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The influence of government capacity on contract management efficiency: Evidence from green public procurement

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IMPACT

Improving contract management efficiency is of key scholarly and practical interest, as greater contract management efficiency is expected to improve contractor performance and public organizations' goal achievement. This study examines how contract management capacity (CMC) and organizational size influence contract management efficiency. Higher CMC—measured by staffing resources—significantly enhances contract management efficiency within green public procurement. Additionally, the analysis reveals that larger organizations demonstrate higher contract management efficiency. Public organizations may achieve noticeable improvements in contract management efficiency by increasing their number of procurement officers. Furthermore, the study indicates that, even within existing staffing constraints, procurement departments can enhance contract management efficiency by implementing a systematic compliance approach—including focusing compliance efforts on high-risk areas and clearly delineating responsibilities between the central procurement department and the specialized public service departments.

ABSTRACT

Utilizing a novel and precise measure of contract management capacity (CMC), this study finds that higher CMC significantly enhances contract management efficiency within green public procurement. The relationship is likely driven by a mechanism in which greater CMC facilitates the development of higher-quality contracts from the outset of the procurement process, as well as more effective subsequent supplier monitoring. Additionally, the analysis reveals that larger organizations, on average, demonstrate higher contract management efficiency—probably because they are better positioned to support specialization in contract management functions. The findings underline the importance of public organizations investing in CMC—such as hiring an adequate number of procurement officers—in order to improve management efficiency. By employing an improved measure of CMC and simultaneously controlling for a range of potential confounders, the study provides a more precise estimate of the effect of CMC than has previously been reported in the procurement/contracting literature.

KEYWORDS

Contract management capacity; contract management efficiency; contracting out; Danish local government; government capacity; green public procurement (GPP); organizational size; sustainable procurement

Introduction

Public procurement is increasingly being regarded by both scholars and practitioners as a strategic function aimed at advancing broad policy objectives (Patrucco et al., 2024, p. 3). One key implication of this shift has been a growing emphasis on socially-responsible, innovative, and sustainable procurement practices (Hafsa et al., 2022; Dimand & Neshkova, 2024). The shift toward more strategic procurement probably necessitates enhanced management capacity. Specifically, increased contract management capacity (CMC) is needed to ensure that contracting authorities not only possess sufficient regulatory knowledge but also demonstrate competencies in areas such as strategic thinking, stakeholder engagement, and data utilization (Patrucco et al., 2024, p. 12).

CMC can be expected to positively influence contract management efficiency and, in turn, contractor performance (Romzek & Johnston, 2002; Brown & Potoski, 2003; Joaquin & Greitens, 2012; Petersen et al., 2019; Brunjes et al., 2023; Casady et al., 2023). Investments in public organizations' CMC can thus enhance the ability to evaluate contractors, adjust supplier incentives, foster mutual collaboration and trust between the public authority and the suppliers, and improve contractor performance.

Several studies suggest that, under certain conditions, increased CMC leads to more efficient contract management. For instance, devoting resources to, and providing intensive training in, contract management positively impacts contract implementation and management (Romzek & Johnston, 2002). Moreover, investments in CMC help mitigate contracting risks and reduce transaction costs (Brown & Potoski, 2003; Petersen et al., 2019; Casady et al., 2023).

The literature on public procurement/contracting has made substantial progress in examining the role and characteristics of CMC (Brown & Potoski, 2003; Brown & Potoski, 2006; Yang et al., 2009; Petersen et al., 2019; Casady et al., 2023). However, empirically determining the effect of CMC continues to be a challenge. In particular, it has proven difficult to measure CMC precisely and disentangle its effects from those of population size and local financial conditions. This is because CMC has typically been measured using survey instruments that ask

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government representatives whether they engage in specific procurement activities (for example Brown & Potoski, 2003; Brown & Potoski, 2006; Yang et al., 2009; Joaquin & Greitens, 2012), or through proxy indicators derived from administrative records—such as population size, financial resources, or the proportion of administrative professionals (for example Petersen et al., 2019). Also, the survey measures have been developed over time to capture CMC across several sub-dimensions—for example, the capacity for agenda setting, contract formulation, implementation, and evaluation (Yang et al., 2009; Joaquin & Greitens, 2012).

Table 1. Examples of previously used concepts and indicators for measuring aspects of CMC.

Brown & Potoski, 2003 ('contract-management capacity')

- *Feasibility capacity:* A binary variable coded as 1 if the government in the survey reported having studied the feasibility of adopting private service delivery within the past five years.
- *Implementation capacity:* A binary variable coded as 1 if the government in the survey reported having undertaken specific activities to support the successful implementation of private service delivery.
- *Evaluation capacity:* A binary variable coded as 1 if the government in the survey reported using defined techniques to systematically evaluate its private service delivery efforts.
- *Total capacity:* A composite measure representing the sum of the three individual capacity indicators (range: 0–3).

Yang et al., 2009 ('contracting capacities')

- *Agenda-setting capacity:* An index comprising four survey items measured on a seven-point Likert-type scale, including motivations and goals, identification of services suitable for contracting out, and the transparency and organization of the 'make-or-buy' decision-making process.
- *Formulation capacity:* An index comprising five survey items measured on a seven-point Likert-type scale, assessing aspects such as contract negotiation and development, the presence of standard contract management procedures, availability of information about contractors, contract specificity, and clarity of responsibility and accountability.
- *Implementation capacity:* An index comprising five survey items measured on a seven-point Likert-type scale, covering regular meetings and communication with contractors, collaboration, standardized service procedures or protocols, and the availability of resources for contract implementation.
- *Evaluation capacity:* An index comprising four survey items measured on a seven-point Likert-type scale, including the existence of a formal monitoring system, use of monitoring techniques, performance reporting practices, and the frequency of monitoring activities.

Joaquin & Greitens, 2012 ('contract management capacity')

- *Agenda-setting capacity:* A binary variable based on the survey question: 'Has your local government studied the feasibility of adopting private service delivery within the past five years?'
- *Formulation capacity:* A binary variable based on the survey question: 'Has your local government undertaken any activities to ensure success in implementing private service delivery?'
- *Implementation capacity:* A binary variable based on the survey question: 'Has your local government encountered any obstacle in adopting private service delivery?'
- *Evaluation capacity:* A binary variable based on the survey question: 'Does your local government use any techniques to systematically evaluate its private service delivery?'

Alkadry et al., 2019 ('size and capacity to handle sustainable buying')

- *Number of staff in purchasing units:* This indicator was measured using a survey primarily targeting local government managers and procurement personnel, which included a question regarding the number of staff employed in their purchasing units (response rate was 16.3%).

Petersen et al., 2019; Casady et al., 2023 ('administrative capacity' and 'financial capacity')

- *Administrative capacity:* Measured as the number of full-time administrative employees per 1,000 inhabitants in the local contracting authority, based on registry data.
- *Financial capacity:* Measured as the local government's wealth, operationalized as the average tax base per 1,000 inhabitants, based on registry data.

Table 1 provides an overview of previous approaches to measuring various aspects of CMC, highlighting both the similarities and differences in the concepts, indicators, and data sources employed.

While both survey-based measures and proxies derived from administrative records may serve as reasonable approximations of CMC, they may also be imprecise. For instance, survey responses regarding procurement practices can be subject to measurement error and suffer from low response rates (Brown & Potoski, 2006; Rosell et al., 2024). Moreover, commonly used proxies derived from administrative records—such as local financial resources—may reflect broader resources allocated to purposes other than CMC.

In other words, government capacity is frequently cited as a critical factor for successful contract management and high performance by private providers. However, upon closer examination, there are considerable differences in how government capacity is understood and measured in both research and practice. Organizational capacity, for example, has been conceptualized as comprising a range of internal factors—such as organizational infrastructure, human resources, financial resources, and management systems—as well as external factors, including the political and market environments (Christensen & Gazley, 2008). This article defines and measures CMC in a manner that distinguishes it from other potential drivers of contract management efficiency. Such clarification is essential for advancing research and for providing more precise policy recommendations on how public organizations can improve contract management efficiency.

The article contributes to the literature on public procurement/contracting by examining how the level of CMC influences contract management efficiency. CMC is measured using a novel dataset on the number of procurement officers in Danish local governments set in proportion to local purchase volume. By employing this improved measure of CMC—while simultaneously controlling for a range of potential confounding variables—this article offers a more accurate estimate of the effect of CMC.

The context of the study is Danish local governments' efforts to manage private vendors' compliance with green procurement requirements—an area that places substantial demands on CMC (Sönnichsen & Clement, 2020; Plaček et al., 2021). The Danish central government has one of the world's most ambitious emission reduction targets, with green public procurement (GPP) expected to play a pivotal role in achieving the target (Ministry of Finance, 2020). Accordingly, Danish local governments have been compelled to incorporate green criteria into their procurement practices, thereby intensifying the need for supplier monitoring of green requirements.

This article aims to both estimate how the level of CMC affects contract management efficiency and to control for potential confounders such as population size and financial resources. In doing so, this study addresses a significant gap in the literature and offers valuable practical insights into how public organizations can strengthen their management capacity in the area of green procurement in particular—and possibly also in public procurement more broadly.

Theoretical-conceptual framework

This section presents the theoretical-conceptual framework which introduces the key concepts of contract management efficiency, CMC, and organizational size. Based on the framework, two hypotheses are formulated: one concerning the relationship between CMC and contract management efficiency within the context of GPP, and the other concerning the relationship between organizational size and contract management efficiency, also within the GPP context.

Contract management efficiency

In line with Romzek and Johnston (2002, pp. 430–431), contract management efficiency is defined here as a public organization's ability to evaluate contractor performance and address deficiencies by ensuring matters such as timely and accurate reporting from private contractors. Higher contract management efficiency is expected to improve contractor performance, for instance by reducing the likelihood of vendor opportunism and costly disputes (Petersen et al., 2019). Contract management efficiency is linked to contractor performance as effective monitoring and enforcement are expected to enhance both contract outputs and contract outcomes (Brunjes et al., 2023).

Contract management capacity and GPP

Contract management capacity: CMC can be regarded as a sub-category of public sector capacity. Public sector capacity refers to the skills, capabilities, and resources necessary to carry out policy functions, ranging from public service delivery to policy design and implementation (Wu et al., 2018; Mazzucato & Kattel, 2020). Public sector capacity encompasses both inputs—often referred to as 'resources'—and the systematic deployment and adaptation of this input, commonly described as 'organizational capabilities' (Piening, 2013). One form of public sector capacity is administrative capacity, understood as the public bureaucracy's ability to contribute to governance innovation and public problem-solving (Lodge & Wegrich, 2014). Four types of administrative capacity can be distinguished: the capacities to deliver, co-ordinate, regulate, and analyse (Lodge & Wegrich, 2014).

Related to the above administrative capacities is CMC, which is defined as a public organization's ability to assess procurement feasibility, solicit bids, select providers, negotiate contracts, and evaluate contractor performance (Brown & Potoski, 2003). To perform these functions effectively, contracting authorities need personnel with expertise in regulatory frameworks, strategic thinking, stakeholder engagement, and data utilization (Patrucco et al., 2024; Grimbert et al., 2024).

Higher CMC is expected to enhance contract management efficiency, as sufficient capacity may facilitate the development of higher-quality contracts from the outset of a procurement process and, in turn, enable more effective monitoring of supplier performance—including the ability to correct behaviour and strengthen collaboration and trust between public authorities and suppliers. In practice, building CMC typically involves 'hiring and training administrative, legal, and managerial staff to serve as purchasers, contract drafters, contract specialists, contract managers, and contract enforcers' (Petersen et al., 2019, p. 4). In other words, CMC depends on the number of procurement officers employed as well as on their skills, strategic orientation, work practices, and their use of relevant data and tools.

When CMC is sufficiently developed, contracting risks are expected to decrease. Higher CMC may reduce contracting risks by facilitating stronger contract design, limiting the scope for vendor opportunism, and fostering improved communication and trust between the contracting authority and private suppliers (Brunjes et al., 2023).

The specific activities that constitute efficient contract management may vary across markets and services as well as depend on the initial level of trust between the contracting authority and the vendors (Brown & Potoski, 2003; Van Slyke, 2007; Brown et al., 2018). In this context, a substantial body of literature suggests that product and service characteristics—such as asset specificity, complexity, and measurability—influence contracting risks and, by extension, the required level of CMC (Brown & Potoski, 2003; Petersen et al., 2019; Anguelov, 2020).

The demands of GPP on CMC: Although GPP encompasses a diverse range of tasks, products, and services with varying levels of complexity, it is generally assumed that GPP places substantial demands on CMC (Sönnichsen & Clement, 2020; Plaček et al., 2021). That is, the risks of disputes and vendor opportunism may be high in the context of GPP. Two factors can explain this:

- First, many contracting authorities and private vendors remain relatively inexperienced with GPP practices (Michelsen & de Boer, 2009; Preuss & Walker, 2011; Dimand & Cheng, 2023), which may impede the development of trust, the establishment of collaborative contractual frameworks, and a shared understanding of risks (Van Slyke, 2007; Brown et al., 2018).
- Second, persistent challenges in obtaining reliable performance data on GPP—such as accurate information on suppliers' environmental impacts—increase contracting risks and heighten the need for robust CMC (Sönnichsen & Clement, 2020; Patrucco et al., 2024).

Based on the preceding considerations, the first hypothesis is:

> *H1: A higher level of CMC is associated with a higher level of contract management efficiency in GPP.*

Organizational size

sA positive effect of organizational size on contract management efficiency may be expected, even after accounting for CMC. Two arguments support this expectation.

First, larger organizations may, in some cases, benefit from economies of scale in public procurement (Brown & Potoski, 2003, p. 156). For example, the additional effort required by procurement officers to prepare a food tender for 50 daycare units may increase less than proportionally compared to the effort needed for a tender covering five units. Furthermore, all else being equal, larger organizations have more specialized procurement departments, enabling individual officers to specialize in areas such as contract

management and sustainable procurement (Michelsen & de Boer, 2009; Smith & Terman, 2016).

Second, larger organizations often possess greater buyer power. This is because higher procurement volumes make large public entities more influential customers, thereby increasing private suppliers' incentives to comply with the sustainability requirements set by these buyers (Marron, 1997; Strömbäck, 2015).

While studies do not generally identify organizational size as a key driver in public procurement (Brammer & Walker, 2011; Prier et al., 2016; Testa et al., 2016; Sönnichsen & Clement, 2020), organizational size may play a particularly important role in supplier monitoring in GPP. The underlying rationale is that larger organizations are better equipped to support specialization, allowing them to employ dedicated contract managers (Michelsen & de Boer, 2009; Testa et al., 2012; Smith & Terman, 2016). By contrast, in smaller organizations, contract management is often performed by a procurement officer who is also responsible for contract preparation and issuing tenders—tasks that might be prioritized over subsequent monitoring activities.

In sum, based on the arguments above, the following hypothesis is proposed:

H2: Larger public organizations are associated with higher levels of contract management efficiency in GPP.

H2 is based on arguments related to economies of scale and buyer power. Parts of the literature, however, suggest that organizational size is not necessarily associated with greater contract management efficiency—and may even diminish it when factors such as the content of the GPP strategy are considered (Bryngemark et al., 2023).

One explanation for this is that there may be no independent effect of population size once local investments in CMC are accounted for. For instance, the relative number of procurement officers, rather than population size, may be the primary driver of contract management efficiency. Another possibility is that larger organizations may, in some instances, even experience diseconomies of scale in contract management. For example, collaboration with internal departments and private suppliers might be less flexible in larger organizations adhering to more bureaucratic values (Walker, 2014; Dimand & Cheng, 2023).

Methods

The study covered the 98 Danish municipalities, which are responsible for approximately half of all public procurement in Denmark. These municipalities are multi-purpose entities tasked with delivering a broad range of services, including daycare, education, eldercare, labour market programmes, spatial planning, infrastructure, and cultural services. The primary reason for not including the central government level or the regional government level in Denmark (comprising five regions) is the study's focus on examining comparable political units that share similar task portfolios and operate under the same legal conditions for GPP.

Methodologically, the article employs a mixed-methods research design (Hendren et al., 2023) incorporating both quantitative and qualitative evidence from the municipalities (see Figure 1). The quantitative component uses multiple regression to estimate the independent effects of CMC and organizational size on contract management efficiency. The qualitative component explores the underlying mechanisms at work in four Danish municipalities, thereby helping to substantiate or challenge the proposed mechanisms between the variables.

As shown in Figure 1, the quantitative and qualitative approaches are seen here as complementary—each offering distinct methodological advantages—in addressing the same overarching research question and related hypotheses (Gerring, 2011, pp. 362–366). The following sections elaborate on Figure 1 by detailing the mixed-methods

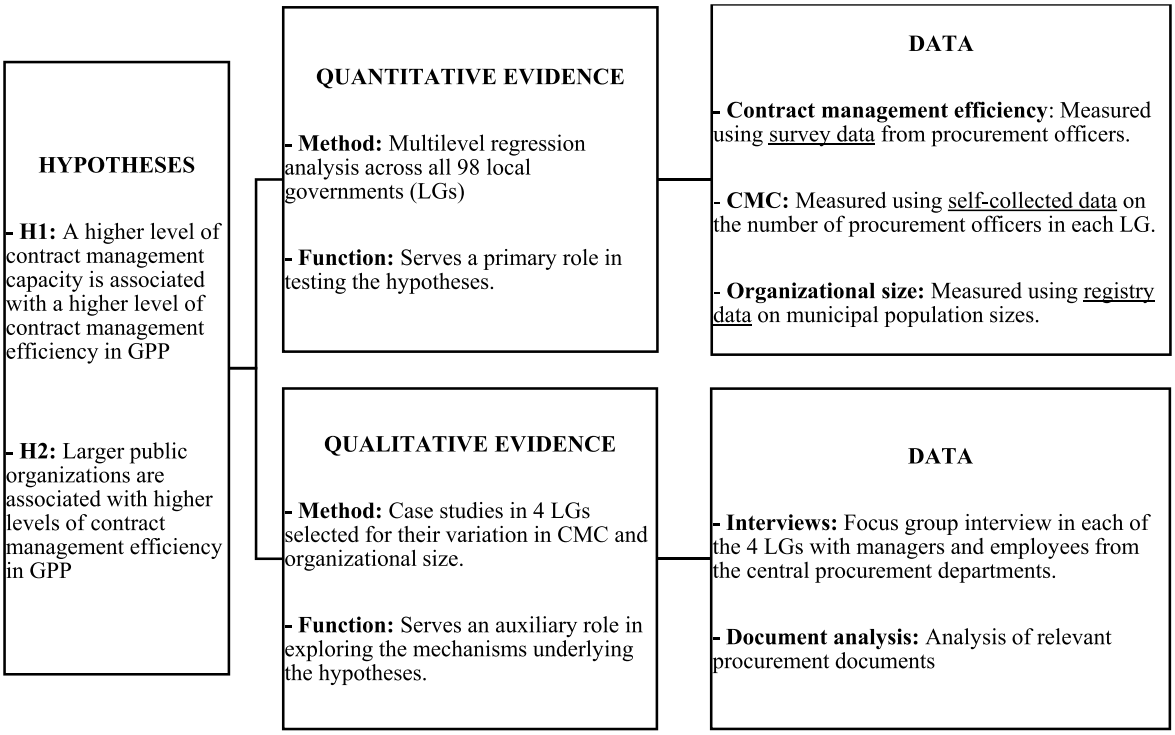


Figure 1. The mixed-methods research design.

research design, including the indicators and data used in the quantitative and qualitative approaches.

Research design

Quantitative evidence: The quantitative component of the research design is based on multilevel regression analysis that incorporates both individual-level and municipal-level variables.

The individual-level data were from a survey sent to local government (LG) procurement officers. The survey was distributed via email to a list of procurement employees across all 98 Danish municipalities. The list was provided by the Danish Association of Public Purchasers. Although the Danish Association of Public Purchasers has extensive coverage of municipal purchasers, the respondent list was further refined by manually checking websites and contacting individual municipalities. Ultimately, the survey was sent to 581 municipal procurement officers, which, to the best of our knowledge, covers the vast majority of procurement staff working within municipal procurement functions. Of the 581 procurement officers contacted, 271 responded to the survey, resulting in a response rate of 47%. These 271 respondents represent 84 out of the 98 municipalities, corresponding to a municipal coverage rate of 86% (see Rosell et al., 2024, for a discussion of survey response rates in GPP research).

Subsequently, the survey data at the individual level were merged with municipal-level register data. Most of the municipal-level variables were drawn from existing registers, with the exception of the local number of procurement officers, which was determined through a separate procedure (see the section on 'Indicators and data').

To test the two hypotheses, multilevel regression was applied to the dataset. Multilevel regression accounts for the hierarchical structure of the data, where respondents are nested within municipalities. The following model was estimated:

$$\begin{aligned} &\textit{Contract management efficiency}_{ji} \\ &= \beta_0 + \beta_1 \textit{Capacity}_j + \beta_2 \textit{Size}_j + \beta_3 \textit{Controls}_j + \beta_4 \textit{Controls}_{ji} \\ &\quad + \varepsilon_{ji} \end{aligned}$$

In the specification, $\textit{Contract management efficiency}_{ji}$ refers to respondent i's assessment of contract management efficiency in municipality *j*. $\textit{Capacity}_j$ is the relative number of procurement officers in municipality *j*, while $\textit{Size}_j$ is the population size (ln) of municipality *j*. Additionally, control variables are included at both the municipality level and at the respondent level ($\textit{Controls}_j$ and $\textit{Controls}_{ji}$). The notation ε_{ji} constitutes the error term.

The model was estimated using random effects, with standard errors clustered at the municipality level to account for potential intra-municipality dependence among respondents.

Qualitative evidence: The quantitative component was complemented by case studies conducted in four strategically selected municipalities. The purpose of the case studies was to provide insights into the possible mechanisms through which CMC and organizational size influence contract management efficiency. The case studies primarily serve an auxiliary role in exploring the potential mechanisms linking the key variables identified in the regression analysis, and secondarily, function as a form of data triangulation (Gerring, 2011, pp. 332–333; Hendren et al., 2023).

In each of the four municipalities, a 1.5-hour focus group interview was conducted with the local procurement manager and one or two procurement officers from the central procurement department. Additionally, relevant documents were collected from the municipalities, such as work descriptions related to contract management, sustainable procurement and GPP.

The four cases were selected based on variation in the two main independent variables: organizational size (small/large) and CMC (low/high). As shown in Figure 2, the four local governments represent various combinations of these two variables. Two of the four municipalities had populations below the Danish municipal population average of 60,000 inhabitants, while the other two municipalities had populations well above the average. Similarly, two of the municipalities had a below-average number of procurement officers relative to their purchasing volume, while the other two municipalities were among the top 10% in terms of the relative number of procurement officers.

Also, all four municipalities were part of a total of 22 municipalities that, at the time of the interviews, had politically committed to prioritizing green procurement by

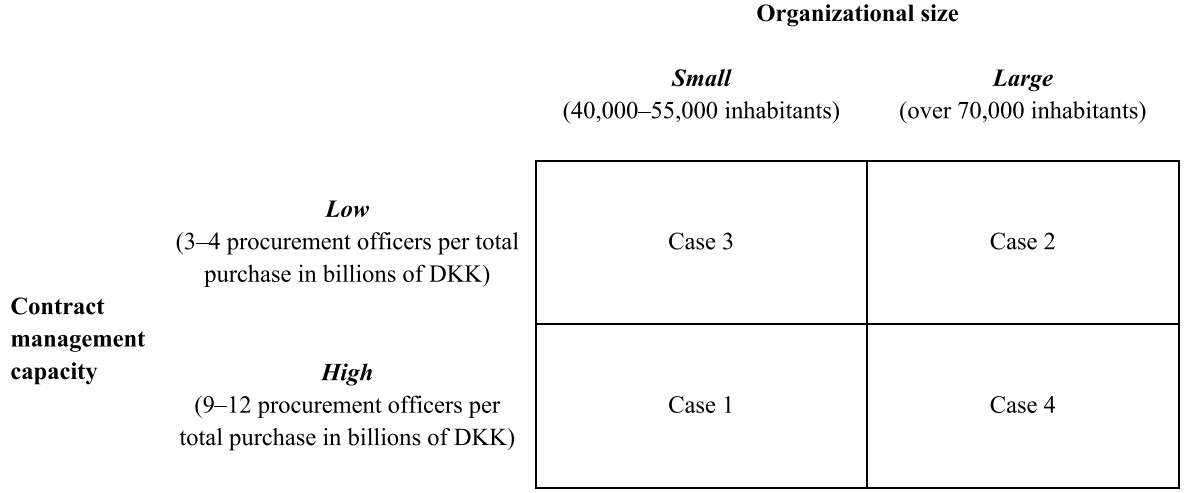


Figure 2. The four case study municipalities.

joining the Danish Partnership for GPP (POGI). This POGI partnership involves a variety of networking initiatives and commits its members to a set of green procurement goals. The rationale for restricting the municipal selection to POGI members was to 'hold constant' the local political commitment to GPP, thereby providing a clearer understanding of the distinct roles of CMC and organizational size for contract management efficiency.

Indicators and data

Contract management efficiency is defined as the ability of a public organization to evaluate contractor performance and correct deficiencies. Contract management efficiency is measured by respondents' level of agreement with the following statement included in the survey regarding their workplace: 'We are good at ensuring that green requirements are subsequently complied with by the suppliers'. Respondents were asked to indicate their level of agreement on a seven-point scale, ranging from 'completely disagree' to 'completely agree'. Accordingly, the indicator captures the procurement officers' *perception* of the local level of contract management efficiency. An advantage of the indicator is that it is based on the judgments of the procurement officers who are directly involved in daily contract management activities.

Figure 3 shows the variation in the indicator for contract management efficiency. According to the figure, approximately one-third of respondents believe their workplace is effective at ensuring that green requirements are complied with by external suppliers (response categories 5–7), while almost half of the respondents disagree with this statement (response categories 1–3).

A limitation of the indicator of contract management efficiency is that it is based on procurement officers' perceptions rather than on observable behaviour. As such, the indicator reflects procurement officers' subjective understanding of what constitutes efficient contract management of private vendors. This might raise concerns. In particular, procurement officers in municipalities with more ambitious GPP goals may assess contract management efficiency against a higher standard than their counterparts in municipalities with less ambitious GPP goals. To address this, a control variable to capture local green ambitions was included ('Ambitious greenhouse gas reduction target').

CMC was measured by counting the number of procurement officers in the central procurement department relative to the local purchase volume (in billions of DKK). The indicator thus primarily captures CMC in terms of inputs or resources, rather than organizational capabilities. As a result, the statistical models estimate the effect of the number of procurement officers without accounting for aspects of CMC related, for example, to staff competencies and work practices. These broader dimensions of CMC were instead examined in the four qualitative case studies, which offer a more comprehensive account of CMC—also encompassing the organization, management, and training of procurement personnel.

As a robustness check, CMC was also operationalized as the number of procurement officers relative to the local population size (per 100,000 inhabitants).

The number of procurement officers in each municipality was determined through a two-step procedure. (For further information about this two-step procedure, a table is available from the author upon request.) First, desk research was conducted to identify the number of procurement officers listed on municipal websites and in job advertisements. Using this approach, the number of central procurement officers was identified in 54 out of the 98 municipalities. In the second step, the remaining 44 municipalities were contacted via email and/or telephone, resulting in the identification of procurement officer counts in a further 43 municipalities. In total, information on the number of procurement officers was obtained for 97 out of 98 municipalities.

Figure 4 shows the variation in the resulting CMC indicator. The figure shows noticeable variation in procurement officer investments across Danish local governments. For example, the relative number of procurement officers is approximately six times higher in the cluster of municipalities with the most procurement officers compared to those with the fewest procurement employees.

As an alternative indicator of CMC, a variable was created to capture perceived resources in the central procurement function. This variable was based on two survey items, where respondents were asked to indicate their agreement

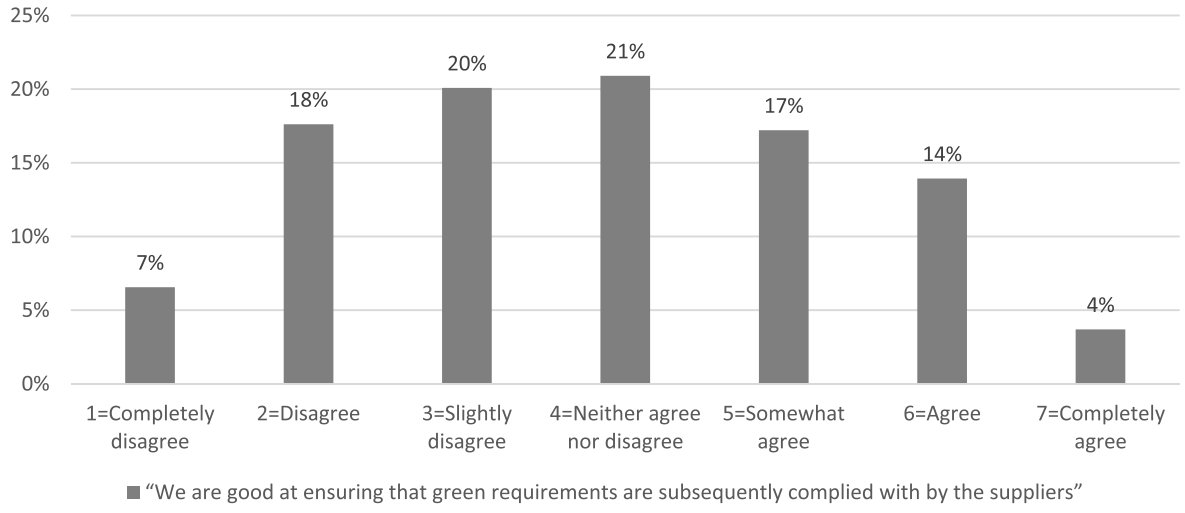


Figure 3. Contract management efficiency (N = 244).

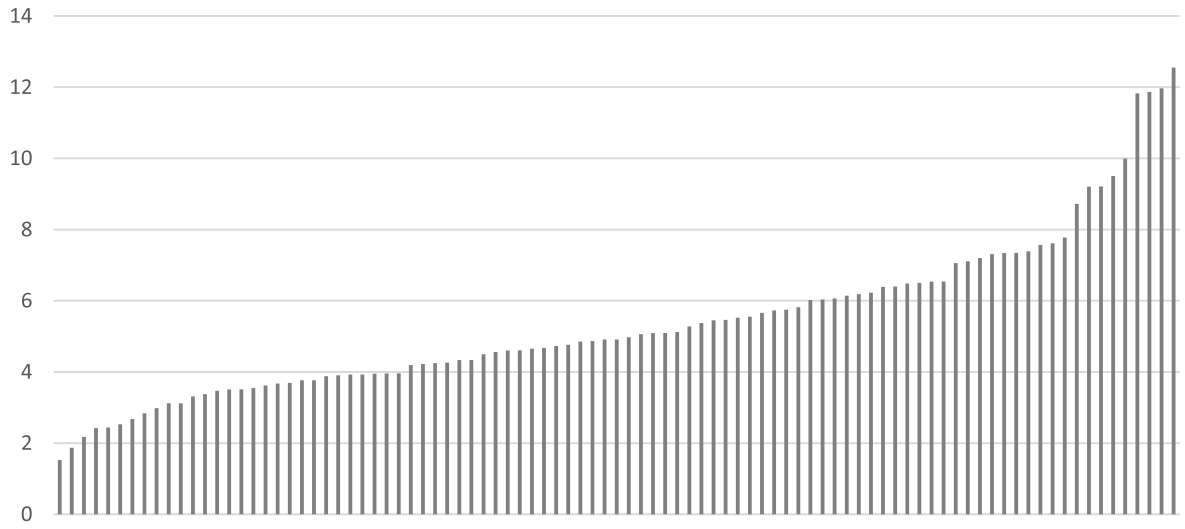


Figure 4. Procurement officers in Danish local governments (per total purchase in billions of DKK).

Note: N = 93 municipalities. Five municipalities are not included in Figure 4, including four small islands and one municipality that did not respond to this study.

with the following two statements: 'We lack resources at my workplace to lift the agenda on green procurement' and 'We have enough resources to thoroughly investigate the market and suppliers for green solutions'. Based on these two items, an index was created (standardized to have a mean of 0 and a standard deviation of 1, Pearson's r = 0.49).

Organizational size: The other main independent variable, *organizational size*, was measured by the municipality's population (ln). For a local government, a relevant measure of size is the number of inhabitants to whom the local government provides services. Normally, municipal population size should correlate strongly with the total volume of municipal purchases. Consistent with standard practice in studies of Danish local governments, municipal population size was log-transformed due to high skewness of the untransformed variable (Petersen et al., 2015).

Furthermore, to account for unique small-scale production and market conditions, a dummy variable was included indicating whether the respondent was from one of four small municipal islands. This variable was included because these islands are significantly smaller—each with fewer than 15,000 inhabitants—than the average Danish municipality and face distinct challenges related to scale and transportation, often relying on ferry services. Such conditions tend to discourage private contractors from participating in the market.

Other independent variables: Control variables were included to mitigate omitted variable bias. First, fiscal pressure was accounted for, as less prosperous local governments may lack the financial resources necessary to invest in GPP compliance (Young et al., 2016). In accordance with standard practice in studies involving Danish local governments, fiscal pressure was measured as the ratio of local spending needs to the municipality's tax base (for example Petersen et al., 2015).

Second, two variables capturing local political preferences were included: the local green voter percentage and the municipality's greenhouse gas reduction target. Given the increasing politicization of environmental and climate change issues (Fisher et al., 2022), voter preferences can be expected to shape local governments' contract management efforts within GPP. Specifically, a higher green voter percentage may be expected to provide local politicians and procurement departments with a stronger mandate to pursue and enforce GPP. Green voter percentage is measured as the percentage of voters in each municipality who supported one of the four prominent green parties in the most recent national election: the Red-Green Alliance (Ø), the Socialist People's Party (SF), the Social-Liberal Party (B), and the Alternative (Å). This national measure is considered the most accurate indicator of green voter preferences at the local level, as green attitudes are difficult to discern from party affiliation in local municipal elections. To ensure transparency, however, the statistical analyses were also conducted using the proportion of left-wing mandates in the municipal council as an alternative indicator of political preferences, given that left-wing parties are generally associated with more environmentally oriented policies (a table with this material is available from the author upon request).

Additionally, a dummy variable was included for the group of municipalities with the most ambitious greenhouse gas reduction targets—specifically, the municipalities that aim

Table 2. Descriptive statistics.

Variable	Observations	Mean	SD	Min	Max
Contract management efficiency	244	3.8	1.6	1.0	7.0
Procurement officers (per total purchase in billions of DKK)	244	6.1	2.7	1.5	12.5
Procurement officers (per 100,000 inhabitants.)	244	12.6	6.1	4.9	56.5
Perceived procurement resources (z score)	214	0.0	1.0	-1.4	2.9
Population size (ln)	244	11.3	1.0	7.5	13.4
Small island (dummy)	244	0.02	0.14	0.0	1.0
Fiscal pressure (index 100)	244	1.0	0.17	0.4	1.4
Green voter percentage	244	19.7	10.3	6.9	44.7
Left-wing mandates (%)	244	50.1	14.1	11.1	73.7
Ambitious greenhouse gas reduction target (dummy)	244	0.26	0.44	0.0	1.0
Clear GPP strategies/plans	216	5.0	1.6	1.0	7.0
Manager (dummy)	216	0.27	0.44	0.0	1.0
In central purchasing function (dummy)	216	0.87	0.34	0.0	1.0
Education (master's degree dummy)	216	0.64	0.48	0.0	1.0
Age (years)	216	44.7	11.3	24	68
Female (dummy)	216	0.56	0.50	0	1

for CO_2 neutrality by 2030. Such an ambitious CO_2 goal may increase the local demands placed on public compliance efforts, as the scope of green procurements is likely to be greater and, accordingly, more burdensome to monitor.

Third, the clarity of local GPP strategies was controlled for, as a clear strategy is expected to promote a more systematic approach to GPP compliance. The clarity of the GPP strategy was measured by respondents' assessments of the extent to which their workplace has a well-defined strategy and/or action plan for implementing GPP.

Finally, the respondents' background characteristics were controlled for, including job position (manager or employee), educational attainment, age, and gender. Descriptive statistics for all included variables are presented in Table 2.

Results

Quantitative findings

The influence of CMC (H1): The models in Table 3 test the relationship between the main independent variables—CMC and organizational size—and contract management efficiency. Model 1 shows the bivariate relationship between CMC and contract management efficiency. Model 2 adds municipal-level variables, including organizational size, while Model 3 adds variables at the level of the respondent. Models 4 and 5 show specifications with the alternative indicator for CMC, 'Perceived procurement resources'.

As expected, Models 1–3 show a positive and statistically significant relationship between CMC and contract management efficiency ($p < 0.01$). The effect size does not change when municipal-level variables are included (Model 2), and increases somewhat when individual-level variables are added in Model 3.

The estimated effect size is substantial. In the preferred Model 3, a municipality with median CMC that doubles its number of procurement officers was estimated to increase contract management efficiency by 1.0 point on the seven-point scale.

Figure 5 illustrates the predicted effects from Model 3 across the full range of local capacity levels. Figure 5, for instance, demonstrates that increasing the number of procurement officers from 2 to 12 per total purchase in billions of DKK increases contract management efficiency from 3 to 5 (on the seven-point scale). Also, when the alternative operationalization of the number of procurement officers—measured relative to the local population size—is used, the significant results remain largely unchanged (a table is available from the author upon request).

Table 3. What drives contract management efficiency?

	(1) Contract management efficiency	(2) Contract management efficiency	(3) Contract management efficiency	(4) Contract management efficiency	(5) Contract management efficiency
Contract management capacity					
Procurement officers (per total purchase in billions of DKK)	0.122***	0.132***	0.200***		0.199***
	(3.28)	(3.08)	(4.11)		(4.24)
Perceived procurement resources (z score)				0.341***	0.316***
				(3.12)	(2.90)
Scale economies					
Population size (ln)		0.399***	0.333**	0.150	0.312*
		(2.62)	(2.09)	(0.75)	(1.86)
Small island (dummy)		1.025	0.969	1.291**	0.786
		(1.22)	(1.57)	(2.17)	(1.34)
Economic situation					
Fiscal pressure (index 100)		1.303**	1.855***	1.690**	1.744***
		(2.26)	(2.66)	(2.19)	(2.79)
Political preferences					
Green voter percentage		0.0674***	0.0572***	0.0676***	0.0524***
		(3.58)	(2.90)	(3.09)	(2.75)
Ambitious greenhouse gas reduction target (dummy)		-1.339***	-1.352***	-0.884**	-1.342***
		(-4.49)	(-4.32)	(-2.38)	(-4.11)
Organization and management					
Clear GPP strategies and plans			0.262***	0.218***	0.222***
			(4.93)	(3.48)	(3.57)
Respondent characteristics (position, education, age, gender)	No	No	Yes	Yes	Yes
N	245	244	216	214	214
Municipalities	84	84	80	79	79

Note: Multilevel regression with municipality-specific intercepts (random). Municipalities defined as groups. Standard errors clustered at the municipality level, z-statistics in parentheses. *p < 0.10. **p < 0.05. ***p < 0.01. The complete model specification with all control variables is available from the author upon request.

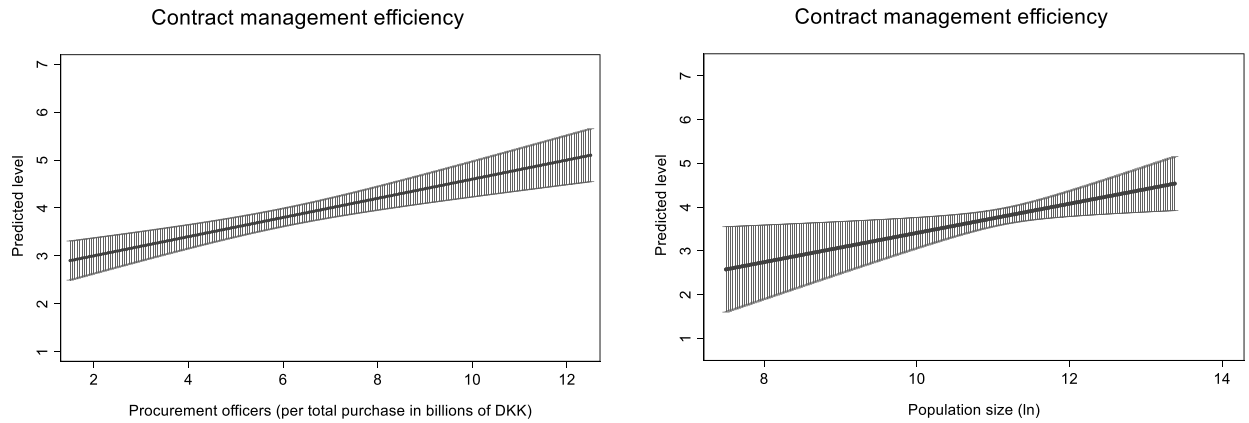


Figure 5. Predicted effects of management capacity and population size on contract management efficiency.
Note: Predicted effects estimated based on Model 3 in Table 3. Effects are shown with 90% confidence intervals.

Also, when using the alternative capacity indicator in Model 4, 'Perceived procurement resources', a positive and statistically significant relationship was estimated.

Furthermore, Model 5 indicates that this perceptual measure of CMC ('Perceived procurement resources') captures variation not explained by the number of procurement officers, as both CMC indicators exhibit significant effects when included in the same model (Model 5). A possible interpretation of this finding is that 'Perceived procurement resources' reflect not only the quantity of procurement *resources*, but also how these resources are organized, managed, and trained—that is, the broader organizational *capabilities*.

Taken together, the results in Table 3 support H1.

The influence of organizational size (H2): Turning to H2, the preferred Model 3 estimates a positive and statistically significant relationship between population size and contract management efficiency ($p < 0.05$). The positive estimate can be interpreted as an independent size effect related to economies of scale and/or greater market power. The effect size is non-negligible, as a doubling of population size is expected to increase contract management efficiency by around 0.5 on the seven-point scale. In Figure 5, the predicted effects are illustrated across the full range of local population sizes. This empirical evidence supports H2.

The influence of other variables: Most of the control variables exhibit the expected effects on contract management efficiency. Local governments with clear GPP strategies report significantly higher contract management efficiency in the context of GPP. Similarly, higher green voter percentages are positively associated with contract management efficiency. One possible interpretation is that greener political preferences provide the local administration with a stronger mandate to pursue GPP, including stronger efforts to ensure that suppliers comply with GPP requirements.

Furthermore, as expected, highly ambitious reduction targets are associated with lower perceived contract management efficiency—potentially because ensuring compliance becomes more demanding as GPP ambitions increase and the scope of green requirements to be monitored expands accordingly.

One independent variable, however, yields a somewhat unexpected result: high fiscal pressure is positively correlated with greater contract management efficiency. This finding is somewhat surprising, given that wealthier municipalities are generally assumed to be in a better financial position to invest in contract management (Casady et al., 2023). A possible explanation for this finding—aligning with studies indicating that wealthier local governments tend to be less efficient (for example Borge et al., 2015)—is that more affluent municipalities may face weaker financial incentives to rigorously enforce compliance.

Qualitative findings

As previously noted, the aim of the four case studies is to provide insights into how CMC and organizational size influence contract management efficiency, thereby helping to substantiate the proposed mechanisms between the variables.

To what extent is supplier monitoring prioritized by the local governments? Despite two of the municipalities having among the highest relative number of procurement officers in Danish local governments, all four municipalities acknowledge that supplier monitoring is often underprioritized in the context of GPP. This under-prioritization is primarily attributed to limited procurement resources, as procurement staff are largely devoted to preparing new contracts and tenders. Moreover, when procurement personnel are specifically assigned to compliance functions—as observed in the two high-capacity municipalities—their efforts are often focused on internal compliance, that is, ensuring that internal employees adhere to contracts.

The under-prioritization of supplier monitoring is particularly evident in the two low-capacity municipalities. In these two cases, no procurement officers are dedicated to compliance; instead, the same procurement officers are responsible for both drafting tenders and overseeing compliance activities.

Table 4 summarizes the key similarities and differences across the four local governments, including an overall assessment of their supplier monitoring efforts. This overall assessment is based on an evaluation of both interview data and collected documents. The ranking of the municipalities was relatively straightforward, as the informants generally appeared open and transparent in their reflections on their local supplier monitoring.

How do CMC and organizational size shape contract management efficiency? Across all four local governments,

Table 4. Key similarities/differences across the four local governments.

	Case 1	Case 2	Case 3	Case 4
Number of procurement officers (per total purchase in billions of DKK)	*High (12)*	*Low (4)*	*Low (4)*	*High (12)*
Population size	*Medium/ small*	*Large*	*Medium/ small*	*Very large*
Employee(s) working primarily with contract management?	*Yes*	*No*	*No*	*Yes*
Employee(s) working primarily with sustainability?	*No*	*Yes*	*No*	*Yes*
Focus on private suppliers' GPP compliance	*Moderate / strong*	*Weak / moderate*	*Weak*	*Strong*

Note: Categorization of population size: Small = < 30,000 inhabitants.; medium/small = 30,000–60,000 inhabitants.; large = 60,000–100,000 inhabitants; very large = > 100,000 inhabitants.

there was a shared emphasis on the importance of CMC investments for enhancing contract management efficiency. According to the four municipalities, two general aspects were key to the local level of CMC: a sufficient number of procurement officers; and how these procurement officers were organized, managed and trained. All four local governments emphasized that adequate staffing was essential for building and maintaining CMC. This claim is supported by the observed variation across the four cases: the two municipalities with relatively higher numbers of procurement officers report substantially greater contract management efficiency.

Furthermore, the local governments highlighted that the number of procurement officers was by no means the sole determinant of CMC. According to the informants, how procurement officers are trained and managed is also a critical factor. Specifically, the four municipalities agree that adopting more systematic compliance approaches strengthens CMC and, in turn, enhances contract management efficiency in GPP. The municipalities describe a systematic compliance approach as one that begins with thorough contract preparation, incorporates monitoring mechanisms from the start, and is followed by risk-based supplier oversight that gradually fosters mutual trust.

Another key component of a systematic compliance approach is a clear division of internal departmental responsibilities regarding supplier compliance. Hence, all four municipalities highlight the challenges that arise when a central procurement department is responsible for establishing the contract, while operational managers and employees from specialized public service departments (for example daycare, schools, eldercare) are tasked with executing purchases. In cases where these operational buyers are well-informed about contract terms—facilitated by close cooperation and clearly defined responsibilities between the central procurement department and the specialized public service departments—the municipalities experience higher levels of contract management efficiency.

Finally, with respect to organizational size, it is noteworthy that the largest municipality (case 4) emphasized its perceived scale advantages in contract management within the context of GPP—particularly its capacity to specialize in supplier monitoring and sustainable procurement.

Among the four municipalities, case 4—characterized by both high CMC and a larger population—demonstrated the highest level of contract management efficiency.

While the case studies presented above offer valuable insights into the potential mechanisms linking CMC and organizational size to contract management efficiency, the case studies are also based on a limited number of interviews in a minor subset of Danish local governments. As such, the cases may not capture other variables and mechanisms that could be important for contract management efficiency. Consequently, the case studies should primarily be viewed as serving a supplementary function in substantiating the findings of the regression analyses.

Discussion

Understanding and improving public contract management efficiency is of key academic and practical interest, as higher contract management efficiency is expected to enhance contractor performance—ultimately benefiting both the public organization in question and society at large (Brunjes et al., 2023). This study examines the factors that influence contract management efficiency, with particular attention paid to CMC and organizational size.

This study employs a novel and precise measure of CMC and, based on this measure, finds that higher CMC is associated with higher contract management efficiency within GPP. In doing so, the study extends existing research on the role of CMC in influencing contract management efficiency and contractor performance (Romzek & Johnston, 2002; Brown & Potoski, 2003; Yang et al., 2009; Joaquin & Greitens, 2012; Casady et al., 2023).

The study also identifies a positive effect of population size on contract management efficiency, after accounting for the level of CMC. This finding aligns with prior research suggesting that larger entities may, under certain conditions, benefit from economies of scale and/or increased buyer power in public procurement (Testa et al., 2012; Strömbäck, 2015; Ferraresi et al., 2021). While organizational size is not generally considered a decisive factor in public procurement (Sönnichsen & Clement, 2020), the findings suggest that larger organizational size improves the conditions for effective supplier monitoring in GPP. A plausible explanation is that larger organizations are better positioned to support specialization, enabling them to recruit and train dedicated contract managers and staff with area-specific expertise, such as in sustainable procurement (Michelsen & de Boer, 2009; Testa et al., 2012; Smith & Terman, 2016). By contrast, in smaller organizations, contract management is often carried out by a procurement officer who is also responsible for issuing tenders; thus, such officers may prioritize pre-award activities over post-award contract oversight. This is not to suggest that combining these responsibilities is problematic. On the contrary, having a single procurement officer oversee both contract preparation and subsequent supplier monitoring may enhance contract management by ensuring intimate knowledge of contract requirements and intended monitoring arrangements. By contrast, the case studies simply support the argument that, under conditions of limited staffing, procurement officers with such dual roles tend to prioritize tender preparation and issuance over post-award monitoring activities.

Whether this study's findings on the association between CMC and organizational size, on the one hand, and contract management efficiency, on the other, apply exclusively to GPP or reflect broader patterns in public procurement remains a question for future research. For instance, the findings presented here may be broadly applicable to other areas of public procurement that entail distinct requirements for contract follow-up and specialized staff competencies—such as other areas of sustainable procurement.

The study also reveals a positive association between increased green voter percentage and contract management efficiency for GPP. This finding suggests that public procurement is becoming more politicized, which corresponds to its increasingly strategic and policy-oriented role (Grandia & Kruyen, 2020; Brunjes & Rodriguez-Plesa, 2023; Patrucco et al., 2024).

Finally, from a practitioner's standpoint, the findings suggest that public organizations may achieve noticeable improvements in contract management efficiency by increasing their number of procurement officers. Furthermore, the qualitative component of the study indicates that, even within existing staffing constraints, procurement departments can enhance contract management efficiency by implementing a systematic compliance approach—including focusing compliance efforts on high-risk areas and clearly delineating responsibilities between the central procurement department and the specialized public service departments.

A key limitation of the study is that it assesses contract management efficiency based on procurement officers' perceptions, rather than on observable behaviour. Future research is encouraged to find more robust indicators of contract management efficiency—such as metrics based on actual procurement behaviour or external evaluations. Another option for future research would be to continue using procurement officers' perceptions of contract management efficiency as an indicator, but to repeat the measurement multiple times over a period (for example through repeated surveys). This would allow for an examination of how changes in perceived contract management efficiency are associated with changes in other variables, such as CMC.

Conclusion

The literature on public procurement/contracting has made substantial progress in examining the characteristics of CMC, as well as its likely importance for contract management efficiency and contractor performance. However, estimating the effect of CMC remains challenging—particularly when trying to identify a precise measure of CMC and disentangling its influence from factors such as population size and local fiscal conditions. In this context, this article contributes by estimating how the level of CMC—measured as the number of procurement officers relative to local purchasing volume—affects contract management efficiency, while controlling for potential confounders such as population size and financial resources.

The study shows that higher levels of CMC are significantly associated with higher contract management efficiency in the context of GPP (H1). This positive relationship is likely driven by a mechanism in which greater employee resources facilitate the development of higher-quality contracts from the outset of a procurement process and, in turn, enable more effective monitoring of supplier performance—including the ability to correct behaviour and strengthen collaboration and trust between public authorities and suppliers.

In addition, larger municipalities exhibit higher levels of contract management efficiency (H2). This is interpreted as a distinct size effect, possibly attributable to scale advantages and greater buyer power in larger entities. Specifically, larger organizations may be better positioned to support specialization, enabling them to employ dedicated contract managers and staff with area-specific expertise, such as in sustainable procurement.

Taken together, the findings suggest that public authorities and their central procurement departments may enhance contract management efficiency by increasing the number of procurement officers and by implementing systematic compliance practices—such as targeting compliance efforts and clearly delineating responsibilities between the central procurement department and specialized public service departments.

The study has implications for both future research and policy. First, future research is encouraged to identify more robust indicators of contract management efficiency—such as metrics derived from actual procurement behaviour or longitudinal indicators derived from repeated observations. Second, the findings suggest that public organizations may improve contract management efficiency by increasing the number of procurement officers, concentrating compliance efforts on high-risk areas, and clearly delineating responsibilities between the central procurement department and specialized public service departments.

Disclosure statement

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