



Intensifying Competition in Public Procurement

Tünde Tátrai¹ · Gyöngyi Vörösmarty¹ · Péter Juhász¹

Accepted: 9 August 2023
© The Author(s) 2023

Abstract

The intensity of competition is typically measured according to the number of bidders on any given public procurement market. By analysing the Tenders Electronic Daily database 2017–2020, we examine the conditions in the contract notices which have an impact on increasing competition in launching public procurement procedures. The research findings show that the longer duration of the contract, the lowest price awarding criteria, the division of the subject matter into lots and the possibility of negotiations are essential elements which can activate bidders. These are unequivocal prerequisites for creating effective and fair competition in public procurements.

Keywords Public procurement · Tenders Electronic Daily · Intensity of competition · Single bid problem

Introduction

Encouraging intense competition in public procurement is of fundamental importance for the presence of a sufficient number of competitors and their active commitment to bidding is a key element of efficient public spendings. In the public procurement market, the degree of competition is typically measured by the number of bids, the price, and the level of savings, depending on the methodology used to determine the estimated value (Broms et al, 2019; Nemeč et al., 2020; Džupka et al., 2020; Onur et al., 2012). However, the adequacy of prices and the estimation of savings are difficult to measure objectively. It is no coincidence that the European Union Single Market Scoreboard (2022) methodology focuses on the number of bids. Still, its emphasis on single-bidder procedures raises concern about the insufficient degree of competition.

✉ Tünde Tátrai
tunde.tatrai@uni-corvinus.hu

Gyöngyi Vörösmarty
gyongyi.vorosmarty@uni-corvinus.hu

Péter Juhász
peter.juhasz@uni-corvinus.hu

¹ Budapest, Hungary

The starting point of analyzing the level of competition in Europe is the European Commission's Single Market Scoreboard (2022), which records and examines twelve indicators for Member States each year. The most important indicator from the point of view of competition is the so-called Single Bid Indicator, which according to data from the Member States poses a severe problem in relation to purchases of value greater than the EU threshold. In fact, the indicator shows that there are a number of EU Member States in which contracting entities encounter single bidders in more than one-third of their procedures: Poland, Slovenia, Hungary, Greece, Czech Republic, Italy, Romania and Bulgaria. (Single Market Scoreboard, 2022).

Graells (2016) calls the attention to national practices that distort competition and focuses on the primacy of the principle of competition in Art. 18(1) of the related Directive. Despite the focus on the principle of competition in EU Public Procurement Directives (2014), the use of the Single Bid Indicator does not really reflect this goal.

The analysis described in this study was built on the use of the TED database to examine the existence of competition in the EU Member States not only by looking at single-bidder procedures without competition but at a more complex set of variables in terms of the number of bidders. The aim of this article is to identify those conditions in the contract notice that lead to an increase in the number of bidders, i.e. that have an impact on increasing competition. The theoretical contribution of our article is that it highlights that although the number of bidders is indeed relevant when measuring the degree of competition, a more complex analysis is needed to identify how attracting only a small number of bidders is related to other elements of procedures, such as how they are financed or the awarding criteria.

After having reviewed the literature on competition in public procurement and TED analysis, the paper describes the research methodology in detail and summarises its results. Finally in the discussion section we highlight a number of issues related to the interpretation of the data analysis and draw the conclusions.

Literature

There are a number of legitimate public procurement objectives outlined in the relevant literature, such as integrity, transparency, efficiency, customer satisfaction, best value, wealth distribution, risk avoidance, and uniformity, as outlined in Schooner (2002). Moreover, securing competition is a much more complex issue, as Vagstad (1995) highlights in his seminal work promoting and analysing fair competition in public procurement contexts. Ensuring competition is typically not a cross-border issue. A number of organizations and legislators are working to open up national markets and increase international competition in public procurements. The role of the WTO GPA and the OECD's activities in recent decades are indispensable in this respect. From a research perspective, there have been several analyses promoting the opening of public procurement markets to bidders from other countries (Graells, 2015; Hunja, 2003). Caldwell et al. (2005) take a different perspective and look beyond national borders in their research on the role of public sector procurement agencies in influencing the development of competitive markets. The literature on public-procurement approaches to competition provides numerous and, to a certain

extent, conflicting results about competition. Nemeč et al. (2020) found a clear link between adequate levels of competition and the efficiency of public procurement in European data. A similar conclusion was reached by Onur et al. (2012) when it states that the number of bidders significantly and negatively affects the procurement price. However, their research exclusively focused on the auction and found for instance that high-value auctions attract more bidders or that e-procurement itself is another tool that can be used to increase bidder participation.

It is common for researchers to focus on the success and involvement of SMEs in the public procurement market as an indicator of competition dynamics (Ancarani et al., 2019). However, Tammi et al. (2020) identified an inverted-U relationship between competition and SME innovativeness highlighting that intense competition may also diminish SMEs' innovation orientation in public procurement. Nevertheless, many researchers speak out in favour of competition.

Despite all efforts, competition cannot always be achieved. Vagstad (1995) sees the problem in the discriminatory approach of contracting authorities. Graells (2016) even considers forced 'greening' policy to be a mistake which does not serve to meet the goal of promoting competition while Jones (2007) calls attention to the problem of discrimination between bidders, which often results in the exclusion of foreign bidders and creates a similarly unequal playing field however open the competition. Hunja (2003) in his work on the transition countries highlights the system in place, adequate regulation, and publicity as the most important conditions for competition. Fernández (2019) relates the topic mainly to different forms of transparency, using Spanish examples. Likewise, Tas (2020) identified a connection between higher-quality public procurement regulation, competition, and cost-effectiveness in the European Economic Area, Switzerland and Macedonia. Racca et al. (2011) found a link between the stage of completion and competition.

It is also true in public procurement that the nature of the relationship between the contracting authority and the potential suppliers, and the tools to carry out the procedure which can influence the whole process and therefore the outcome. From the contracting authorities' point of view, several studies have highlighted the importance of supplier relationship management (Caldwell et al., 2005) in competition or have analysed supply management strategies in public procurement (Erridge & McIlroy, 2002). In terms of relationship management, many similarities can be identified with supplier management in the private sector, although the general system of public procurement is much more complex. In an early work, Erridge and Nondi (1994) reject the highly competitive, non-communicative model of public procurement and clearly emphasise the importance of negotiation. Dotoli et al. (2020) focused on the supplier selection problem and found that multicriteria group decision-making approaches were useful tools to support decision-maker(s) in this task. For them, the decision-making process was therefore primarily helpful, with a partial focus on the design of the evaluation criteria during the preparation of the process.

From a competition law perspective, Anderson et al. (2011) draw attention to the importance of the use of advertised procedures to ensure transparency and open opportunities for market participants on a level playing field. This is not in contrast to Kim's (1998) research on selective tendering, where the aim is to reduce the number of partners to achieve higher quality. In this case, the contracting authority

chooses from among the candidates during the procedure, i.e. selection does not occur by preventing access to the procedure, but in the procedure itself.

As for the US, Atkinson (2020) found that the competition in public procurement of 2015–2018 is far from being “full and open”. The paper shows the extent of competition that was different across industries and years and that more competitive processes had a higher chance to accept the bid of bigger firms. He also concludes that many vendors may be discouraged from taking part in the public procurement processes. Reviewing lessons learned from public procurements in the US during the COVID-19 crisis, Atkinson et al. (2020) highlight that the opaque connections between the public and private sectors may lower the level of transparency and fairness. They also underline that there should be no preferred vendors and public procurement systems should be available to the highest possible number of suppliers.

The most important database for European public procurement research nowadays is TED (Tenders Electronic Daily). It has been analysed on a wide range of topics. For example, Soylyu et al. (2020, 2022) searched for data linkages between the TED databases for contract notices and contract award notices. They identified only a slight overlap (9%). Several researchers (Bauhr et al., 2020; Dávid-Barrett & Fazekas, 2020; Wachs et al., 2021) have investigated the database from a transparency and corruption perspective. In-depth analysis of the TED database has been undertaken mainly from a procurement expenditure perspective (Prier et al., 2018, 2021; McCue et al., 2021; Plaček et al., 2020; Soylyu et al., 2020). Researchers also strongly criticised the database due to data sparsity and quality problems which arise during data analyses that require lengthy data cleaning. Among others, Csáki and Prier (2018) draw attention to this situation and identify an accountability problem with the TED database, while Soylyu et al. (2022) dedicate a separate article to the topic of data quality barriers to transparency in public procurement, inter alia, in terms of TED. Moreover, Hafsa et al. (2021), when analysing the actual volume of public procurement, concluded that estimating the size of the public procurement market on the basis of TED would be incorrect due to data errors and gaps.

Although competition is an important topic in public procurement research, few have analyzed the TED database specifically for this purpose. Among the relevant studies it is worth highlighting Nemeč et al. (2020) who found, based on a study on the Czech and Slovak healthcare sector, that the more bidders, the lower the final price. Beyond the impact of an increase in the number of bidders, Džupka et al. (2020) found that more bids, as well as more bids from small and medium-sized enterprises, induce greater savings. Muñoz-García and Vila (2019) explored relationship between firm size, involvement, and success in cross-border public procurement. The next step is, therefore, to study bidders active in public procurement, for which the database could be suitable.

Based on the literature, competition is strengthened when more market players bid on tenders. It is no coincidence that Tas (2020) points out that improvements in the quality of regulation significantly increase the number of bidders. However, the literature has not examined the characteristics of the call for competition and those important decision points which could be relevant when preparing the public procurement procedure and lead to a more intense competition. The literature also shows that the TED database – despite data-related problems – is a good starting

point for studies about EU public procurement practices. However, one research gap is the lack of research on in-depth competition analysis based on the TED database.

Methodology

Similar to the approach of Nemeč et al. (2020) and Wachs et al. (2021) we analyse and draw conclusions from the TED database. TED is suitable for showing the relationship between the number of genuine bidders and additional variables with full European coverage at above EU public procurement thresholds.

In examining the database, we sought to answer the following research questions. First: how are the ten variables we identified related to the number of bidders? Second: how can competition in the public procurement market be increased in relation to these variables?

Two hypotheses were formulated as follows:

H1. The number of procedures with a single bidder is not the sole determinant of the strength of competition.

The degree of competition is often measured by examining the proportion of single-bidder procedures. However, our research identifies a much broader set of potential criteria. Therefore, we investigate whether the evolution of the number of bidders is similar across Member States and whether a more sophisticated analysis of bids than that of the number of single-bidder procedures is necessary.

H2. Public procurement instruments have the potential to increase competition.

We also assess what relationships among data are identifiable in relation to the number of single-bidder procedures and the variables we identify. This helps us identify opportunities that may increase competition. Our research involved examining the TED database of 2017–2020 with a focus on the number of bidders. After having presented the basic statistics, we examine the data relationships using variables selected from among the data and options available at the time of the preparation of procedures taking into account the data that was available in the contract notice templates associated with European public procurement procedures.

1. Type of contracting authority (ministry, body governed by public law, utility, etc.).
2. Type of subject matter (work, supplies, services).
3. Division of subject matter into lots.
4. Value of contract.
5. Whether EU-funded.
6. Duration of contract.
7. Presence of negotiation.
8. Accelerated procedure.
9. Awarding criteria (lowest price, most economically advantageous tender).

10. SME winners.

These ten variables are considered public procurement instruments. To the best of our knowledge, TED data has (TED CSV open data Notes and Codebook, 2022) not been examined in such depth using these elements. One of the reasons for this is that two databases are needed to explore all the above-described data in relation to the number of bidders. Our database was constructed as follows: We created two versions of the database, the first of which contained data on the level of procedure and the second referring to individual lots. This distinction made it possible to analyse both the procedure-level and the lot-level characteristics of the public procurement processes.

In the first step, data from the contract notices and contract award notices were paired and merged into a single database. In doing this, we were able to cover approx. 50% of notices. Next, we cleaned the data and removed unrealistic and presumably false records. We retained incomplete records (where some variables had missing values) and did not use imputation for the latter or to replace data deleted for being unrealistic.

The cleaning process highlighted some poor recording practices. For example, the number of offers received for a call ranged from 0 to 999 in the original dataset. To avoid distortion due to the inclusion of false data records, we incorporated only those tenders which attracted a number of offers ranging between a more realistic 1 to 98. This cleaning reduced the number of eligible calls from 432,646 to 377,761 (a loss of 12.7%) and decreased the average slightly but reduced the standard deviation radically (Tables 1 and 2).

Moreover, we also review the reported value of contracts. Based on the data distribution, it seems that artificial values containing only the digit 9 (e.g., 9, 99, 999, 9999) were too often entered instead of the actual value (Table 3). While the reporting rules

Table 1 Number of bids received for calls

Number of offers received	Original TED dataset	Cleaned dataset
0	54,315	0
1	100,478	100,478
2	79,237	79,237
3	61,776	61,776
4	42,560	42,560
5	29,348	29,348
6 to 96	64,355	64,355
97	1	1
98	6	6
99	80	0
100	50	0
101	3	0
more than 101	437	0

Own compilation

Table 2 Number of bids received for calls

	N	Minimum	Maximum	Mean	Std. Deviation
Original TED dataset	432,646	0	999	3.97	27.414
Cleaned dataset	377,761	1	98	3.62	3.824

Own compilation

Table 3 Frequency of a recorded total value awarded with the digit 9 only

	Awarded value recorded (euros)	Original TED dataset	Proportion
9		25	0.01%
99		10	0.00%
999		6	0.00%
9 999		8	0.00%
99 999		3	0.00%
999 999		23	0.01%
9 999 999		6	0.00%
99 999 999		9	0.00%
999 999 999		37	0.01%
9 999 999 999		5	0.00%
99 999 999 999		4	0.00%
Digit 9 only numbers		136	0.03%
All other valid		407,358	94.16%
Missing		25,152	5.81%
Total		432,646	100.00%

Own compilation

require authorities to upload values in euros, some of the values were unrealistic (the maximum value recorded for a single contract was higher than 60 percent of the total GDP of the European Union in 2020). Thus, no contract values with a value of fewer than 9999 euros or higher than 999 million euros were included, and we deleted contract values containing only the digit 9 too. System-missing values substituted these field values (Table 4).

We also removed some records due to their unrealistic duration. We included contracts not longer than 180 months (15 years). The maximum duration in the database was 44,870 months (the questionnaire requests the duration in months), which was unrealistic. Even if this number had been intended to refer to days, this would have implied a contract of 123 years duration (Table 5).

Table 4 Number of bids received for calls

Awarded value recorded (euros)	Original TED dataset	Proportion
0	35,143	8.12%
1 – 9 999	47,472	10.97%
10 K – 999 M	324,768	75.07%
more than 999 M	111	0.03%
Missing	25,152	5.81%
Total	432,646	100.00%

Own compilation

Table 5 Recorded duration of contracts

Duration (months)	Original TED dataset	Proportion
0	5915	1.37%
1–12	79,229	18.31%
13–24	56,462	13.05%
25–36	36,751	8.49%
37–48	26,879	6.21%
49–60	13,064	3.02%
61–72	3784	0.87%
73–84	1950	0.45%
85–96	1559	0.36%
97–108	522	0.12%
109–120	1630	0.38%
121–132	225	0.05%
133–144	284	0.07%
145–156	96	0.02%
157–168	40	0.01%
169–180	382	0.09%
More than 180 months	873	0.20%
Total valid	229,645	53.08%
Missing	203,001	46.92%
Total	432,646	100.00%

Own compilation

Results

The cleaned database contained 973,376 lots linked to 377,761 calls. However, the data is unevenly distributed across years and countries (Figs. 1 and 2). For example, the year 2020 is associated with a smaller share than in 2017–2019 because only those calls were included that were associated with a published application and an award notice published in 2020.

Fig. 1 Distribution of procurement calls according to years. Source: Own compilation

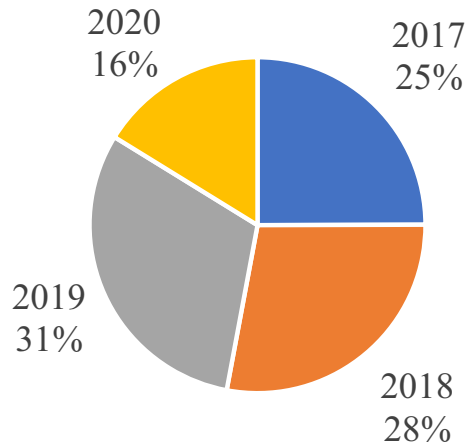
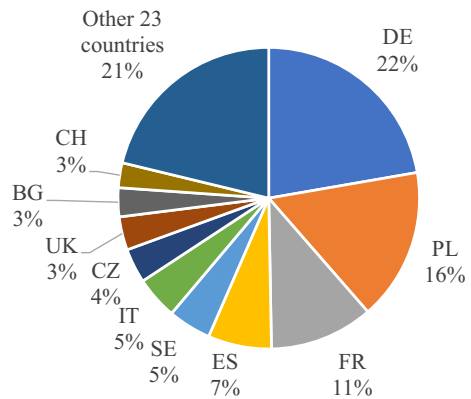


Fig. 2 Distribution of procurement calls by country. Source: Own compilation



The size of the EU countries considerably affects the number of public procurement tenders. The database is dominated by German, Polish, and French procurement calls which make up for 49.7 percent of the total calls in our database (See Fig. 2).

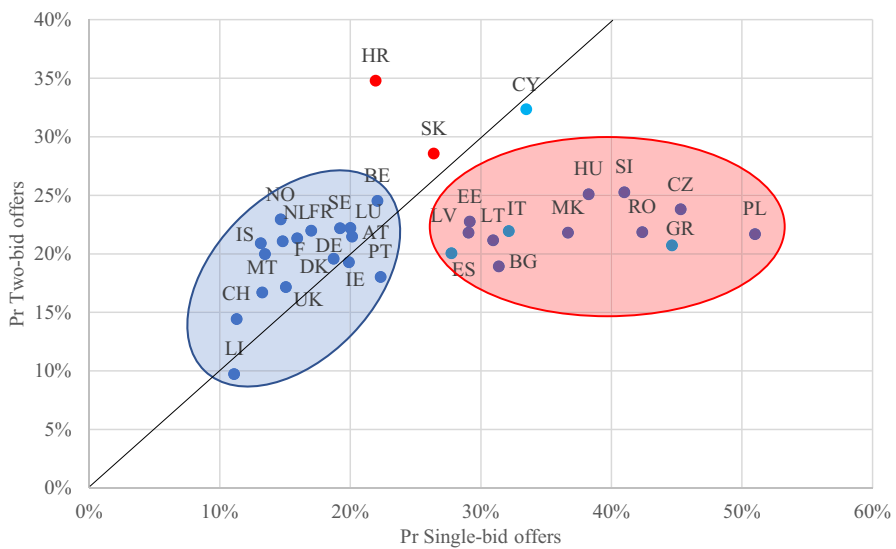
Five groups were created in line with the quantiles of the dataset to track the connections between the number of offers that were received and the characteristics of the procurement (Table 6). To measure the association between other nominal variables, cross-table analyses with Chi-square tests were used. In addition, we calculated ANOVA and paired T-tests for scale variables to help identify significant differences among groups.

Cross-country differences in the number of offers are clearest when countries are categorised according to the likelihood of having single-bid or two-bid offers, as these are the offers criticised most for their poor efficiency (Fig. 3). We identified two groups: procurement in most Western European countries (total share of procurement calls: 57.5%) is less likely to attract either type of bid, but two-bid

Table 6 Classification of procurement calls based on the number of offers received

Offer number groups	Frequency	Percent	Valid Percent
1 offer	100,478	23.2	26.6
2 offers	79,237	18.3	21.0
3 offers	61,776	14.3	16.4
4 or 5 offers	71,908	16.6	19.0
More than 5 offers	64,362	14.9	17.0
Total	377,761	87.3	100.0
System Missing	54,885	12.7	
Total	432,646	100.0	

Own compilation

**Fig. 3** The proportion of single-bid and two-bid offers according to country (%). Source: Own compilation

offers are slightly more common than their single-bid counterparts. However, less-developed Southern European (Spain, Italy, Greece) and Eastern European countries (40.9%) are identified with a relatively large proportion of two-bid offers, although the likelihood of single-bid offers is even greater. Three countries (Croatia, Cyprus, and Slovakia), which have a modest number of procurements (total 1.5%) in the database, are not associated with either of these groups.

First, we checked for connections between the type of contracting authority and the number of offers. All tests of association showed a significant relationship at all levels. While procurements that attract one and two bids are the type most frequently issued by most authorities, regional and local authorities are more successful at attracting applicants. For example, 43 percent of their calls had at least four bidders.

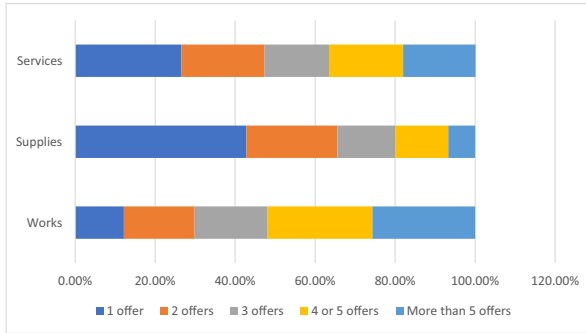


Fig. 4 The connection between the type of contracts for a lot and the number of offers. Source: Own compilation

Table 7 The connection between the number of lots in a call and the number of offers received

Number of offers	N	Mean	Std. Deviation	Std. Error	Lower Bound*	Upper Bound*	Min	Max**
1 offer	321,225	26.14	36.511	0.064	26.01	26.26	0	198
2 offers	202,241	22.35	36.159	0.080	22.19	22.51	0	198
3 offers	144,060	20.93	35.980	0.095	20.74	21.11	0	200
4 or 5 offers	153,258	18.30	33.580	0.086	18.14	18.47	0	198
More than 5 offers	118,695	12.39	26.888	0.078	12.24	12.55	0	198
Total	939,479	21.51	35.082	0.036	21.44	21.58	0	200

Own compilation

The calls of bodies governed by public law were associated with the most significant risk of receiving a single bid only.

The TED classification refers to the item or service purchased as the type of contract. As a single contract may include various things, the connection must be analysed at the lot level (Fig. 4). Statistics confirm the differences across contract types at all significance levels. While nearly 43 percent of all contracts lots for supplies (the purchase of goods) received one valid offer only, almost 52 percent of lots that involved construction work received more than three offers.

Regarding the connection between the number of lots in the given contract and the number of offers, lot-level data are more meaningful than procedure-level data. (It is trivial to mention that calls divided into more lots receive more offers, as the number of call-level offers at least totals those of successfully awarded lots). Table 7 presents the results of applying ANOVA and the significance of pairwise differences. Tests at all significance levels confirm that the number of offers and lots are not independent.

Results reveal an inverse linear connection between the number of lots and the number of offers received: the greater the number of lots contained within a single

Table 8 The connection between the value of the contract and the number of offers

Number of offers	N	Mean	Std. Deviation	Std. Error	Lower Bound*	Upper Bound*
1 offer	84,620	1,193,771	8,974,182	30,850	1,133,304	1,254,237
2 offers	66,614	1,688,488	12,030,419	46,612	1,597,129	1,779,848
3 offers	52,258	2,187,480	16,203,115	70,880	2,048,555	2,326,405
4 or 5 offers	61,829	2,124,858	13,024,827	52,381	2,022,191	2,227,526
More than 5 offers	55,388	1,921,243	11,841,337	50,314	1,822,626	2,019,859
Total	320,709	1,763,589	12,294,587	21,710	1,721,038	1,806,140

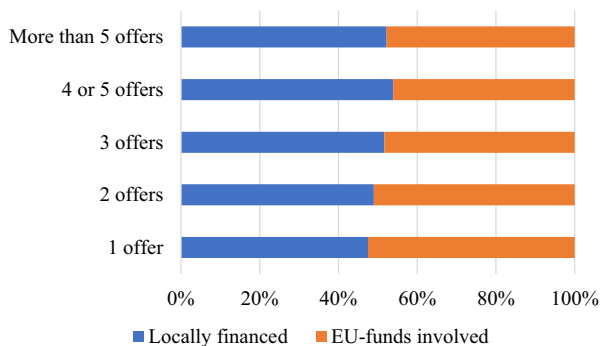
*95% Confidence Interval for Mean

Own compilation

Table 9 Summary of findings

Positive effect on the number of bidders	Negative effect of the number of bidders
Type of contracting authority – regional, local authority	Type of contracting authority – ministry
Type of subject matter—work	Type of subject matter – service, good
Division of subject matter into LOTS	Division of subject matter into too many LOTS
Value of contract—high	Value of contract—low
SME – if many bidders, many of them SMEs	EU-Funded project
Presence of negotiation	Accelerated procedure
Awarding criteria – lowest price	Awarding criteria—MEAT
Duration of contract—longer	Duration of contract—shorter

Own compilation

Fig. 5 The difference in the number of offers between locally financed and at least partly EU-funded contracts. Source: Own compilation

call, the more likely it is that only one applicant will bid. Conversely, calls with fewer lots appear to attract more bidders.

In terms of the relation between the value of contracts and the number of offers received, we identified an inverted U-shaped relationship (Tables 8). Contracts of high total value generally attract from three to five bidders, while smaller value calls either receive little attention or because they are not too big for some firms (e.g., SMEs), an increase in the number of offers. Differences across most groups are associated with a significance level of 5 percent. However, we cannot reject

Fig. 6 Difference in the number of offers between calls involving negotiated and non-negotiated processes. Source: Own compilation. *Negotiated process types: Competitive dialogue, Negotiated without a call for competition, Negotiated with a call for competition; Non-negotiated process types: Restricted, Open

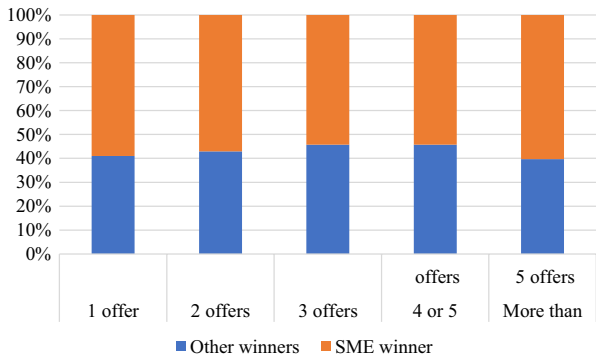


Fig. 7 The difference in the number of offers between accelerated and non-accelerated processes. Source: Own compilation



the hypothesis that calls attracting three bids and those with four or five bids have the same averages.

Public procurement completely or partly financed from EU funds is often suspected to be sub-optimally managed and to attract far too few bids. As financing schemes may differ across lots in the same call, we tested this assumption on the lot-level database (Fig. 5).

All statistical measures showed a significant difference between the two groups at all significance levels. The data show that the receipt of only one or two offers is indeed more common for EU-funded calls. In particular, single-bid calls are widespread, while those with more than five offers are rare.

It is common to assume that shorter-duration contracts attract more bidders (as the latter are of smaller value and associated with less risk). Testing this assumption, we found no significant difference between the average length of the three-offer and the four- or five-offer contracts. However, all other pairwise comparisons indicated significant deviation at a 5 percent significance level. The results support the claim that more extended contracts attract more attention than shorter ones.

We created two categories for the type of procedure based on whether negotiation played a significant role. Statistics (Fig. 6) support this division. Negotiated processes are better at attracting from two to five bids, while non-negotiated ones attract

Fig. 8 The difference in the number of offers according to the contract award criteria. Source: Own compilation

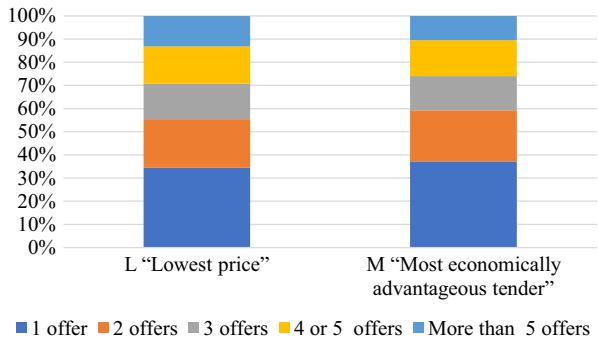
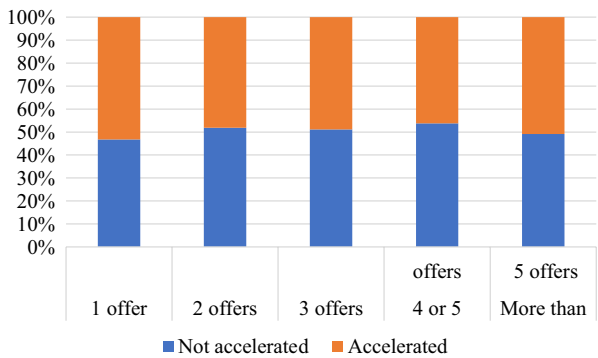


Fig. 9 The difference in the number of bids for tenders in relation to whether an SME won the contract. Source: Own compilation



more single bids and more than five bidders. We assume that this result is explained by the fact that, when organising negotiations, purchasers strive to attract several but not too many applicants so they can manage negotiations easily. (All tests of statistical difference are significant at all levels.)

Accelerated processes involve shorter implementation periods in competitive offers. Thus, it is rational to assume that these calls would receive fewer bids. Figure 7 shows that this assumption is partly true: single-bid offers are more common with accelerated processes. Nevertheless, the former also perform better at attracting more than five offers. (The two groups differ significantly based on all tests at all significance levels.)

It is safe to assume that the criteria applied to determine the winning bid significantly impact the popularity of calls. Figure 8 presents differences in the lot-level database, as these criteria may differ across lots. Results show that focusing only on the 'lowest price' boosts the likelihood of obtaining three or more offers. However, applying the more complex and 'soft' criterion of selecting the 'most economically advantageous tender' (MEAT) reduces the number of interested suppliers.

It is common to assume that SMEs only have a chance to win contracts that attract few bids and that larger companies always win more popular calls. However, findings based on the lot-level database indicate that when only one offer is received or more than five, SMEs have a larger-than-average chance to win (Fig. 9). This

implies an above-average probability of SMES bidding in single-bid offers. The larger proportion of SME wins for offers with many bids may be because most of the offers were made by SMEs.

Discussion

The analysis described here examined the relationship between the number of bidders and different variables; many relevant relationships were identified (Table 9).

The types of products and services purchased through the contract influence the likelihood of receiving fewer offers. While tenders for 'work' attract more bids, the typical 'supply' contract attracts fewer suppliers. While the situation is more balanced for services in terms of the number of bids (1–4), the proportion of single-bid procedures is disproportionately high for goods.

Contracts divided into fewer lots are more likely to attract more bidders. However, the results suggest that it is not advisable to separate a procedure into a huge number of lots unless this has economy-of-scale benefits for the contracting authorities. Contracting authorities should consider the interests of SMEs in general terms when splitting their procurements into several lots and evaluate whether it is worth issuing tenders for smaller lots at all and whether this approach is professionally justifiable.

We identified an inverted-U shape relationship between the value of contracts and the number of offers received. Higher-value contracts usually attract three to five bids, while one or two and more than five bids are more likely with lower-value agreements. This result should be treated cautiously, as the data problem mentioned earlier also exists here – i.e., contract values are often inaccurate, incomplete, and incorrect. However, based on the results of the cleaned database, it seems that bidders prefer to bid for projects that are optimal for the market and not too large than for very small or overly large projects, which is a logical choice for market players, as most of them are small and medium-sized enterprises.

It is a particularly interesting finding that EU-funded contracts receive fewer offers than their entirely locally financed counterparts. This may be for a number of reasons, such as extremely lengthy audits, greater administration, difficulty paying invoices, and difficulty with contract modifications. Overall, the experiences of market players influence attitudes towards EU-funded projects, making these procedures less attractive.

Longer-duration contracts attract more attention than shorter-period agreements. In other words, operators prefer doing business with public operators because they expect more secure revenue, which makes bidding for longer-term projects more attractive.

Although Ochrana and Pavel (2013) found a positive effect on competition for open procedures on the supply side, we do not think that this conclusion contradicts our results for the research did not specifically investigate the effect of open procedures on competition and the corresponding emergence of more bidders but solely the general impact of transparency on competition. In our case, however, we

were concerned only and exclusively with those procedures that had been publicly advertised.

In contrast to the general belief, negotiated procedures are better at attracting two to five bids than non-negotiated alternatives but less so with collecting more than five offers. As single-bid offers are rarer with negotiation-based tenders, it is still to be determined which solution may boost competition more efficiently. The result calls attention to the fact that insisting on an open procedure because it appears to be more transparent (as there is no possibility to change the subject matter or the contract content during the procedure) may actually be counterproductive. Market players value communication, which is reflected in the interest of bidders.

Accelerated processes are more likely to attract only one bid and more than five bids than non-accelerated calls. Therefore, accelerated procedures should be used with restraint by contracting authorities. It should be borne in mind that only the proper professional can make a valid bid within a concise timeframe – suggesting a very competitive market in this area. However, in the case of complex procurement processes, a shorter deadline entails that the only bidder with experience with the contracting authority may be favoured. Accordingly, the accelerated procedure, which may be discriminatory, is ideally avoided.

The tenderer may receive more bids when choosing the best offer based on price only than in the case of applying the most economically advantageous tender (MEAT) awarding criterion. This result conflicts with the EU's ambitions of employing the MEAT criterion as the general rule, with lowest price used as an exceptional awarding criterion. Not surprisingly, as the only awarding criteria is the price this does not seem to deter operators and more of them may participate in such procedures. Nevertheless, this strongly suggests that contracting authorities should be cautious about requiring tenderers to use awarding criteria other than price, particularly those that are too subjective and thus reduce the confidence of bidders in contracting authorities. Albano et al. (2017) by linking past performance to the score in the current competitive process highlight the advantage of US federal regulation, which make it an important element of every evaluation and contract award. The limitation of the present research is that in our case it is not possible in Europe to include past performance as part of the evaluation, to consider only qualitative aspects in addition to price, or to evaluate the lowest cost.

There is a higher-than-average chance of an SME winning a contract when the tenderer receives only one or more than five bids. This relative success suggests that if many bidders are bidding, most of them will be SMEs (i.e., SMEs are competing against each other), but the reasons for their success in each market are complex and deserve further research.

As regards the types of contracting authorities, ministries and 'bodies governed by public law' receive fewer bids, while regional and local authorities are far more successful. This is because local authorities can address the market more directly and activate bidders. We also looked specifically at the procedures of central purchasing organisations. However, the results should be treated with great caution. Although CPBs' procedures may appear to result in more bids, we cannot examine the related framework agreements as they are part of a closed-loop system which

involves new tender issues or selecting a bidder from among the best ones. Thus, so-called long-term procurement models (framework agreements, dynamic purchasing systems) are not the subjects of our analysis. However, CPBs typically operate according to such frameworks. Thus, the former analytical result should not be taken into consideration.

Likewise, it is a technical question for competition law if there is effective competition when there is a second bidder whose bid is invalid. Parikka-Alhola and Nissinen (2012) also raises the issue of the impact of invalid bids on evaluation. However, from the perspective of competition, having more active bidders certainly implies greater market interest, even if more of the latter is invalid.

The practical importance of the research is that it contributes to the decision of contracting authorities when they are explicitly interested in increasing the number of bidders. Given that there is less freedom for contracting authorities to choose the subject matter of the procurement when defining their procurement needs furthermore, the estimated value of the contract and the EU funding are also given, the following criteria remain, where contracting authorities have relative freedom to apply them with due justification. Paradoxically, applying the following criteria is invariably restricted by the European regulatory framework, which sees it as a restriction of competition. Therefore, there are four remaining possibilities (from the 10 examined variables) for the contracting authority to increase the number of tenderers, which are proposed based on our analysis but not supported by the legislation, EU policy and/or the decisions of the European Court of Justice.

- Negotiated procedure: contracting authorities (non-utilities) may only negotiate in justified cases, (Dir. 2014/24. Art. 26(4))
- Only price criterion: may only be used in exceptional cases, (Dir. 2014/24. Art. 67(2))
- Dividing subject matter into LOTS: if contracting authorities do not divide the subject matter of the contract into several LOTS the contracting authority shall justify it (Dir. 2014/24. Art. 46)
- Duration of the contract: an excessively long procedure may be considered as restrictive of competition. (C-451/08)

Accordingly, European legislation separates the number of bids from the competition. It treats it as an independent element, whereas in fact, it is one, but not the only, proof of the existence of competition if a sufficient number of bids is received. Our research sought to help market players from this practical point of view and found a contradiction that makes it hard to increase competition and the number of bidders in the same regulatory environment.

Conclusion

The research has highlighted the differences between countries and the many decisions that can be taken during the preparation phase of bidding procedures that can affect the degree of competition. It is concluded that the analysis of a Single Bid

Indicator is insufficient; much more analysis of indicators is needed, especially for understanding the differences among countries and for identifying country-specific solutions.

The research results raise questions about the relevance of examining multiple bids in addition to single-bidder procedures. The fact that this is yet to be investigated makes the question relevant, as knowledge of the average number of bidders may need to be refined. In contrast, examining only the number of single bidders is equally misleading. Our research suggests that Member States can be divided into two major groups, with the more developed group having a more even distribution of bids, i.e., few outliers in single-bidder procedures. In contrast, the second group has a more uneven distribution of bids and many more single-bidder procedures (see Fig. 3). This study draws attention precisely to the need to look at the structure of bids and challenges the approach of the Single Market Scoreboard, which examines the existence of competition only from one point of view, namely, through a single bidder.

In our research we identified the conditions in the contract notice which lead to an increase in the number of bidders which is the finding of our research. Thus, a longer contract period, the possibility of negotiation, the division of the procurement object into LOTS, the choice of the lowest price evaluation criterion or higher value purchases are more likely to lead to more bidders. When applying these conditions, the contracting authorities should always take into account the specifications of the items being procured. On the other hand it makes no sense to divide a procurement item into too many LOTS or to increase the estimated value pointlessly in order to reach more bidders.

Accordingly, the first hypothesis (H1) that the number of procedures with a single bidder should not be the sole determinant of the strength of competition, as well as the second hypothesis (H2) that public procurement instruments have the potential to increase competition, can not be rejected.

As outlined above, a number of approaches may be deployed to increase competition. It would be worth negotiating, allowing more time for bidding, using price-based evaluation and concluding a longer-term contract, even with an option to extend the initial contract period.

Economic development and cultural background affect the number of offers for a typical public procurement call. During the research, it became clear that two major groups of European countries may be differentiated in the TED database. In the more advanced group, the pattern of received bids is more balanced, with from one to five (or more) bids typically received in almost equal quantities. The other less well-developed group is associated with many single-bid procedures, and values for other variables are also much lower. The latter countries are typically Eastern and Central and Eastern European ones with a shorter history of public procurement and a weaker procurement culture. While these countries are at the same level of development and can certainly do something to reduce single-bidder procedures, competition dynamics are much more complex than can be addressed with simple measures. Important areas for further research are the public procurement markets in less developed countries and a detailed analysis of the intensity of competition in public procurement, including an analysis of invalid bids.

Among the research limitations are erroneous and missing data in the TED database and the fact that we could only examine procedures valued above the EU public procurement threshold. In the future, the European Public Procurement Dataspace should allow researchers to study the whole spectrum of procurement procedures above and below the EU threshold. Accordingly, comprehensive research could be carried out on all public procurement procedures and conclusions that could help increase the intensity of competition for smaller-value procurement tenders.

Funding Open access funding provided by Corvinus University of Budapest. This project was supported by NKFIH (Project K137794).

Declarations

Conflict of Interest None.

Informed Consent None.

Ethical Approval None.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Albano, G. L., Cesi, B., & Iozzi, A. (2017). Public procurement with unverifiable quality: The case for discriminatory competitive procedures. *Journal of Public Economics*, *145*, 14–26.
- Ancarani, A., Di Mauro, C., Hartley, T., & Tátrai, T. (2019). A comparative analysis of SME friendly public procurement: Results from Canada, Hungary and Italy. *International Journal of Public Administration*, *42*(13), 1106–1121.
- Anderson, R. D., Kovacic, W. E., & Müller, A. C. (2011). Ensuring integrity and competition in public procurement markets: A dual challenge for good governance. *The WTO Regime on Government Procurement: Challenge and Reform*, *681*, 681.
- Atkinson, C. L. (2020). Full and Open Competition in Public Procurement: Values and Ethics in Contracting Opportunity. *International Journal of Public Administration*, *43*(13), 1169–1182.
- Atkinson, C. L., McCue, C., Prier, E., & Atkinson, A. M. (2020). Supply Chain Manipulation, Misrepresentation, and Magical Thinking During the COVID-19 Pandemic. *The American Review of Public Administration*, *50*(6–7), 628–634.
- Bauhr, M., Czibik, Á., de Fine Licht, J., & Fazekas, M. (2020). Lights on the shadows of public procurement: Transparency as an antidote to corruption. *Governance*, *33*(3), 495–523.
- Broms, R., Dahlström, C., & Fazekas, M. (2019). Political competition and public procurement outcomes. *Comparative Political Studies*, *52*(9), 1259–1292.
- Caldwell, N., Walker, H., Harland, C., Knight, L., Zheng, J., & Wakeley, T. (2005). Promoting competitive markets: The role of public procurement. *Journal of Purchasing and Supply Management*, *11*(5–6), 242–251.
- Csáki, C., & Prier, E. (2018). Quality issues of public procurement open data. In *Electronic Government and the Information Systems Perspective: 7th International Conference, EGOVIS 2018, Regensburg, Germany, September 3–5, 2018, Proceedings 7*, 177–191. Springer International Publishing.

- Dávid-Barrett, E., & Fazekas, M. (2020). Grand corruption and government change: An analysis of partisan favoritism in public procurement. *European Journal on Criminal Policy and Research*, 26(4), 411–430.
- Dotoli, M., Epicoco, N., & Falagario, M. (2020). Multi-Criteria Decision Making techniques for the management of public procurement tenders: A case study. *Applied Soft Computing*, 88, 106064.
- Džupka, P., Kubák, M., & Nemec, P. (2020). Sustainable Public Procurement in Central European Countries. Can It Also Bring Savings? *Sustainability*, 12(21), 9241.
- Erridge, A., & McIlroy, J. (2002). Public procurement and supply management strategies. *Public Policy and Administration*, 17(1), 52–71.
- Erridge, A., & Nondi, R. (1994). Public procurement, competition and partnership. *European Journal of Purchasing & Supply Management*, 1(3), 169–179.
- EU Public Procurement Directives. (2014). Directive 2014/24/EU on public procurement; Directive 2014/25/EU on procurement by entities operating in the water, energy, transport and postal services sectors.
- Fernández, P. V. (2019). Transparency in public procurement in the Spanish legal system. In *Transparency in EU Procurements* (pp. 272–295). Edward Elgar Publishing.
- Graells, A. S. (2015). *Public procurement and the EU competition rules*. Bloomsbury Publishing.
- Graells, A. S. (2016). Truly competitive public procurement as a Europe 2020 lever: what role for the principle of competition in moderating horizontal policies? *European Public Law*, 22(2), 377–394.
- Hafsa, F., Darnall, N., & Bretschneider, S. (2021). Estimating the true size of public procurement to assess sustainability impact. *Sustainability*, 13(3), 1448.
- Hunja, R. R. (2003). *Obstacles to public procurement reform in developing countries* (pp. 13–22). Public Procurement.
- Jones, D. S. (2007). Public procurement in Southeast Asia: Challenge and reform. *Journal of Public Procurement*, 7(1), 3–33.
- Kim, I. G. (1998). A model of selective tendering: Does bidding competition deter opportunism by contractors? *The Quarterly Review of Economics and Finance*, 38(4), 907–925.
- McCue, C. P., Prier, E., & Lofaro, R. J. (2021). Examining year-end spending spikes in the European Economic Area: A comparative study of procurement contracts. *Journal of Public Budgeting, Accounting & Financial Management.*, 33(5), 513–531.
- Muñoz-García, C., & Vila, J. (2019). Value creation in the international public procurement market: In search of springbok firms. *Journal of Business Research*, 101, 516–521.
- Nemec, J., Kubak, M., Krapek, M., & Horehajova, M. (2020, July). Competition in Public Procurement in the Czech and Slovak Public Health Care Sectors. *Healthcare*, 8(3), 201. MDPI.
- Ochrana, F., & Pavel, J. (2013). Analysis of the impact of transparency, corruption, openness in competition and tender procedures on public procurement in the Czech Republic. *Central European Journal of Public Policy*, 7(2), 114–134.
- Onur, İ., Özcan, R., & Taş, B. K. O. (2012). Public procurement auctions and competition in Turkey. *Review of Industrial Organization*, 40(3), 207–223.
- Parikka-Alhola, K., & Nissinen, A. (2012). Environmental impacts and the most economically advantageous tender in public procurement. *Journal of Public Procurement*, 12(1), 43–80.
- Plaček, M., Ochrana, F., Schmidt, M., Nemec, J., & Půček, M. (2020). The factors causing delays in public procurement: The Czech Republic versus the UK. *Public Money & Management*, 40(2), 131–139.
- Prier, E., Prysmakova, P., & McCue, C. P. (2018). Analysing the European Union's tenders electronic daily: Possibilities and pitfalls. *International Journal of Procurement Management*, 11(6), 722–747.
- Prier, E., McCue, C., & Boykin, E. A. (2021). Assessing European Union standardization: A descriptive analysis of voluntary ex ante transparency notices. *Journal of Public Procurement.*, 21(1), 1–18.
- Racca, G. M., Perin, R. C., & Albano, G. L. (2011). Competition in the execution phase of public procurement. *Public Contract Law Journal*, 41(1), 89–108.
- Schooner, S. L. (2002). Desiderata: Objectives for a system of government contract law. *Public Procurement Law Review*, 11, 103.
- Single Market Scoreboard. (2022). European Commission https://single-market-scoreboard.ec.europa.eu/business-framework-conditions/public-procurement_en Uploaded: 02.04.2023.
- Soylu, A., Corcho, O., Elvæsæter, B., Badenes-Olmedo, C., Martínez, F. Y., Kovacic, M., ... & Roman, D. (2020). Enhancing public procurement in the European Union through constructing and exploiting an integrated knowledge graph. In *International Semantic Web Conference* (pp. 430–446). Springer.
- Soylu, A., Corcho, Ó., Elvæsæter, B., Badenes-Olmedo, C., Yedro-Martínez, F., Kovacic, M., & Roman, D. (2022). Data quality barriers for transparency in public procurement. *Information*, 13(2), 99.

- Tammi, T., Saastamoinen, J., & Reijonen, H. (2020). Public procurement as a vehicle of innovation—What does the inverted-U relationship between competition and innovativeness tell us? *Technological Forecasting and Social Change*, 153, 119922.
- Tas, B. K. O. (2020). Effect of public procurement regulation on competition and cost-effectiveness. *Journal of Regulatory Economics*, 58(1), 59–77.
- TED CSV open data Notes & Codebook. (2022). TED CSV open data notes & codebook Version 3.2, 2019–05–16. [https://data.europa.eu/euodp/repository/ec/dg-grow/maps/TED\(csv\)_data_information.pdf](https://data.europa.eu/euodp/repository/ec/dg-grow/maps/TED(csv)_data_information.pdf), Accessed: 24 March 2022
- Vagstad, S. (1995). Promoting fair competition in public procurement. *Journal of Public Economics*, 58(2), 283–307.
- Wachs, J., Fazekas, M., & Kertész, J. (2021). Corruption risk in contracting markets: A network science perspective. *International Journal of Data Science and Analytics*, 12(1), 45–60.

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Tünde Tátrai Full Professor at the Department of Supply Chain Management, Corvinus University of Budapest, specialising in public procurement.

Gyöngyi Vörösmarty Associate Professor at the Department of Supply Chain Management, Corvinus University of Budapest, specialising in procurement.

Péter Juhász Associate Professor at the Institute of Finance, Corvinus University of Budapest, specialising in corporate finance.