.190 | 1.557 |
| Political fragmentation | FRG | –0.083 | –0.946 | –0.108 | –0.657 | –0.080 | –0.641 |
| Political stability | STA | –0.194 | –2.159** | –0.051 | –0.276 | –0.203 | –1.602 |
| Fiscal pressure | PRE | 0.076 | 1.021 | 0.280 | 2.318** | 0.013 | 0.115 |
| Smart City | SC | 0.224 | 2.548** | 0.236 | 1.871* | – | – |
| R ² | | 0.328 ⁺ | | 0.300*** | | 0.141** | |

Source: Own elaboration.

Significant at the 0.001⁺; Significant at the 0.01***; Significant at the 0.05**; Significant at the 0.1*.

100,000 inhabitants.

We can observe that, in the case of municipal wealth, and according to legitimacy and institutional theories (Powell and DiMaggio, 2012; Weber, 2018), the data shows a positive and significant relationship with the disclosed information and format used (we cannot reject H_{3,2}), in all models: when citizens have a higher economic level, they tend to demand more information so that they know how the financial resources are managed.

Political stability is the only political factor that has a negative and significant relationship with transparency when we considered all local governments (Model 1) (β = –0.194; β < 0.050). There is no significance in the other models (we reject H_{5,2} and H_{6,2}, but not reject H_{7,2}). This evidence is contrary to goal setting theory (Jochimsen and Thomasius, 2014), as with access to the OG section.

Fiscal pressure supported by the citizens positively and significantly affects transparency in large municipalities (β = 0.280; β < 0.050). When citizens pay high taxes, they demand more information (we cannot reject H_{4,2}). This evidence is in accordance with agency theory (Jensen and Meckling, 1976). Similarly, when the municipality is a smart city, local governments are more transparent and disclose more information (β = 0.224; β < 0.050; β = 0.236; β < 0.100; we cannot reject H_{8,2}).

5. Discussion

This section examines and explains the main contributions of the findings of our research, as well as their implication for public policies and future research directions in the OG initiatives area. We analyse the impact of our findings on both theoretical foundations and practical experiences found in previous research concerning information transparency and OG initiatives.

5.1. Theoretical implications

The present study has theoretical implications for OG research in a local government context. Initially, the authors observed that public officials have been under pressure to modify governance tools due to the rapid population growth in cities, which has made OG initiatives relevant in this new scene (Royo-Montañés and Benítez-Gómez, 2019). Public managers and politicians should thus consider OG projects as tools for the new collaborative governance models implemented in cities.

Most of information disclosed in OGS and OGDs is mainly disclosed in the pdf format, which is a widely-accepted and commonly used format mainly for reading, since it does not allow citizens to edit their own reports easily, so as to make decisions or participate in public affairs. Our findings thus seem to confirm the use of ICT by policymakers to increase the legitimacy of public actions, but not for promoting citizen engagement in public decisions. This could be a reaction to the citizen pressure on policymakers, with the increasing urban challenges due to rapid urban population growth, seeking to adopt structures, and also legitimate and socially acceptable practices for being accountable to citizens (legitimacy theory) (Weber, 2018). This is the first and main contribution of our research.

Although governments seem to understand that ICTs offer great potential in information transparency, they are not adding public value to the information they are disclosing. Our findings, contrary to goal setting theory (Jochimsen and Thomasius, 2014), indicate that incoming politicians foster the implementation of OG initiatives, mainly in cases of corruption involving Spanish politicians, but this implementation is not focused on improving citizen engagement, or as noted previously, for legitimacy purposes. This is another main contribution of our research.

Our findings confirm the pillars of agency theory (Jensen and Meckling, 1976), showing a link between fiscal pressure and OG initiatives in sample large-size cities. These sample cities were characterised by high economic and educational level citizens who demand information to monitor public policies and their effect on financial information from local government, perhaps due to their higher financial contribution through taxes, which is especially relevant for information transparency in large municipalities (see Table 6).

Finally, our findings seem to indicate that municipalities do not show a mimetic isomorphism stream when they design their information transparency models implementing OG initiatives. In fact, contrary to the main propositions posed by institutional theory, the political ideology is not a significant attribute regarding access to OG projects, or in the disclosure of information in the OGDs or municipal official websites. This finding raises questions about prior findings regarding the policymakers with left-wing ideologies as the main drivers of improving information transparency (Tejedo-Romero and Araujo, 2018, 2020) or right-wing parties as the main drivers for citizen engagement and knowledge sharing concerning the technological innovation of public services (Rodríguez-Bolívar, 2015).

Similarly to prior research (Puron-Cid, 2014), our findings show both the non-significant character of the political fragmentation of OG initiatives and the greater difficulty in fragmented governments of approving and undertaking reforms, policies, and these initiatives. In brief, our contradictory findings regarding prior research seem to be caused by the complex political contexts in which municipalities work. Future research should therefore undertake more in-depth studies focused on the institutional arena of sample municipalities with the aim of identifying patterns in OG initiative models.

5.2. Practical implications

Our research also has practical implications. Firstly, findings seem to indicate that the need to implement ICT initiatives and the way they are implemented is affected by the context. The cases of corruption involving Spanish politicians in recent years could have been good motivation for incoming politicians to promote these initiatives in SLGs. In fact, the context in which information transparency is developed can help us to understand the underlying forces that are supporting OG initiatives and the implementation of OGDs. Public managers and politicians should therefore examine the context in which the local government is running before implementing and designing their OG initiatives, which is a good avenue for future research (in-depth analyses of different contexts to identify the main drivers for implementing and designing OG initiatives).

While focusing on the way OG initiatives are implemented, our research has found that only a few local governments have created specific links to an OG and undertaken initiatives OGDs, which could mean the involvement of these governments in increasing their accountability to the public. We believe that the policies related to the process of adoption of OG projects in a complex political environment is a promising area of study. The results of future studies could strengthen the connection between OG projects and the traditional concerns of public administration.

Local governments in municipalities with larger populations, higher fiscal pressure, and citizens with higher economic levels usually make more efforts in the design of an OG website, facilitating citizens to access the information they disclose. Similar results are obtained regarding the disclosure information in the OGDs or municipal official websites but, in this case, the main demographic attribute is the population density and not the population size. This finding suggests public managers and politicians should analyse these attributes, which could be the main drivers for them to adopt open information policies and collaborative models of governance.

Finally, as noted by Pereira et al. (2017), the smart city context seems to promote more information transparency because city governments

are aware of the potential that technologies have to create interactive and participatory urban environments that favour the co-creation and co-design of public products and services. Indeed, for truly effective local governance, it is essential that public managers and politicians not only govern effectively, efficiently, and economically, but that they also engage citizens in open and participative information sharing and decision-making (Rodríguez-Bolívar, 2017).

6. Conclusions

Our study provides interesting new insights concerning the main factors affecting both the ways of accessing OG projects in municipal official websites and the information content and format of data published in OGD projects. Firstly, the findings show that sample local governments, irrespective of their profiles and characteristics, work at a different pace in the development of OG strategies and the implementation of OGDs. A novel finding of our research is the intention of sample governments to increase their information disclosure as a way to improve their reputation or the government's image, introducing OGDs initiatives as the main action in their transparency policies, given that these projects have increased their implementation over time (Royo-Montañés and Benítez-Gómez, 2019).

Nonetheless, our study also reveals differences among analysed municipalities regarding the context in which information is disclosed. Attributes focused on the institutional context, and the municipality attributes were significant in promoting the implementation of OGS and OGDs initiatives. Politicians and public managers should pay attention to these attributes when designing new collaborative governance models and implementing OG initiatives for achieving a higher level of citizen engagement in public affairs. In fact, the focus of our research on a particular setting is a main limitation of our paper and provides a good avenue for future research.

Our experience focusing on large SLGs reveals that they are not using them to enhance citizen engagement in public affairs and public services co-creation. The main questions for future research are: a) Are the findings of this research because the implementation of OG initiatives are still in the early stages? b) Are the findings affected by the context of the study (Spain) where there is currently a traditional bureaucratic model of production in local government? c) Do OG initiatives allow the creation of public value for society? d) Are there any differences in the information disclosed in a government's transparency section and in the OGD, and are both initiatives affected by the same factors? e) Do open government portal initiatives involve participation initiatives that complement and facilitate this direct interaction with public managers? Future research should analyse all these questions to better understand the OG initiatives and the implementation of OGDs, their success in improving accountability, and in allowing collaborative models of governance in cities, especially in smart cities, where there are fertile grounds for these technological tools and, indeed, our research indicates that they are increasingly and better used by local governments for information transparency.

Declaration of Competing Interest

None.

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Laura Alcaide Muñoz is Associate Professor in Accounting and Finance in the Department of Financial Economy and Accounting at the University of Granada. She is interested in new technologies and internet favour the evolution and improvement the citizens' quality of life in Smart Cities. Also, she is interested in financial sustainability in local governments. She has been author of articles published in *Administration & Society*, *International*

Journal of Information Management, *International Public Management Journal*, *American Review of Public Administration*, *Information Technology for Development*, *Local Government Studies*, *Government Information Quarterly*, *Internet Research*, among others, and has written book chapters in prestigious editorials like IGI Global, Springer and Routledge-Taylor & Francis, and also co-editor of book in Palgrave Macmillan, IGI Global and Springer.

Manuel Pedro Rodríguez Bolívar is Professor in Accounting at the University of Granada. He has authored numerous articles in international journals, among them we can highlight *Public Money & Management*, *Government Information Quarterly*, *Public Administration and Development*, *Online Information Review*, *International Review of Administrative Sciences*, *American Review of Public Administration*, *International Public Management Journal*, *Journal of Environmental Policy & Planning*, *Information Technology for Development*, *Electronic Commerce Research*, *Internet Research*, *Administration & Society*, among others. He has been also the author of several book chapters published in Routledge, Kluwer Academic Publishers, Springer, Nova Publishers and IGI Global, and is author of full-length books published by the Ministry of Economy and Finance in Spain. He is also editor of books in Springer and Routledge, member of the Editorial Board of *Government Information Quarterly* and Associate Editor in other leading international journals.

Cinthia L. Villamayor Arellano is Doctoral student in the Doctorate program in Economic and Business Sciences at the University of Granada. Her thesis is about Open Government initiatives implemented in Spanish Local Governments.