Public Procurement Failure

The Role of Transaction Costs and Government Capacity in Procurement Cancellations

Casady, Carter; Petersen, Ole Helby; Brogaard, Lena

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Public procurement failure: The role of transaction costs and government capacity in procurement cancellations

Carter B. Casady[a,b,c], Ole Helby Petersen[d] and Lena Brogaard[d]

[a]Civil & Environmental Engineering, Stanford University, Stanford, CA, USA; [b]Schar School of Policy and Government, George Mason University, Fairfax, VA, USA; [c]Bartlett School of Sustainable Construction, UCL, London, UK; [d]Department of Social Sciences and Business, Roskilde University, Roskilde, Denmark

ABSTRACT

Public management research contains little analysis on procurement cancellations – i.e. when contracts fail to make it through procurement, resulting in termination during the pre-award tender phase. Combining theoretical perspectives on administrative capacity and transaction costs, we investigate both the propensity and reasons for public procurement cancellations. Drawing on a unique dataset of 5,558 local government contracts in Denmark, we find the likelihood of cancellation is greater for highly asset-specific investments and lower when governments have more administrative capacity. Since lack of competition is the main reason for these cancellations, public buyers should focus on capacity building and engaging market suppliers.

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KEYWORDS Public procurement; contract cancellations; administrative capacity; transaction costs; third-party contracting

Introduction

Governments around the world routinely use third-party contracting to provide goods, services, and public works. Today, government procurement represents 12% of national GDP in OECD countries (OECD 2021), making procurement and contract management a core topic for public management research (Brown and Potoski 2003; Chen et al. 2022; Eckersley et al. 2023). Public procurement allows public agencies to tap into the expertise, capacity, and innovation of private companies. Apart from unsolicited proposals (Casady and Baxter 2021), public procurement is often a highly formal and regulated procedure, designed to ensure accountability, proportionality, transparency, and equal treatment of selling firms (Harland et al., 2021; Cutcher, Ormiston, and Gardner 2020). However, public procurement is often criticized for being both inefficient in awarding third-party contracts (Karjalainen 2011) and excessively bureaucratic (Di Mauro, Ancarani, and Hartley 2020). Inadequate competencies, procedures, and practices on the part of government are often cited as key barriers for

CONTACT Carter B. Casady cbcasady@stanford.edu Civil & Environmental Engineering, Stanford University, Stanford, CA, USA

suppliers looking to engage with buying governments (Loader and Norton 2015). Optimizing procurement processes is thus of critical importance to the mission and values of public organizations (Alonso, Clifton, and Díaz-Fuentes 2015; Patrucco, Agasisti, and Glas 2021; Schotanus et al. 2011).

The purpose of this study is to heed recent calls for more research on inefficiencies in the procurement process (Patrucco, Luzzini, and Ronchi 2016; Trammell, Abutabenjeh, and Dimand 2020). Specifically, we focus on the central but overlooked problem of procurement cancellations—i.e. when third-party contracts fail to make it through procurement, resulting in cancellation during the pre-award tender phase. While there is an extant public management literature on procurement and contracting (Abutabenjeh et al. 2021; Brown and Potoski 2003; Callens, Verhoest, and Boon 2022; Chen et al. 2022; Levin and Tadelis 2010; Wang and Li 2014), procurement cancellations have so far gone unnoticed. This oversight is surprising as value creation through public procurement is inherently dependent on successfully completing the procurement process, from issuing invitations for bids to awarding and enforcing contracts (Anguelov 2020; Petersen et al. 2019).

With limited knowledge on procurement cancellations, public authorities lack a fundamental understanding of how to avoid failure in awarding procurement contracts. Our study investigates these mismanaged public procurements before any contract is signed, thereby offering insights into the ex-ante side of public procurement failure. Cancellations in the ex-ante phase of public procurement may have important performance implications, as they may create significant inefficiencies and carry large sunk transaction costs for both the buyer and supplier side of the relationship (Hearth, Melicher, and Gurley 1990; see also Harris, Hodges, and Schur 2003; Harris and Pratap 2009). Cancellations can also discourage businesses from engaging with the public sector and potentially cause credibility issues that feed into prevalent perceptions of inefficacy in the public sector (Döring 2022). Lastly, cancellations affect not only businesses and public buyers but also local service users. When procurements are cancelled, the delivery of products, services, or public works will either be delayed or not proceed at all. Either way, this has a cost for citizens.

Combining transaction cost economics (TCE) and resource-based theory (RBT), this study examines how transaction attributes and government capacity affect the likelihood of cancellations in the procurement (pre-award) phase of government contracting. Using this rare combination of theoretical perspectives allows us to account for the strategic resources of local governments—i.e. a buying organization's administrative and financial resources – as well as economic perspectives on the measurability and asset specificity of the products and services being exchanged. The empirical context of this study is Denmark, where public sector contracting amounts to ~ €51 billion each year, corresponding to 14% of GDP (OECD 2021). We utilize a unique dataset covering the population of 5,558 Danish local government contracts tendered according to joint European Union (EU) public procurement directives. The data cover all procurements for 60 different products, services, and public works contracts over a five-year period from 2017 to 2021, representing a procurement contract value of €24.13 billion in taxpayers' money. We use this data and theoretical perspectives to address the following research questions:

(1) What is the propensity for cancellations in local government procurements?
(2) What are the reasons for cancellations in local government procurements?

(3) What theoretical factors affect the likelihood of cancellations in local government procurements?

The study offers two contributions to public management research and theory. First, this paper advances our theoretical understanding of public procurement management by combining an economic perspective on transaction cost attributes with a human resource capacity perspective on public procurement management. Second, there have been no previous analyses in the public management field of cancelled procurements using large-N data. Our analysis suggests that cancellations in public procurement by Danish local authorities are very widespread: 1,365 out of 5,558 procurements were cancelled, representing a cancellation rate of 24.6%. This paper thus offers a rare glimpse at the pervasiveness of cancellations in public procurement, using local government procurement as an empirical setting to advance public management theories of procurement (Patrucco, Agasisti, and Glas 2021; Patrucco, Luzzini, and Ronchi 2016; Petersen et al. 2019). In doing so, the paper offers theoretical insights for public management research and practical recommendations for targeted policy interventions that can harness the contributions of public procurement to strategic objectives and value creation in public organizations (Farr 2016; Moore 2013).

The remainder of this paper is structured into five sections. The next section uses concepts from TCE and RBT to develop hypotheses on how transaction attributes (i.e. measurability and asset specificity) and government capacity (i.e. administrative and financial capacity) influence the likelihood of cancellations in public procurement. The third section presents the population dataset of local government procurements and the methods used in this study. In the fourth section, we answer our research questions by analysing the propensity of procurement cancellations and explain patterns of variation in these cancellations. Finally, in the last two sections, we conclude with a discussion of our findings and their implications for public management theory and practice.

Theory and literature

Transaction attributes and procurement cancellations

In public procurement, both the procuring authority and third-party suppliers face large information, bargaining, negotiation, monitoring, and enforcement costs. These costs incurred by both suppliers and purchasing governments represent *ex ante* and *ex post* transaction cost expenditures (Williamson 1979). Ex ante transaction costs often include expenses before the execution of a contract or sale, such as "searching for products and suppliers, preparing requirement specifications, evaluating bidders' offerings, and negotiating contract terms" (Barthélemy and Quélin 2006; Coase 1937; Marsh 1998; Melese et al. 2007; Williamson 1996; as cited in; Petersen et al. 2019, 642–643.) Conversely, ex post transaction costs are incurred after the execution of a sale and typically encompass expenses associated with monitoring service performance, assessing product quality, and enforcing contract terms, especially in cases of arbitration, conflict resolution, and contractual renegotiation (Gifford et al. 2023).

Understanding these types of transaction costs in public procurement is important because high transaction costs can deter potential bidders, thereby limiting competition for contracts. Third parties seeking to acquire government contracts must incur

substantial costs in assembling bids that may or may not be selected (Casady et al. 2019). If transaction costs are high, this limits the incentives of suppliers to participate in public procurement. This, in turn, may eliminate the potential for lower costs, ultimately reducing the prospect of achieving better value for money (KPMG 2010; National Audit Office 2007). When procurements are cancelled, both the government and potential suppliers incur substantial sunk costs, leading to large inefficiencies in the public procurement process. Therefore, it is important governments allocate sufficient resources and establish procedures to appropriately manage contract risk and improve contract value.

However, third-party contracts do not always deliver their intended value. Sometimes, products and services purchased by governments are more expensive than anticipated, delayed in their delivery, or do not work out for other reasons (Milward and Provan 2003; Sclar 2000; Van Slyke 2003; Brunjes and Anguelov 2021). In certain cases, procurements are cancelled altogether, meaning no products or services are purchased by the government at all. These failed procurements are the primary focus of this research. We are therefore interested in understanding the transaction cost attributes associated with these procurement cancellations.

According to Williamson (1979, 1991, 1996), transaction risks are driven by transaction attributes—i.e. the characteristics of products/services and markets. This means public procurement practices need to reflect the characteristics of the product or service being purchased. For instance, simple products tend to have low uncertainty because they are often available in more standardized and commoditized forms and are supported by robust markets with many buyers and sellers engaging in recurring transactions. These transaction attributes ultimately lower transaction cost expenditures because transaction risks are minimal (Brown and Potoski 2003; Petersen et al. 2019). Yet, cancellation may still be high for such products because the sunk costs associated with such procurements is relatively small. On the other hand, complex services, like public works contracts, are inherently more difficult to prepare ex ante (i.e. high uncertainty) and typically rely on markets with relatively few buyers and sellers (Girth et al. 2012). As result, these complex services require more transaction cost spending because the associated contracting risks are higher, making them more prone to cancellations. Taken together, this conceptualization of product measurability in public procurement produces our first hypothesis:

Hypothesis 1: Contracting authorities are more likely to cancel procurements for difficult-to-measure products and services than for those that are relatively easier to measure.

Related to product measurability, asset specificity is often regarded as the most important transaction attribute influencing transaction risks (Riordan and Williamson 1985). Asset specificity refers to investments in machinery, equipment, and labour that cannot be adapted and redeployed for alternative purposes without partial or complete loss of their value (Williamson 1996). In the context of public procurement, specialized investments tailored specifically to a procuring authority's needs (e.g. public works projects or customized information technology projects) are often regarded as having high asset specificity and, therefore, involving high transaction risks for both buyers and sellers (Levin and Tadelis 2010; Petersen, Potoski, and Brown 2021; Schepper, Steven, and Dooms 2015).

Scholars have sought to better understand the effects of asset specificity on procurement performance for decades (Sorana 2003), especially for local governments 'where procurement consumes a substantial part of the budget cost, thus representing a key mechanism to provide value for citizens' (Patrucco, Agasisti, and Glas 2021, 630). Recent studies examining procurement performance measurement systems (Patrucco, Luzzini, and Ronchi 2016), and the design of procurement organization variables (Patrucco et al. 2019) have specifically focused on improving the efficiency and efficacy of public procurement, with some of the latest research suggesting public procurement should perform better for simple transactions with low asset specificity and low uncertainty (Rokkan and Haugland 2022), thereby reducing the likelihood of cancellations. These insights from the literature lead to our second hypothesis:

Hypothesis 2: Contracting authorities are more likely to cancel procurements for products and services with high asset specificity than those with low asset specificity.

Administrative and financial capacity

In addition to measurability and asset specificity, cancellations in public procurement may also be attributed to deficiencies in the strategic—i.e. valuable, rare, difficult to imitate, and non-substitutable – resources of a public organization. Barney (2012) notes that purchasing, as well as supply chain management, can be a source of sustained competitive advantage for a firm in at least some settings. But a public agency' ability to procure various goods, services, and public works contracts is only as good as the resources and capabilities it can leverage (Mai and Casady 2023). Organizational capabilities are thus needed to bundle, manage, and otherwise exploit resources (Barney 1991). This resource-based view therefore provides a more internally focused perspective of public procurement and may offer a clearer explanation for why performance results vary in these procurements (Brewer, Wallin, and Ashenbaum 2014).

Of all the skills and abilities (i.e. resources) a public sector organization needs to procure goods and services (Madhok 2002), administrative and financial capacity appear to be particularly important attributes for successful procurements. Scholars have previously shown that effective contract management strategies—e.g. writing requests for proposals, creating systems to evaluate bid submissions, and monitoring the performance of third-party contractors – help mitigate risks associated with transaction attributes, such as measurability and asset specificity (Joaquin and Greitens 2012; Lawther 2002). This highlights that additional importance of governments investing in their administrative capacity to manage contract service delivery (Brown and Potoski 2003; Romzek and Johnston 2002). Without 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, 644), successful public procurement would not be possible. Therefore, one can expect increases in competence to improve public procurement performance, especially for complex transactions (Rokkan and Haugland 2022). Thus, our third hypothesis is as follows:

Hypothesis 3: Contracting authorities with greater administrative capacity are less likely to cancel procurements.

This previous hypothesis assumes that additional administrative capacity is always beneficial. But one cannot rule out the possibility that less capacity might also stimulate public buyers to tender more carefully or to take less risks. Additionally, large public agencies with lots of administrative capacity might also struggle to utilize this capacity efficiently. And supporting such personnel is often constrained by financial capacity as well. This means strong financial capacity also enables governments to make additional investments in public procurement management. Petersen et al. (2019) specially show that governments with higher levels of financial capacity are better able to mitigate contracting risks (e.g. cancellations) and incur ex ante transaction cost expenditures. Without these investments in critical management personnel, 'governments may lack the ability to prepare and complete a tender in a way that maximizes public value (e.g. by taking full advantage of available market competition or minimizing uncertainty)' (Petersen et al. 2019, 644). Naturally, this gives rise to our fourth hypothesis:

Hypothesis 4: Contracting authorities with greater financial capacity are less likely to cancel procurements.

Methods and data

To test our hypotheses, we examine a large population dataset of public procurement cancellations in Danish local governments. Denmark provides an empirical setting of broader international relevance because all procurement contracts above a certain value limit (threshold) are tendered according to joint EU procurement directives, making the EU the largest economically joint procurement area worldwide. Sub-central (regional, local) contracting authorities in the 27 EU member states are required to send tasks to EU tender if contracts exceed threshold values of €215,000 for general goods and services, €750,000 for social and other specific services, and €5,382,000 for public works contracts (European Commission 2023).

The EU procurement directives are implemented in Danish legislation via the Danish Public Procurement Act, which means that procurement above the threshold values strictly follow EU-wide procedures and guidelines. The procurement contracts in our dataset are all procured according to rules and procedures featured in common EU directives, thereby offering insights of broader relevance to international procurement research. Our analysis is situated in local government procurement because it allowed us to obtain a large-N dataset of relatively similar procurements for goods, services, and public works contracts, thereby enabling statistical analysis of theoretical factors explaining procurement cancellation when holding constant several features in the regression analyses.

We draw on a comprehensive population dataset of all 5,558 local government EU procurements for 60 frequently purchased goods, services, and public works procurements in the period 2017 to 2021. The EU procurement regulations require that all procurements over the threshold values are registered in the joint Tenders Electronic Daily (TED) database. Our dataset includes all Danish local government tenders extracted from the TED database that are quality inspected weekly by the Danish Competition and Consumer Authority. This involves manual checks of all variables for all tenders. When information for a variable is either missing or looks suspect (e.g. a contract value of 1 Danish Krone), the Danish Competition and Consumer Authority

directly contacts the purchasing authority to verify the information. The Danish Competition and Consumer Authority then manually corrects the data. The average contract size in our data of local government tenders is 32.3 million Danish Kroner (approximately €4.34 million), meaning that the procurements in our data are worth of approximately €24.13 billion.[1]

Like other scholars who have exploited open data from the TED database to generate insights about public procurement (e.g. Cox and Furlong 1995; Erridge Ruth Fee and McIlroy 1998; Madsen 2002; Nielsen and Hansen 2001; Prier, Prysmakova, and McCue 2018), we used detailed and uniform information in the contract data to construct key variables for our analysis, including variables about the procuring authority, the procurement process, the subject of the contract, the award criteria, number of lots, whether the procurement concerned a public contract or a framework agreement, and much more. Additionally, the data also contains information on whether the procurement was completed with a contract award or was cancelled. Moreover, in most instances, the buying authority also provides a reason for cancelling the procurement, which in addition to our main analysis enables more fine-grained analysis of the determinants of various types of procurement cancellations.

To enrich our contract data, we used two additional data sources. First, we manually imported detailed information from Danish administrative registers about local government size, administrative capacity, financial status, ideology of the mayor, and other variables we needed to construct several independent and control variables (further presented below). After manually importing this data, we ran multiple regression models to investigate the main variables of interest for our hypotheses related to administrative and financial capacity as well as relevant control variables. Second, to measure the transaction costs attributes of the procurements (hypotheses 1 and 2), we build on previous public management research on transaction costs (in particular, Brown and Potoski 2003; Hefetz and Warner 2012; Levin and Tadelis 2010) and conducted a comprehensive survey distributed to 1,061 Danish public procurement managers to measure transaction cost attributes of the goods, services and public works contracts in our data, which we elaborate on below.

Dependent variables

We use two dependent variables to examine procurement cancellations – i.e. tenders that the procuring authority cancelled before awarding the contract. The first, cancellation, is a dummy variable coded as 1 for cancelled tenders and 0 for non-cancelled tenders. The second, reasons for cancellations, is a nominal variable that consists of five categories indicating reasons for why a tender was cancelled in the pre-award phase. These reasons are, in most cases, made public by the procuring authority via the TED database and thus serve as a relevant variable in our dataset. The original variable had 23 groupings, but we aggregated these groupings into five categories because many of the reasons overlapped. The categories are: 1) lack of competition, 2) errors and changes in tender material, 3) economic reasons, 4) other causes (unspecified), and 5) no reason provided.

Independent variables

We use four independent variables to capture the capacity of the procuring authority as well as transaction attributes. The first two variables measure two types of capacity.

Administrative capacity is the number of full-time administrative employees per 1,000 inhabitants in the local contracting authority. While this variable does not directly measure the skills and abilities of the procurement staff, administrative employees possess the economic and legal training that public procurement requires, thus providing an aggregated measure of the strategic resources of the procuring authority (Bhatti, Olsen, and Pedersen, 2009; Petersen, Houlberg, and Christensen, 2015). The variable for financial capacity measures local government wealth as the average tax-base per 1,000 inhabitants. Both variables originate from Danish administrative registers containing population data for all local governments.

The third and fourth independent variables capture the transaction attributes of product measurability and asset specificity (Hefetz and Warner 2012; Williamson 1996). As there is no universal way of measuring transaction attributes objectively, we followed the approach of previous procurement studies (Brown and Potoski 2003; Levin and Tadelis 2010) by using a survey, which we distributed to 1,061 public procurement officers in Denmark. We use well-tested international survey instruments and scales to measure both asset specificity and product measurability (Brown and Potoski 2003; Levin and Tadelis 2010; Hefetz and Warner 2012 in the US; In Europe Schoute, Budding, and Gradus 2018; Petersen et al. 2019). The variable measuring product measurability is based on the respondents' evaluation of how easy or difficult it is to describe a given product in a contract on a scale from 1–5. Asset specificity measures respondents' assessment of sunk costs on a five-point scale from very small to very high. The survey items and product categories are detailed in full in the appendix (see Table A1).

While we draw on robust and well-tested international measures of transaction cost attributes from other procurement scholars, our study makes three important improvements for measuring transaction attributes in public management research. First, the survey was sent to the entire known population of 1,061 public procurement managers in Denmark (549 responses, response rate 51.7%), potentially increasing both validity and reliability compared to previous convenience samples of ~ 40 (or fewer) procurement managers (Brown and Potoski 2003; Levin and Tadelis 2010; Petersen et al. 2019; Schoute, Budding, and Gradus 2018).[2] Moreover, we identified the 60 most common categories of procured products and services for assessment, covering slightly more than 80% of all procurements and representing a total value worth €24.13 billion. This extends the coverage of previous studies from the procurement of services (Brown and Potoski 2003; Levin and Tadelis 2010; Schoute, Budding, and Gradus 2018) to also include public procurement of goods and public works contracts (see full list of product categories in Table A1). Third, we randomized whether respondents were asked to evaluate asset specificity or product measurability as well as which product categories they were presented with to reduce potential bias from question order effects (Thau et al. 2021).

Control variables

We control for three local government and four contract characteristics that might influence the propensity for procurement cancellations. First, as municipal experience with procurement is likely to correlate with cancellations, we control for the degree of third-party contracting by employing the variable *Government contracting indicator*. The contracting indicator measures the share of local government expenditure that is spent on purchasing from private providers relative to the local government's total expenditure on services that are eligible for third-party contracting (percentage). Second, to account

for other sources of financial capacity beyond the income tax of inhabitants, we include *Income from corporate tax*, which is measured as the local governments' net income per inhabitant from taxation of companies (DKK). Third, as the number of inhabitants is strongly correlated with our fiscal variables, we use the variable *Area size* to control for local government size (in square kilometres).

At the contract level, we control for four characteristics. First, we include a continuous variable *Weighting of price* that measures how much price is weighted in the evaluation of bids (percentage). The weighting of price ranges between 0 and 100% and is always 100% when the tender award criteria is lowest price. Second, the variable *Number of lots* controls for the number of potential lots that the contract is divided into (continuous variable). Third, we include the variable *Framework agreement* to account for whether the contract is a single public procurement or a framework agreement (dummy variable 0/1). Finally, since our data is a pooled dataset with five years of local procurement contracts, we include a control variable for *Contract year* using four dummy variables with 2017 as the reference category.

Table 1 summarizes key statistics for all dependent, independent, and control variables in our analysis.

Methods of estimation

We apply two different methods of estimation corresponding to each of the dependent variables. First, we use logistic regression to estimate the association between capacity, measurability, and asset specificity and the likelihood of procurement cancellations, which is a binary variable. Second, we use multinomial logistic regression to estimate the influence of our independent variables on the probability of different reasons for cancellations, which is a nominal variable with five categories. We apply two-way clustered standard errors in both models to account for the data structure, which has two levels consisting of product codes and the local contracting authority. With a mean variance inflation factor (VIF) of 1.53, there is no concern for multicollinearity. To test the robustness of the models, we used OLS regression, which provided similar results. We also examined fluctuations in the coefficients for our primary independent variables by applying different control variables in the models, but the direction of the

Table 1. Summary statistics for all variables.

	Count	Mean	SD	Min	Max
Cancellation	5,558	0.25	0.43	0	1
Administrative capacity (pr. 1000 inhabitants)	5,558	15.05	1.33	11.2	23.9
Financial capacity (taxbase pr. 1000 inhabitants)	5,558	187.10	32.10	152.95	388.83
Asset specificity	5,558	2.45	0.37	1.31	4.00
Product measurability	5,558	2.71	0.37	1.92	3.72
Government contracting indicator	5,558	26.75	3.77	17.7	48.5
Income from corporate tax (ln)	5,558	6.83	0.75	2.20	9.82
Area size	5,558	572.50	399.29	8.7	1,473.4
Weighting of price	5,558	0.73	0.28	0	1
Number of lots	5,558	10.94	14.65	1	64
Framework agreement	5,558	1.48	0.50	1	2
Contract Year (year dummies)	5,558	2,018.85	1.29	2017	2021

coefficients – and for most variables also the substantial size and p-value – were robust across our tests. All analyses were carried out in Stata 17.

Empirical results

In this section, we present the empirical results. Due to the lack of previous research on procurement cancellations, we first present descriptive results for the frequency of cancellations across goods, services, and public works procurement. We also present novel data on the reason for cancellations as provided by procuring authorities. We then present the results of logistic regression analysis of factors influencing public procurement cancellations, focusing on the four theoretically grounded hypotheses about government capacity and transaction cost attributes. Finally, we carry out a multinomial logistic regression analysis of factors influencing different reasons for public procurement cancellations.

Descriptive statistics of procurement cancellations

Figure 1 provides an overview of the prevalence of cancellations in Danish local government EU-procurements. The descriptive statistics in Figure 1 reveal that cancellations in Danish local government procurement are very frequent with an average cancellation rate of 25.13%. This corresponds to 1,397 out of 5,558 contracts. Furthermore, when we examine cancellations for different types of contracts, Figure 1 shows that cancellations occur most frequently for the procurement of goods (30.88%) and service contracts (23.98%), while procurement of

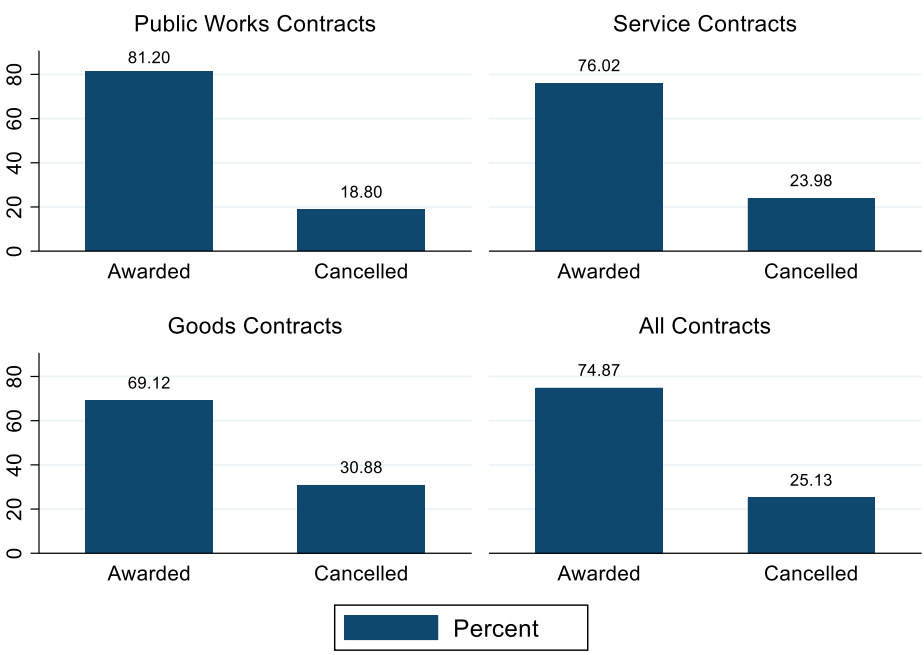

Figure 1. Propensity for procurement cancellations of public works, services, and goods.

public works contracts has the lowest percentage of cancellations (18.80%). Cancelling every fourth contract may involve significant transaction costs for both buyers and sellers on several accounts: resources spent on preparing the initial tender – or bid – and, in some cases, revising the cancelled contract before sending it to public tender again (Petersen, Potoski, and Brown 2021; Schepper, Steven, and Dooms 2015).

To examine how the propensity for cancellations in local government procurement has evolved over time, Figure 2 shows the percent of procurements that have been cancelled for each of the five years covered by our data. This figure illustrates a steady increase in the rate of cancellations in the five-year period. Overall, cancelled procurements have grown from 22.3% of all local government procurements in 2017 to 28.3% in 2021, corresponding to a 27% increase in five years.

To further explore the nature of public procurement cancellations, Table 2 summarizes the reasons local governments provided for why these procurements were cancelled. According to EU procurement regulations, the procuring authority has the right to cancel a contract at any point during the tendering period but involved bidders must be informed of the cancellation and the underlying cause. As most, but not all, procuring authorities inform potential bidders by announcing the cancellation through TED, we have information about cancellation reasons for nearly 83% of the tenders in our dataset.

The results in Table 2 show that cancellations have two main causes: (1) there are not enough or any bidders (i.e. lack of competition) or (2) there are errors or changes made in the tender documents. The third most common reason is related to economic issues, often because the procuring authorities receive bids that are significantly higher

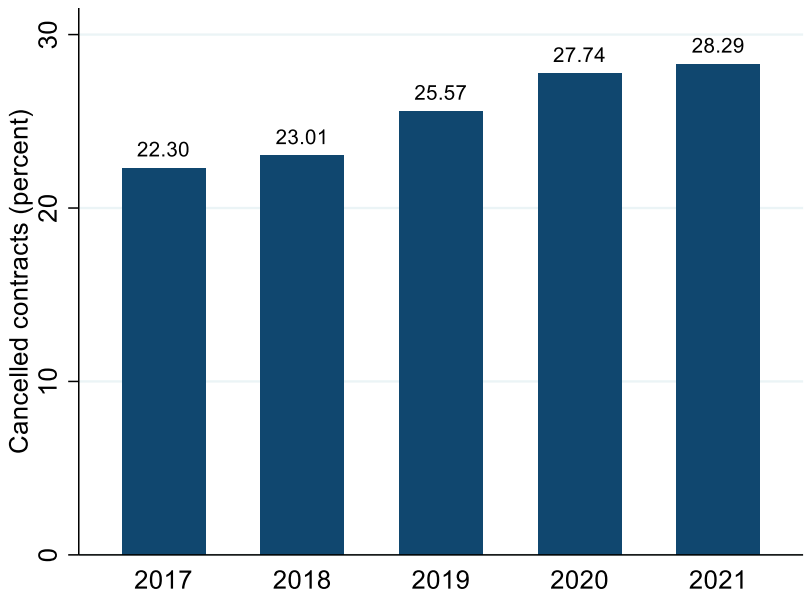

Figure 2. Procurement cancellation rates from 2017–2021.

Table 2. Overview of reasons for procurement cancellations.

	Freq.	Percent
Completed tenders	4,161	74.87
Reasons for cancellations:		
Lack of competition	366	6.59
Errors and changes in tender material	112	2.02
Economic reasons	66	1.19
Other causes (unspecified)	582	10.47
No reason provided	271	4.88
Total	**5,558**	**100.00**

Note: The cancellation reasons are known for 1,128 contracts, where the procuring authority have announced the reason in the TED database, corresponding to 82.5% of the cancelled contracts in our data.

than their own estimated value. Table 2 furthermore shows that there is a substantial share of cancellations where the reason is registered as other causes; or no reason is provided by the procurement authority.

Factors influencing procurement cancellations

To examine the relationship between our independent variables for government capacity and transaction attributes and the likelihood of procurement cancellations, Table 3 displays the results of our logistic regression analysis for factors influencing public procurement cancellations. For a more intuitive interpretation of the logistic regression coefficients, the table also includes average marginal effects (AMEs) indicating the percentage point change in the likelihood of public procurement cancellations from a one-unit increase in each independent and control variable while holding all other variables in the model constant at their mean.

Starting with the two independent variables for government capacity, the results show that administrative capacity of local contracting authorities is negatively associated with the likelihood of procurement cancellations, consistent with hypothesis 3. For every increase in the number of full-time administrative employees per 1,000 inhabitants, the probability of procurement cancellations decreases by 3.2% points ($p < .001$). This finding corresponds to our theoretical expectations, suggesting that the strategic resources of the procuring authority play an important role in ensuring an efficient procurement process, e.g. by reducing the risk of errors in the tender material and product specifications that might lead to cancellations. Contrary to hypothesis 4, however, the coefficient for financial capacity is not statistically significant. Together, the findings for our government capacity variables suggest that public procurement authorities' administrative capacity is associated with a lower likelihood of cancellations, whereas financial capacity is not.

For the two independent variables representing transaction cost attributes of the procurement contract, Table 3 shows that the coefficients for asset specificity and product measurability are both statistically significant. With every 1-point increase in the 1 to 5-point scale of asset specificity, the probability of procurement cancellation increases by 12.8% points ($p < .001$). Conversely, every 1-point increase in the 1 to 5-point scale for product measurability is associated with a 12.0% point ($p < .01$) decrease in the likelihood of cancellation. Thus, while our results support the second hypothesis

Table 3. Logistic regression analysis for the likelihood of procurement cancellations.

	Model 1: Cancellation	
	Coefficients	*AMEs*
Independent variables		
Administrative capacity (pr. 1000 inhabitants)	−0.186*** (0.051)	−0.032*** (0.009)
Financial capacity (taxbase pr. 1000 inhabitants)	−0.005 (0.003)	−0.001 (0.001)
Asset specificity	0.734***	0.128***
	(0.204)	(0.036)
Product measurability	−0.688**	−0.120**
	(0.262)	(0.046)
Control variables		
Government contracting indicator	−0.004	−0.001
	(0.026)	(0.005)
Income from corporate tax (ln)	0.102	0.018
	(0.154)	(0.027)
Area size	−0.000	−0.000
	(0.000)	(0.000)
Weighting of price	−0.200	−0.035
	(0.303)	(0.053)
Number of lots	0.022***	0.004***
	(0.006)	(0.001)
Framework agreement	0.513**	0.091**
	(0.179)	(0.031)
Year dummies (ref.= 2017)		
Year=2018	0.150	0.024
	(0.216)	(0.034)
Year=2019	0.338	0.056
	(0.208)	(0.033)
Year=2020	0.350	0.059
	(0.409)	(0.068)
Year=2021	0.654*	0.117**
	(0.271)	(0.045)
Observations	5,558	5,558
Pseudo R^2	0.06	0.06
Clustering at local contracting authorities	Yes	Yes
Clustering at product categories	Yes	Yes

Note: Standard errors in parentheses. Coefficients are logistic regression coefficients. AMEs are the Average Marginal Effects. Two-way clustering of standard errors at local contracting authorities and 60 product codes. * $p < .05$, ** $p < .01$, *** $p < .001$.

on the positive association between asset specificity and procurement cancellations, the results for product measurability are contrary to hypothesis 1, suggesting that cancellations are less likely for more complex products.

A possible explanation for the negative association between product measurability and cancellations is that both procurement authorities and private bidders are more likely to find and reveal errors in the request for proposals, product descriptions, and contract material for more simple products than for complex products. In contrast to the expectations derived from transaction cost theory, simpler contracts may thus be more prone to cancellations because the simpler nature of the product being

exchanged makes it easier to objectively identify errors in the contract documents that require rectification, which according to EU procurement directives requires a re-tender of the contract. The summary of procurement cancellations for goods, services, and public works contracts found in Figure 1 tentatively supports this interpretation: in contrast to the general expectation that public works and service procurements are more complex, Figure 1 shows that cancellations are more frequent in the procurements of goods. These findings suggest a need for further theoretical work on the link between transaction cost attributes and the propensity for procurement cancellations, which we return to in the discussion section.

Finally, as a robustness check, we run the analyses with interactions to test for moderations between our independent variables (see Appendix Table A2). None of the interaction terms in Table 2 are statistically significant.

Reasons for procurement cancellations

We now look at how capacity and transaction attributes influence the likelihood of different reasons for public procurement cancellations. Table 4 shows the results of our multinomial logistic regression analysis estimating the probability of procurement cancellations because of one of the following reasons: (1) lack of competition, (2) errors in the tender material, (3) economic reasons (e.g. the price offered exceeds budgets), and (4) other causes such as political and organizational changes. The multinomial regression also includes the results for procurement cancellations where the reason was not publicly announced (see model 5). Completed procurements constitute the baseline for interpreting the log-odds coefficients for each cancellation reason. As with the logistic regression in Table 3, average marginal effects are included in Table 4 to ease interpretation of the substantive sizes of the logistic coefficients. When interpreting these results, it is important to bear in mind that N in each response category is smaller than in Table 3, thereby reducing the statistical power to reject the null hypothesis in each of the five models.

For government capacity, the results show that administrative capacity only has a statistically significant association with one out of the five cancellation reasons. Corresponding to the results for cancellations in Table 3, an increase in administrative capacity is associated with a decrease in the likelihood of procurement cancellations due to lack of competition relative to completed tenders ($p < .001$). Specifically, adding one extra full-time staff is expected to decrease cancellations due to lack of competition by 2.0% points. For financial capacity, we find a statistically significant association with two cancellation reasons. An increase in financial capacity reduces the probability of cancellations due to lack of competition ($p < .01$) and economic reasons ($p < .01$) relative to completed tenders. When we calculate the average marginal effects, the p-value increases for both findings, leaving only the coefficient for lack of competition significant ($p < .05$). The p-value is generally higher for the average marginal effects compared to the log-odds, likely because the marginal effects for cancellation reasons are not relative to the baseline of completed procurements but calculated for the model overall.

For transaction attributes, we only find one statistically significant coefficient for the association between asset specificity and economic reasons for cancellations. With a one unit increase in our asset specificity variable, the likelihood of procurement cancellations due to economic reasons is expected to decrease relative to completed tenders ($p < .001$). Once again, the result is not significant when we calculate the

Table 4. Multinomial logistic regression for the likelihood of cancellation reasons (Base: Awarded procurements).

	Model 1: Lack of competition		Model 2: Errors and changes in tender material		Model 3: Economic reasons		Model 4: Other causes		Model 5: Not announced	
	Coef.	AMEs	Coef.	AMEs	Coef.	AMEs	Coef.	AMEs	Coef.	AMEs
Independent variables										
Administrative capacity	−0.370***	−0.020*	−0.231	−0.003	−0.597	−0.001	−0.164	−0.011	0.053	0.003
	(0.109)	(0.08)	(0.197)	(0.004)	(0.393)	(0.001)	(0.100)	(0.009)	(0.115)	(0.004)
Financial capacity	−0.021**	−0.001*	−0.021	−0.000	−0.113**	−0.000	−0.003	−0.000	0.000	0.000
	(0.008)	(0.001)	(0.016)	(0.000)	(0.035)	(0.000)	(0.004)	(0.000)	(0.000)	(0.000)
Asset specificity	0.679	0.033	0.822	0.014	4.932***	0.006	0.123	0.002	1.140	0.036
	(0.603)	(0.036)	(0.685)	(0.014)	(0.925)	(0.003)	(0.362)	(0.034)	(0.748)	(0.025)
Product measurability	−0.579	−0.027	−0.847	−0.014	0.034	0.000	−0.345	−0.023	−1.183* (0.603)	−0.038
	(0.589)	(0.033)	(0.483)	(0.010)	(1.268)	(0.001)	(0.337)	(0.030)		(0.020)
Control variables										
Government contracting indicator	0.015	0.001	0.005	0.000	−0.091	−0.000	0.003	0.000	−0.057	−0.002
	(0.037)	(0.002)	(0.057)	(0.001)	(0.188)	(0.000)	(0.032)	(0.003)	(0.057)	(0.002)
Income from corporate tax (ln)	−0.212	−0.013	0.220	0.004	0.842	0.001	0.298	0.028	−0.624	−0.021
	(0.194)	(0.010)	(0.207)	(0.004)	(1.611)	(0.002)	(0.218)	(0.020)	(0.359)	(0.011)
Area size	−0.000	−0.000	−0.001	−0.000	−0.002	−0.000	0.000	0.000	−0.001	−0.000
	(0.001)	(0.000)	(0.001)	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Weighting price	0.412	0.025	−0.708	−0.016	0.163	0.000	0.640	0.058	−2.146*	−0.073**
	(0.455)	(0.028)	(0.417)	(0.009)	(1.779)	(0.002)	(0.386)	(0.035)	(0.839)	(0.025)
Number of lots	0.036**	0.002**	−0.063	−0.001	0.077	0.000	−0.066*	−0.006*	0.079***	0.003***
	(0.012)	(0.001)	(0.035)	(0.001)	(0.041)	(0.000)	(0.029)	(0.002)	(0.015)	(0.001)
Framework agreement	0.318	0.012	1.079*	0.018	1.279	0.002	0.270	0.017	1.080***	0.034***
	(0.226)	(0.013)	(0.486)	(0.011)	(0.942)	(0.001)	(0.236)	(0.020)	(0.285)	(0.009)
Year dummies (ref. 2017)										
Year=2018	2.092**	0.059**	1.302	0.005	15.016***	0.011*	1.785**	0.098**	−2.286***	−0.132***
	(0.728)	(0.021)	(1.117)	(0.004)	(3.341)	(0.004)	(0.604)	(0.036)	(0.534)	(0.035)

(*Continued*)

Table 4. (Continued).

	Model 1: Lack of competition		Model 2: Errors and changes in tender material		Model 3: Economic reasons		Model 4: Other causes		Model 5: Not announced	
	Coef.	AMEs	Coef.	AMEs	Coef.	AMEs	Coef.	AMEs	Coef.	AMEs
Year=2019	2.198**	0.061**	2.958**	0.030*	16.309***	0.013***	1.744**	0.088**	−1.705*	−0.120**
	(0.642)	(0.024)	(1.092)	(0.015)	(1.958)	(0.002)	(0.611)	(0.028)	(0.534)	(0.038)
Year=2020	2.729**	0.107*	2.817*	0.025	17.094***	0.016**	1.744*	0.080*	−19.550***	−0.154***
	(0.968)	(0.050)	(1.110)	(0.014)	(1.999)	(0.005)	(0.611)	(0.035)	(0.362)	(0.035)
Year=2021	2.952***	0.129***	3.417***	0.041*	3.537*	0.000	2.249***	0.136**	−19.950***	−0.154***
	(0.781)	(0.039)	(0.811)	(0.018)	(1.693)	(0.000)	(0.621)	(0.044)	(0.703)	(0.035)
N	5,558		5,558		5,558		5,558		5,558	
Pseudo R^2	0.23		0.23		0.23		0.23		0.23	
Clustering at local contracting authorities	Yes		Yes		Yes		Yes		Yes	
Clustering at product categories	Yes		Yes		Yes		Yes		Yes	

Note: Standard errors in parentheses. Two-way clustering of standard errors at local contracting authorities and 60 product codes. Coefficients are log-odds.
AMEs are the Average Marginal Effects. * $p < .05$, ** $p < .01$, *** $p < .001$.

average marginal effects. Although there are no statistically significant associations between product measurability and any of the cancellation reasons, we observe that the direction of nearly all the coefficients is negative, while the coefficients for asset specificity are mostly positive. This result corresponds to the logistic regression analysis of cancellations in Table 3, suggesting some consistency in the association between our measures of transaction attributes and the likelihood of procurement cancellations.

Taken together, most of our independent variables are not statistically significant in the analysis of reasons for procurement cancellations, possibly because of the reduced power when the dependent variable is divided into five categories of cancellations. However, our results do offer a few interesting insights. First, we find more statistically significant associations between the capacity variables and cancellation reasons compared to the transaction attributes, in particular for cancellations due to lack of competition. This difference might suggest that lack of competition relates to the administrative and economic resources that go into market research, product descriptions, and attracting contract bids from private vendors (Girth et al. 2012; Petersen et al. 2019). In addition, asset specificity seems to increase the probability of cancellations due to economic reasons, suggesting that procuring authorities are more likely to receive bids over budget for highly asset-specific products. Meanwhile, the probability of this cancellation reason is lower when buying municipalities have more financial capacity, possibly reflecting the fact that wealthier municipalities have more financial muscle to absorb above-price contract offers.

Discussion

The results of our analysis offer important theoretical and practical contributions for the public management field. Applying well-known public management theories (e.g. transaction cost economics) to public procurement, we first show there is a strong positive association between asset specificity and procurement cancellations. This finding largely confirms our theoretical expectations. Yet, when it comes to product measurability, the findings contradict our hypothesis derived from transaction cost theory – i.e. cancellations are less likely for more complex products and services. Our findings suggest that simpler contracts may be more prone to cancellations, possibly because it is easier to objectively identify errors in these procurements, unlike more complex products and services where errors and issues may arise after the tender has been awarded (i.e. ex post).

Outside of transaction cost economics, our research also contributes to theory commonly applied in other disciplinary fields studying public procurement. Taking a resource-based view (Barney 2012), our analysis suggests that the administrative capacity of public procurement authorities may reduce the likelihood of cancellations, whereas financial capacity does not. This finding suggests that lack of adequate administrative competencies significantly impact the ability of public organizations to successfully procure goods, services, and public works from third-party suppliers (Loader and Norton 2015). The finding that administrative capacity matters for public procurement failure aligns with recent private sector procurement research emphasizing the importance of procurement skills and competencies for effective execution of the procurement function (Bals et al. 2019; Stek and Schiele 2021).

Taken together, this (re)conceptualization of public procurement cancellations using transaction cost economics and resource-based theory helps advance our

understanding of public procurement as a key contributor to broader public management goals, especially if we view procurement as a precondition for the performance of public service delivery (i.e. efficiency, effectiveness, accountability, and transparency). Thus, more theoretical work is needed to link transaction cost attributes and administrative capacity with the public sector's propensity for contract cancellations.

Our findings also have practical implications for public procurement management. The financial value of procurements and the high frequency of cancellations suggest significant potential for improved practice through targeted initiatives aimed at reducing the propensity for cancellations. For example, because lack of competition is the single biggest reason for procurement cancellations, public buyers should spend more time engaging with the marketplace and use Prior Information Notices (PINs) to give suppliers advanced notice of impending contracts. Yet, engaging in these market management activities require additional administrative capacity and resources as well as additional ex ante transaction cost expenditures to manage the exchange (Girth et al. 2012; Petersen et al. 2019).

In substantial terms, our empirical findings suggest that local procuring authorities with more administrative capacity are less likely to cancel public procurements in the ex-ante phase. This indicates that human resources in the procurement function positively reduce the risk of procurement failure. Purchasing authorities can use these insights to invest in recruitment and/or training of employees to strengthen administrative capacity. In addition, procuring authorities can also increase access to administrative resources through collaborative purchasing, enabling individual authorities to harness necessary skills, knowledge, and resources by linking up with the administrative procurement capacities of other authorities (Katri and Van Raaij 2015). Likewise, centralized procurement and framework agreements provide opportunity for pooling resources by using designated expert teams to negotiate contracts on behalf of all local governments, which is already a growing trend in many countries, including Denmark (Petersen, Jensen, and Bhatti 2022). However, joint purchasing may involve larger and more complex contracts, which in turn may reduce market competition and require additional procurement competencies in public agencies. Buying agencies therefore need to strategically balance the scale advantages of collaborative procurement (Karjalainen 2011) against other potential consequences, such as greater market concentration and contract complexity.

As stated above, our finding that procurements of asset-specific products are more prone to cancellations also aligns well with insights from existing public management literature, suggesting procurements are riskier when exchanges involve high sunk costs (Anguelov 2020; Hefetz and Warner 2012). Public procurement authorities can use these insights to target management efforts to reduce risk in procurements for services, goods, and public works involving high sunk costs. Public buyers can reduce sunk costs on both the buyer's and seller's side by developing templates for product requirements and contract specifications, thereby lowering the relationship-specific investments for both parties involved. By reducing the risk of lock-in due to high switching costs, procuring authorities have an opportunity to capture significant value from improved procurement efficiency. Likewise, private sellers may incur lower transaction risk by finding it easier and less costly to bid on public tasks (Petersen, Potoski, and Brown 2021). This may help expand the supplier market and make public buyers less exposed to the disadvantages of purchasing in thin markets (Girth et al. 2012).

Finally, the results for product measurability have implications for procurement management practice as well. Contrary to the theoretical expectations derived from transaction cost economics, our results suggest that public authorities are more likely to cancel contracts for simple products than for complex products. One possible explanation is that public buyers devote more time and effort into writing Requests for Tenders (RFTs) for complex contracts, thereby reducing the likelihood of cancellations. However, the data seem to indicate buyers and sellers may be more likely to find errors and shortcomings in the tender material and descriptions of simple products because the attributes of these products are more easily verified. Thus, procurements for these products are easier to cancel.

This conclusion is supported by our finding that procurements for goods have the highest cancellation rate, contrary to conventional wisdom. Because public works and service contracts are generally regarded as more complex than goods contracts, they involve more uncertainty (Anguelov 2020; Brown and Potoski 2003; Williamson 1979, 1996). Consequently, it may be harder to ascertain deficiencies in the contract material in the ex-ante phase, which may increase the risk of failed exchanges in the ex-post phase if the contract is not appropriately specified. This suggests more emphasis in public management should be placed on mitigating contract cancellation throughout all phases of the market exchange, not merely in the procurement phase.

Conclusion, limitations, and future research

This study was designed to investigate cancellations in public procurement, benefitting from a comprehensive population dataset of 5,558 goods, services, and public works contracts procured by Danish local governments from 2017 to 2021, worth approximately €24.13 billion. These contracts come from the EU's TED database and are quality inspected (and corrected) weekly by the Danish Competition and Consumer Authority, offering higher data quality compared to other datasets drawing on the TED database. The broader relevance of our analysis is bolstered by the use of procurement contracts awarded (or cancelled) according to common EU-procurement directives – the largest joint public procurement area worldwide – and a theoretical contribution combining transaction cost attributes and human resource capacity for effective public procurement management. Our findings suggest that cancellations are widespread in local government procurement, representing 25.1% of all contracts put out for tender. Our regression analyzes indicate that cancellations are more widespread when procurements involve asset specific investments – i.e. when high sunk costs are prevalent, whereas administrative and financial capacity in purchasing organizations is associated with reduced propensity for cancellations. Together, these findings offer insights that suggest that governments can invest in administrative resources and reduce procurement cancellations by taking management steps to mitigate cancellations, especially when exchanging products involving highly asset-specific investments.

While offering a rare theoretical and empirical perspective on cancellation in public procurement, this study also has several limitations. One limitation is we do not have data on the relationship between cancellations and other outcomes, such as costs, quality, and satisfaction with the contractual relationship. While being potentially costly for buyers and sellers alike, cancellations can potentially also lead to improvements in bad contracts, which are subsequently subject to retendering. Another limitation of our study is that our variables for human

resources and capacity are measured at the organizational level. We are thus unable to examine the importance of individual-level skills and competences among procurement officers in the purchasing organizations. Finally, our study is limited to the empirical setting of Danish governments, which limits the potential for generalizing the results to other contexts and national settings.

Future research can build on and extend this study by collecting data on procurement contract performance, thereby linking cancellations in the procurement phase (i.e. ex ante) to contract outcomes in the delivery (ex post) phase of the contracting relationship. Such research has the potential to offer further knowledge about the significance of procurement cancellations for subsequent contract success and failure. Another important task for further research is to expand our study to other empirical contexts, thereby broadening public management research on procurement success and failure to additional institutional settings.

Expanding our study to other settings could include, e.g. examining procurement cancellations below the threshold values of the EU procurement regulation or cancellations in countries outside of the EU. Additionally, interviews should be conducted with procurement officers from local governments to better understand cancelling behaviour. For instance, does political party control of local government influence the frequency of cancelled procurements? One might also implicitly assume that all cancellations are inherently bad. But certain cancellation decisions may be strategically good, for example, if a public buyer decides to publish a risky tender to test the market price and quality but receives no satisfactory bids. The implications of this have yet to receive significant attention in the current public management scholarship, and such a study would significantly contribute to our understanding of cancellations as well as recommendations for practice. Finally, future research should conceptualize and empirically measure knowledge, skills, and competencies among public buyers and link them to procurement performance. Linking organizational and individual-level competencies more closely to the transaction cost attributes of each exchange has the potential to make procurement a more strategic function that delivers enhanced value to public organizations.

Notes

1. There is information for the final contract for 4,139 procurements in our data. We calculated the average contract worth and multiplied it by the 5,558 contracts in our data.
2. The survey was distributed to 1,061 public procure managers in Denmark, as a part of a wider research project on public procurement. The respondents were randomized across the two transaction cost attributes, i.e. product complexity and asset specificity, to reduce the risk of response alignment across these two theoretical constructs. Question order was moreover randomized using both block randomization and question order randomization. Each respondent received a random selection of six question blocks with five services, products, or works in each block (i.e. 30 services, products, or works per respondent). Following the international procurement literature (e.g. Brown and Potoski 2003; Hefetz and Warner 2012; Levin and Tadelis 2010) we used a balanced 5-point Likert scale including a ´Don't know" response option to measure our two transaction cost variables, with a '1' indicating that, for each product, procurement managers assess it is easy to describe and monitor service quality (product complexity) and find and replace vendors (asset specificity), and a '5' indicating that it is very difficult to describe and monitor service quality (product complexity) and find and replace vendors (asset specificity).

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Appendices

Table A1. Product measurability and asset specificity for all surveyed products.

No.	Product category	Product measurability					Asset specificity				
	English_productname	Mean	SD	Min	Max	N	Mean	SD	Min	Max	N
1	Job training programs	3.41	1.01	1	5	83	2.81	0.97	1	5	64
2	Interpreting services	3.29	0.99	1	5	96	2.83	1.03	1	5	92
3	Maintenance of green areas, sports facilities, etc.	2.35	0.91	1	5	108	2.21	0.96	1	5	98
4	Office and school supplies – blackboards, paper, ink, and writing utensils	1.92	0.87	1	5	119	1.71	1.00	1	5	107
5	Coffee and tea	2.12	0.99	1	5	118	1.70	0.79	1	5	113
6	Home services for the elderly – practical and personal assistance	3.45	0.82	2	5	91	2.96	0.97	1	5	77
7	Special driving and referred driving	2.76	0.93	1	5	92	2.86	0.97	1	5	85
8	Apparel, uniforms, etc.	2.21	0.90	1	5	106	2.40	0.99	1	5	101
9	Rodent control	2.54	0.88	1	5	98	1.97	0.85	1	4	73
10	Toys, sporting equipment, and musical instruments	2.13	0.87	1	4	97	1.79	0.94	1	5	85
11	Legal services	3.16	0.98	1	5	99	2.13	0.84	1	5	107
12	Operation of school busses	2.44	0.89	1	4	98	2.64	0.98	1	5	81
13	Repair and maintenance of vehicles	2.81	1.00	1	5	101	1.98	0.84	1	5	94
14	Installation of sewerage, district heating, etc.	2.79	1.01	1	5	85	2.67	1.05	1	5	72
15	Medical consumption materials – health service items, ostomy products, compression products, diabetes aids	2.49	0.94	1	5	90	2.72	0.91	1	5	72
16	Payroll systems	3.02	1.17	1	5	98	3.77	1.17	1	5	96
17	Insurance services	2.86	1.01	1	5	90	2.41	1.04	1	5	101
18	Cleaning of work apparel	2.26	0.92	1	5	112	2.35	1.00	1	5	101
19	Maintenance of streams	2.87	1.09	1	5	77	2.59	0.84	1	4	61
20	Cleaning and window cleaning in public buildings	2.25	0.98	1	5	114	1.82	0.85	1	5	113
21	Banking and asset management	3.04	1.16	1	5	79	2.55	1.01	1	5	78
22	Installation of internet and network connections	2.30	0.87	1	4	79	2.40	0.93	1	5	81

(*Continued*)

Table A1. (Continued).

No.	Product category	Product measurability					Asset specificity				
	English_productname	Mean	SD	Min	Max	N	Mean	SD	Min	Max	N
23	Fire prevention and emergency services	2.81	1.13	1	5	63	4.00	1.01	1	5	54
24	Waste containers	1.95	0.68	1	4	99	2.33	0.89	1	5	82
25	Solid waste disposal	2.81	0.88	1	5	83	2.70	0.92	1	5	67
26	Computers and tablets	2.07	0.89	1	4	111	1.94	0.90	1	5	114
27	Street cleaning and draining of rainwater gullies	2.37	0.92	1	5	95	2.24	0.79	1	4	79
28	Residential solid waste collection	2.29	0.90	1	5	94	2.74	0.94	1	5	94
29	Undertaker and funeral services	2.66	1.00	1	5	76	1.97	1.01	1	5	72
30	Coaching and mentoring programs, including the employment area	3.72	0.87	2	5	94	2.60	1.06	1	5	70
31	Danish lessons for foreigners	3.41	0.92	1	5	88	2.81	1.04	1	5	73
32	Signs, traffic control, and street lighting	2.20	0.78	1	5	96	2.43	0.97	1	5	76
33	Educational offers related to job training programs	3.53	1.02	1	5	88	2.74	1.02	1	5	68
34	Tradesman services	3.05	1.04	1	5	112	1.90	0.88	1	4	118
35	Maintenance of elevators and ventilation systems	2.53	0.90	1	5	110	2.49	1.09	1	5	102
36	Temporary services	3.08	1.09	1	5	106	2.67	1.16	1	5	78
37	Building and construction material	2.62	1.01	1	5	100	2.27	0.99	1	5	88
38	Electronic systems for fire and burglary prevention	2.72	0.93	1	5	92	2.84	1.09	1	5	68
39	Heavy equipment vehicles – busses, trucks, refrigerated vans	2.28	0.74	1	4	99	2.57	0.92	1	5	84
40	Operation of public busses – public transit	2.56	1.00	1	5	90	2.99	1.08	1	5	67
41	Gifts and rewards	2.73	1.20	1	5	73	1.31	0.69	1	5	84
42	Fuel – gas, oil, wood pellets	2.32	1.11	1	5	98	2.18	0.95	1	4	85
43	Dental products – dentures and other equipment	2.62	0.91	1	5	78	2.74	0.86	1	4	66
44	Operation and maintenance of fire engineering facilities	2.74	0.92	1	5	86	2.72	0.81	1	4	75
45	Catering centre equipment and domestic appliances	2.03	0.64	1	4	101	1.98	0.80	1	5	95
46	Indoor lighting – lamps and light bulbs	1.98	0.83	1	4	117	1.74	0.72	1	4	101
47	Cafeteria and catering	2.67	0.92	1	5	109	2.52	0.98	1	5	94

(*Continued*)

Table A1. (Continued).

No.	Product category	Product measurability					Asset specificity				
	English_productname	Mean	SD	Min	Max	N	Mean	SD	Min	Max	N
48	IT consultancy and program development	3.41	0.99	1	5	103	3.04	1.17	1	5	97
49	Furniture and fixtures – office and school furniture	2.12	0.78	1	5	123	1.83	0.74	1	4	106
50	Emergency call devices, burglary protection, and fire extinguishing material	2.57	0.92	1	5	101	2.72	1.06	1	5	81
51	Winter services – snow plowing/sanding	2.57	1.08	1	5	115	2.48	0.95	1	5	92
52	Miscellaneous food	2.54	0.91	1	5	115	2.20	1.00	1	5	95
53	Light vehicles – cars, mini busses, etc.	2.25	0.77	1	4	110	2.05	0.99	1	5	101
54	Personal care products – toiletries, toilet paper, and infant care	2.25	0.88	1	5	106	1.74	0.68	1	3	92
55	Maintenance of street lights, signs, and lane markings	2.52	0.88	1	4	100	2.65	0.78	1	4	60
56	Turnkey and individual trade contracts in construction	3.29	1.05	1	5	86	2.53	0.92	1	5	79
57	Management training and continuing professional development	3.39	1.06	1	5	90	2.30	0.96	1	5	77
58	Medical equipment and products – beds, wheelchairs, walkers, shower chairs, and commodes	2.68	1.08	1	5	99	2.71	0.96	1	5	83
59	Cleaning supplies, garbage bags, etc.	2.02	0.89	1	4	104	1.65	0.80	1	5	93
60	Engineering and architect consultancy	3.32	1.02	1	5	99	2.45	0.90	1	5	91

Table A2. Logistic regression of the likelihood of procurement cancellations with interactions.

	Model 1	Model 2	Model 3	Model 4
Administrative capacity	0.164	0.513	−0.185***	−0.187***
	(0.349)	(0.546)	(0.052)	(0.051)
Financial capacity	−0.005	−0.005	0.007	0.006
	(0.003)	(0.003)	(0.011)	(0.010)
Asset specificity	2.838	0.726***	1.655	0.737***
	(1.981)	(0.207)	(0.910)	(0.204)
Product measurability	−0.687**	3.211	−0.677*	0.119
	(0.261)	(3.234)	(0.263)	(0.838)
Administrative capacity * Asset specificity	−0.141			
	(0.141)			
Administrative capacity * Product measurability		−0.260		
		(0.214)		
Financial capacity * Asset specificity			−0.005	
			(0.005)	
Financial capacity * Product measurability				−0.004
				(0.004)
Government contracting indicator	−0.005	−0.005	−0.004	−0.005
	(0.026)	(0.027)	(0.027)	(0.026)
Income corporate tax (ln)	0.100	0.105	0.100	0.101
	(0.156)	(0.155)	(0.155)	(0.154)
Area size	−0.000	−0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Weighting price	−0.203	−0.201	−0.207	−0.206
	(0.303)	(0.304)	(0.303)	(0.303)
Number of lots	0.022***	0.023***	0.022***	0.022***
	(0.005)	(0.005)	(0.006)	(0.006)
Contract type	0.509**	0.513**	0.510**	0.516**
	(0.181)	(0.178)	(0.178)	(0.178)
Year dummies (ref. = 2017)				
Year = 2018	0.154	0.153	0.142	0.142
	(0.215)	(0.214)	(0.220)	(0.215)
Year = 2019	0.334	0.355	0.330	0.330
	(0.207)	(0.205)	(0.208)	(0.207)
Year = 2020	0.345	0.372	0.341	0.338
	(0.407)	(0.406)	(0.410)	(0.408)
Year = 2021	0.655*	0.670*	0.649*	0.646*
	(0.269)	(0.275)	(0.273)	(0.268)
Observations	5,558	5,558	5,558	5,558
Pseudo R^2	0.06	0.06	0.06	0.06

Note: Standard errors in parentheses. Two-way clustering of standard errors at local contracting authorities and 60 product codes. Entries are logistic regression coefficients. * $p < .05$, ** $p < .01$, *** $p < .001$.