

Anatomy of competition in public procurement

Journal of Public
Procurement

Jan Jääskeläinen

*Department of Economics, Aalto University, Helsinki, Finland, and
Finnish Competition and Consumer Authority, Helsinki, Finland*

Janne Tukiainen

Department of Economics, University of Turku, Turku, Finland

Tuomas Hiilamo

Faculty of Social Sciences, University of Helsinki, Helsinki, Finland, and

Kirsi-Maria Magga

Faculty of Law, University of Lapland, Rovaniemi, Finland

Received 25 August 2025

Revised 21 November 2025

20 January 2026

Accepted 26 January 2026

Abstract

Purpose – This paper aims to study the extent and determinants of competition, entry and the effect of competition on prices in public procurement using rich data from Finland.

Design/methodology/approach – This paper applies quantitative methods to analyze public procurement bidding data linked to firm register data in an auction theoretical framework. More than 17,000 invitations to tender in Finland in 2010–2017 are examined using both descriptive regression analysis and an instrumental variable (IV) design for the price effects.

Findings – Public procurement in all regions, types of contracting authority and most industries faces the problem of low competition. This is a concern, because prices are shown to decrease with competition, and the estimated price effect is larger in a low competition environment. Contract design is predictive of competition and firm characteristics such as experience and location can predict entry patterns among the potential bidders indicating entry costs.

Social implications – The lack of competition in public procurement is costly for taxpayers. Reducing entry costs should be the focus of policy design and policy efforts should be targeted to tenders where competition is expected to be low.

Originality/value – This paper uses large and rich data sets to study competition in public procurement of all sizes in all industries and for a wide range of contracting authorities. Novel entry analysis is facilitated by observing the potential bidders using registrations as proxy and linking these potential bidders to firm data. Registration data also facilitates the use of IVs strategy to study the effects of competition.

Keywords Competition, Entry, Prices, Public procurement

Paper type Research paper

© Jan Jääskeläinen, Janne Tukiainen, Tuomas Hiilamo and Kirsi-Maria Magga. Published by Emerald Publishing Limited. This article is published under the Creative Commons Attribution (CC BY 4.0) licence. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this licence may be seen at <http://creativecommons.org/licenses/by/4.0/>

Funding: This study was supported by Strategic Research Council No. 340044; Strategic Research Council No. 340045; Yrjö Jahnsson Foundation No. 20187077; Yrjö Jahnsson Foundation No. 20197180.



Journal of Public Procurement
Emerald Publishing Limited
1535-0118
DOI 10.1108/JOPP-08-2025-0100

1. Introduction

In most countries, a large share of public sector purchases are implemented via public procurement (PP). For example, in the OECD countries, PP is estimated to have accounted for about 13% of GDP in 2021 [1]. Adopting PP is often seen as addressing both issues related to the lack of incentives, inefficiencies and rent-seeking possibly involved in in-house production by the public sector (e.g. Niskanen, 1971; Alchian and Demsetz, 1972), and various market imperfections arising in private markets producing public goods. However, recently policymakers in the EU have been increasingly worried that PP does not work as it should due to a severe lack of competition. For example, according to the European Court of Auditors (2023, p. 4), “Overall, we conclude that the level of competition for public contracts to deliver works, goods and services, decreased over the past 10 years in the EU single market. There is a lack of awareness for competition as prerequisite for value for money procurements.”

Despite the policy need to understand the implications of, the reasons and the remedies for this lack of competition, the existing evidence is limited in scope. Prior research on competition in PP is mainly industry specific and we seem to be missing an in-depth, comprehensive and broad picture regarding some of the fundamental questions about the anatomy of competition in public procurement in any country. We ask three key questions. First, how extensive is the lack of competition and how does it vary across contracting authorities, industries, regions and the applied auction mechanisms? Second, does competition have the desired effect on prices for the procurer? Third, what factors are associated with the level of competition and entry? For example, can economic operators’ interest to bid be subject to the tender design? What type of potential bidders bid and what type abstain?

We leverage rich and large data to provide both descriptive and quasi-experimental evidence on these questions across a wide spectrum of public procurement contract awards in Finland. Our data contain information on a large amount of invitations to tender (ITT) including all bids as well as bidder registration data, which we argue to be a good proxy for potential bidders. We also have detailed administrative register data information about the firms who bid and register for the observed ITTs. These allow for a detailed and novel analysis of entry choices. Our data contain all types of public contracting authorities [2] and cover all industries. Finland is an interesting case for PP analysis as it uses standard procurement contract award mechanisms (lowest tender, also referred to as first-price sealed-bid) with open competition (open procedure) and regulatory framework that follow the standards adopted in the EU.

The reason for the lack of prior comprehensive evidence is that most of the applications using PP data usually analyze special cases, that is, they use data from a single type of service or good, or a single type of contracting authority. In cases where more comprehensive data are used, often the contract award mechanism is nonstandard (see Ferraz *et al.*, 2016 for Brazil and Lee, 2017 for Korea) or the data are limited in other ways, such as lacking information on all the bids (e.g. Decarolis *et al.*, 2020 for the USA). The richest data (aside ours) concern Denmark (Aagaard and Linaa, 2024), Lithuania (Baltrunaite, 2020), Russia (Vitalijs, 2017 and Best *et al.*, 2023) and Turkey (Onur and Tas, 2019), but even in those, and in all the large data sets we are aware of, information on (or a good proxy for) potential bidders is missing. In addition to these data limitations, research questions are usually focused on specific topics in specific industries, for good scientific reasons, rather than aimed at providing a comprehensive picture of reasons and remedies for the lack of competition. The few exceptions such as European Court of Auditors (2023), Aagaard and Linaa (2024), Halonen and Tukiainen (2020), Tátrai *et al.* (2024) have been conducted after the working

paper version of the study at hand (Jääskeläinen and Tukiainen, 2019) and contain less rich information.

We make several key observations. First, there is lack of competition in Finnish PP with a median number of actual bidders being only two. This means that in more than half of the contract awards, there are either no bidders, a monopoly bidder or a duopoly of bidders. Even conditional on attracting at least one bidder, the level of competition is low with the median number of actual bidders being three. We observe a large heterogeneity in size between bidders within the tenders, which probably further exacerbates the issues associated with lack of competition (Cantillon, 2008). Lack of competition is particularly problematic in small municipalities, yet this issue affects all types of contracting authorities and regions, as well as nearly every industry.

Second, we argue that lack of competition is likely to increase costs for procuring goods and services, as we show competition (both the number of actual and potential bidders) to correlate negatively with two standardized price measures (win margin and the difference between the expected and realized price). Increasing competition has only a minor influence after six or more bidders participate, but most ITTs could benefit from an increase in competition, as less than 10% of ITTs attract this many bidders. These results are robust to identifying the effect of competition on win margins using instrumental variable (IV) strategy where the instrument for the number of actual bidders is the number of potential bidders in other tenders in the same region and industry.

Third, and crucially for improving management practices in public procurement, our data offers a unique opportunity to understand the reasons behind the lack of competition. We show that the lack of competition arises partly from the lack of potential bidders, but more importantly from entry costs (transaction costs to submit a bid) that deter potential bidders from submitting bids. We analyze the presence of entry costs by both estimating entry shares at tender level and estimating at individual potential bidder level whether they submit a bid or not. Although there is a minor entry cost to registering as a potential bidder, we argue that this cost is negligible compared to the entry costs of submitting a bid for the decision making process of the bidder. Firms may keep the option of participation open by registering, which explains the gap we observe between the number of registrations and the number of actual bids. This gap may also reflect factors not related to cost of submitting a bid or production costs, such as temporary unavailability of relevant expertise (for example, during holiday periods). Given factors likely to reflect production costs such as bidder location and factors likely to reflect entry costs such as bidders' public procurement experience, predict entry, we have evidence of entry costs. Therefore, our results indicate a need to design both the contracts and the actual procurement documents and procedure so that it is simple for firms to calculate production costs and inexpensive to submit bids.

Our study is most closely related to studies of the nature, amount and effects of competition. Onur and Tas (2019) study the effects of competition on procurement costs in Turkey. Kang and Miller (2021) explain with search frictions, information asymmetry and seller discretion why there is so little competition in public procurement. Coviello and Mariniello (2014) provide causal estimates that increased publicity requirements realizing above given value cutoffs induce more entry and higher winning rebates. Drake *et al.* (2024) find that Green Public Procurement in cleaning service procurements does not influence bids in such a way that it would be considered an effective environmental policy instrument, and it results in a lower degree of competition and increased prices. Detkova *et al.* (2018) show that in the most corrupt regions of Russia, most of the auctions have only one bidder. Bhagat and Jha (2023) survey a large number of expert practitioners in India to identify reasons for the lack of competition. Hong and Shum (2002) and Tukiainen (2008) approach competition

from the perspective of common versus private values information environment in specific industries.

Our study relates also to the well-established literature on entry costs in public procurement contract awards. Papers combining auction theory and econometric theory, for example, [Gentry and Li \(2014\)](#) and [Marmer et al. \(2013\)](#), demonstrate the role of entry costs in explaining why only a subset of potential bidders submits a bid and how entry costs can be identified from data. Using structural models, empirical papers corroborate these theoretical results. They tend to find economically significant entry costs, ranging from 1 to 10% of the winning bid, which partly explain why a sizable portion of potential bidders do not submit a bid ([Bajari et al., 2010](#); [Li and Zheng, 2009](#); [Xu, 2013](#)).

To our knowledge, we are the first to provide a comprehensive reduced form quantitative description of how competition and bidder entry work in PP in a country.

More broadly, public procurement scholarship has studied various topics. For example, [Bergman and Stake \(2015\)](#) document the amount and type of public procurement in Sweden. [Coviello et al. \(2018\)](#) show that an inefficient court system weakens the performance in public works. [Caldwell et al. \(2005\)](#) use case studies to improve understanding of strategic priorities in managing public procurement to maintain competitive markets. [Vagstad \(1995\)](#) studies theoretically whether foreign firms will be discriminated against. [García-Santana and Santamaría \(2025\)](#) quantify the importance of home bias in explaining governments' purchases using a large data set for Spain and France.

2. Institutional setting

Finnish Act on Public Procurement and Concession Contracts (1397 / 2016) is based on the EU Procurement Directive 2014 / 24/EU [3]. These rules set out obligations for contracting authorities. EU rules and national procurement acts require that all contracts exceeding predetermined thresholds shall be awarded through certain predetermined procurement procedures.

The procurement procedure in a nutshell is as follows. When a public entity decides to make a purchase that exceeds the national and/or EU threshold values, it must advertise the contract notice and the Invitation to Tender (ITT) on an electronic notice board. The ITT must include all information about the purchase, thus ensuring that complete information is available to all potential bidders [4]. The invitation also sets the timeline for the procurement procedure and informs the bidders about the award criterion. If the contract also exceeds the EU threshold value, the contract notice shall also be advertised in the EU's online contract notice service TED (Tenders Electronic Daily).

Two different award criteria rules are used dominantly in public procurement in Finland. The first mechanism, the lowest price tender, chooses the lowest price from all bidders who meet the minimum (quality) requirements. The second rule allocates the purchase to the bid with best price-quality ratio. In practice, this means using a scoring auction rule to evaluate the quality criteria ([Asker and Cantillon, 2008](#); [Asker and Cantillon, 2010](#)). All bids in our samples are submitted as sealed bids and the winning bidder is paid the amount bid.

3. Data

Although there is a publicly operated notice board (called Hilma) in Finland, it does not collect any detailed information on contracts or bids. However, a substantial share of public sector entities use electronic procurement software provided by a single private firm Cloudia Oy to conduct their procurement auctions. Cloudia's expansion has been rapid as their software was introduced only in 2010. From 2010, a gradually increasing number of municipalities and other public sector agents have started to use their platform. We use Cloudia data from public

procurement auctions held in Finland between June 2010 and September 2017. A large part of our data come from the later years.

Our data contain 18,000 ITTs with at least one bidder registration, 170,000 (e.g. contracts or individual lots), and 705,000 bids [5]. ITTs often contain several separate auctions (lots) for which bidders submit individual bids. For example, an ITT may be about office stationery and the individual auctions within it about paper and pens. The last full year in our data (2016) contains about 30% of all ITTs for that year (in Hilma), totaling 5.3 billion euro in expected costs [6].

Information on expected cost of procurement is missing for approximately 25% of the ITTs. This is due to no requirement to post the information for ITTs below EU-threshold as well as weak enforcement of the requirement for contracts above EU-threshold. Furthermore, The industry classifications of the ITTs are obtained from common procurement vocabulary (CPV) classification codes [7].

The data generating process is as follows: First, a contracting authority makes a decision to procure and chooses how to conduct the procurement. At this stage, most of the procurement process related data are created, including all the ITT-specific variables. These are the objects of the procurement, the engineer-estimate of the cost, the award criterion [scoring (price and quality) vs price only] and whether bidders are allowed to bid to lots. We refer to this option of dividing the contract into separate lots as a partial procurement. All tenders in our data follow an open procedure [8].

In the second step, potential bidders opt in to an invitation to tender by registering for the ITT in the Cludia system. Based on our discussions with several Cludia employees, firm managers and civil servants who conduct public procurement, registration is a very good proxy for being a potential bidder. Registering requires only a very small (but nonzero) amount of effort and allows bidders to access the full tender information that is only available to registered firms. The registered firms then choose whether to actually bid in the auctions (contract awards). It is not possible to bid without registering. We have data on all the firms that have registered in an ITT and all the bids submitted in the auctions. We also observe auctions where no bids were submitted.

In the final step, the contracting authority awards a contract to one or several economic operators that have submitted a bid. We have information on the chosen winner(s), which is important in the case of scoring auctions, where sometimes the lowest price does not win. We do not have detailed information on what kind of scoring rule (quality criteria and evaluation methods) has been used or how the bids and quality characteristics are translated into scores.

We merge procurement data with detailed firm-level data and with Finnish Longitudinal Employer-Employee Data (FLEED) obtained from Statistics Finland. These data contain information on all of the approximately 300,000 Finnish firms and their employees up to and including the year 2016.

The firm data contain all the information found in the firms' financial statements as well as information on the municipalities where the firm is registered for business. Approximately 10% of observations on bidders are lost when merging the data due to incorrect or missing corporate IDs in the procurement data. We show that the merged data remains representative in the supplementary material Table s1, but we nevertheless conduct many of our analyses without firm level data to grasp the correct state of competition in public procurement. In this study, firm data are used to analyze how firm characteristics correlate with entry and competition.

4. The level of competition in public procurement

Attracting enough competition is a central ingredient from both an academic and an intuitive perspective in making public procurement auctions work to obtain high quality goods and

services at reasonable prices (Bulow and Klemperer, 1996; Klemperer, 2000). In addition, in discussions with public procurement officials, receiving enough bidders has been stated as a key practical concern. The first analysis in this section concerns the extent of competition in public procurement.

In the left section of Table 1, we describe the data at the ITT level and report the share of ITTs that have a given number of distinct actual bidders (unique actual bidder identities across all auctions within the ITT), distinct actual bidders conditional on there being at least one and registrations for the ITT. In the right section of Table 1, we describe the data at the within-tender auction level. We report the shares of ITTs within a given bracket as the average number of bidders across the lots within the ITT, both unconditionally and conditionally on there being at least one actual bidder [9]. The difference between the ITT level and the level of individual lots is potentially relevant as one ITT can contain many lots in which different bidders participate.

As reported in Table 1, 31.7% of Finnish ITTs have no actual bidders (first row of column 2). This is mainly due to the lack of entry of potential bidders as only 7.2% of ITTs have no potential bidders either (first row of column 4). In total, 15.2% of ITTs have only one actual bidder (row 2, column 2) and 14.4% only two (row 3, column 2). Less than 10% of ITTs have more than seven bidders. A similar picture emerges when we look at the level of lots within the ITTs, where the real competition takes place (the last two columns in Table 1). A table describing the amount of competition in Finnish public procurements for recent years is provided in the supplementary material B and a descriptive analysis of Finnish PP data from 2017 to 2022 can be found in Hiilamo et al. (2023).

Levels of competition appear to be low across all types of contracting authorities, as shown in Tables S2 and S6 in the Supplementary material. In Finland, the median number of bidders is two for large municipalities including the municipalities in the capital area as well as for regional contracting authorities. Both the government authorities and small municipalities seem to attract less competition than large municipalities, with the median number of bidders being only one. When excluding ITTs without any bids, we notice that

Table 1. Distribution of bids and registrations in public procurement in Finland

Count	Bidders (<i>n</i>)	ITT level		Auction level		
		bidders (<i>n</i> > 0)	Registrations (<i>N</i>)	Count bracket	Bids	Bids (<i>n</i> > 0)
0	31.72%		7.17%	0–0.99	35.14%	6.88%
1	15.15%	22.18%	8.81%	1–1.99	17.23%	23.37%
2	14.37%	21.04%	10.19%	2–2.99	15.50%	22.70%
3	11.31%	16.57%	11.56%	3–3.99	11.45%	16.76%
4	8.01%	11.73%	10.50%	4–4.99	6.94%	10.16%
5	5.07%	7.43%	9.13%	5–5.99	4.50%	6.59%
6	3.60%	5.27%	7.17%	6–6.99	2.79%	4.09%
7	2.35%	3.44%	6.24%	7–7.99	1.86%	2.72%
8+	8.43%	12.35%	29.22%	8 -	4.60%	6.73%
obs	17,944	12,253	17,944		17,944	12,253

Note(s): The table shows the distributions of observed bids and registrations by potential bidders in public procurement in Finland. Bidders are calculated as the number of distinct bidders in an ITT who have submitted at least one bid. The shares of ITTs are reported separately for ITTs with at least one bidder. The right half of the table presents the shares of ITTs at the level of an individual lot. These bids are calculated first for each lot within the ITT, then averaged over the ITT. The average number of bids can be lower than one, because there are lots where a bidder has not bid

Source(s): Authors' own work

small municipalities are a clear outlier in the amount of competition. Finnish small municipalities also receive on average almost two registrations less than their larger counterparts. These results indicate that both lack of potential bidders and low entry are involved in explaining low competition [10].

We also look at competition at the industry level and find that, aside from a few outlier industries, low competition is an issue across most of the industries. In fact, no industry has a median number of bidders greater than three. The amount of competition at industry level is presented in Figure 1, where each bar represents an industry in the two-digit CPV classification [11].

We also analyze the asymmetry of the bidders. Large asymmetries in production costs between bidders lead to less intense competition (Cantillon, 2008). Large asymmetries can work both as entry barriers (extensive margin) and also lead to less intense competition between the actual bidders (intensive margin). We study to what extent bidders differ from each other within ITTs based on their observed characteristics. Naturally, production costs are not observed. To understand the overall heterogeneity in size, Figure 2 reports the asymmetry of bidders within ITTs based on their employee counts, calculated by dividing the largest bidder's employee count in an ITT by the ITT's average employee count [12]. We find that, in general, there is heterogeneity in size between bidders within ITTs. This means competition is likely to be even less intense than our analysis of number of actual bidders indicates.

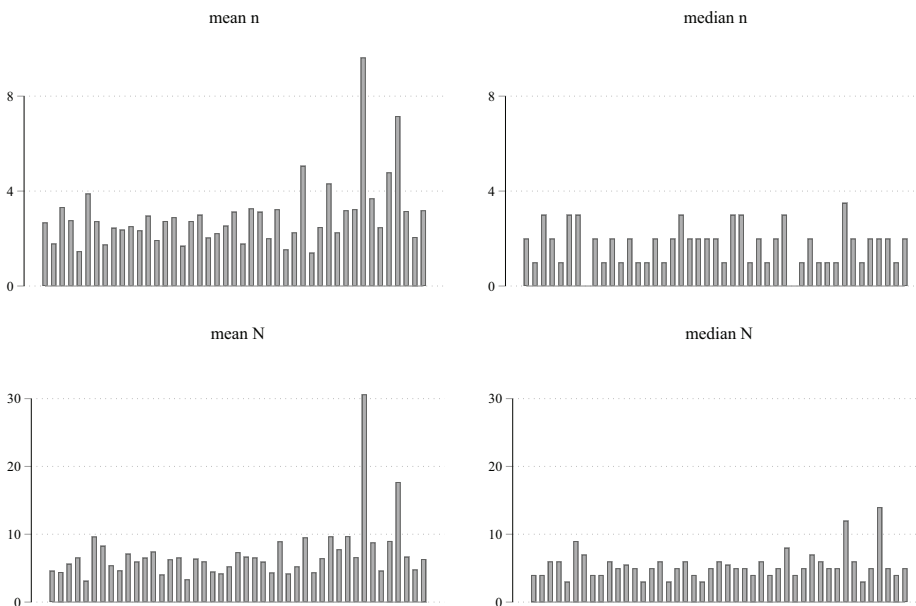


Figure 1. Numbers of bidders and registrations by industry

Note(s): Each bar represents an industry categorized at two-digit CPV classification. The two outliers are forestry and social and healthcare services both of which commonly procure using framework agreements involving dozens of small firms. For example in forestry services it is common that up to 30 winners are awarded in ITTs where over a hundred companies have registered as potential bidders.

Social and healthcare services similarly have several ITTs with very large numbers of bidders

Source: Authors' own work

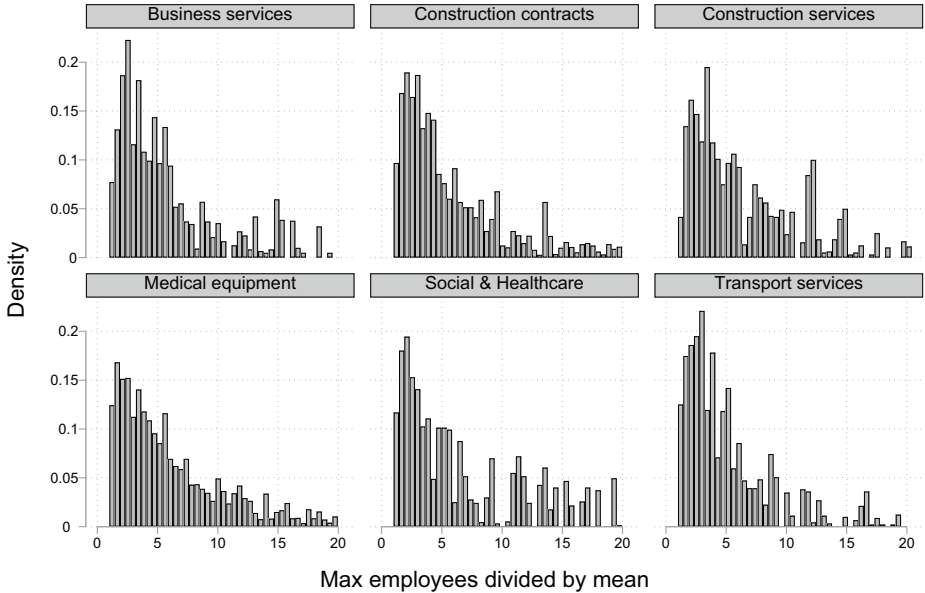


Figure 2. Distribution of bidder asymmetry, by industry group

Note(s): Bidder asymmetry is calculated for each invitation to tender by dividing the largest bidder’s employee count by average employee count. Bidders’ employee counts are recorded as an average over the year the ITT took place. Distributions are truncated at 20

Source: Authors’ own work

5. Relationship between competition and prices

This section concerns both how competition is associated with prices in Finland and whether competition affects prices. The standard auction theory competition argument (“competition effect”) predicts that an increase in competition, that is, a higher number of actual bidders (denoted by n), leads to lower prices (and/or higher contractable quality) in PP. This is because more aggressive bidding is needed to win with more intense competition.

However, auction theory and empirical evidence also argue that competition may sometimes have the opposite effect. In common-value PP auctions, the winner is the bidder who has estimated the production costs to be lowest (even if the real costs are the same for all bidders). Thus, the winner may suffer from the winner’s curse as the real production costs are higher than the winner thought. This underestimation becomes more severe as the number of bidders increases. Rational bidders account for this and bid less aggressively as competition increases. This is called the “Common values effect” (Bulow *et al.*, 1999; Hong and Shum, 2002). A similar winner’s curse may arise in affiliated value auctions where the bidder with the lowest signal on the costs (i.e. the winner) also believes that the other bidders have very low signals and thus assumes that a lower bid is needed to win than they would assume without the updating of their beliefs resulting from affiliation. A rational bidder accounts for this and bids less aggressively as competition increases. This is called the “Affiliation effect” (Pinkse and Tan, 2005; Hubbard *et al.*, 2012). The “Entry effect” (Li and Zheng, 2009) arises from entry costs to bidding. The higher the number of potential bidders (denoted by N), the less profitable it is to enter due to the more intense competition, therefore, with a larger N , it

makes less sense to pay the entry costs. Thus, an increase in N does not necessarily reflect an increase in n or may even lead to a decrease in n under some assumptions. Due to these concerns, it is an empirical question whether competition has the desired effects on prices. It may also be the case that the effects are nonlinear and the relationship may even reverse at some point. In addition, the effects of competition are likely to vary case by case.

Estimating the effect of competition on prices is tricky, for example, due to variables being omitted and the selection of bidders via entry. In the auction literature, this is typically addressed with structural models (or experimental designs in a laboratory setting). However, the scope of our paper is descriptive. We try to address these issues to some extent through measurement, providing different types of outcomes for which the methodological issues differ and by using IVs identification strategy.

First, we use win margin [equation (1)], which is available for all auctions with $n > 1$, as a measure of the intensity of competition. The lowest bid refers to the minimum bid price, while the runner-up bid is the price of the second-lowest bid:

$$\text{win margin} = \frac{\text{runner-up bid} - \text{lowest bid}}{\text{runner-up bid}} \quad (1)$$

The second measure used is the difference between the realized and expected price (equation (2)) calculated at an ITT level [13]:

$$\text{difference between expected and realized price} = \frac{\text{expected price ("engineer estimate")} - \text{realized price}}{\text{expected price}} \quad (2)$$

These standardizations partially address the omitted variables issues (contract heterogeneity) by differencing across bidders within the same auction, but may involve some other issues. First, the win margin and n have a statistical relationship as the expected difference between the lowest and second lowest value of practically any distribution gets smaller as the number of draws from the distribution increase. On the other hand, Virtanen (2025) shows using auction theory based simulations that the relationship of the number of bids to the winning bid price can be proxied by the relationship of the number of bids n to the win margin. Second, the win margin only reflects the competition between the two lowest bids but may not capture the intensity among all of the bids. Third, other factors than competition intensity, such as uncertainty over the production costs, information provided on the ITT and bidder asymmetry, likely influence the win margin. Our IV identification strategy and sectoral fixed effects should to some extent address this concern. Although, heterogeneous treatment effects are possible or likely and we are capturing only a local average treatment effect in the IV.

We correlate win margin with n at the auction level and difference between expected and realized price with both n and N at the ITT level. Using both n and N partially addresses the selection issue. However, collusion may still be an issue. For example, if bidders submit phony bids, then the observed n is upward biased from the real level of competition. N and n are also somewhat limited in information content if bidders are very asymmetric.

Next, we analyze the correlation between our standardized price measures and the level of competition. We report both mean and median values, but focus on the median in the analysis as the mean win margin is very susceptible to outliers [14]. The pattern of results shown in Figure 3 suggests that by and large competition is desirable for contracting authorities as it decreases the win margin. However, the relationship between win margin and n is not

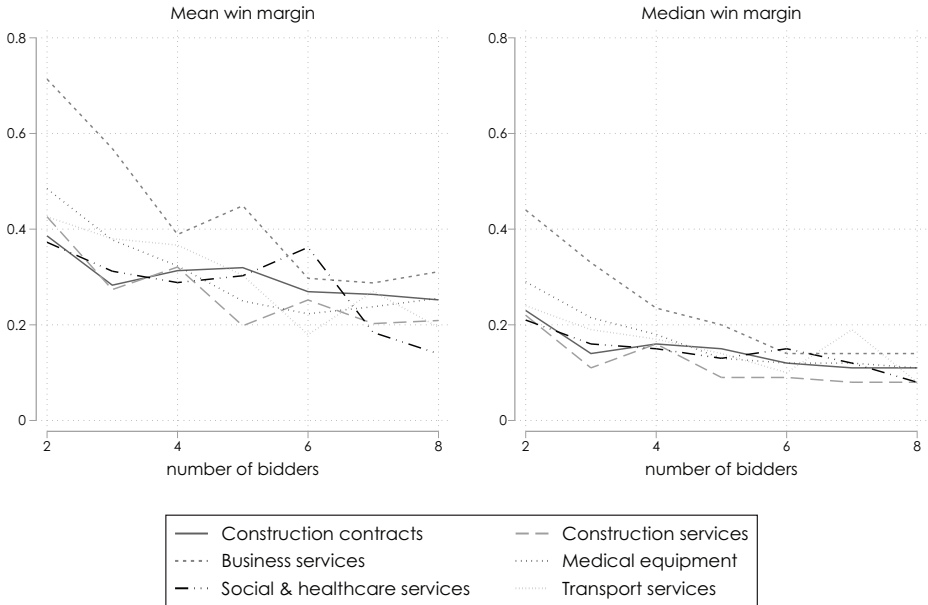


Figure 3. Win margins, by industry group

Note(s): Graphs are presented for most commonly procured industries in Finland. Win margins are calculated at an auction level. Largest 1% of win margins are omitted due to the data containing unreasonable outliers. Number of bidders is right-censored at 8

Source: Authors' own work

monotonic. This is consistent with case studies (structural econometrics of single industries) reporting nonmonotonicity due to the common values effect, the affiliation effect or the entry effect.

We provide more detailed evidence in Table S4 in the supplementary material. We show that the quadratic relationship between the win margin and n (*bids*) is robust to the addition of various control variables and fixed effects. In Supplementary material Table A5, we also look at the relationship between the number of registrations N and the win margin. Although the shape of the relationship is the same as with bids, the magnitude is significantly smaller and the coefficients are not statistically significant.

To further explore the relationship between the win margin and the number of bids and to address the potential issue of the win margin and n having a statistical relationship and omitted variable concerns, we create an instrument for n which we will denote N_i^{IV} and which we calculate separately for each ITT i . N_i^{IV} is the average number of registrations in other ITTs within the same region and industry as ITT i . The claim we make is that the average number of potential bidders in other ITTs $j \neq i$ affects only the number of bidders in ITT i but not the win margin. This exclusion restriction could be violated if regional shocks or procurement practice reforms influence both registrations and the win margin. Time-invariant buyer heterogeneity is controlled with the buyer fixed effects. Another possible issue with this instrument is the possible sensitivity to the broadness of industry classifications used.

We perform IV regressions for the whole sample as well as individually for ITTs with six or fewer bidders and seven or more bidders. The results are shown in Table 2. The coefficient for n is -0.0261 for the whole sample and -0.0517 when looking at auctions with six or fewer bidders. That is, for ITTs with 2–6 bidders, an extra bidder decreases the difference between the lowest and second lowest bid by about five percentage points. The coefficients are both small and statistically insignificant when looking at the sample of auctions with six or more bidders, as would be expected. Both coefficients are also statistically significant with the 5% confidence level. The above results imply that getting about six actual bidders could be “enough” competition to achieve reasonably narrow win margins.

In Figure 4, we plot the mean and median values of the relative differences between estimated and realized costs. As the number of unique bidders and the number of potential bidders’ registrations increases, the cost difference also increases. This result suggests that, at least when the number of bidders is lower than 7, the competition effect dominates and an increase in competition lowers prices.

6. Determinants of competition

Next, we turn to analyzing the reasons for the lack of competition. Why are the levels of competition so low? What are the possible obstacles in attracting more potential bidders and getting potential bidders to actually bid?

We first look at the association between bidding and registering. In Figure 5, we report 95% confidence intervals for the predicted ratio n/N for different number of actual bidders (n) and registrations (N). There are two key observations: First, the high level of actual competition (n) is achieved only when most potential bidders end up bidding, that is, n/N is about 0.7. Second, the presence of more potential entrants does not fully translate into more actual bidders, as entry shares are on average relatively low for any number of potential entrants N and get smaller as N increases. This leads to an important conclusion: it seems to be rather the low level of entry than the low number of potential bidders that is the key driver for the lack of competition even if both are somewhat relevant.

Given the descriptive nature of this figure, we do not want to draw strong conclusions on what mechanism is behind these associations. Nonetheless, this result is in line with auction theory entry effect discussed above, where anticipation of competition reduces entry. However, in our data this interpretation may be problematic as the bidders do not observe the registrations of other potential bidders. However, if we think the bidders can form expectations of N with some predictive power, then the same pattern should emerge. But alternative explanations are possible. For example it could be that unclear procurement documents get high N and small n/N and clear procurement documents get small N but high n/N . From policy perspective both mechanisms would recommend making clearer procurement documents to promote entry.

In Table 3, we analyze entry patterns by regressing n (at both the ITT and auction level), N and n/N on the ITT characteristics of using quality scoring award criterion (denoted by scoring) and allowing bidding to lots (partial), ITT size (denoted by engineer estimate) and on how detailed CPV classification is used, while controlling for industry, region and time fixed effects.

Engineer estimate shows some interesting patterns. Larger contracts have more potential bidders, but they bid less often as *engineer estimate* negatively predicts n/N . The actual resulting number of bidders n remains roughly unaffected. However, the size estimates are fairly small in magnitude as the unit is in millions of euro and typically the contracts are much smaller (median estimated value is 0.157 million euro), implying that adjusting size is of limited practical relevance for affecting competition. The observed auction characteristics

Table 2. Effects of number of bidders on win margin

Dependent variable	OLS		IV		<i>n</i> > 6	<i>n</i> ≤ 6	<i>n</i> > 6	<i>n</i> > 6
	Full sample	<i>n</i> ≤ 6	Full sample	<i>n</i> ≤ 6				
First stage								
<i>n</i>	-0.0171 *** (0.00154)	-0.0233 *** (0.00222)	-0.0123* (0.00520)	0.179*** (0.0403)	-0.0261** (0.00814)	0.0785*** (0.0217)	0.0256 (0.0137)	0.0787 (0.0787)
Outcome mean	0.20	0.20	0.16	0.20	0.20	0.20	0.16	0.16
Observations	95602	83258	12344	94943	12344	82640	12303	12303
<i>R</i> -squared	0.08	0.08	0.06	0.07	0.06	0.05	0.06	0.06
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note(s): IV estimates are obtained using two-stage least squares. In the first stage, we regress the instrument N^{IV} on the number of actual bidders n . Two-digit CPV classification is used for industry fixed effects. Constant is included in the regression. The unit of observation is an auction. Standard errors are clustered at the industry level. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source(s): Authors' own work

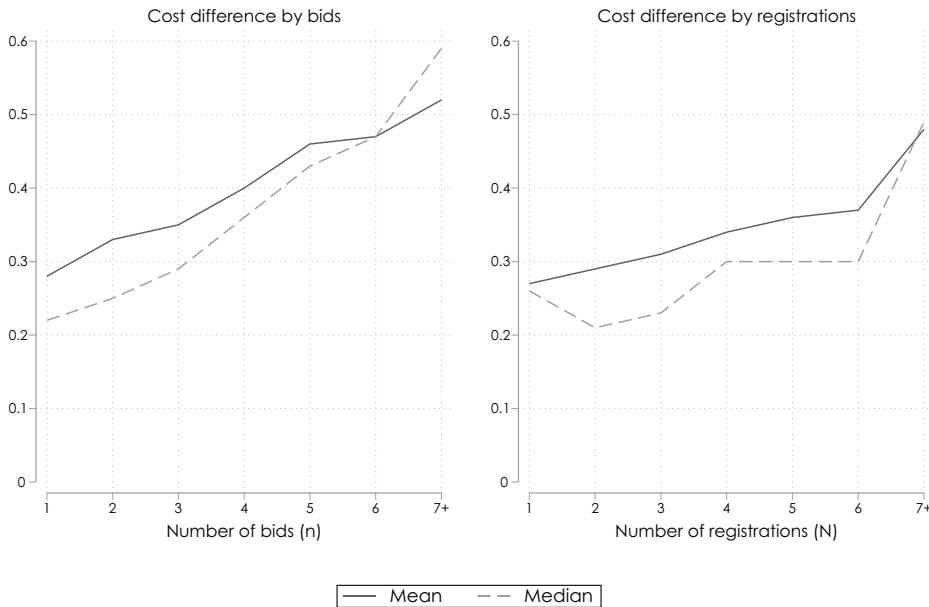


Figure 4. Relative differences in estimated and realized costs in Finnish public procurement

Note(s): Estimated costs are an engineer estimate posted in the ITT. Realized cost is calculated using data on bids and the quantities procured. Differences are calculated only for goods where the quantities are known. These data restrictions limit the number of observations to 1 601. Actual contracts might incur additional costs not observable in our data

Source: Authors' own work

have varying success in predicting competition and entry. First, allowing bidding to lots (*partial*) is a significant predictor only for the ITT level n and N , but this is just mechanical, while it is not significant in its relevant column of auction level n .

In contrast, the use of quality award criteria (*scoring*) is statistically significant and negatively associated with actual number of bidders n as well as the share of bidders to registrations n/N suggesting that having more complex auction rules can present an entry barrier. Using quality award criteria is associated with receiving 0.28 fewer bids. The positive estimate for the use of quality award criteria in column (2) can be explained by potential bidders needing more information about the ITT before deciding on participation.

Finally, we turn to data on individual bidders and examine the firm-level entry choices of registered potential bidders. We use combined public procurement and firm register data. Based on Table 4, locality strongly correlates with entry, as being located in the same municipality is associated with a 6 percentage point increase in the probability of entry (e.g. submitting a bid). Previous bidding experience is also a strong predictor, as having bid in a previous year is linked to a 16 percentage point increase in the probability of entry. Other firm characteristics have less predictive power. Another interesting result, consistent with our previous findings, is that the use of scoring auctions appears to be associated with lower entry rates. Specifically, using a quality criteria is associated with 7 percentage points decrease in the likelihood of bidding.

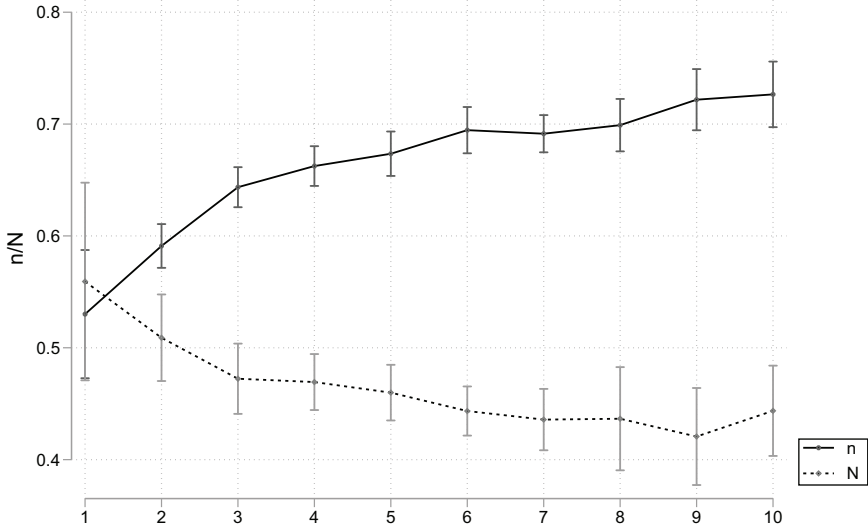


Figure 5. Predicted shares of bidders (n) to registrations (N) by realized number of bidders and registrations

Note(s): Predicted shares and their 95% confidence intervals (y -axis) are obtained by regressing n/N on n and N dummies (x -axis) respectively. We control for contracting authority and industry group fixed effects. Standard errors are clustered at the two-digit CPV category level

Source: Authors' own work

7. Discussion

Despite the richness of our data, many relevant ITT characteristics are not directly observed. For instance, contract complexity, exact industry conditions or specific quality criteria and their weighing are unobserved and may both introduce bias into the results and leave interesting questions unexplored. The data set covers only procurements conducted through Cloudia, and Cloudia adoption may be associated with differences in competition that we do not observe. Moreover, price information is incomplete: it is partly missing and based on data prior to contract fulfillment, meaning that unexpected costs arising after procurement are not captured.

The price measures used also have limitations. The win margin captures only the gap between the two lowest bids and not price differences across the full distribution of bids. The accuracy of the difference between estimated and realized costs depends on the precision of the engineer's estimate, which is unknown and it may vary. In addition, the cost difference measure is available for only approximately ten percent of ITTs.

Most of the results should be considered descriptive. Although the evidence reveals systematic correlations between competition and price outcomes, only the IV estimations provide exogenous variation in the number of bidders. Because firm entry, bidder selection and auction design are endogenous and some relevant variables are omitted from the regressions, most of the findings should be understood primarily as informative patterns rather than definitive causal estimates.

The IV approach mitigates part of the endogeneity by exploiting exogenous variation in bidder availability within industry and region. However, regional procurement reforms, unobserved local demand shocks or the reputation of the contracting authority could still jointly affect both bidder registrations and pricing outcomes, violating the exclusion restriction.

Table 3. OLS regressions on determinants of competition

Dependent variable	<i>N</i> (1)	(2)	<i>n</i> (ITT) (3)	(4)	<i>n</i> (auction) (5)	<i>n/N</i> (6)	(7)
Scoring	0.259 (0.132)	0.361** (0.127)	-0.280** (0.0944)	-0.210* (0.0809)	-0.283* (0.117)	-0.0529*** (0.0127)	-0.0516*** (0.0119)
Partial bids allowed	2.770*** (0.316)	2.712*** (0.330)	1.190*** (0.117)	1.253*** (0.114)	0.207 (0.123)	0.00510 (0.0173)	0.0144 (0.0195)
Engineer estimate (dummy)	-1.133*** (0.152)		-0.0650 (0.140)		-0.0115 (0.107)	0.0861*** (0.0228)	
Engineer estimate		0.0748** (0.0224)		-0.00993 (0.0176)			-0.00469* (0.00218)
Engineer estimate ²		-0.000214*** (0.0000584)		0.0000244 (0.0000426)			0.0000151* (0.00000582)
Inaccuracy of ITT notice	0.0730* (0.0300)	0.0706* (0.0327)	0.00850 (0.0191)	0.0162 (0.0195)	0.0145 (0.0433)	-0.00600 (0.00355)	-0.00606 (0.00346)
Government authority	-0.573 (0.501)	-0.750 (0.518)	-0.765*** (0.185)	-0.724** (0.206)	-0.704* (0.304)	-0.0644* (0.0251)	-0.0526 (0.0275)
Regional authority	-4.341*** (0.401)	-1.296* (0.539)	-1.435*** (0.206)	-0.272 (0.371)	-0.987** (0.325)	0.0915*** (0.0190)	0.0800** (0.0258)
Large municipality	-2.434* (1.041)	-2.069 (1.027)	-0.715 (0.598)	-0.619 (0.646)	-0.630 (0.381)	0.175* (0.0731)	0.163 (0.0880)
Small municipality	1.026 (0.841)	1.043 (0.823)	0.157 (1.041)	0.171 (1.030)	-0.449 (0.648)	-0.0365 (0.244)	-0.0403 (0.243)
Outcome mean	5.81	5.61	2.49	2.45	2.22	0.46	0.47
Observations	12,411	10,872	12,411	10,872	169,954	11,511	10,052
R-squared	0.20	0.20	0.13	0.13	0.12	0.11	0.11
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note(s): Number of bidders (*n*) is right-censored at 8 and number of registrations (*N*) is right-censored at 15. Inaccuracy of an ITT notice is measured as the number of zeroes present in the CPV code used in the ITT notice. Capital area municipalities are used as baseline for contracting authority dummies. Two-digit CPV classification is used for industry fixed effects. Engineer estimate is in million euro and is corrected for inflation using 2016 as the base year. Monthly dummies show statistically significant reduction in competition in July. Constant is included in the regressions. The unit of observation is ITT except for regression (5) where the unit is auction. Standard errors are clustered at the industry level. Standard errors in parentheses. **p* < 0.05, ***p* < 0.01, ****p* < 0.001

Source(s): Authors' own work

Table 4. Regressions on determinants of entry for registered bidders

Dependent variable	Logit (1)	(2)	OLS (3)	(4)
Has bid in previous year	0.851*** (0.0698)	0.739*** (0.0505)	0.191*** (0.0113)	0.159*** (0.00851)
Has bid in previous year, same region and industry	0.234*** (0.0379)	0.255*** (0.0421)	0.0578*** (0.00963)	0.0611*** (0.0100)
Has registered in previous year	-0.824*** (0.0828)	-0.720*** (0.0606)	-0.184*** (0.0208)	-0.154*** (0.0138)
Present in same municipality	0.254*** (0.0406)	0.256*** (0.0420)	0.0615*** (0.00988)	0.0603*** (0.00966)
Present in same region	0.180*** (0.0559)	0.187*** (0.0486)	0.0430*** (0.0135)	0.0443*** (0.0112)
Backlog	0.0000197	0.0000159	0.00000451	0.00000417
	0.0000182	0.0000151	0.00000439	0.00000371
Backlog/Turnover	-0.0000403** (0.0000139)	-0.0000144 (0.0000149)	-0.00000931** (0.00000300)	-0.00000378 (0.00000345)
Scoring	-0.173 (0.0957)	-0.287** (0.0931)	-0.0409 (0.0228)	-0.0655** (0.0206)
Partial	0.222 (0.118)	0.171 (0.102)	0.0512* (0.0243)	0.0387 (0.0215)
Engineer estimate	-0.0219 (0.0273)	-0.0185 (0.0266)	-0.00373 (0.00221)	-0.00296 (0.00186)
Engineer estimate ²	0.000112 (0.000328)	0.0000875 (0.0000290)	0.00001211* (0.00000561)	0.0000101* (0.00000467)
Outcome mean	0.46	0.46	0.46	0.46
Observations	67,517	67,457	67,517	67,470
Firm characteristics	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	Yes
Region FE	No	Yes	No	Yes
Year FE	No	Yes	No	Yes

Notes: Dependent variable is a dummy indicating whether a firm has bid in any lot in an ITT conditional on registering for the given ITT. Firm characteristics include turnover, turnover/engineer estimate and employee count. Regressions include constant. Backlog and engineer estimate are in million euro. Backlog is calculated taking the sum of the values (engineer estimates) of tenders awarded to the firm during one year prior to the observed ITT. Standard errors are clustered at the industry level. Observations are firm – ITT pairs. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source(s): Authors' own work

Furthermore, if bidding activity in one region constrains bidders' capacity in neighboring regions, such spillovers would lead to an effect from treatment to control group. These spillovers would violate the stable unit treatment value assumption necessary for the IV.

Another consideration not studied in our paper is that perhaps not all auctioneers want to engage in attracting more competition, but rather have their favored producers. In some cases such discretion may be warranted and optimal (Kang and Miller, 2021; Coviello *et al.*, 2018), but it can also be motivated by favoritism (Hyytinen *et al.*, 2018) or corruption (Boas *et al.*, 2014; Balrunaite, 2020; Gulzar *et al.*, 2022; Ruiz, 2018). Moreover, there can be principal-agent problems between the tax payer and the auctioneer, as the auctioneer may want to limit competition simply to avoid the administrative costs of conducting and evaluating the procurement (Bajari and Tadelis, 2001; Bandiera *et al.*, 2009 and Kang and Miller, 2021). Recently, contracting authorities' preferences have been studied by Tukiainen *et al.* (2024), they find that on average public buyers prefer mostly to avoid contract winners with prior bad performance. This suggests that one reason for the lack of bidders is that bidders could engage in either favoritism or benevolent discretion related to bidder quality rather than corruption *per se*.

8. Conclusion

We use unique, comprehensive and rich data on Finnish public procurements, bidder registrations and firm characteristics across all industries to provide novel evidence on the extent, price implications and determinants of competition.

We document lack of competition in Finnish PP across almost all industries, all regions and contracting authority types. The median number of bidders in ITTs is only two, and nearly a third of the tenders receive no bids at all. Conditional on attracting at least one bidder, the median number of bidders increases to three. Although the lack of heterogeneity is in itself an argument in favor of the external validity of our results, the lack of competition seems not to be limited to Finland, as similar patterns are also observed in Swedish (Tukiainen and Halonen, 2020), Russian (Vitalijs, 2017), Danish (Aagaard and Linna, 2024) and Lithuanian data (Balrunaite, 2020), and in the EU in general (European Commission, 2017), as well as in the US (Kang and Miller, 2021). Moreover, substantial asymmetry in bidder size, large differences in firm employee count, within tenders indicates that effective competition is even weaker than bidder counts alone suggest.

The lack of competition seems to be an issue for tax payers since we observe competition having desired and expected associations with standardized price measures. The correlations observed are, however, nonlinear: beyond roughly six bidders, additional participation yields limited further benefits. Since fewer than ten percent of tenders reach this level, most public procurements could still benefit from increased competition.

Third, the lack of competition seems to result from low entry among those who register more than the low number of potential bidders. As such this calls for the contract design and other procedural improvements to make contracts more attractive and to decrease costs of bidding. Entry is more likely among firms with prior procurement experience and those located in the same municipality as the contracting authority. By contrast, procedures where contracts are awarded based on a combination of price-quality criteria are associated with lower entry rates. Future research could analyze the causal effects of scoring and other auction design choices on entry, the heterogeneity in the effects across industries and more detailed design of the scoring rules. Moreover, both quantitative and qualitative research design should be used to better understand what exactly should the buyers do to attract more competition. Attracting competition should still be feasible given that Titl (2023) show that in Czechia buyers attracted more sellers when regulation forced them to do so by forbidding buying when there is only one bidder. This regulation also decreased prices. Motivated by

our study at hand and that of [Titl \(2023\)](#), there is an ongoing (in Autumn 2025) legislative change in Finland to implement the same regulation.

However, in practice, it can be still be difficult in some cases to attract substantially more competition. Therefore, a more rigorous use of reservation prices could also be implemented to limit the high prices resulting from lack of competition ([Myerson, 1981](#); [Gentry and Li, 2014](#) and [Vitalijs, 2017](#)).

Notes

- [1.] Source: www.oecd.org/gov/public-procurement/ accessed on 9 February 2025.
- [2.] Central, regional and local governments, and other types of public authorities conducting PP such as public universities, national church, municipal co-operations, bodies governed by public law.
- [3.] Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC, OJ L 94, 28.3.2014, pp. 65–242.
- [4.] The disclosure of expected costs in Finnish PP is not fully enforced.
- [5.] We drop most ITTs with zero registrations from our data as for them we cannot disentangle whether it is a real tender, a mistake or some kind of a test in the Cludia system. Therefore, the real extent of competition may be even lower than we document. However, we do include ITTs with zero registrations if we can successfully link them to the Hilma database.
- [6.] We cross-reference our data with Hilma to ensure there are no pre- or post-announcements which are not meant for bidding or registrations. We also exclude all such announcements from the Hilma database when comparing the two data sets. Comparison of our data and Hilma data can be seen in Figure S1 in the supplementary material.
- [7.] The CPV establishes a single classification system for public procurement in the EU aimed at standardizing the references used by contracting authorities and entities to describe procurement contracts.
- [8.] Restricted tenders are available in Finnish public procurement, but they are rare, only approximately 5% of all Finnish ITTs. Moreover, they are less often conducted via the Cludia system. Therefore, in our available data, only about 1.5% of tenders are restricted. This paper's focus is therefore exclusively on open procedures.
- [9.] Certain ITTs have several independent contracts that can be awarded. Hence instead of looking at total number of bids (or bidders) in an ITT, we look at the average number of bids across all lots within each ITT.
- [10.] Relatedly, Table S3 in the supplementary material that while some regional differences in levels of competition exist, they are not large.
- [11.] For years 2017 to 2023 competition at the industry level is shown in the supplementary material Figure S2.
- [12.] Bidder asymmetry by industry for years 2017 to 2023 is shown in the supplementary material Figure S3.
- [13.] The expected price is the estimated cost, also known as the engineer's estimate, provided by the contracting authority in the ITT. It is available for about 75% of Finnish ITTs, while the realised price is available only for about 10% of ITTs. The reason is that while bids are in unit prices, we often do not observe the respective quantities of those units. Overall, this measure is therefore available only for 10% of ITTs.
- [14.] This is due to certain contracts consisting of several objects, for which bidders must submit bids separately. However, the contract is based on the combined value of bids across all objects, and hence a bidder can bid one euro on all but one object, where a bid for the entire contracts' worth is placed.

References

- Aagaard, K.B. and Linaa, J.G. (2024), "The impact of competition for public contracts on public finances", Discussion Paper, Copenhagen.
- Alchian, A.A. and Demsetz, H. (1972), "Production, information costs, and economic organization", *The American Economic Review*, Vol. 62 No. 5, pp. 777-795.
- Asker, J. and Cantillon, E. (2008), "Properties of scoring auctions", *The RAND Journal of Economics*, Vol. 39 No. 1, pp. 69-85.
- Asker, J. and Cantillon, E. (2010), "Procurement when both price and quality matter", *The RAND Journal of Economics*, Vol. 41 No. 1, pp. 1-34.
- Bajari, P. and Tadelis, S. (2001), "Incentives versus transaction costs: a theory of procurement contracts", *The RAND Journal of Economics*, Vol. 32 No. 3, pp. 387-407.
- Bajari, P., Hong, H. and Ryan, S.P. (2010), "Identification and estimation of a discrete game of complete information", *Econometrica*, Vol. 78 No. 5, pp. 1529-1568.
- Baltrunaite, A. (2020), "Political contributions and public procurement: evidence from Lithuania", *Journal of the European Economic Association*, Vol. 18 No. 2, pp. 541-542.
- Bandiera, O., Prat, A. and Valletti, T. (2009), "Active and passive waste in government spending: evidence from a policy experiment", *American Economic Review*, Vol. 99 No. 4, pp. 1278-1308.
- Bergman, M. and Stake, J.Y. (2015), "The anatomy of public procurement in Sweden", in Stake, J. (Ed), *Essays on Quality Evaluation and Bidding Behavior in Public Procurement Auctions*, Södertörn Doctoral Dissertations, Sweden.
- Best, M.C., Hjort, J. and Szakonyi, D. (2023), "Individuals and organizations as sources of state effectiveness", *American Economic Review*, Vol. 113 No. 8, pp. 2121-2167.
- Bhagat, G. and Jha, K.N. (2023), "Modeling the competition-restrictive actions in public works procurement", *Journal of Public Procurement*, Vol. 23 Nos 3-4, pp. 365-388.
- Boas, T.C., Hidalgo, F.D. and Richardson, N.P. (2014), "The spoils of victory: campaign donations and government contracts in Brazil", *The Journal of Politics*, Vol. 76 No. 2, pp. 415-429.
- Bulow, J. and Klemperer, P. (1996), "Auctions versus negotiations", *The American Economic Review*, Vol. 86 No. 1, pp. 180-194.
- Bulow, J., Huang, M. and Klemperer, P. (1999), "Toeholds and takeovers", *Journal of Political Economy*, Vol. 107 No. 3, pp. 427-454.
- Caldwell, N., Walker, H., Harland, C., Knight, L., Zheng, J. and Wakeley, T. (2005), "Promoting competitive markets: the role of public procurement", *Journal of Purchasing and Supply Management*, Vol. 11 Nos 5-6, pp. 242-251.
- Cantillon, E. (2008), "The effect of bidders' asymmetries on expected revenue in auctions", *Games and Economic Behavior*, Vol. 62 No. 1, pp. 1-25.
- Coviello, D. and Mariniello, M. (2014), "Publicity requirements in public procurement: evidence from a regression discontinuity design", *Journal of Public Economics*, Vol. 109, pp. 76-100.
- Coviello, D., Guglielmo, A. and Spagnolo, G. (2018), "The effect of discretion on procurement performance", *Management Science*, Vol. 64 No. 2, pp. 715-738.
- Decarolis, F., Giuffrida, L.M., Iossa, E., Mollisi, V. and Spagnolo, G. (2020), "Bureaucratic competence and procurement outcomes", *The Journal of Law, Economics, and Organization*.
- Detkova, P., Podkolzina, E. and Tkachenko, A. (2018), "Corruption, centralization and competition: evidence from russian public procurement", *International Journal of Public Administration*, Vol. 41 Nos 5-6, pp. 414-434.
- Drake, S., Lundberg, J. and Lundberg, S. (2024), "Market response to environmental policy via public procurement: an empirical analysis of bids and prices", *Journal of Environmental Management*, Vol. 365, p. 121547.

- European Commission (2017), "Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions: making public procurement work in and for Europe", Strasbourg, 3.10.2017 COM/2017/0572.
- European Court of Auditors (2023), Public procurement in the eu: less competition for contracts awarded for works, goods, and services in the 10 years up to 2021.
- Ferraz, C., Finan, F. and Sberman, D. (2016), "Procuring firm growth: the effects of government purchases on firm dynamics", Working Paper No. 21219, National Bureau of Economic Research, Cambridge, MA.
- García-Santana, M. and Santamaría, M. (2025), "Governments' home bias and efficiency losses: evidence from national and subnational governments", Centre for Economic Policy Research, Paris and London, doi: [10.2139/ssrn.5180435](https://doi.org/10.2139/ssrn.5180435).
- Gentry, M. and Li, T. (2014), "Identification in auctions with selective entry", *Econometrica*, Vol. 82 No. 1, pp. 315-344.
- Gulzar, S., Rueda, M.R. and Ruiz, N.A. (2022), "Do campaign contribution limits curb the influence of money in politics?", *American Journal of Political Science*, Vol. 66 No. 4, pp. 932-946.
- Halonen, K.-M. and Tukiainen, J. (2020), "Competition and litigation in Swedish public procurement", *Uppdragsforskningrapport*, Swedish Competition Authority, p. 1.
- Hiilamo, T., Jääskeläinen, J. and Reyes, W. (2023), *Kilpailu Julkisissa Hankinnoissa*, Finnish Competition and Consumer Authority, Helsinki.
- Hong, H. and Shum, M. (2002), "Increasing competition and the winner's curse: evidence from procurement", *Review of Economic Studies*, Vol. 69 No. 4, pp. 871-898.
- Hubbard, T.P., Li, T. and Paarsch, H.J. (2012), "Semiparametric estimation in models of first-price, sealed-bid auctions with affiliation", *Journal of Econometrics*, Vol. 168 No. 1, pp. 4-16.
- Hyytinen, A., Lundberg, S. and Toivanen, O. (2018), "Design of public procurement auctions: evidence from cleaning contracts", *The RAND Journal of Economics*, Vol. 49 No. 2, pp. 398-426.
- Jääskeläinen, J. and Tukiainen, J. (2019), "Anatomy of public procurement", *SSRN Electronic Journal*, Vol. 118.
- Kang, K. and Miller, R.A. (2021), "Winning by default: why is there so little competition in government procurement?", *The Review of Economic Studies*, Vol. 89 No. 3, pp. 1495-1556.
- Klemperer, P. (2000), "Why every economist should learn some auction theory", *Available at SSRN Electronic Journal*, doi: [10.2139/ssrn.241350](https://doi.org/10.2139/ssrn.241350).
- Lee, M. (2017), "Government purchases, firm growth and industry dynamics", Working Paper, University of California San Diego, La Jolla, CA, USA.
- Li, T. and Zheng, X. (2009), "Entry and competition effects in first-price auctions: theory and evidence from procurement auctions", *Review of Economic Studies*, Vol. 76 No. 4, pp. 1397-1429.
- Marmor, V., Shneyerov, A. and Xu, P. (2013), "What model for entry in first-price auctions? a nonparametric approach", *Journal of Econometrics*, Vol. 176 No. 1, pp. 46-58.
- Myerson, R.B. (1981), "Optimal auction design", *Mathematics of Operations Research*, Vol. 6 No. 1, pp. 58-73.
- Niskanen, W.A. (1971), *Bureaucracy and Representative Government*, Aldine-Atherton, Chicago.
- Onur, I. and Tas, B.K.O. (2019), "Optimal bidder participation in public procurement auctions", *International Tax and Public Finance*, Vol. 26 No. 3, pp. 595-617.
- Pinkse, J. and Tan, G. (2005), "The affiliation effect in first-price auctions", *Econometrica*, Vol. 73 No. 1, pp. 263-277.
- Ruiz, N.A. (2018), "Power of money: the consequences of electing a donor funded politician", Working Paper.

- Tátrai, T., Vörösmarty, G. and Juhász, P. (2024), "Intensifying competition in public procurement", *Public Organization Review*, Vol. 24 No. 1, pp. 237-257.
- Titl, V. (2023), "The one and only: single bidding in public procurement", SSRN 3954295.
- Tukiainen, J. (2008), "Testing for common costs in the city of helsinki bus transit auctions", *International Journal of Industrial Organization*, Vol. 26 No. 6, pp. 1308-1322.
- Tukiainen, J. and Halonen, K.-M. (2020), "Competition and litigation in swedish public procurement".
- Tukiainen, J., Blesse, S., Bohne, A., Giuffrida, L.M., Jääskeläinen, J., Luukinen, A. and Sieppi, A. (2024), "What are the priorities of bureaucrats? Evidence from conjoint experiments with procurement officials", *Journal of Economic Behavior and Organization*, Vol. 227, p. 106716.
- Vagstad, S. (1995), "Promoting fair competition in public procurement", *Journal of Public Economics*, Vol. 58 No. 2, pp. 283-307.
- Virtanen, J. (2025), "Value of algorithms in public procurement policy", Hanken School of Economics PhD Thesis, Essays on Microeconomic Prediction Problems, Hanken School of Economics.
- Vitalijs, J. (2017), "Can entry mitigate the effect of inflated reserve prices in public procurement?", Working Paper, National Research University Higher School of Economics, Moscow, Russia.
- Xu, P. (2013), "Nonparametric estimation of entry cost in first-price procurement auctions", *Journal of Applied Econometrics*, Vol. 28 No. 6, pp. 1046-1065.

Supplementary material

The supplementary material for this article can be found online.

Corresponding author

Janne Tukiainen can be contacted at: janne.tukiainen@utu.fi