IS TRANSPARENCY A WAY TO IMPROVE EFFICIENCY? AN ASSESSMENT OF SPANISH MUNICIPALITIES

Guillamón, María D.

University of Murcia, Department of Financial Economy and Accounting
Campus de Espinardo, ES-30100, Murcia (Spain)
Email: mdguillamon@um.es

Cuadrado-Ballesteros, Beatriz

University of Salamanca, Department of Administration and Business Economics; Multidisciplinary Institute for Enterprise
Campus Unamuno, FES, ES-37007, Salamanca (Spain)
Email: u77171@usal.es

ABSTRACT

This paper shows that the level of municipal transparency influences the level of efficiency, which is measured by parametric and non-parametric techniques. More concretely, our findings suggest that the most transparent municipalities in terms of financial and economic information, as well as information on public services contracts, tend to be more efficient. The results have been obtained for a sample of the 100 largest Spanish local governments over 2008–2014, which focuses attention on the information disclosed by local governments.

KEYWORDS: Efficiency; Data Envelopment Analysis; Order-m; Transparency; Local government.

JEL CODES: H83; M48; D61; D73

INTRODUCTION

The search for efficiency in the provision of public services has been a major research objective in recent years, with special attention being paid to local governments (LGs). These objectives acquire greater relevance in the current context where the European Economic and Monetary Union has established restrictions on public deficit and indebtedness. Thus, governments should assign their resources more efficiently to satisfy their citizens and comply with those restrictions (Benito et al., 2010).

Accordingly, efficiency has received attention in the literature (Narbón-Perpiñá and De Witte, 2018a, 2018b). However, to the best of our knowledge, the relationship between efficiency and transparency of LGs has not been studied previously. Transparency has been widely analysed (see Rodríguez-Bolívar et al., 2013), but previous studies have focused on explaining the determinants of LGs disclosures. Scholars have noted the relevance of transparency for accountability and good governance, but this paper goes further and highlights the relevance of transparency in terms of efficiency.

Transparency requires the disclosure of all relevant information in a timely and systematic manner, and it is considered essential for increasing accountability, thus resulting in better governance (Barrett, 2002; OECD, 2003). Since better governance is associated with greater efficiency (Méon and Weill, 2005), we expect that transparency positively affects the level of efficiency of LGs. In order to empirically test this, we used a sample of the 100 largest Spanish municipalities for the period 2008–2014.

LITERATURE REVIEW: EFFICIENCY AND TRANSPARENCY

Efficiency refers to the level of output that can be obtained by a specific level of input, in comparison with the "optimal" combination input-output. The optimal refers to the maximum output obtained from the given input, or the minimum input required to produce the given output (Greene, 1993). Adapting this definition to the public sector, output refers to public services and input refers to resources that governments use to provide such public services. Thus, the most efficient government is able to provide "the most" public services with the least public resources.

Public sector efficiency has been an important topic for several decades because of the demand for more and better public services and because of the limitations on public deficit and debt. On the basis of the New Public Management (NPM) approach, several studies focus on the dichotomy between private and public management (e.g. Balaguer-Coll et al., 2007; Benito et al, 2010; García-Sánchez, 2006, 2007; 2008). In addition, many studies have attempted to determine whether internal and external factors (e.g. socio-economic, political, financial, or institutional) affect the level of efficiency (Narbón-Perpiñá and De Witte, 2018b).

A large part of the literature focuses on specific services, such as water disposal, waste collection, road maintenance, public transport, police services and so forth (García-Sánchez, 2006, 2007, 2008; among others). However, these studies do not provide a complete picture of the overall efficiency. This paper adopts a global perspective, measuring the efficiency of a variety of public services (Narbón-Perpiñá and De Witte, 2018a; 2018b).

In the specific case of Spanish LGs, most studies focus on socioeconomic, financial, and political factors to explain the level of efficiency (e.g. Balaguer-Coll et al., 2010a; 2010b; 2007; Benito et al., 2010; 2014; Giménez and Prior, 2007; Cuadrado-Ballesteros et al., 2013; Pérez-López et al., 2015). Our study adds evidence by showing the effect of another factor, transparency, which has been never been analysed previously.

There is no single definition of transparency, but it usually refers to the ability of the public to access government information (Tejedo-Romero and Araujo, 2018; Piotrowski and Van Ryzin, 2007; Piotrowski, 2007; Piotrowski and Bertelli, 2010). In general, such information refers to government decision-making (Premchand, 1993), which implies an openness regarding policy intentions, formulation, and implementation (Kopits and Craig, 1998). Kraay and Kaufmann (2002) refer to the flow of timely and reliable economic, social, and political information accessible to all relevant stakeholders. Thus, transparency additionally requires that such information should be understandable to external stakeholders (Lindstedt and Naurin, 2010). Furthermore, Grimmelikhuijsen and Welch (2012) and Grimmelikhuijsen (2010) highlight the usefulness of information, which allows the performance of an organization to be monitored by external stakeholders. That is the essence of transparency; it helps citizens to enhance the governments' performance.

Similarly, we defined transparency as the availability of information about a LG that allows citizens to monitor the performance of the former (Meijer, 2013). This definition implies that:

- Transparency is an institutional relationship between the LG and citizens.
- Transparency is an information exchange between the LG and citizens.
- Transparency allows citizens to monitor LG.
- Transparency refers to performance, in terms of actions, responsibilities, decision-making, transactions, and policy intentions, formulation and implementation.

THEORETICAL FRAMEWORK AND RESEARCH HYPOTHESIS

In recent decades, scholars have extensively investigated factors promoting transparency, frequently using the agency theory perspective (Rodríguez Bolívar et al., 2013), according to which politicians (agents) are expected to act in the interests of citizens (principal). A conflict of interest between them can occur (Jensen and Meckling, 1976), as politicians could adopt opportunistic behaviour in the face of information asymmetries (Rogoff and Sibert, 1988).

Given that politicians have an information advantage; why would they be interested in disclosing information? One possible explanation comes from the neo-institutional theory, which highlights the role of social influences and external pressures on organisation's behaviour. To survive, organisations should accommodate institutional expectations and thus, their behaviours are responses to external pressures (DiMaggio and Powell, 1983; Powell and DiMaggio, 1991). Hence, information disclosures are sometimes a strategy to respond to external pressures (Wang, 2002), holding politicians accountable for their actions, in order to demonstrate that they act according to their responsibilities. This would mean that the conflict of interests between politicians and citizens can be solved by allowing citizens to monitor the actions of politicians (Laswad et al., 2005). Accordingly, more information could stimulate politicians to act in the interest of citizens by trying to allocate public resources in the best way, which translates into better performance.

Lack of transparency is frequently related to bad public governance (OECD, 2003). Barrett (2002) suggested that transparency is essential to ensure that public bodies are fully accountable, and it is therefore central to good governance overall. Sharman and Chaikin (2009) posit that good governance is firstly assessed in terms of degrees of transparency in decision-making and policy implementation. Good governance is usually related with better performance and greater efficiency (Méon and Weill, 2005); so, all these arguments lead us to propose the following hypothesis:

H_1: The level of transparency may lead LGs to be more efficient.

METHODOLOGY

Sample

We have chosen the local level because local politicians are usually more discrete in the decision-making, so leading to greater problems with transparency (Guillamón et al., 2011). The Spanish context is highly appropriate because LGs have autonomy to set some specific taxes and to decide on spending, which directly affects the level of efficiency. Furthermore, according to the International Budget Partnership (2015), the Spanish governments do not provide sufficient information to citizens.

Concretely, we selected the 100 largest ones[1] over 2008–2014, due to the availability of data on transparency[2] from Transparency International Spain (TI-Spain). This sample is worthy of study because these LGs are obliged to provide the greatest number of public services to citizens, according to Article 26 of the LGs Regulatory Law, so the results will take into account more services than those that would be considered in a sample using smaller municipalities. Our dataset also includes political, socioeconomic and financial variables obtained from the Spanish Home Office, the Spanish National Statistics Institute, the Klein Institute and the Spanish Ministry of Finance.

Specification of the model and variables

With the aim of analysing the influence of the level of transparency on efficiency, we estimated the following model:

$$E_{it} = \alpha + \gamma \cdot K_{it} + \beta_j \cdot C_{j,it} + \eta_i + \varepsilon_{it} \quad (1)$$

for E_{it} = DEA, DEAbc, Orderm, Cobb_effi and Translog_effi.

K_{it} = ITA_total, ITA_eco and ITA_ser

$C_{j,it}$ = Right, Herfindahl, Incomepc, Transferspc and Balance.

In Model 1, i and t refer to LG and year, respectively; E_{it} represents the efficiency; K_{it} represents the level of transparency; $C_{j,it}$ is the vector of the j control variables; α, γ and β_j are the parameters to be estimated; η_i refers to unobservable heterogeneity and ε_{it} is the classical disturbance term.

Dependent variable

The dependent variable (E_{it}) represents the efficiency of LGs. It refers to the maximum potential output (public services) obtained from the given input (budgetary resources). The selection of inputs and outputs is a controversial issue because it depends on the public services considered. Furthermore, outputs are difficult to measure (Giménez and Prior, 2007), and information is sometimes difficult to obtain (Balaguer-Cool et al., 2007). In such a situation, we use proxy indicators to represent public services delivery (Vanden Eeckaut et al., 1993).

More concretely, inputs represent the cost of public services, through current, capital and total expenditures. Outputs were selected based on previous literature (Narbón-Perpiñá and De Witte, 2018a):

- Number of inhabitants (De Borger and Kerstens, 1996; Balaguer-Coll et al., 2007; Balaguer-Coll et al., 2010a, 2010b; Cuadrado-Ballesteros et al., 2013; Pérez-López et al., 2015; Lo Storto, 2016).
- Surface area (Cuadrado-Ballesteros et al., 2013; Giménez and Prior, 2007; Pérez-López et al., 2015; Lo Storto, 2016).
- Population density (Cuadrado-Ballesteros et al., 2013).
- Unemployment rate (Cuadrado-Ballesteros et al., 2013; De Borger and Kerstens, 1996).

- Population ratio of ages above 65 (De Borger and Kerstens, 1996; Geys, 2006; Geys and Moesen, 2009; Ashworth et al., 2014), and also the population ratio of ages under 16, since the needs of the dependent population (under 16 and over 65) lead to increases in the public services provided (Rodríguez-Bolívar et al., 2016).

These variables represent public services that Spanish LGs should provide, according to Article 26 of the LGs Regulatory Law (see Table 1). These output variables reflect public services for which more direct outputs do not exist (e.g. number of lighting points, length of municipal roads, amount of waste collected, area of public parks, etc.). These more desirable outputs are available only for municipalities with less than 50,000 inhabitants, while our sample municipalities are over 50,000. In such a situation, our proxy outputs work as indirect approximation for the demand of public services delivered to citizens, based on the evidence that have been found in previous studies on efficiency (see Narbón-Perpiñá and De Witte, 2018a). This supports the reliability and consistency of selected outputs here.

<Insert Table 1 about here>

After selecting inputs and outputs, efficiency is estimated, by using frontier functions that refer to the best possible input–output combinations. Previous literature reveals a wide range of techniques. On the one hand, non-parametric approach determines the best frontier as a linear envelopment of the data, which is created with the most efficient decision-making units (here, LGs). On the other, the parametric approach determines the best frontier by using a specific functional form for the technology that is estimated with econometric techniques – the deviation from such an estimated best frontier is interpreted as inefficiency (deterministic approach) and, additionally, stochastic influences may be taken into account, such as socioeconomic and institutional conditions, or even measurement errors (stochastic approach).

The choice of the estimation method is an issue of debate. The main advantage of non-parametric techniques is that they do not require a specific functional form; however, it is not possible to estimate parameters for the models due to their deterministic nature. In contrast, parametric techniques do allow such an estimation, but this may cause both specification and estimation problems in the definition of a specific functional form. As both approaches have advantages and disadvantages, we use both in order to check the robustness of our findings for different efficiency measures (Kalb, 2014; Geys and Moesen, 2009).

The dependent variables in Model 1 are the following (see Appendix A for a more detailed formalisation):

- Non-parametric approach: (i) DEA refers to efficiency obtained by the Data Envelopment Analysis; (ii) DEAbc was obtained by using bootstrap methods based on subsampling to correct DEA bias generated by its drawbacks (no noise is allowed, difficulty to make statistical inference and influence of outliers); and (iii) Orderm refers to the partial frontier model to avoid outlier bias and the curse of dimensionality.
- Parametric approach: Cobb_effi and Translog_effi were obtained by using the Stochastic Frontier Approach (SFA), adopting a Cobb–Douglas and translogarithmic specification, respectively.

Independent variable

The independent variable (K_{it}) in Model 1 represents the level of transparency, through the indicator published by TI-Spain, which has been used in previous studies (Guillamón et al., 2011; Albalate del Sol, 2013; Cuadrado-Ballesteros, 2014). To create these indicators, TI-Spain sent a questionnaire to the 100/110 largest Spanish municipalities, so creating a global transparency index and five sub-indices that refer to transparency in five areas: a) information about the municipal corporation; b) relations with citizens and society; c) economic and financial transparency; d) information about municipal service contracts bidding; and e) transparency on urban development/public works.

Here, we selected three of them, which are more related with the level of efficiency in providing public services: sub-index (c) <, which refers to the economic and financial transparency (ITA_eco); sub-index (d) <, which represents the municipal service contracts bidding (ITA_ser); and, the global index (ITA_total). All of them range from zero to 100, where the greater the score, the higher the degree of transparency.

Control variables

Additionally, empirical results are controlled by socioeconomic factors whose effect on efficiency has been demonstrated (Narbón-Perpiñá and De Witte, 2018b):

- Political ideology, represented by a dummy variable (Right) that takes the value 1 for right-wing governments, and 0 otherwise.
- Political strength, is represented by a Herfindahl index[3] (Herfindahl), calculated as: $\sum_{k=1}^{n} S_k^2 / (\sum_{k=1}^{n} S_k)^2$, where S refers to the number of councillors of party k and n is the number of parties in the LG. It takes values between 0 and 1, from the lowest to the highest level of concentration (i.e. from the highest to the lowest level of fragmentation).
- The economic level is represented by the income per capita (Incomepc).
- Transfers received by the LG divided by population (Transferspc).
- The budget balance (Balance) is calculated as the difference between revenue and expenditure divided by total revenue.

Analysis technique

Model 1 was estimated by using the fixed- (FE) or random-effects (RE) estimators, which require homoscedastic and no serially correlated errors. So, firstly, we test these conditions by using the Breusch–Pagan and Wooldridge tests. The p-values led us to reject the null hypotheses of “homoscedastic errors” and “no serially correlated errors” at a 95% confidence level.

Furthermore, endogeneity problems arise in Model 1 due to three reasons (Wooldridge, 2010): (i) the use of proxy variables to represent unobservable or difficult to quantify concepts (such as efficiency and transparency) results in measurement errors that may be correlated with some explanatory variables; (ii) results could be additionally controlled by other variables (e.g. density, age distribution, education, unemployment, etc.) that have been omitted due to multicollinearity problems; and (iii) reverse causality between efficiency and transparency (we can expect transparency impacts on the level of efficiency, but also more efficient governments have incentives to signal their good performance).

The endogeneity problem can be addressed by using instrumental variables (IV) methods. However, the conventional IV estimator is inefficient (although consistent) in the presence of heteroscedasticity (Baum et al., 2003). Alternatively, the dynamic panel estimator proposed by Arellano and Bond (1991) overcomes this problem. This estimator uses lagged values of the right-hand-side variables included in the model as instruments, so it uses more instruments than the traditional IV estimator. These instruments are uncorrelated with the errors, and they contain information about the current value of the variable, improving external instruments that are traditionally selected for the conventional IV estimators (Pindado and Requejo 2015).

Concretely, we use the two-step system estimator of Arellano and Bover (1995), which augments the initial difference estimator (Arellano and Bond, 1991), making the additional assumption[4] that the first differences of instrumental variables are not correlated with the fixed effects. The difference estimator is consistent as the sample size is large (approaching infinity), but it has poor finite sample properties; in such a situation, the system estimator is more appropriate (Blundell and Bond, 1998).

Nevertheless, using the system estimator, instead of the traditional IV estimator, may result in a proliferation of instruments. Their validity is checked through two tests: (i) the Arellano-Bond test for AR(2) in first differences is the test for second-order serial correlation in the first-differenced residuals, under the null hypothesis of no serial correlation between the error terms; and (ii) the Hansen test is the test for the validity of the over-identifying restrictions, under the null hypothesis that the over-identifying restrictions are valid.

RESULTS

Descriptive analysis

Table 2 shows the descriptive statistics of all the variables entered in the model, as well as statistics of input and output magnitudes. We can see that, in general, efficiency values obtained by non-parametric techniques (DEA, DEAbc, Orderm) are higher than scores obtained through parametric methods (Cobb_effi, Translog_effi). This can also be seen in Figure 1. There are no large changes over the period, although a slight reduction of all variables was seen.

<Insert Table 2 about here>

<Insert Figure 1 about here>

Regarding transparency, the three indicators show a relatively high mean value, 70.7 in the case of the global index (ITA_total), 65 for ITA_eco and 64.4 for ITA_ser (ranging between 0 and 100). The level of transparency has improved over the period of analysis, as Figure 2 shows. The three indicators increased from 2008 to 2014, but the increase is especially relevant in the case of ITA_eco. That may be explained by the austerity measures that all levels of Spanish government should implemented during the 2008 crisis, especially the spending rule and deficit limit established by Organic Law 2/2012, of April 27, on Budgetary Stability and Financial Sustainability. These measures motivated public managers to provide greater information in order to generate positive signals about their performance (Rodríguez-Bolívar et al., 2013).

<Insert Figure 2 about here>

Table 3 shows the bivariate correlations between all variables described previously. There are high and relevant correlations between DEA and DEAbc (0.9824), as both represent efficiency from the non-parametric approach. We have a similar situation with the parametric scores, obtained by the SFA, i.e. Cobb_effi and Translog_effi (0.999). Regarding transparency indicators, there are also large and relevant correlations between them, suggesting that they represent similar features. Thus, they will be entered in Model 1 one by one to avoid multicollinearity problems. The remaining correlations are not so high.

<Insert Table 3 about here>

Empirical analysis

Table 4 shows the effect of transparency indicators on efficiency scores obtained by non-parametric techniques; similarly, Table 5 shows the effect of transparency indicators on parametric efficiency scores. At the bottom of each equation the p-values obtained for the Arellano-Bond test for AR(2) in first differences and the Hansen test are shown. In general, we cannot reject the null hypotheses for both, supporting the validity of instruments.

Focusing on Table 4, we can see that ITA_global impacts positively on DEA and it is statistically relevant at the 99.9% confidence level. This result means that, in general, improving transparency may improve the level of efficiency of Spanish LGs. The results are similar in the case of the two sub-indexes: ITA_eco and ITA_ser impact positively on DEA, and are relevant at 99.9% and 90%, respectively. These findings are very important for the Spanish context because they suggest that the most transparent municipalities tend to be more efficient, understanding transparency as the degree of information that LGs disclose in terms of public services contract bidding, cost of services, and financial and economic data.

In Panel B and C of Table 4, we can see the effect of the three transparency indicators on efficiency scores obtained by DEA on applying bootstrapping and the Order-m model, respectively. The results are similar to those obtained previously, i.e. the three transparency indicators impact positively on that efficiency measures.

Regarding control variables, the political ideology (Right) is statistically relevant in many equations, especially in Panel C, showing a positive effect in all cases. This result indicates that right-wing LGs tend to show a higher level of efficiency than others (Borge et al., 2008; Kalb et al., 2012; Ashworth et al., 2014; Helland and Sørensen, 2015). Right-wing governments are traditionally characterised by introducing budget discipline and private control mechanisms in order to improve public sector efficiency (Borge et al., 2008; Cuadrado-Ballesteros et al., 2013); while left-wing parties tend to prefer a larger public sector, and this is usually associated with low efficiency (Narbón-Perpiñá & De Witte, 2018b).

Government fragmentation (Herfindahl) is also relevant in many equations and affects efficiency positively. When the political concentration is higher, it is easier to carry out new policies and reforms, which may increase the LGs' performance (Borge et al., 2008; Doumpos and Cohen, 2014).

Incomepc is significant in many equations, especially in Panel C, and it suggests a positive link between economic development and efficiency, as Cuadrado-Ballesteros et al. (2013) obtained in terms of GDP. As higher income citizens may pay more taxes, they will demand more public services and facilities, which presses LGs to improve the efficiency (Afonso et al., 2010). The amount of transfers received by the LGs (Transferspc) negatively affects the level of efficiency. This is in line with previous studies (Balaguer-Coll et al., 2007; Doumpos and Cohen, 2014; Pérez-López et al., 2015), suggesting that transfers lead LGs to be less careful in managing resources adequately, and so efficiency may be reduced. Finally, the variable Balance shows relevant positive coefficients in most of the equations, indicating that LGs with better financial performance also show higher levels of efficiency (Geys, 2006; Geys and Moesen, 2009; Ashworth et al, 2014).

<Insert Table 4 about here>

Table 5 shows the effect of the three transparency indicators on efficiency variables obtained through the SFA, by using Cobb–Douglas (Panel A) and translogarithm functions (Panel B). In both cases, the control variables Right and Herfindahl have been dropped from the analysis, as they are the exogenous variables used to estimate the efficiency scores.

The results are similar to those obtained previously for non-parametric indicators. Concretely, improving transparency may be a way to increase efficiency of LGs, since the three ITA indicators impact positively on Cobb_effi and Translog_effi variables.

<Insert Table 5 about here>

Discussion of results

In general, our empirical results suggest that higher levels of transparency are related to higher levels of efficiency of Spanish LGs. From the agency theory point of view, transparency could be defined as a tool to control opportunistic behaviours of politicians, such as other scholars have noted in terms of spending (Vicente et al., 2013). This means that information helps citizens know where and how many resources are being allocated, so favouring the understanding of decisions and policies implementation. Transparency allows the observation and analysis of the ways in which governance, business and public affairs should be conducted (Heald, 2006). So, it is a way to motivate governments to be more efficient, due to the fear of being poorly evaluated by citizens.

According to the neo-institutional theory, information disclosure is a symbol of trust and modernity, constituting a trend that governments adopt in response to external pressure (Rodríguez-Bolívar et al., 2013). Requiring greater transparency of public functions may motivate politicians to act in more efficient ways, because they are under the public scrutiny.

Transparency is relevant to improve the level of efficiency, but just making information available is not enough. Literally, transparency refers to the availability of information, but it does not refer to the quality of such information. To be effective, the content of the available information should become known and understood by readers (Lindstedt and Naurin, 2010). If citizens do not understand information, transparency does not meet its control function over opportunistic politicians.

CONCLUSIONS

The efficiency of LGs has attracted the attention of several scholars for decades, but there are still certain aspects that have not been addressed, such as the role of transparency. To fill this gap, this paper examines the effect of transparency on efficiency by using a sample of the 100 largest Spanish municipalities for the period 2008–2014. Our empirical results suggest that more transparent LGs tend to show better levels of efficiency.

This paper contributes to the literature on efficiency and transparency, which have been investigated separately in previous studies. To the best of our knowledge, this is the first attempt to examine whether a relationship between them exists. In addition, we use different measures of efficiency through parametric and non-parametric techniques, while previously scholars have generally taken non-parametric approaches to represent the efficiency of Spanish LGs (e.g. Balaguer-Coll et al., 2007, 2010a, 2010b; Giménez and Prior, 2007; Benito et al., 2010, 2014; Pérez-López et al., 2015). This paper assesses the validity of empirical findings across different efficiency measurement, which is crucial to avoid incorrect inferences (Geys and Moesen, 2009).

Our findings contribute to agency theory, suggesting that transparency, in general, could be a way to control opportunistic behaviours of politicians and push them to allocate resources more efficiently. This is essential in the case of LGs, which are subject to financial and budgetary constraints, so the efficient use of resources is a prime area of concern (Geys and Moesen, 2009). Furthermore, it contributes to neo-institutional theory, by highlighting the role of external pressure [e.g. regulations, sanctions, social embarrassment, social media, media pressure, etc., (Albalate del Sol, 2013)] in improving the efficiency of LGs, through requiring information about their actions.

In addition, our findings have implications for practitioners, since they suggest the relevance of developing a transparency culture, especially in Spanish LGs, where several cases of corruption in the last decade (Jiménez et al., 2012) have compromised the reliability of governments and damaged the confidence of citizens. Transparency is essential to prevent corruption (Lindstedt and Naurin, 2010); politicians and public managers should assign public resources more efficiently, since they are under public scrutiny.

This is very relevant nowadays, not only to fight against cases of corruption, but also to comply with the EU restrictions on public deficit and debt, which has driven governments to assign their resources more efficiently (Benito et al., 2010). In addition, decentralisation of competences from the central government to LGs has increased in the last decade (Dafflon, 2015), so taxes and fees have become insufficient to cover citizens' demands. Hence, public managers need to act as efficient as they can to try to comply with new (and additional) competences with the same (or fewer) resources.

Despite these contributions, this study is not free of limitations. Firstly, transparency is represented by data published by TI-Spain, and the availability of this information restricts the sample in terms of individuals and years. This limitation especially affects to data on efficiency. We use several variables as a proxy for the demand for public services delivered by Spanish LGs, instead of using indicators on infrastructures and facilities (e.g. number of lighting points, length of municipal roads, amount of waste collected, area of public parks, etc.), which are published in the Survey on Infrastructures and Local Facilities (*Encuesta de Infraestructuras y Equipamientos Locales*, *EIEL*). The reason is that EIEL data are only available for municipalities with fewer than 50,000 inhabitants, while our sample municipalities have over 50,000. Given that EIEL is not available for the largest Spanish municipalities, using proxy outputs is the only way to analyse the efficiency of Spanish municipalities with more than 50,000 inhabitants. Although EIEL data may be considered as the most desirable to create outputs, the proxy variables used here are also valid, and their reliability and consistency has been proved in many previous studies (see Narbón-Perpiñá and De Witte, 2018a).

Secondly, here we use the GMM system estimator (Arellano and Bover, 1995; Blundell and Bond, 1998) to solve, mainly, the endogeneity problem. This estimator does not take into account that the dependent variable takes values between 0 and 1 (it is not strictly continuous). In such a situation, others like the Tobit estimator or truncated regression models may be used, but they do not allow control or solve endogeneity, as the system estimator does.

Regardless of these limitations, our results are robust to the model specification, by using several variables to represent the same concepts. The results suggest a positive effect of the three transparency indicators (ITA_global, ITA_eco, and ITA_ser) on the six efficiency variables (DEA, DEAbc, Orderm, Cobb_effi, and Translog_effi). Thus, our findings are robust for different measures of efficiency and transparency. This is a strength of the paper because it suggests it is necessary to represent efficiency with different techniques, while most previous studies use one parametric or non-parametric approaches, but not both.

For future research, it could be interesting to replicate this study for small Spanish municipalities, for which other outputs may be used to represent each service, on the basis of data published in the EIEL. A future project could also involve a comparative study of various countries, for instance, including German, British or Baltic LGs, which would allow control of other contextual factors (e.g. legal origin, governance quality, the size of public sector, degree of decentralisation, etc.). Furthermore, comparative studies are useful to know how different public administrations work.

NOTES

1. All have more than 50,000 inhabitants, except *Soria* and *Teruel*, which are included because they are provincial capitals.

2. In 2008, TI-Spain assessed the transparency of the 100 largest Spanish municipalities. In subsequent years, TI-Spain added 10 further municipalities. So, although currently TI-Spain assesses the transparency of the 110 largest municipalities, our sample comprises only the 100 that were included in the first year of publication, 2008.

3. The Herfindahl index is the most common way to represent the political concentration (fragmentation) of a government, also called political strength (see Narbón-Perpiñá and De Witte, 2018b). It has been calculated according to previous studies, such as Borge (2005), Hagen and Vabo (2005), Benito and Bastida (2008), and García-Sánchez et al. (2011).

4. The rest of assumptions are: $E(\varepsilon it) = 0$; $E(\varepsilon it, \varepsilon is) = 0$; and $E(\eta i , \varepsilon it) = 0$; for $t = 2, \ldots, T$ and $t \neq s$

APPENDIX A. FORMULATION OF EFFICIENCY VARIABLES

Data Envelopment Analysis (DEA)

This variable, DEA, estimates technical efficiency by using the FEAR 1.15 software. The DEA model (Charnes et al., 1978) is based on linear programming techniques to define an empirical frontier which creates an envelope by the most efficient decision-making units. Like other measures of efficiency, it tries to get the maximum level of output with the minimum input. In the specific case of the public sector, outputs (public services) are totally or partially set externally by law (Local Government Regulatory Law), so it is more appropriate to evaluate efficiency in terms of the minimisation of inputs (budgetary variables), while assuming variable returns to scale (VRS). The minimum is found by selecting, by year, the optimal weights associated with inputs and outputs, by solving the following programme:

$$\begin{aligned}
&\text{Min}_{\theta,\lambda}\ \theta \\
\text{s.t.}\quad & y_{ri} \leq \sum_{i=1}^{n} \lambda_i y_{ri}\ , \quad r = 1, \ldots, p \\
& \theta x_{ji} \geq \sum_{i=1}^{n} \lambda_i x_{ji}\ , \quad j = 1, \ldots, q \\
& \lambda_i \geq 0\ , \quad i = 1, \ldots, n \\
& \sum_{i=1}^{n} \lambda_i = 1
\end{aligned}$$

where i represents each local government (i = 1, …, n), y_r refers to each output (r = 1, …, p) and x_j refers to each input (j = 1, …, q). The restriction $\sum_{i=1}^{n} \lambda_i = 1$ implies the assumption of variable returns to scale (VRS), which ensures that each local government is compared only with others of similar sizes. For each local government, we obtain the value of θ, that is the efficiency score (*DEA*): if θ = 1, then it is defined as efficient; if θ < 1, then it is has an inefficient performance.

However, the DEA technique has some background due to its deterministic nature (De Witte and Marques, 2010): firstly, it is highly sensitive to extreme values and outliers, since it creates a frontier that envelops all data; and secondly, the DEA assumes the absence of statistical noise, so it is sensitive to measurement errors. Accordingly, other methodologies may overcome these backgrounds, such as bias corrected DEA via bootstrapping techniques, and the Order-m methodology.

DEA with the application of bootstrapping techniques (DEAbc)

The bootstrap is a way to analyse the sensitivity of efficiency to the sampling variations, simulating the efficiency for different sub-samples (Simar and Wilson, 1998). Here, we use the Simar and Wilson (1998) algorithm that applies the smoothed bootstrapping procedure to generate θ_i^* (i = 1, …, n), with replacement from $(\hat{\theta}_1, \dots, \hat{\theta}_n)$, producing $(\theta_{1b}^*, \theta_{2b}^*, \dots, \theta_{nb}^*)$, where b is the b-th iteration of the re-sampling process (Assaf and Matawie, 2010).

Then, the bootstrap inputs are obtained as $x_{ib}^* = \left(\frac{\hat{\theta}_i}{\theta_{it}^*}\right) x_i$; these bootstrap inputs are used to obtain the new estimates of efficiency, namely $\hat{\theta}_{ib}^*$. These steps are repeated B times, producing a set of $\hat{\theta}_{ib}^*$ where b = 1, …, B. Finally, the mean of the bootstrap estimator is used as bootstrap DEA estimates, namely $DEAbc = \frac{1}{B}\sum_{b=1}^{B} \hat{\theta}_{ib}^*$. Therefore, the difference between the original DEA estimates and these newly created scores is usually called bias $(\widehat{bias_i} = \frac{1}{B}\sum_{b=1}^{B} \hat{\theta}_{ib}^* - \hat{\theta}_{in})$.

Moreover, we can obtain confidence intervals via$(\tilde{\theta}_{in}^{\alpha}, \tilde{\theta}_{in}^{1-\alpha})$, where $\tilde{\theta}_{in}^{\alpha}$ is the 100α percentile of the distribution of θ_{in}^*; and, shifting the bounds of the interval by the factors $(2 * \widehat{bias_i^*})$ will ensure that the bootstrap distribution centres on the bias corrected estimate $\tilde{\theta}_{in} = \hat{\theta}_{in} - \widehat{bias_i^*}$ (Assaf and Matawie, 2010).

Order-m methodology (Orderm)

The Order-m frontier (Cazals et al., 2002), may overcome DEA backgrounds, since it does not require the enveloping of all data. We also take an input orientation since the outputs are required externally, as was indicated previously. In this case, the Order-m estimator uses as a benchmark of the expected minimum level of inputs given a fixed number of *m* local governments producing at least an output level *y* (Narbón-Perpiñá et al., 2017). Thus, following a similar notation, efficiency (*Orderm*) is defined as:

$$\hat{\theta}_m(x, y) = E[(\hat{\theta}_m(x, y)|Y \geq y)]$$

This means that for a given level of input–output, the estimation defines the expected maximum of *m* random variables, drawn from the conditional distribution of the output matrix Y observing the condition Y ≥ y. A value greater than 1 indicates super-efficiency, suggesting that the local government that operates at the level (x, y) is more efficient than the average of the *m* peers randomly drawn from the rest of population producing more output level than *y* (Narbón-Perpiñá et al., 2017).

Stochastic Frontier Approach (Cobb_effi and Translog_effi)

Through the Stochastic Frontier Approach (Aigner et al., 1977), efficiency is obtained from a cost function in the form of a common regression, but the error term is broken into two parts: the classical statistical noise, which is assumed to be normally distributed; and a one-sided non-negative component that represents inefficiency, i.e. the failure to produce the maximum level of output given the level of input. The latter part of the error term refers to the stochastic term.

In a formal way, the stochastic parametric model is adopted, by employing a Cobb–Douglas (1) and translog (2) specification, represented as:

$$\log x_{j,it} = \delta + \sum_{j=1}^{k} \alpha_j \log y_{r,it} + \underbrace{v_{it} + \mu_{it}}_{\epsilon} \quad (1)$$

$$\log x_{j,it} = \delta + \sum_{r=1}^{p} \alpha_r \log y_{r,it} + \frac{1}{2}\sum_{r=1}^{p}\sum_{s=1}^{k} \lambda_{rs} \log y_{r,it} \log y_{s,it} + \underbrace{v_{it} + \mu_{it}}_{\epsilon} \quad (2)$$

where, *i* refers to each local government and *t* refers to the temporal moment in the panel dataset; y_r refers to each input (r = 1, …, p) and x_j refers to each output (j = 1, …, q); δ, α and λ are parameters to be estimated with the Stata software; v is the random error term, which is assumed to be identically independent and identically distributed; and μ represents the technical inefficiency ($\mu \geq 0$), for which truncated normal distribution is assumed. In the literature, different distributions have been assumed, and the most frequently used ones are half-normal, exponential (Jondrow et al., 1982) and truncated (Greene, 1993). Here, we assume truncated distribution because the stochastic frontier model for panel data implemented in Stata models this error term as a truncated-normal random variable.

Additionally, nondiscretionary factors that affect government performance are taken into account through the latter part of the error term (μ). This error may be modelled as a function of a set of exogenous variables (Battese and Coelli, 1995), such as socioeconomic characteristics, assuming they are independently distributed as truncations at zero of the $N(m_{it}, \sigma_{it}^2)$ distribution, being $m_{it} = \delta z_{it}$ (Coelli, 1996).

$$\nu_{it} = \theta_0 + \sum_{i=1}^{n} \theta_i z_{it} + \omega_{it} \quad (3)$$

where, *z* is a vector of exogenous variables for local government *i* in year *t*; and *ω* is defined by the truncation of the normal distribution.

Inputs and outputs are those previously defined, but in this case, the model includes exogenous variables. Concretely, they are: the political ideology, namely *Right* (z_1) and the political fragmentation of the government, namely *Herfindahl* (z_2), which describe the institutional effect on public services delivery. These variables can hardly result from active policies of the local government, so they describe the context in which policymakers have to take decisions; for this reason, they are considered as exogenous variables instead of outputs.

Equations 1 and 2 described above are estimated by using the Stata software, and the error term is predicted, which represents the technical efficiency (*Cobb_effi* and *Translog_effi*).

REFERENCES

Afonso, A., Schuknecht, L., & Tanzi, V. (2010). Public sector efficiency: evidence for new EU member states and emerging markets. *Applied Economics*, 42(17), 2147-2164.

Aigner, D.J., Lovell, C.A.K., & Schmidt, P. (1977). Formulation and estimation of stochastic frontier production function models. *Journal of Econometrics*, 6: 21-37.

Albalate del Sol, D. (2013). The institutional, economic and social determinants of local government transparency. *Journal of Economic Policy Reform*, 16(1): 90-107.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies*, 58: 277-297.

Arellano, M., & Bover, O. (1995). Another look at the instrumental variables estimation of error components models. *Journal of Econometrics*, 68: 29-51.

Ashworth, J., Geys, B., Heyndels, B., & Wille, F. (2014). Competition in the political arena and local government performance. *Applied Economics*, 46(19): 2264-2276.

Assaf, A., & Matawie, K.M. (2010). Improving the accuracy of DEA efficiency analysis: a bootstrap application to the health care foodservice industry. *Applied Economics*, 42(27): 3547-3558.

Balaguer-Coll, M.T., Prior, D., & Tortosa-Ausina, E. (2007). On the determinants of local government performance: A two-stage nonparametric approach. *European Economic Review*, 51(2): 425-451.

Balaguer-Coll, M.T., Prior, D., & Tortosa-Ausina, E. (2010a). Decentralization and efficiency of local government. *The Annals of Regional Science*, 45(3): 571-601.

Balaguer-Coll, M.T., Prior, D., & Tortosa-Ausina, E. (2010b). Devolution dynamics of Spanish local government. *Environment and planning A: Economy and Space*, 42(6): 1476-1495.

Barrett, P. (2002). Achieving better practice corporate governance in the public sector. Australian National Audit Office. Available at: www.anao.gov.au [Accessed May 2018].

Battese, G.E. & Coelli, T.J. (1995). A model for technical inefficiency effects in a stochastic frontier production function for panel data. *Empirical Economics*, 20: 325–32.

Baum, C.F., Schaffer, M.E. & Stillman, S. (2003). Instrumental variables and GMM: Estimation and testing. *Stata Journal*, 3 (1): 1-31.

Benito, B., & Bastida, F. (2008). Politics and Municipal Financial Management. *Revista de Contabilidad-Spanish Accounting Review*, 112(2): 43-66.

Benito, B., Bastida, F., & García, J. A. (2010). Explaining differences in efficiency: an application to Spanish municipalities. *Applied Economics*, 42(4): 515-528.

Benito, B., Solana, J., & Moreno, M.R. (2014). Explaining efficiency in municipal services providers. *Journal of Productivity Analysis*, 42(3): 225-239.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87 (1): 115-143.

Borge, L. (2005). Strong politicians, small deficits: evidence from Norwegian local governments. *European Journal of Political Economy*, 21: 325–44.

Borge, L.E., Falch, T., & Tovmo, P. (2008). Public sector efficiency: the roles of political and budgetary institutions, fiscal capacity, and democratic participation. *Public Choice*, 136(3-4): 475-495.

Cárcaba-García, A. I., & García-García, J. (2010). Determinants of Online Reporting of Accounting Information by Spanish Local Government Authorities. *Local Government Studies*, 36(5): 679-695.

Cazals, C., Florens, J.P., & Simar, L. (2002). Nonparametric frontier estimation: a robust approach. *Journal of Econometrics*, 106(1): 1-25.

Charnes, A., Cooper, W.W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European Journal of Operational Research*, 2(6): 429-444.

Coelli, T.J. (1996). A guide to FRONTIER Version 4.1: a computer program for stochastic frontier production and cost function estimation, CEPA Working Paper No. 7/96, School of Economics, University of New England.

Cuadrado-Ballesteros, B. (2014). The impact of functional decentralization and externalization on local government transparency. *Government Information Quarterly*, 31(2): 265-277.

Cuadrado-Ballesteros, B., García-Sánchez, I.M., & Prado-Lorenzo, J.M. (2013). Effect of modes of public services delivery on the efficiency of LGs: A two-stage approach. *Utilities Policy*, 26: 23-35.

Dafflon, B. (2015). The assignment of functions to decentralized government: from theory to practice. In Ahman, E. and Brosio, G. (Eds.), *Handbook of multilevel finance*. Edward Elgar Publishing: Northampton.

De Borger, B., & Kerstens, K. (1996). Cost efficiency of Belgian local governments: A comparative analysis of FDH, DEA, and econometric approaches. *Regional science and urban economics*, 26(2): 145-170.

De Witte, K., & Marques, R.C. (2010). Influential observations in frontier models, a robust non-oriented approach to the water sector. *Annals of Operations Research*, 181(1): 377-392.

DiMaggio, P.J., & Powell, W. (1983). The Iron Cage Revised: Institutional Isomorphism and collective rationality in organizational fields. *American Sociology Review*, 48(2): 147-160.

Doumpos, M., & Cohen, S. (2014). Applying Data Envelopment Analysis on Accounting Data to Assess and Optimize the Efficiency of Greek Local Government. *Omega*, 46: 74-85.

Gandía, J.L., & Archidona, M.C. (2008). Determinants of web site information by Spanish city councils. *Online Information Review*, 32: 35-57.

García-Sánchez, I. M., Prado-Lorenzo, J. M., & Cuadrado-Ballesteros, B. (2011). Do progressive goverments undertake different debt burdens? Partisan vs. electoral cycles. *Revista de Contabilidad-Spanish Accounting Review*, 14(1): 29-57.

García-Sánchez, I.M. (2006). Efficiency measurement in Spanish local government: the case of water services. *Review of Policy Research*, 23 (2): 355-371.

García-Sánchez, I.M. (2007). Evaluating the effectiveness of the Spanish police force through data envelopment analysis. *European Journal of Law and Economics*, 23 (1): 43-57.

García-Sánchez, I.M. (2008). The performance of Spanish solid waste collection. *Waste Management Research*, 26 (4): 327-336.

Geys, B. (2006). Looking across borders: A test of spatial policy interdependence using local government efficiency ratings. *Journal of Urban Economics*, 60(3): 443-462.

Geys, B., & Moesen, W. (2009). Measuring local government technical (in) efficiency: an application and comparison of FDH, DEA, and econometric approaches. *Public Performance & Management Review*, 32(4): 499-513.

Giménez, V.M., & Prior, D. (2007). Long-and short-term cost efficiency frontier evaluation: evidence from Spanish LGs. *Fiscal Studies*, 28(1): 121-139.

Greene, W.M. (1993). The econometric approach to efficiency analysis. In Fried, H.O., Lovell, & Schmidt, P. (Eds.), *The measurement of productive efficiency: Techniques and applications*. Oxford University Press: Oxford.

Grimmelikhuijsen, S. G. (2010). Transparency of Public Decision-Making: Towards Trust in Local Government?. *Policy & Internet*, 2(1): 5-35.

Grimmelikhuijsen, S. G., & Welch, E. W. (2012). Developing and testing a theoretical framework for computer-mediated transparency of LGs. *Public Administration Review*, 72(4): 562-571.

Guillamón, M.D., Bastida, F., & Benito, B. (2011). The determinants of LGs' financial transparency. *Local Government Studies,* 37(4): 391–406.

Hagen, T. P., & Vabo, S. I. (2005). Political characteristics, institutional procedures and fiscal performance: Panel data analyses of Norwegian local governments, 1991–1998. *European Journal of Political Research*, 44: 43-64.

Heald, D. (2006). Varieties of Transparency. In C. Hood and D. Heald (Eds.), *Transparency: The Key to Better Governance?*. Oxford: Oxford University Press, 25-43.

Helland, L., & Sørensen, R.J. (2015). Partisan bias, electoral volatility, and government efficiency. *Electoral Studies*, 39: 117-128.

International Budget Partnership (2015). *Open Budgets. Transform Lives. The Open Budget Survey 2015*. Washington, DC: International Budget Partnership.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4): 305-360.

Jiménez, F., Villoria, M., & Quesada, M.G. (2012). Badly designed institutions, informal rules and perverse incentives: Local government corruption in Spain. *Lex localis - Journal of Local Self-Government*, 10(4): 363.

Jondrow, J., Lovell, C.A.K., Materov, I.S., & Schmidt, P. (1982). On the estimation of technical inefficiency in the stochastic frontier production function model. *Journal of Econometrics*, 23: 269-274.

Kalb, A. (2014). What determines local governments' cost-efficiency? The case of road maintenance. *Regional Studies*, 48(9): 1483-1498.

Kalb, A., Geys, B., & Heinemann, F. (2012). Value for money? German local government efficiency in a comparative perspective. *Applied Economics*, 44(2): 201-218.

Kopits, G. & Craig, J. (1998). Transparency in Government Operations. IMF Occasional Paper no. 158. Washington: International Monetary Fund

Kraay, A., & Kaufmann, D. (2002). Growth without Governance, Policy Research Working Paper 2928, World Bank.

Laswad, F., Fisher, R., & Oyelere, P. (2005). Determinants of voluntary Internet financial reporting by local government authorities. *Journal of Accounting and Public Policy*, 24(2): 101-121.

Lindstedt, C., & Naurin, D. (2010). Transparency is not enough: Making transparency effective in reducing corruption. *International Political Science Review*, 31(3): 301-322.

Lo Storto, C. (2016). The trade-off between cost efficiency and public service quality: a non-parametric frontier analysis of Italian major municipalities. *Cities*, 51: 52-63.

Meijer, A. (2013). Understanding the complex dynamics of transparency. *Public Administration Review*, 73(3), 429-439.

Méon, P.G., & Weill, L. (2005). Does better governance foster efficiency? An aggregate frontier analysis. *Economics of Governance*, 6(1): 75-90.

Narbón-Perpiñá, I., & De Witte, K. (2018a). LGs' efficiency: a systematic literature review—part I. *International Transactions in Operational Research*, 25(2): 431-468.

Narbón-Perpiñá, I., & De Witte, K. (2018b). LGs' efficiency: a systematic literature review—part II. *International Transactions in Operational Research*, 25(2): 1107-1136.

Narbón-Perpiñá, I., Balaguer-Coll, M.T., Petrovic, M., & Tortosa-Ausina, E. (2017). Which estimator to measure LGs' cost efficiency? An application to Spanish municipalities. Working paper 2017/06, Economics Department, Universitat Jaume I, Alicante (Spain).

OECD (2003). Public Sector Transparency and International Investment Policy, Directorate for Financial, Fiscal and Enterprise Affairs. Paris: Organisation for Economic Co-Operation and Development.

Pérez-López, G., Prior, D., & Zafra-Gómez, J.L. (2015). Rethinking new public management delivery forms and efficiency: Long-term effects in Spanish local government. *Journal of Public Administration Research and Theory*, 25(4): 1157-1183.

Pindado, J., & Requejo, I. (2015). Panel data: A methodology for model specification and testing. *Wiley Encyclopedia of Management*, 4: 1-8.

Piotrowski, S. (2007). Governmental transparency in the path of administrative reform. New York: State University of New York Press.

Piotrowski, S. J., & Bertelli, A. (2010). Measuring municipal transparency. In 14th IRSPM Conference, Bern, Switzerland, April.

Piotrowski, S. J., & Van Ryzin, G. G. (2007). Citizen attitudes toward transparency in local government. *The American Review of Public Administration*, 37(3): 306-323.

Powell, W. & DiMaggio, P.J. (1991). *The New Institutionalism in Organizational Analysis*. Chicago, IL: The University of Chicago Press.

Premchand, A. (1993). *Public Expenditure Management*. Washington, DC: International Monetary Fund.

Rodríguez-Bolívar, M., Navarro-Galera, A., Alcaide-Muñoz, L., & López-Subires, M. (2016). Analyzing forces to the financial contribution of LGs to sustainable development. *Sustainability*, 8(9): 925.

Rodríguez-Bolívar, M.P., Alcaide-Muñoz, L., & López-Hernández, A.M. (2013). Determinants of financial transparency in government. *International Public Management Journal*, 16(4): 557-602.

Rogoff, K., & Sibert, A. (1988). Elections and macroeconomic policy cycles. *Review of Economic Studies*, 55(1): 1–16.

Sharman, J. C., & Chaikin, D. (2009). Corruption and anti-money-laundering systems: putting a luxury good to work. *Governance: An International Journal of Policy, Administration, and Institutions*, 22(1): 27–45.

Simar, L., & Wilson, P.W. (1998). Sensitivity analysis of efficiency scores: How to bootstrap in nonparametric frontier models. *Management Science*, 44(1): 49-61.

Tejedo-Romero, F., & de Araujo, J. F. F. E. (2018). Determinants of LGs' transparency in times of crisis: evidence from municipality-level panel data. *Administration & Society*, 50(4): 527-554.

Vanden Eeckaut, P., Tulkens, H., & Jamar, M.A. (1993). Cost efficiency in Belgian municipalities. In Fried, H.O., Know Lovel, C.A., and Schmidt, S.S. (Eds.), *The measuring of productive efficiency: Techniques and applications*. New York: Oxford University Press.

Vicente, C., Benito, B., & Bastida, F. (2013). Transparency and political budget cycles at municipal level. *Swiss Political Science Review*, 19(2): 139–156.

Wang, X. (2002). Assessing administrative accountability. Results from a national survey. *American Review of Public Administration*, 32(3): 350–370.

Wooldridge, J.M. (2010). *Econometric analysis of cross section and panel data*. Cambridge: The MIT Press.

Table 1. Public services by municipality size and related outputs

All		Population over 5000	
Public services	Outputs	Public services	Outputs
Ligthing	Population Surface area Density	Park and green areas	Population Surface area Density Population under 16 Population over 65
Cementery	Population Density		
Waste collection	Population Surface area Density	Library	Population Density Population under 16
Street cleaning	Population Surface area Density	Waste treatment	Population Density
Drinking water	Population Density		
Sewer system and drains	Population Surface area Density		
Access to the municipality	Population Surface area		
Paving	Population Surface area Density		
Population over 20000		**Population over 50000**	
Public services	Outputs	Public services	Outputs
Police	Population Surface area Density	Public transport	Population Surface area Population over 65
Firefighting	Population Surface area Density	Environmental protection	Population Surface area
Social services	Population Density Unemployment Population under 16 Population over 65		
Sports facilities	Population Density Population under 16		

Table 2. Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
DEA	0.9817	0.0309	0.851	1
DEAbc	0.9626	0.0260	0.8410	0.9912
Orderm	1.3531	0.7919	1	8.4128
Cobb_effi	0.6072	0.1165	0.4047	0.9605
Translog_effi	0.6083	0.1166	0.4048	0.9597
ITA_total	70.7191	21.9465	12.5	100
ITA_eco	65.0027	35.6462	0	100
ITA_ser	64.3634	30.2585	0	100
Right	0.6314	0.4828	0	1
Herfindahl	0.4006	0.0877	0.2128	0.6672
Incomepc	15195.82	3504.22	9121.04	33659.75
Transferspc	356.12	144.55	92.01	1066.87
Balance	-0.0054	-0.1440	-0.7859	0.3197
Inputs				
Current expenditure	190.00	403.00	0	4130.00
Capital expenditure	39.20	91.50	0	981.00
Total expenditure	251.00	551.00	30.80	5700.00
Outputs				
Population	216433.2	361525.3	35037	3273049
Surface (km2)	168.8400	256.3873	7	1750
Density	3963.62	7370.55	40.12	60056.93
Unemployment	20.4603	6.5161	5.8	42.07
Population over 65	16.0960	3.9963	5.5901	26.2431
Population under 16	15.0421	2.2742	10.0653	21.4385

Table 3. Bivariate correlations

	DEA	DEAbc	Orderm	Cobb_effi	Translog_effi
DEA	1				
DEAbc	0.9824***	1			
Orderm	0.1254***	0.1001**	1		
Cobb_effi	-0.0078	-0.0056	0.0679	1	
Translog_effi	-0.0088	-0.0064	0.0691	0.9999***	1
ITA_global	-0.0729†	-0.0566	0.1787	0.0198	0.0218
ITA_eco	-0.0858*	-0.0698†	0.1166	0.0451	0.0468
ITA_ser	-0.0577	-0.0504	0.0787	-0.0333	-0.0321
Right	0.124**	0.1128**	0.0239	-0.1174**	-0.1173**
Herfindahl	0.1038**	0.0849*	-0.0223	-0.0707†	-0.0703†
Incomepc	-0.0584	-0.0514	0.1384	0.1025**	0.1003**
Transferspc	-0.1214**	-0.1294***	0.2614	0.0478	0.0469
Balance	0.1161**	0.1155**	0.0774	-0.0847*	-0.083*

	ITA_global	ITA_eco	ITA_ser	Right	Herfindahl	Incomepc	Transferspc	Balance
ITA_global	1							
ITA_eco	0.8913***	1						
ITA_ser	0.7035***	0.5534***	1					
Right	-0.0656†	-0.0451	-0.0519	1				
Herfindahl	-0.1958***	-0.1936***	-0.1446***	0.2541***	1			
Incomepc	0.1387***	0.114**	0.0602	0.0154	-0.0968*	1		
Transferspc	0.0563	-0.0249	0.0777*	-0.2165***	-0.2856***	0.2457***	1	
Balance	0.2127***	0.265***	0.1294***	0.1202**	-0.1525***	-0.1425***	-0.121**	1

Notes:
†, *, **, ***significant at 10, 5, 1, and 0.1 percent level, respectively.

Table 4. Effect of transparency on non-parametric efficiency indicators

Panel A. Effect on DEA						
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
ITA_global	0.0051***	0.0010				
ITA_eco			0.0081***	0.0008		
ITA_ser					0.0010†	0.0005
Right	0.0713	0.0935	0.1575	0.0979	0.0811†	0.0892
Herfindahl	0.5266***	0.1338	0.4034**	0.1376	0.5996	0.1504
Incomepc	0.0002	0.0001	0.0002	0.0001	0.0004**	0.0011
Transferspc	-0.0026***	0.0003	-0.0024***	0.0003	-0.0019***	0.0003
Balance	0.1115***	0.0149	0.1646***	0.0168	0.1074	0.0184
_cons	0.9927***	0.0031	0.9940***	0.0026	0.9897**	0.0026
Arellano-Bond test for AR(2)	Prob > z = 0.150		Prob > z = 0.166		Prob > z = 0.143	
Hansen test	Prob > chi2 = 0.466		Prob > chi2 = 0.470		Prob > chi2 = 0.593	
Panel B. Effect on DEAbc						
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
ITA_global	0.0057***	0.0011				
ITA_eco			0.0075***	0.0008		
ITA_ser					0.0012†	0.0007
Right	-0.0365	0.0668	0.0821	0.0797	0.0185†	0.0628
Herfindahl	0.3267**	0.0987	0.1941†	0.1125	0.3877	0.1230
Incomepc	0.0001	0.0001	0.0002	0.0001	0.0002***	0.0001
Transferspc	-0.0031***	0.0002	-0.0032***	0.0003	-0.0028***	0.0002
Balance	0.1296***	0.0073	0.1707***	0.0115	0.1071	0.0119
_cons	0.9764***	0.0022	0.9776***	0.0021	0.9713**	0.0023
Arellano-Bond test for AR(2)	Prob > z = 0.152		Prob > z = 0.165		Prob > z = 0.147	
Hansen test	Prob > chi2 = 0.194		Prob > chi2 = 0.213		Prob > chi2 = 0.351	
Panel C. Effect on orderm						
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
ITA_global	0.0465**	0.0157				
ITA_eco			0.0557***	0.0091		
ITA_ser					0.0416***	0.0074
Right	0.0479***	0.0060	0.0389***	0.0067	0.0407***	0.0067
Herfindahl	-0.0110	0.0177	0.0020	0.0188	0.0179	0.0169
Incomepc	0.0007**	0.0002	0.0008***	0.0002	0.0008**	0.0003
Transferspc	0.0030	0.0022	0.0016	0.0028	-0.0044	0.0033
Balance	0.4651***	0.1177	0.0366**	0.0107	0.1574***	0.0123
_cons	1.1688***	0.0297	1.1707***	0.0293	1.1181***	0.0335
Arellano-Bond test for AR(2)	Prob > z = 0.849		Prob > z = 0.856		Prob > z = 0.705	
Hansen test	Prob > chi2 = 0.656		Prob > chi2 = 0.577		Prob > chi2 = 0.555	

Notes: Instruments are first to second-order lags (t to t-2) of independent and control variables, except Right and Herfindahl that are exogenous. All regressions include year fixed effects through dummy variables that are considered exogenous.
†, *, **, ***significant at 10, 5, 1, and 0.1 percent level, respectively.

Table 5. Effect of transparency on parametric efficiency indicators

Panel A. Effect on Cobb_effi						
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
ITA_global	0.0661***	0.0012				
ITA_eco			0.0440***	0.0017		
ITA_ser					0.0382***	0.0026
Right	Dropped because of collinearity					
Herfindahl	Dropped because of collinearity					
Incomepc	0.0061***	0.0002	0.0075***	0.0004	0.0063***	0.0005
Transferspc	-0.0026***	0.0002	-0.0003	0.0004	-0.0016***	0.0004
Balance	0.2824**	0.0835	0.0364***	0.0035	0.0163***	0.0029
_cons	0.5695***	0.0037	0.5401***	0.0076	0.5403***	0.0071
Arellano-Bond test for AR(2)	Prob > z = 0.243		Prob > z = 0.091		Prob > z = 0.105	
Hansen test	Prob > chi2 = 0.345		Prob > chi2 = 0.088		Prob > chi2 = 0.130	
Panel B. Effect on Translog_effi						
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
ITA_global	0.0819***	0.0040				
ITA_eco			0.0435***	0.0017		
ITA_ser					0.0379***	0.0026
Right	Dropped because of collinearity					
Herfindahl	Dropped because of collinearity					
Incomepc	0.0068***	0.0005	0.0074***	0.0004	0.0063***	0.0005
Transferspc	-0.0018**	0.0005	-0.0003	0.0004	-0.0015***	0.0004
Balance	0.0129**	0.0042	0.0372***	0.0035	0.0150***	0.0029
_cons	0.5695***	0.0087	0.5421***	0.0076	0.5424***	0.0070
Arellano-Bond test for AR(2)	Prob > z = 0.123		Prob > z = 0.106		Prob > z = 0.118	
Hansen test	Prob > chi2 = 0.127		Prob > chi2 = 0.090		Prob > chi2 = 0.142	

Notes: Instruments are first to third-order lags (t to t-3) of independent and control variables. All regressions include year fixed effects through dummy variable that are considered exogenous.

†, *, **, ***significant at 10, 5, 1, and 0.1 percent level, respectively

Figure 1. Evolution of efficiency indicators

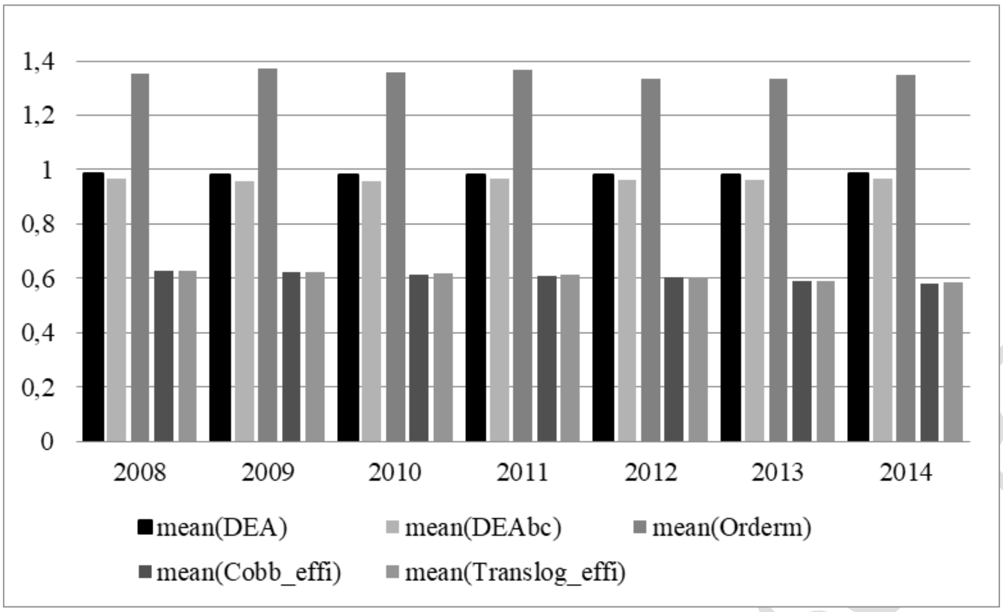

Figure 2. Evolution of transparency indicators