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Structuring Public Procurement in Local Governments: The Effect of Centralization, Standardization and Digitalization on Performance

Andrea S. Patrucco^a, Tommaso Agasisti^b , and Andreas H. Glas^c

^aFlorida International University College of Business, Department of Marketing and Logistics, Miami, USA; ^bSchool of Management, Politecnico di Milano, Milan, Italy; ^cBundeswehr University Munich, Werner-Heisenberg-Weg, Neubiberg/Munich, Germany

ABSTRACT

There is broad recognition of the potential contribution of procurement within public administrations at all levels, as efficient and effective management of required inputs has a crucial impact on the achievement of high-level objectives. This is particularly true for local governments, where procurement consumes a substantial part of the budget cost, thus representing a key mechanism to provide value for citizens. Through the analysis of quantitative data collected from municipalities in two different countries (Italy and the USA), the current paper analyzes how specific structural decisions for public procurement (i.e., level of centralization, level of digitalization, level of standardization) are linked to performance. Multiple regression analyses show a positive linkage between the levels of centralization and digitalization and procurement performance, while no evidence is found for what concerns the standardization of the processes. Digitalization is ultimately a potential factor that mitigates the negative effects of decentralization on cost savings. Cluster analysis identifies two types of procurement systems—one more oriented toward cost efficiency and the other more focused on quality. Some antecedents (country, size, and magnitude of spending) affect the procurement design but not the performance.

KEYWORDS

centralization; e-procurement; performance; procurement

The relevance of public procurement for national and local economies

Fostering efficiency in public spending, enhancing cooperation among states and establishing a common regulatory framework are the main reasons for public procurement reforms around the world (Piga & Tatrai, 2017). Such efforts have a potentially enormous impact, as public spending can represent almost 50% of government expenditure and up to 20% of a country's gross domestic product (GDP, OECD, 2019). In addition, the recent COVID-19 emergency has demonstrated the crucial role of public

CONTACT Andrea S. Patrucco  apatrucc@fiu.edu  Marketing and Logistics, Florida International University College of Business, Department of Marketing and Logistics, Miami, FL 33199-0001, USA.

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procurement in satisfying the demand for medical equipment (Vecchi et al., 2020). This highlights the relevance of public procurement but also points to the decision of how to configure public procurement.

Public procurement configuration is the basis to obtain desired operational performance (Grandia & Meehan, 2017; Patrucco, Walker, et al., 2019), to create public value (Furneaux & Barraket, 2014; Meehan et al., 2016; Porter et al., 2011) and to increase government resiliency (Quarshie & Leuschner, 2020). The discussion about how to configure government functions is ongoing in the public management field (e.g., Taylor, 2014), and the topic of procurement has been given increasing attention (e.g., Glas & Eßig, 2018; Harland et al., 2019). However, knowledge about public procurement configuration is still incomplete; many studies investigate the topic with a distinct focus on the private sector (e.g., Bals et al., 2018), but it is questionable if findings fully apply to public administration.

A second research gap exists because existing literature on the topic often adopts a country-wide perspective (e.g., Wang & Li, 2014), excluding implications for sub-types of institutions, such as local governments. This is particularly concerning given that the benefits of procurement are most likely to be captured at the single organization level.

Third, a majority of the contributions are focused on the analysis of specific organizational aspects, such as the level of centralization or process-execution aspects (Edler and Yeow, 2016; Tkachenko et al., 2018). Only a few studies refer to a comprehensive procurement system design with qualitative methodologies (Bals et al., 2018; Patrucco, Walker, et al., 2019). Thus, a comprehensive quantitative statistical analysis is still missing.

The present article addresses the aforementioned research gaps and explores the relationship between public procurement configuration and performance by using local governments as the unit of analysis. For this purpose, a two-country dataset of municipalities is used. The intention is to (1) analyze the effect of different procurement structural variables (i.e., level of centralization, standardization, and digitalization) on operational performance (i.e., cost, quality, and demand management) and the net of the influence of contingent factors (such as country, magnitude of spending, and the municipality's size) and (2) improve understanding of configuration patterns. This second objective is important for providing actionable suggestions to decision-makers and practitioners.

The paper is organized as follows. In the next Section "The characteristics of public procurement: structural choices and performance impact," the main elements of public procurement will be introduced. This is followed by a discussion of the research framework and questions motivating this study in Section "Structuring public procurement for achieving better performance: a conceptual framework" and a presentation of the methodology

and empirical data in Section “Methodology.” Section “Results” presents the results of the analysis, and finally, the article concludes with a discussion of the main contributions (Section “Discussion of results”), and suggestions for further research (Section “Conclusions and implications”).

The characteristics of public procurement: structural choices and performance impact

In the last decade, governments worldwide have been facing economic crises and several emergency situations that have radically transformed strategic public management, leading to conflicting needs, such as spending reduction, better cooperation among central and local bodies, and stronger innovation orientation (Eriksson et al., 2020). Research has proven that public procurement can be a powerful government mechanism to achieve political goals, impact the economy and society, and better respond during emergency situations (Edquist & Zabala-Iturriagoitia, 2012; Harland et al., 2019; Meehan et al., 2016; Papanagnou & Shchaveleva, 2018).

Public procurement, at an operational level, connects the needs of government departments with supply sources, and in countries where government procurement spending is a significant percentage of GDP (e.g., the Netherlands 19.5%, Japan 16.1%, Canada 13.3%, UK 13.0%, the USA 9.3%; OECD, 2019), it has significant influence over private sector supply chains. National governments promote the use of procurement activities for core missions, such as increasing the performance of municipalities in delivering services and creating public value (Grandia & Meehan, 2017).

Despite its relevance, public administrations seem to struggle in forging and sustaining effective procurement management, both in the complexities that managers face in organizing public procurement and in the normative framework, which limits the degree of freedom of decisions about procurement configuration (Piga & Tatrai, 2017). Procurement organizations may vary from more straightforward to more complex structures (Glock & Broens, 2013), with alternative configurations discriminated according to specific variables (Glas et al., 2017; Patrucco et al., 2016). If we look at recent studies about procurement organization (Bals et al., 2018; Glock & Broens, 2013; Glock & Hochrein, 2011; Patrucco, Moretto, et al., 2019; Schneider & Wallenburg, 2013), the relevant organizational variables to be considered in the public context are (1) the level of centralization (and responsibility assigned to procurement), (2) the degree of standardization (and formalization), and (3) the type of tools used to support the execution of process activities.

Centralization refers to the extent to which responsibilities on procurement activities are concentrated within a department as opposed to being

spread across several offices (Albano & Sparro, 2010). The discussion about centralization in public procurement is longstanding; however, univocal results are still not present, as some authors provide evidence on the effectiveness of more decentralized strategies, while others present centralization as the best way to maximize performance (Baldi & Vannoni, 2017; Dimitri et al., 2006; Karjalainen, 2011; Patrucco, Walker, et al., 2019; Patrucco, Moretto, et al., 2019; Tkachenko et al., 2018; Wang & Li, 2014).

Standardization refers to the extent to which the procurement process is executed according to established internal procedures (other than the regulation; DeHart-Davis et al., 2013). The degree of standardization has been largely debated, and the ability to define a proper level of standardization has been presented as a critical factor in achieving good performance (Glock & Broens, 2013; Johnson et al., 2014; Patrucco, Moretto, et al., 2019).

Tools that are available for public buyers shall allow to ease procurement operations. The literature recognizes information technology (i.e., “e-procurement” or “digital procurement”) as one of the most powerful mechanisms to support process execution (Haim Faridian, 2015; Ma & Zheng, 2017). However, a shared view on the use of tools in public procurement is not present, especially in the presence of different degrees of centralization and standardization (Croom & Brandon-Jones, 2007; McCue & Roman, 2012; Nurmandi & Kim, 2015; Walker & Brammer, 2012).

In summary, the existing literature suggests that the design configuration of public procurement influences its performance. Among the various structural dimensions, centralization, digitalization, and standardization appear to be the main elements. Returning to the research gaps, it is still not clear how these aspects relate to procurement performance or if specific combinations of structural variables are superior in terms of performance.

Structuring public procurement for achieving better performance: a conceptual framework

To address the identified research gaps, this study is grounded in the research framework represented in Figure 1.

When configuring public procurement, previous literature emphasizes the variables of centralization and standardization (Glas et al., 2017; Glock & Hochrein, 2011; Patrucco et al., 2017; Wang & Li, 2014). Higher procurement centralization may bring savings but also more complexity (Keränen, 2017; McCue & Pitzer, 2000; Wang et al., 2020), while greater standardization can lead to fewer process costs (Glock & Broens, 2013) but also a potential excess of bureaucracy, which might negatively affect performance (Van Den Hurk & Verhoest, 2016). Furthermore, centralization and standardization are not stand-alone decisions; they are usually

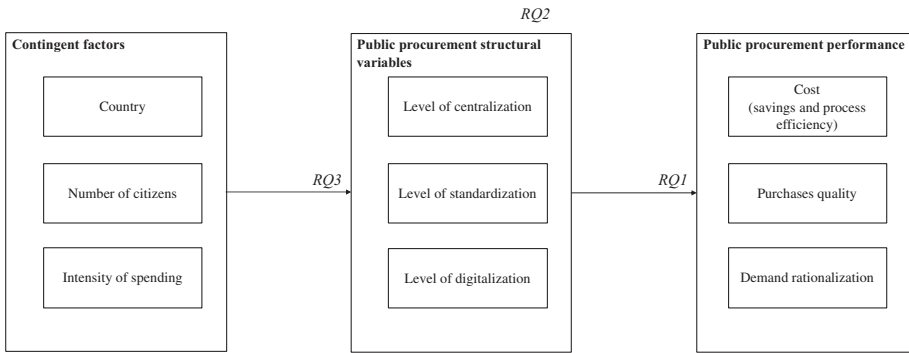


Figure 1. Research framework.

connected. Several studies analyze structural variables in public procurement and have found that they have a greater effect on performance than individual decisions (Plaček et al., 2020). The study of Wang et al. (2020), for example, proposes very distinct recommendations on how to configure public procurement by jointly considering structural aspects. Other studies (Glas et al., 2017; Patrucco, Walker, et al., 2019) analyze patterns and archetypes of specific centralization and standardization decisions.

This study adds the use of technology to this discussion, as modern tooling is of high relevance (Haim Faridian, 2015). New tools shall guarantee better execution of activities, provide more knowledge, better information, and ultimately, optimize purchasing decisions (Croom & Brandon-Jones, 2007; Nurmandi & Kim, 2015; Walker & Brammer, 2012). It is no surprise that digital tools have a major effect on procurement (Glas & Kleemann, 2016), but it is still not clear how these tools, as a structural variable, interact with centralization and standardization.

In conclusion, a comprehensive analysis of how these three variables are connected to procurement performance is still missing. This is the basis for our first research question:

RQ1: How do decisions about public procurement structural variables impact public procurement performance?

When debating procurement issues in public institutions, we must recognize that its role and perception can be very different (Glas et al., 2017; Patrucco et al., 2017; Tkachenko et al., 2018), and this influences decisions about its structural configuration. In institutions where procurement is seen mostly as an operational and bureaucratic function, the primary objective is compliance with regulations. In such institutions, the primary task is to regard procedures and contracting rules when awarding procurement contracts (McKevitt & Davis, 2015; Meehan et al., 2016). In cases where procurement is instead perceived as a more strategic function, there is a focus on the final outcomes (i.e., to manage the tradeoff between cost and quality).

While several studies consider how structural variables can be combined together in order to design strategically aligned configurations (Glock & Broens, 2013; McKevitt & Davis, 2015; Patrucco, Walker, et al., 2019; Patrucco, Moretto, et al., 2019), the literature still lacks a comprehensive understanding of how different combinations of procurement structural variables deliver different performance and what (and if) causality exist between structural decisions and specific performance dimensions. This is the basis for the second research question:

RQ2: How do specific configurations—referring to the combination of public procurement structural variables—impact public procurement performance?

In addition to structural variables, contingency theory shows that organizations perform better when their structures are appropriately aligned with the context within which they operate (Donaldson, 2001); in other words, contingent factors also have an effect on how structural variables are formed. Contingencies such as size, revenues, and geographical location are often used to explain procurement structural decisions in the private sector (Bals et al., 2018; Schneider & Wallenburg, 2013); in the public management context, these can be adapted as the number of citizens, the intensity of spending, and the country (Alonso et al., 2015; Baldus & Hatton, 2020). This is the basis for the third research question:

RQ3: How do contingent variables impact decisions about public procurement structural variables?

Methodology

Variable measures

To investigate our research questions a survey methodology was adopted. The operationalization of the constructs into items for the survey was adapted based on existing measures proposed by the literature.

The *level of centralization* measures the extent to which the execution of the procurement process is concentrated within a central department, in line with Karjalainen (2011), Keränen (2017), Glas et al. (2017), and Patrucco, Walker, et al. (2019). Respondents were asked to select the configuration that best described the procurement process in their institution, with choices ranging from completely decentralized (1) to fully centralized (4).

The *level of standardization* measures to what extent the activities of the procurement process are precisely defined in formal documents describing rules, procedures, and policies (in line with Bals & Turkulainen, 2017; Patrucco, Moretto, et al., 2019). For each phase of the procurement process, we asked the respondent to rate the degree of

freedom in the execution of activities, with choices ranging from very low (1) to high (5).

The *level of digitalization* measures how much the different phases of the procurement process are supported by technologies. For each phase of the procurement process, we asked the respondent to rate the intensity of technological use in line with the e-procurement models and technologies provided by McCue and Roman (2012) and Costa et al. (2013), with choices ranging from no technological support (1) to complete and advanced use of technology (5).

Finally, we conceptualize public procurement performance as a multidimensional construct integrating different dimensions. In line with previous literature (Diggs & Roman, 2012; Flynn, 2018; Patrucco et al., 2016; Rendon, 2008), we focused on the level of cost, the quality of purchases, and the ability to properly manage user demand, because they are the most tangible and measurable aspects in public procurement (Patrucco et al., 2016), considering the relatively low diffusion of structured performance measurement systems in public organizations (Van Dooren & Van de Walle, 2016).

Cost can be conceptualized at two levels: savings on contract prices and efficiency in the procurement process execution (Baldus & Hatton, 2020).

Savings are usually defined as the ability to acquire goods and services at convenient prices, lower or in line with those budgeted for (Karjalainen, 2011; Wang et al., 2020). To measure savings, we asked respondents to provide an estimation of the difference between the procurement budget and the actual spending of the institution for different types of goods and services, with choices ranging from strongly below expectations (1, if the variation is lower than -20%) to strongly above expectations (5, if the variation is higher than 20%).

Process efficiency refers to the ability to realize an output by optimizing the effort required, and it is a proxy of the costs for the procurement process (Costantino et al., 2012). For our purpose, we interpret process efficiency in terms of how much the procurement process is characterized by value adding activities and minimizes wait times and waste (Kestenbaum & Straight, 1995). For each phase of the procurement process, we asked the respondents to rate the level of process efficiency, with choices ranging from strongly below expectations (1, in case of high inefficiency) to strongly above expectations (5, in case of high efficiency).

Purchases quality can be conceptualized as the ability to acquire goods and services that satisfy the needs of the internal clients of the organization. From such a perspective, it is important to collect data about the level of satisfaction regarding the execution of the supplier contracts, which is key for understanding whether the specific goods/services purchased align with

the expectations of the final users. For this reason, we asked respondents to provide the value of the average satisfaction for different types of goods and services purchased, with choices ranging from strongly below expectations (1, in case of high dissatisfaction) to strongly above expectations (5, in case of high satisfaction). If available, we directly collected the results of the internal user satisfaction surveys related to goods and services purchased.

Finally, bundling demand is also a lever in public procurement, even if its use (separation of a demand into lots) is issue of regulation (Di Mauro et al., 2020). Overall, we interpret *demand rationalization* as the ability to bundle the requests from internal customers into frame agreements. We asked the respondents to rate how much of the internal demand was satisfied using frame agreements for different types of goods and services purchased, with choices ranging from very low (1, in case of lower than 10%) to very high (5, in case of higher than 75%).

The contingency variables *size* and *intensity of spending* were measured by classifying the number of citizens and the procurement spending in discrete classes.

Sample characteristics

As a unit of analysis, we decided to focus our attention on local governments. These institutions have, on the one hand, a significant impact on government spending (30–40% for OECD countries; OECD, 2019). On the other hand, local governments are high in number, which is advantageous with regard to research quality criteria, because decisions about how to structure internal processes in local governments can provide evidence on a broader spectrum (Agasisti et al., 2019; Loader, 2016). This is also true for procurement, and local governments have been used as units of analysis in several studies (Glock & Broens, 2013; Loader, 2016; Murray, 2011; Patrucco, Moretto, et al., 2019).

The sample design targeted local governments in Italy and the United States. The choice to compare these two countries can be considered appropriate, as both of these countries have a combination of institutional and procurement characteristics that make them interesting for our study. The relevance of government spending on GDP is similar (10.4% for Italy and 9.3% for the United States; OECD, 2019). The public procurement responsibilities are highly delocalized to municipalities, with mixed choices in terms of centralization of procurement and standardization of activities' execution (Baldus & Hatton, 2020; Patrucco, Moretto, et al., 2019). The availability of e-procurement systems is broad; in Italy, local governments can decide to adopt central and regional tools, while in the United States, both state and

central governments provide e-procurement resources to local institutions (OECD, 2019). Issues and performance characterizing their public procurement systems are similar (World Bank Group, 2017). Finally, if we look at IFEL (2018) and US Census Bureau (2017) data, for both countries, a heterogeneous distribution of these local authorities exists in terms of size and magnitude of spending. Given these similarities, exploring potential different patterns is also particularly interesting from a comparative perspective, specifically when considering the country as a contingent factor that can have an impact on choices about procurement design.

To maximize the impact of our findings and to be sure to collect responses from local governments with formal procurement organizations in place, we decided to focus our study on the largest municipalities in each country. For Italy, they are the 110 municipalities classified as “province” in the twenty Italian regions (with a combined spending, in 2018, of more than \$400 million), while for the United States, they are the 100 largest municipalities by number of citizens (with a combined spending, in 2017, of almost \$2 billion).

With highly qualified procurement professionals as the ideal target respondents, the research team was able to collect contacts from all 213 institutions to which the questionnaire was sent as an internet survey in 2018 (Balch, 2010). The final sample includes 151 local governments (71% response rate). Fifteen of them did not provide sufficient information and were excluded from the analysis.

Table 1 summarizes the main characteristics of the sample for the categorical variables, while Table 2 reports the main descriptive statistics for the continuous variables together with the Pearson correlations between them.

Non-response bias was checked by comparing early and late respondents, where a late respondent is used as a proxy for a non-respondent (Lin & Schaeffer, 1995). Chi-square and t-tests were performed on all variables, and no significant differences were found.

Data analysis

We performed three different statistical analyses using Stata 16.0. To analyze the existence of a statistical association between procurement structural variables and performance (RQ1), we performed four generalized linear models in the following form:

$$\begin{aligned} Performance_i = & \beta_{1i}Level\ of\ centralization_i + \beta_{2i}Level\ of\ digitalization_i \\ & + \beta_{3i}Level\ of\ standardization + \varepsilon_i \end{aligned}$$

In each case, we use a different type of performance (i.e., savings, process efficiency, purchases quality, demand rationalization) as a continuous

Table 1. Respondent and sample distribution on categorical variables (data collected in 2018).

# of citizens (,000)		
<50	18	13%
50–100	31	23%
101–250	36	27%
251–500	34	25%
501–1000	15	11%
>1000	2	15%
Respondent		
Procurement director	23	17%
Category manager	54	40%
Buyer/Administrative employee	36	26%
Manager in another department	4	3%
Administrative employee in another department	19	14%
Spending (<i>mln</i> \$)		
<50	8	6%
50–100	29	21%
101–250	37	27%
251–500	23	17%
501–1000	19	14%
>1000	20	15%
Level of centralization		
Procurement managed independently by every single office/department (C1)	23	17%
Procurement managed partially by the single offices/department, partially by the procurement department, but without a structured definition and sharing of responsibilities (C2)	26	19%
Procurement managed partially by single offices/department, partially by the procurement department, with a structured definition and sharing of responsibilities (C3)	75	55%
Procurement centrally managed by the Procurement Department (C4)	12	9%

Table 2. Items descriptive statistics and Person correlation for continuous variables.

	Mean	Std. Dev.	Level of process digitalization	Level of process standardization	Savings	Process efficiency	Purchases quality	Demand rationalization
Level of digitalization	3.36	0.73	1					
Level of standardization	2.98	0.81	.566**	1				
Savings	3.35	0.67	.548**	.395**	1			
Process efficiency	3.22	0.87	.317**	.266*	.501**	1		
Purchases quality	3.02	0.86	.193	–.201*	–.256*	–.067	1	
Demand rationalization	3.32	0.85	.371*	.258**	.330**	.064	.192*	1

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

dependent variable, while the dependent variables were the different dimensions of the procurement system design. As a categorical variable, the level of centralization was included as a fixed factor and recoded into four dummy variables representing the different forms of centralization (C1, C2, C3, C4). The model used C4 as the reference category (i.e., the one representing the maximum level of centralization).

To analyze whether specific configurations impact public procurement performance (RQ2), we decided to perform cluster analysis on our dataset using the three structural variables as classification variables and comparing the obtained clusters by their performance.

Finally, to analyze the impact of contingent factors (RQ3), we used chi-square tests, *t*-tests, and analysis of variance (ANOVA), with the aim of identifying structural differences between groups across the factors under analysis.

Results

Regression analysis

The outcome of the linear models is reported in Table 3. The analysis of the variance inflation factors (all lower than 2.5) revealed that multicollinearity was not an issue (Cortina, 1993). Even if the R^2 values show that only a small to medium portion of the dependent variable variance is explained, this does not negate the significance of the predictor variables. All of the models identify significant predictors, which further supports a more in-depth analysis of which variables (centralization, standardization, and digitalization) actually affect procurement performance.

The results show that, for savings, there is a positive correlation with the most centralized form (C4: $\beta = 0.172$, $p < 0.05$) and the level of digitalization ($\beta = 0.289$, $p < 0.01$), while the adoption of more decentralized forms has, instead, a negative relationship with savings ($\beta = -0.309$, $p < 0.01$ for C1; $\beta = -0.280$, $p < 0.01$ for C2). No significant relationship is found for the C3 centralization option.

Similar results are obtained for the process efficiency, which is positively linked to the most centralized forms ($\beta = 0.177$, $p < 0.05$ for C4; $\beta = 0.164$, $p < 0.05$ for C3) and the level of digitalization ($\beta = 0.201$, $p < 0.05$), while negatively related to the decentralized forms ($\beta = -0.361$, $p < 0.01$ for C1; $\beta = -0.310$, $p < 0.01$ for C2).

The situation is slightly different for the demand rationalization, which is positively linked to both the most centralized form (C4: $\beta = 0.235$, $p < 0.01$) and the level of digitalization ($\beta = 0.221$, $p < 0.05$) but negatively related to the adoption of the most decentralized configuration (C1: $\beta = -0.275$, $p < 0.05$). No significant relationships are found for the hybrid forms (C2 and C3).

Completely opposite are the results for the purchases quality, which is strongly and positively related to the most decentralized configurations ($\beta = 0.469$, $p < 0.01$ for C1; $\beta = 0.503$, $p < 0.001$ for C2), while no significant relationships are found for the other variables.

The level of standardization does not appear as a statistically significant variable in any of the models.

As a robustness check, we perform multilevel modeling to verify that slopes and intercepts of public procurement configurational variables are invariant across countries for the different performance dimensions. We

Table 3. Results of linear regressions: determinants of procurement performance.

	VIF	Model 1: Regression on "Savings"				Model 2: Regression on "Process efficiency"				Model 3: Regression on "Demand rationalization"				Model 4: Regression on "Purchases quality"			
		β	Err	t	p-Value	β	Err	t	p-Value	β	Err	t	p-Value	β	Err	t	p-Value
(Intercept)			.440	6.28	***		.632	6.24	***		.621	4.77	***		.643	2.49	*
C1	2.024	-.309	.108	-2.86	**	-.361	.109	-3.31	**	-.275	.094	-2.92	**	.469	.132	3.54	**
C2	1.844	-.280	.106	-2.64	**	-.310	.131	-2.36	**	-.08	.227	-0.35	ns	.503	.102	4.69	***
C3	1.233	.049	.078	0.62	ns	.164	.077	2.12	*	-.025	.344	-0.07	ns	-.025	.344	-.072	ns
C4	1.078	.172	.087	1.97	*	.177	.079	2.22	*	.235	.081	2.93	**	-.048	.249	-.192	ns
Level of process digitalization	2.241	.289	.095	3.04	**	.201	.082	2.44	*	.221	.071	3.14	**	.145	.140	1.03	ns
Level of process standardization	2.074	-.049	.084	-0.58	ns	.096	.093	1.03	ns	-.062	.118	-.341	ns	.151	.139	1.08	ns
R				.612				.471				.470				.438	
R ²				.375				.226				.221				.191	
Adjusted R ²				.351				.192				.191				.160	

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 4. Output of clustering: structural variables and public procurement models.

	Relevance of predictor	<i>p</i> -Value	Value for Cluster 1	Value for Cluster 2
Level of centralization	1	.000***	C1 (46%) and C2 (53%)	C3 (86%) and C4 (14%)
Level of digitalization	0.55	.000***	2.94	3.72
Level of standardization	0.43	.000***	2.50	3.38
Number of cases			49	87
Cluster distance				2.136
Silhouette coefficient				0.523

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

also verify the equality of error variances and normal distribution across groups. These tests do not support the idea that performance values are significantly different between Italian and United States local governments.

Cluster analysis

We then performed clustering by use of the two-step procedure, which assures the minimization of the variance within each cluster (Berntson et al., 2012). Procurement configurational variables were selected to cluster, while analysis of variance (ANOVA) was used to verify the differences between clusters across the different performance dimensions.

From Table 4, we can see that the procedure identified two significant clusters. All configurational variables are relevant predictors for grouping the observations ($p < 0.001$), and the cluster distance and silhouette coefficient indicate good robustness.

In Table 5, the ANOVA shows that each cluster can also be differentiated in terms of procurement performance, with the values for savings, process efficiency, purchases quality, and demand rationalization being significantly different between the groups (for all variables, $p < 0.001$).

The role of contingent factors

To test whether local governments in different countries differ in terms of procurement structural variables, we analyzed the distribution of the Italian and US subsamples around the items included in the dataset; specifically, we ran chi-square tests for the level of process centralization (being a categorical variable) and t-tests for the others.

From Table 6, we can see that the only factor that appears to be significantly different between the countries is the level of centralization ($p < 0.05$), with the US sample including more decentralized configurations (44%) than the Italian sample (30%). No significant national differences can be found in the choices related to the level of standardization and digitalization ($p > 0.1$).

To evaluate the relationship between procurement structural variables, the number of citizens, and the intensity of spending, we tested the differences

Table 5. ANOVA of cluster differences on performance.

	Cluster 1 (49)		Cluster 2 (87)		<i>p</i> -Value
	Mean	St. dev	Mean	St. dev	
Savings	2.86	0.46	3.63	0.61	.000***
Process efficiency	2.73	0.76	3.49	0.81	.000***
Purchases quality	3.49	0.62	2.76	0.88	.000***
Demand rationalization	2.94	0.69	3.54	0.86	.000***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 6. Chi-Square test for the level of process centralization and *T*-tests for the level of digitalization and standardization.

Level of centralization	Italy (80)		USA (56)	
	Frequency	%	Frequency	%
C1	10	12.5%	13	23.2%
C2	14	17.5%	12	21.4%
C3	52	65.0%	23	41.1%
C4	4	5.0%	8	14.3%
Pearson Chi-Square: 9.141 (<i>p</i> -value: .027*)				
	Mean	St. dev	Mean	St. dev
Level of digitalization (<i>p</i> -value .481 ns)	3.35	0.78	3.36	0.72
Level of standardization (<i>p</i> -value .305 ns)	3.0	0.83	2.96	0.77

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 7. Chi-Square test for the level of centralization (number of citizens).

	<50 (<i>N</i> = 18)		51–100 (<i>N</i> = 31)		101–250 (<i>N</i> = 36)		251–500 (<i>N</i> = 34)		501–1000 (<i>N</i> = 6)		>1000 (<i>N</i> = 11)	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
C1	4	22%	4	13%	6	17%	7	21%	2	33%	0	0%
C2	4	22%	7	23%	1	3%	13	38%	0	0%	1	9%
C3	10	56%	17	55%	26	72%	13	38%	3	50%	6	55%
C4	0	0%	3	10%	3	8%	1	3%	1	17%	4	36%

Pearson Chi-Square: 33.751 (*p*-value: .004**).

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

between the different groups of citizens and spending through chi-square tests for the level of centralization (Table 7 and 8), while we performed ANOVA (Table 9) for the level of centralization and digitalization.

The chi-square tests show that for both the number of citizens (Table 7) and the spending magnitude (Table 8), between the different classes, there is a different distribution around the level of centralization ($p < 0.01$), with smaller governments being less likely to have a high level of centralization.

For the level of process digitalization (Table 9), while there seem to be no differences between local governments with different numbers of citizens ($p > 0.05$), there are variations if we look at the intensity of spending, where municipalities with expenditures lower than \$100 million seem to be characterized by a level of process digitalization that is significantly lower than those municipalities with expenditures between \$251–500 million and higher than \$1 billion ($p < 0.01$).

Table 8. Chi-Square test for the level of process centralization (intensity of spending).

	<50 (N = 8)		51–100 (N = 17)		101–250 (N = 37)		251–500 (N = 23)		501–1000 (N = 31)		> 1000 (N = 20)	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
C1	3	38%	4	24%	5	13.5%	1	4%	9	29%	1	5%
C2	2	25%	4	24%	5	13.5%	3	13%	9	29%	3	15%
C3	3	38%	9	53%	24	65%	17	74%	12	39%	10	50%
C4	0	0%	0	0%	3	8%	2	9%	1	3%	6	30%

Pearson Chi-Square: 30.034 (p -value: .012*).

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 9. ANOVA for the level of process centralization and digitalization (number of citizens and intensity of spending).

	Number of citizens (,000)				Intensity of spending (mln \$)			
	N	Mean	Std. dev.	p -Value	N	Mean	Std. Dev.	p -Value
Level of digitalization								
<50	18	3.15	0.78	.093 ns	8	2.94	0.86	.006**
51–100	31	3.42	0.77		17	3.21	0.79	
101–250	36	3.52	0.58		37	3.39	0.72	
251–500	34	3.18	0.74		23	3.72	0.57	
501–1,000	6	3.18	0.81		31	3.11	0.65	
>1,000	11	3.78	0.74		20	3.65	0.73	
Level of standardization								
<50	18	2.64	0.99	.001***	8	2.18	1.09	.011*
51–100	31	2.91	0.85		17	2.78	0.90	
101–250	36	3.31	0.66		37	3.04	0.79	
251–500	34	2.68	0.73		23	3.27	0.67	
501–1,000	6	3.13	0.52		31	2.88	0.74	
>1,000	11	3.55	0.37		20	3.21	0.64	

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Both the number of citizens and the spending magnitude seem to affect the choice regarding the level of standardization ($p < 0.001$ and $p < 0.05$, respectively; Table 9), with small local governments being less standardized than larger ones.

Discussion of results

The results of the study can be used to refine our initial research framework (Figure 2).

How do public procurement structural variables influence performance?

The regression models reveal important statistical association between specific structural variables and tangible performance dimensions in local government's procurement.

In line with previous literature, the main driver for obtaining efficiency is the level of centralization (Karjalainen, 2011). A more centralized structure seems to be more capable of obtaining savings, making process execution more efficient, and rationalizing internal demand. Particularly, it is the fully centralized structure (C4) that is actually able to guarantee higher

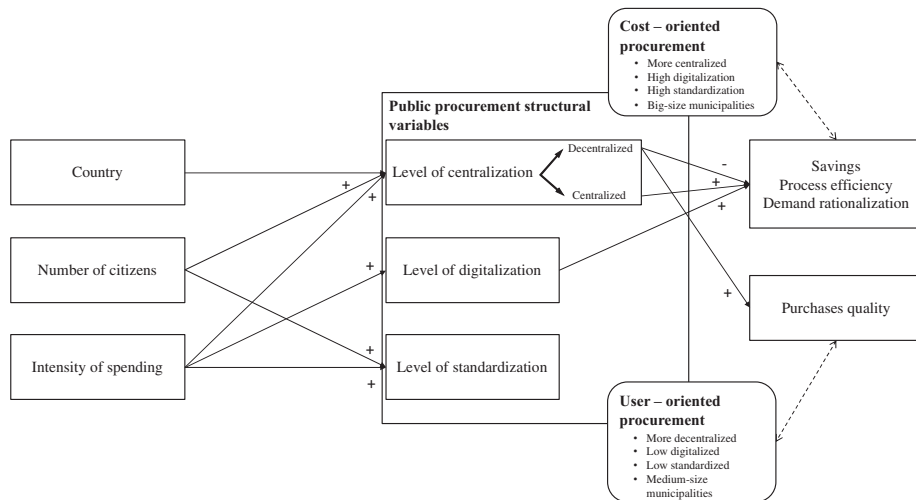


Figure 2. Results of the study.

efficiency in the use of both money and process resources; the hybrid centralized configuration (C3), instead, is only able to provide a positive contribution in reducing procurement process costs by allocating its execution according to the nature of goods/services purchases. This argument is not new, as empirical evidence has shown that governments increase the level of centralization of public procurement when the objective is to reduce their spending and execute process activities more efficiently (Baldi & Vannoni, 2017; Glock & Broens, 2013; Karjalainen, 2011). Our results advance the discussion regarding the benefits of higher centralization, as we are able to differentiate the effects for several levels of centralization; while a full centralization is able to provide benefits for budget savings, process efficiency, and demand rationalization, a hybrid centralized management of the process is only able to deliver efficiency at a process level.

Cost performance and demand rationalization are, instead, negatively affected in a more decentralized context—which aligns with some previous literature (Dimitri et al., 2006; Patrucco, Walker, et al., 2019). When the procurement process is delegated to technical offices and users, and/or the procurement department is simply offering administrative support instead of being assigned decision-making responsibilities, a higher level of inefficiency is likely to occur. The full decentralized structure (C1), in particular, negatively impacts both cost and demand management performance, while the hybrid decentralized structure (C2) seems only to lead to higher price and process inefficiencies.

Considering the managerial challenges connected with increasing procurement centralization in local governments (Albano & Sparro, 2010; McCue & Pitzer, 2000; Wang & Li, 2014), these findings need interpretation beyond the statistical results. Centralization is effective when there

are no gaps between centralized procurement competencies and the effective understanding of internal customer needs (Murray, 2011); in these cases, effective collaboration between procurement people and users can assure volume bundling, economies of scale in the execution of activities, and a better and more integrated execution of procedures that ultimately lead to more rational and responsive demand management. When there is a lack of understanding of internal user needs, the efficiency benefits must be balanced with their possible impact on the ability to satisfy the user demand effectively (Baldi & Vannoni, 2017). Instead, when procurement is decentralized, the user usually drives the procurement process for several critical categories (e.g., infrastructure projects, environmental services, social care services, public transportation services), paying very little attention to cost reduction and demand bundling, while putting the emphasis on purchasing the good/service that best suits their needs. For these reasons, efficiency is difficult to achieve, but the goods/services purchased align with users' requirements. This explains why our results show opposite evidence for the quality of purchases. According to our analyses, while no relationship can be established between a higher level of centralization and the quality of goods and services purchased by the local government, a positive impact on this performance is present in a more decentralized context, where procurement decisions are largely driven by users. This evidence supports the idea that, in (local) governments more oriented toward innovation and the provision of high-quality services to citizens and internal users, full centralization does not seem to be an appropriate choice for procurement (e.g., Furneaux & Barraket, 2014).

In large municipalities, a higher level of digitalization is also able to provide benefits. According to our results, a more intense use of technologies ultimately provides advantages in terms of savings (due to the ability to access more sources of supply), process costs (due to the automation of activities), and demand management (due to increased control of the process and stored data). While previous literature has mostly discussed the role of digitalization and technology in public procurement as a driver of centralization (Croom & Brandon-Jones, 2007; McCue & Roman, 2012; Nurmandi & Kim, 2015; Walker & Brammer, 2012), the fact that more intense use of technologies is able to deliver higher procurement efficiency has important implications in itself. In recent years, governments worldwide have encouraged a more extensive adoption of technology in procurement by launching different procurement digitalization initiatives, ranging from simple (e.g., web pages or portals that provide information on tender notices) to more complex solutions (e.g., e-tendering, e-catalogs, e-marketplaces, and e-auctions; e.g., Muñoz-Garcia & Vila, 2019). Although progress has been made, the integration of technology into public procurement

remains far from ideal in many local governments, as the process of implementing and adopting new procurement technologies presents several challenges (e.g., lack of IT infrastructure and skilled personnel) in addition to related regulatory issues (Croom & Brandon-Jones, 2007). The evidence of a direct impact of digitalization on cost performance can serve as a powerful motivation to sustain government digitalization plans.

No evidence is found concerning the relationship between digitalization and the quality of purchases. This confirms that this aspect seems to depend more on organizational dynamics than on technology adoption (Haim Faridian, 2015).

Finally, in contrast with its importance for private procurement in large organizations (e.g., Bals et al., 2018; Perner & Skjølsvik, 2016), no relevant impacts are found for the relationship between process standardization and procurement performance. This result—which does not reduce the relevance of this choice in public procurement (Glas et al., 2017)—can be explained in two ways. First, with large municipalities as our unit of analysis, a minimum level of standardization must already be set for them; therefore, most of these institutions tend to make their choices in a similar way, thus hiding the actual effect that higher standardization can have compared to public institutions with less structured organizations (e.g., small local governments). Second, this aspect is strictly normative-driven, thus limiting public managers' degree of freedom in its configuration and the possibility to contribute to procurement performance in a relevant way (Georgopoulos et al., 2017).

How do combinations of public procurement structural variables impact performance?

With our cluster analysis, we are able to discuss whether the combination of different public procurement structural variables decisions can be grouped in different archetypes capable of delivering different performance. Our results show that two alternatives models exist, and they can be interpreted in light of previous research addressing how institutions aim to create value for citizens through procurement (Erridge, 2007).

When the objective of the institution is to provide innovative and quality services to citizens, the decisions about procurement structural variables are combined to realize a user-oriented procurement model (Cluster 1). In this model, the objective is to satisfy the tailored procurement needs (e.g., public safety, transportation, recreation, social care, public works), adopting more decentralized organizations where activities are mostly driven by single departments, with low standardization in how the process is executed and limited technological support. In these organizations, although they are

inefficient from a process perspective and in the management of internal demand (thus, spending more), public procurement is able to buy goods and services reflecting the specific requirements of final users; this, in turn, potentially enables the local government to provide higher quality and more innovative goods and services to the citizens and internal users.

When the objective of the institution is efficiency, the decisions about procurement structural variables are combined to realize a cost-oriented procurement model (Cluster 2). In this model, the objectives are to manage the internal demand efficiently, control the spending budget, look for price savings, and use resources more efficiently; this can be done by adopting more centralized and standardized organizations, supported by several types of digital technologies. These procurement organizations, despite being more complex (and expensive) for local governments to design and implement, can help consolidate the procurement demand by standardizing and bundling. In this second case, the potential quality contribution to the services provided to citizens is moved to the background.

These findings complement previous contributions focused on the identification of public procurement models (Glas et al., 2017; Kamann, 2007; Patrucco, Walker, et al., 2019; Patrucco, Moretto, et al., 2019). While these works propose a differentiation of public procurement organization alternatives using an internal system perspective, our results start from the internal combination of structural variables but then identify two models that can be differentiated according to the outcomes they are able to deliver (quality vs. efficiency) and their external focus (more or less user orientation).

Do country, size, and spending impact public procurement structural decisions?

The contingent factors included in the analysis have a mixed impact on decisions regarding the public procurement structural variables.

If we focus on the level of centralization, the different locations of the municipalities (Italy and the US) seem to only partially affect the variables, with American municipalities having a higher tendency toward decentralized structures than Italian municipalities. The different tendencies of certain countries toward more centralized or decentralized public procurement is recognized in the literature (Glas et al., 2017; Patrucco, Walker, et al., 2019); thus, it is not surprising that different country settings present differences in this structural variable. The size seems to influence decisions about the level of centralization as well. For size, in terms of the intensity of spending, the trend is clear: local governments with higher procurement spending tend toward a higher centralization (in line with Dimitri et al.,

2006). This pattern seems less evident if we consider the size in terms of number of citizens: although local governments with a higher number of residents are likely to evolve from a decentralized management toward a more centralized public procurement, this does not necessarily mean they will adopt fully centralized structures.

For the level of digitalization and standardization, patterns are similar. In both cases, the country does not seem to impact decisions on these structural variables. For the level of digitalization, this can be explained by considering the similar level of technological maturity in the US and Italy (Baldus & Hatton, 2020; OECD, 2019; Patrucco, Moretto, et al., 2019); for the level of standardization, instead, we must consider several normative similarities between the European Directives and the US Federal Acquisition Regulation regarding the execution of public procurement. The impact of size is interesting as a contingent factor. For the level of standardization, we can see that, within the largest municipalities, those that have the highest number of citizens and greatest spending are those that have considerably standardized the procurement process. For the level of digitalization, instead, this conclusion is valid only for the intensity of spending; local governments with a higher spending are likely to adopt technology more extensively. This “size matters” trend, however, is not linear. If we look at Table 9, we can see that there is a reduction in the level of digitization and standardization for local governments in the middle classes for citizens and spending. This means that medium-sized municipalities are more likely to fit into the user-oriented procurement model, while large municipalities are more likely to adopt the cost-oriented procurement model.

In conclusion, contingent factors do matter, but they only seem to have a clear influence on structural variables in specific cases. The assumption behind this analysis is that contingent factors actually have a direct influence on procurement configurational variables, but they do not directly affect the procurement performance. In other words, the only channel through which contingent factors influence procurement performance is via the design of the process, which aligns with the contingency theory approach.

Conclusions and implications

In the public sector, the effective management of procurement is a mechanism that governments must exploit in periods of severe financial crisis, where governments at all levels are increasingly required to strictly control their budgets. Even in less turbulent times, an efficient procurement process can help to improve the quality and quantity of services for citizens.

With this study, we analyze data collected from Italian and American municipalities to contribute to the discussion on procurement structural variables. The results, summarized in [Figure 2](#), have several theoretical and managerial implications.

Theoretical contributions

Our results reveal statistical patterns that contribute to the current literature on public procurement design (Patrucco, Moretto, et al., [2019](#); Tadelis, [2012](#)). While it is not new to detect that the degree of centralization and digitalization relate to public procurement performance, the combined effects of these two variables are questioned yet rather unexplored in the literature (Albano & Sparro, [2010](#); Haim Faridian, [2015](#)). By concluding that digitalization has a positive impact on procurement efficiency, our findings advance the discussion of the strategic impact of technologies for public procurement. This adds another perspective in the debate over procurement centralization vs decentralization in the public sector by providing evidence that efficiency is not the prerogative of centralized procurement structures (Baldi & Vannoni, [2017](#); Dimitri et al., [2006](#); Karjalainen, [2011](#); Patrucco, Moretto, et al., [2019](#); Tkachenko et al., [2018](#); Wang & Li, [2014](#)). A decentralized management—more focused on the quality of purchases—can still mitigate the negative effects on cost by investing in more extensive use of technology that then becomes a lever for reducing the tradeoff between quality of purchases and efficiency of public procurement. In this regard, we demonstrate that higher digitalization of procurement contributes to achieving higher efficiency and better demand management, providing more evidence of the benefits of IT investments in the public sector, specifically for the procurement process (Nurmandi & Kim, [2015](#); Walker & Brammer, [2012](#)). Further, we conclude that process standardization in public procurement does not have a significant relation to performance—a surprising finding, because it is usually assumed that standardization of the procurement process execution would somewhat affect efficiency (Pemer & Skjølsvik, [2016](#)).

Next, by identifying two different models for public procurement structures in local governments, the study contributes to public sector organizational design literature (Jung, [2013](#)). Some studies investigate public procurement structures (Glas et al., [2017](#); Patrucco, Walker, et al., [2019](#)), but they have not linked structural variables to performance effects.

Finally, the exploration of the impact of external factors on the structural variables operationalizes organizational contingency theory in the context of public procurement (Patrucco, Moretto, et al., [2019](#); Walker & Andrews, [2015](#)).

Managerial contributions

Our findings may be useful for policymakers and public managers, who should be aware that government performance also depends on the decision-making of procurement configuration. The possibility to change procurement to improve its role (and contribution) strictly depends on how procurement is recognized by the authorities. These motivations must arise from top institutional levels, which should promote public procurement's role for improving public institution performance. It may also help the practice to configure its organization either in an innovative and quality-focused way (user-oriented procurement) or in an optimized efficiency way (cost-oriented procurement). These archetypes can be used as guiding landmarks for public procurement practice. More generally, decision-makers can consider the interplay between contingent factors, design choices, and procurement results when experimenting with different solutions in configuring public procurement.

In this sense, we are aware that the statistical approaches employed are not able to provide complete information about the causal relationships, as there can well be endogeneity issues not captured by the generalized model (e.g., non-observable organizational factors that influence the centralization level of the process and its performance). Regardless, the findings can be interpreted as robust statistical associations, and they can provide a suggestive evidence of key relationships between (i) important public procurement structural variables and (ii) indicators of relevant performance dimensions. The existence (or absence) of such relationships can inform the decision-makers within each organization.

Limitations and future developments

This research presents limitations in the methodology adopted, opening avenues for future research. First, the sample includes only large municipalities, making it necessary to explore if findings change in small municipalities. Second, the sampling strategy was designed to target local governments, thus limiting the unit of analysis and the possibility of generalizing our results to all other levels or types of public institutions. Suggestions for future researchers include the exploration of these relationships in other public administrations (e.g., central governments, universities). Third, the survey was designed and implemented with only two countries; further research might replicate the same studies in other countries.

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Notes on contributors

Andrea S. Patrucco is Assistant Professor of Supply Chain Management at FIU College of Business, and one of the research leaders of the International Research Study on Public Procurement group. His research focuses on performance management and organizational design in Public Procurement, and the orchestration of Buyer-Supplier Relationships. He actively collaborates with procurement organizations in the United States (NIGP and NASPO). His research has appeared in *Journal of Supply Chain Management*, *International Journal of Production Economics*, *International Journal of Production Research* and *Journal of Purchasing and Supply Management*.

Tommaso Agasisti is Full professor at Politecnico di Milano School of Management. His research activity focuses on Economics, Finance and Management of the public sector, with a specific focus on education and local governments. His research has appeared in *Higher Education*, *Studies in Higher Education*, *Public Policy and Administration*, *Public Money and Management*, *Public Performance and Management Review*.

Andreas H. Glas is Assistant Professor in the Working Field Procurement and Supply Management at Bundeswehr University Munich. His research investigates buyer-supplier cooperation and is in particular focusing on performance-based contracts and service-based innovation. He co-edited the book *Performance-based Logistics* and is working on several research topics linked to projects in the automotive, manufacturing and aerospace industries.

ORCID

Tommaso Agasisti  <http://orcid.org/0000-0002-8146-3079>

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