Regulatory Quality and Participation by Small Firms in Public Procurement

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Abstract: This paper investigates the effects of good practices in public procurement on small and medium enterprises (SMEs), using a dataset for European procurement tenders and contract awards that includes information on SME participation. We find that better procurement regulation quality is associated with greater SME participation and higher probability that SMEs win contracts. Dividing contracts into smaller lots also bolsters participation by SMEs, but only increases the probability that SMEs win contracts if the value of a lot is small – with an estimated threshold value around €25,000. Counterfactual simulations suggest MENA governments can enhance participation by SMEs in public procurement by improving the overall quality of procurement regimes, including the timeliness of payment of suppliers.

JEL Codes: H57; O12;

Keywords: Government procurement; public procurement regulation; competition; SMEs

1. Introduction

Small and medium enterprises (SMEs) are the backbone of any economy. They account for more than half of total employment globally and play a vital role in improving and sustaining social cohesion and integration (OECD, 2018). Obi et al. (2018) show that there is a significant relationship between the operation of SMEs and economic growth in developing nations. SMEs represent about 96 per cent of all registered companies in the MENA region (Ghassibe et al. 2019). Relative to other regions SMEs play a greater role in economic activity. One illustration is that the top 1 percent of exporting firms in MENA, accounting for more than half of total exports and export growth, are significantly smaller, on average, than in other regions (Jaud and Freund, 2015).[1]

A substantial body of research has shown that various constraints faced by SMEs diminish their ability to contribute to economic growth. Such constraints range from access to finance to difficulties in complying with administrative/regulatory requirements (e.g., Beck and Demirguc-Kunt, 2006; Iacovone et al. 2014). Given the predominance of SMEs in most economies, many countries complement efforts to improve the general investment climate and business environment (captured by the types of variables included in the World Bank's *Doing Business* and the *Worldwide Governance* indicators) with policies that target SMEs. These generally seek to offset the disadvantages of small size in terms of access to (cost of) finance or compliance with regulation.

Public procurement (PP) is one instrument governments can use to support SMEs. The PP market generally accounts for a significant share of GDP and is therefore a potentially important mechanism to foster demand for goods and services produced by SMEs. In the Arab world, the total government procurement market is large − estimated in the range of 15-20% of GDP (Djankov et al., 2016). Government demand can act as a potential channel for SMEs to offset supply side constraints and expand productive capacity by encouraging additional investment, expand employment and increase productivity.[2]

Much of the economic development literature tends to look at PP through the lens of public sector governance. Studies have shown that adoption of internationally accepted good practices in public procurement – transparency and use of award processes that minimize discretion and control the scope for corruption – fosters greater participation in public tenders and improves outcomes for

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[1] How an SME is defined varies across countries. The OECD defines SMEs as firms with less than 250 employees, comprising medium-sized firms employing between 50 and 250 workers; small firms with 10-49 employees and micro firms having less than 10 employees. In the empirics below we use the standard OECD/EU definition of SMEs as this is the basis for the data reported in the EU Tenders Electronic Daily database.

[2] See, e.g., Geroski (1990), Hebous and Zimmerman (2016), Edler and Georghiou (2007), Aschhoff et al. (2009), Fadic (2018), Edler and Yeow (2016) and Hoekman and Sanfilippo (2019).

contracting authorities (lower average prices; higher quality; better addressing the needs of the procuring agency). Greater participation in PP processes (more competition) is a key mechanism to attain value for money public policy objectives. For example, Knack et al. (2019), using enterprise data for 88 countries, find that firms are more likely to participate in public procurement markets in countries with more transparent procurement systems that rely more on open competition. Ghossein et al. (2018) using data for 109 economies and 59,000 firms confirm this result. Taş (2019), focusing on public procurement in the European Economic Area finds that better PP regulation significantly increases competition and lowers average contract prices.[3] This literature generally uses either firm-level survey data or detailed data on procurement tenders and outcomes. Papers that use contract-level procurement data that is matched with firm-level information are very limited in number and are country-specific, reflecting the lack of comparable cross-country panel data on procurement awards.[4]

In this paper, we examine the impact of PP regulation on participation by SMEs in calls for tenders using data for 31 European countries. We contribute to the literature by analyzing factors influencing whether SMEs can participate in public procurement, and the impact of specific policy measures to increase SME participation. We complement previous studies by focusing on how PP regulation affects SMEs as opposed to the effects of procurement regulation (or reform) on participation in general.[5] We also assess whether a PP policy targeting smaller firms increases participation by such firms and their probability of success. We use detailed panel data on procurement tenders and contract awards in European countries, as such information is not available for a cross-section of MENA countries. We do, however, have information on the overall quality of PP regulation for a sample of MENA countries, which allows us to undertake a counterfactual analysis of the potential effect of procurement policy reforms in MENA on the share of contracts won by SMEs. Our main contribution is to add to the literature by empirically assessing how procurement policies can affect the incentives for SMEs to compete for public contracts. This is a salient question from a policy perspective insofar as many governments seek to use PP as a tool of economic (or social) policy to support SMEs.

We find that the quality of PP regulation, as measured by indicators compiled by the World Bank and by Digiwhist – a European public sector accountability research initiative[6] – has a statistically significant positive effect on SME responses to calls for tender. We also find an associated positive probability that SMEs win more PP contracts in environments where government procurement regulation is closer

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[3] See also Baldi et al. (2016) and Kenny and Crisman (2016).
[4] E.g., Ferraz et al. (2015); Lee (2017).
[5] Most of the related literature assesses the relationship between better procurement regulation and the number of bidders (firms) participating in procurement auctions and does not focus on firm size.
[6] Digiwhist is an acronym for Digital Whistleblower, an EU-funded research project that includes an assessment of the PP regulation and related processes for 35 European countries. See http://digiwhist.eu/.

to international good practice. SMEs are more likely to submit bids when entities employ open procedures (first price auctions). The same finding obtains for instances where procuring entities divide contracts into smaller lots. The latter is a distinct feature of recent EU reforms of procurement regulation that explicitly aims at enhancing SME participation, consistent with studies such as Timmermans and Zabala-Iturriagagoitia (2013) that argue for dividing large tenders into smaller units that are manageable for SMEs. Threshold regression analysis reveals that conditional on contract size, dividing projects (contracts) into smaller lots increases the probability that an SME wins the contract.

The plan of the paper is as follows. Section 2 discusses basic principles of public procurement policy and characterize the quality of PP regimes in European countries and the MENA region. Section 3 describes the data sources used in the empirical analysis. Section 4 reports the results of the empirical analysis of the relationship between PP regulation and SME participation and success. Section 5 provides an illustrative exercise to quantify the potential effects of improving procurement regimes in MENA countries, using the results obtained from the analysis of EU data. Section 6 concludes with some tentative policy recommendations.

2. Conceptualizing and benchmarking public procurement regulation

Most national public procurement systems seek to achieve value for money by ensuring that procurement processes are transparent and utilize competition to award contracts to the lowest cost suppliers able to meet technical specifications required by a project. The basic features of good practice in public procurement from a value-for-money perspective are well known. They form the core of international guidelines, the procurement processes of multilateral development banks and the WTO Agreement on Government Procurement.[7] They call for contracting agencies to conduct procurement in a transparent and impartial manner and to use open (competitive) tendering methods to allocate contracts above a minimum value threshold to avoid conflicts of interest and prevent corrupt practices.[8] Notices of planned procurement should be published (including information on timeframe, technical requirements, the treatment of tenders and contract awards, and terms of payment). Procedures should ensure transparency, including clarity on the evaluation criteria used to determine the winning bid. Implementing regulations should specify whether procuring entities may (or must) treat domestic bids more favorably than those from foreign companies or consortia, what

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[7] See, e.g., UNCITRAL (2014).

[8] Open tendering is any method that allows any supplier to bid, including international companies. Selective tendering is a method where only suppliers that satisfy specific criteria for participation may bid (usually prequalified suppliers). Limited tendering is non-competitive and usually involves a procuring entity approaching one or more potential suppliers of its choice.

such treatment comprises and the criteria that apply.[9] Transparency is critical to make firms aware of opportunities. Publication of notices, ensuring sufficient time to prepare bids, and clearly specifying performance requirements is particularly important to SMEs as small firms have less capacity to keep informed about procurement opportunities and to interact with procuring entities to clarify what they require (Flynn and Davies, 2017).

Theory and practice suggests that transparency, competition and due process will reduce the scope for discretion and the associated incentives for corrupt practices, thereby attenuating problems of asymmetric information and the fixed costs associated with PP procedures (e.g., collecting information on procurement opportunities). Implementation of good procurement practices should change expectations that insiders will obtain contracts and reduce disincentives for firms to bid because they do not have connections with government agencies or are unwilling to provide side-payments.

Evenett and Hoekman (2005) argue there are two important dimensions to observed procurement regulation. One relates to leveling the playing field through open competition, including the removal of explicit discrimination against foreign firms. The other centers on transparency and related mechanisms that reduce discretion and the potential for corruption and collusion in the allocation of contracts. Open competition may reduce the prospects that SMEs can successfully contest procurement opportunities as it implies they will confront larger, potentially more efficient firms, but can also help SMEs insofar as discretionary methods target (favor) large firms − e.g., by procuring entities requiring very high turnover or imposing other demands that arbitrarily exclude SMEs. Greater transparency and due process also may be a positive or a negative for small firms. On the one hand it reduces fixed costs and there is a presumption that small firms will be less able to provide bribes or side-payments than larger firms. On the other hand, 'cleaner' and less discretionary procurement practices may encourage greater participation by firms that otherwise would refrain from bidding for contracts − or were simply excluded because they were not 'connected'. The effect of better procurement policy regimes on participation by SMEs is therefore an empirical question.

Many jurisdictions have taken measures to facilitate participation by SMEs, given a presumption that competitive procurement procedures and transparency and performance requirements may be too burdensome for SMEs to comply with (Glover, 2008; Loader, 2011, 2015). Such measures include defining the appropriate size of public procurement contracts so as to facilitate SME engagement; simplifying documentation; encouraging procuring entities to sub-divide contracts into smaller lots where this will not to be detrimental to the realization of project objectives and implementing e-

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[9] See http://www.sigmaweb.org/publications/key-public-procurement-publications.htm for a set of policy briefs summarizing EU procurement rules and guidance as well as general good procurement practice.

procurement systems. A general aim of these types of provisions in procurement regulation is to take into account specific characteristics of SMEs that may impede their ability to bid successfully for public contracts. A common feature is to reduce the (opportunity) cost of participation and recognize the limited capability of smaller companies to deal with the administrative requirements associated with bidding for public contracts (OECD, 2018).

Characterizing public procurement policy

Djankov et al. (2017) characterize the quality of PP regulation for 142 countries in 2016. They assess three dimensions of procurement regimes: (i) bid preparation, (ii) the content and management of the processes used to allocate contracts, and (iii) issues related to payment of suppliers that have been awarded contracts. The bid preparation score gauges the quality of the needs assessment used for project design and the call for tenders. The bid and contract management score considers the processes used for submission and evaluation of bids. The payment of suppliers score measures payment timeframes and procedures for suppliers to request of payment. An Overall Public Procurement Score ('PP Overall'), calculated as the arithmetic mean of the scores for these three areas provides a summary indicator of the quality of the government procurement regime in a country. The data used to construct these scores come from surveys of more than 1,900 procurement practitioners. They are available for 2016 only.

An alternative exercise with a similar goal centering on European countries is the DigiWhist initiative, an EU Horizon 2020 framework project involving a consortium of six European research institutes that seeks to empower society to combat public sector corruption. It covers the 28 EU Member States, the European Commission and Armenia, Georgia, Iceland, Norway, Serbia, and Switzerland. One element of the project is to produce data measuring the transparency of public administration and the accountability of public officials. The project spans both de jure and de facto practices pertaining to the scope, information availability, evaluation, open competition and institutional arrangements aspects of public procurement in EU and neighboring countries. It builds on the indicators of the World Bank's Public Accountability Mechanisms (PAM) initiative relating to public procurement practices. The resulting EuroPAM indicators score the quality of PP processes and regulation in European countries. The DigiWhist public procurement quality scores are available from 2012 to 2017.

Table 1 reports summary statistics for the PP regulatory quality indicators generated by these two sources for a sample of 33 European countries for which we have detailed data on procurement tenders and outcomes, including participation by SMEs. These data on PP process and outcomes are from the EU's Tenders Electronic Daily (TED) database, discussed further in Section 4 below. The

summary statistics for the two sources are broadly comparable. However, individual country scores presented in Figure 1 reveal substantial differences between the two sources.

Table 1. Summary Statistics: World Bank and Digiwhist EuroPam Public Procurement Indicators

|	Mean	Standard Dev.	Min.	Max
PP Overall Index	0.73	0.09	0.58	0.9
EuroPAM Country Score	62.29	10.28	47.44	83.82

Notes: The World Bank Benchmarking Public Procurement (BPP) overall indicator ranges from 0 to 1, with higher scores denoting better quality regulation. EuroPam scores range between 0 and 100.

Figure 1 shows that overall PP indices vary significantly across countries, making it possible to identify the effect of PP regulation quality on levels of competition and cost-effectiveness using data on the outcomes of procurement processes from the TED database (see Tas, 2019). Figure 2 reports analogous data for several MENA countries. The MENA region has significantly lower public procurement quality scores than European countries.

These characterizations of the quality of PP regulation across countries do not include any measures capturing the extent to which policy seeks to earmark or provide explicit preferences to certain types of firms or to address specific constraints that may impede participation by small firms. The payment indicator is the only one that addresses a feature that is more likely to be of relatively greater importance to small firms. SMEs are more likely to be credit constrained than large companies, and thus less able to incur the cost of lengthy payment delays (e.g., the ability to obtain loans for the working capital needed to execute a contract on a timely basis). In the empirical analysis, we consider the effects of overall PP regulation quality on participation by SMEs as well as the payments-related sub-component separately, and complement this with a focus on a specific measure adopted by some countries to encourage SME engagement: dividing contracts into smaller lots.[10]

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[10] The 2014 EU public procurement Directive requires procuring entities to consider dividing a contract into lots and to justify decisions not to do so. Sub-division into lots may not be used to circumvent thresholds established in EU legislation determining when competitive tendering procedures must be used. Other countries with similar provisions include Japan, South Korea, New Zealand, and Egypt (Nielsen, 2017; OECD 2018).

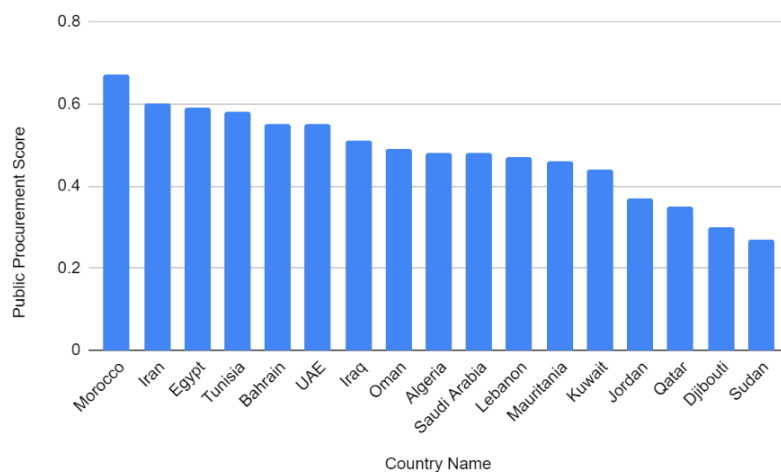**Figure 1. Public Procurement Regulation Scores for EU Countries**
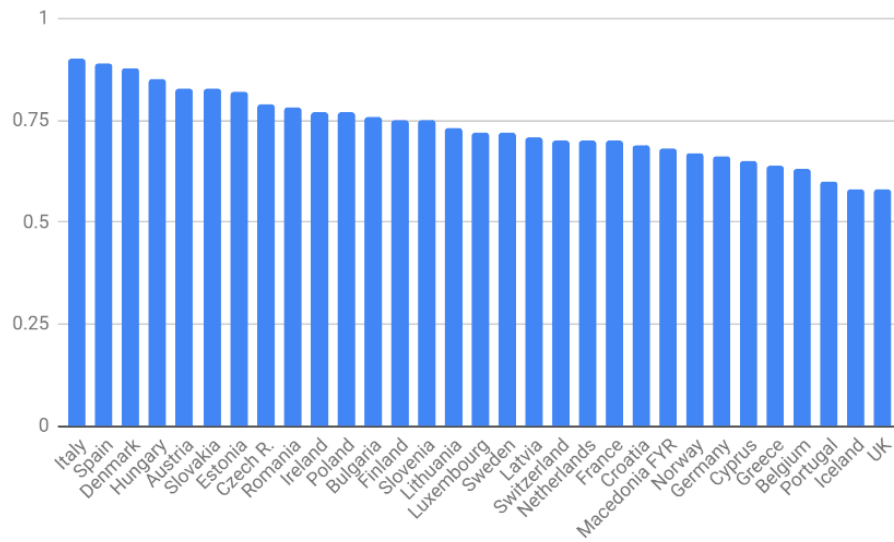
Source: World Bank Overall Benchmarking Public Procurement Index
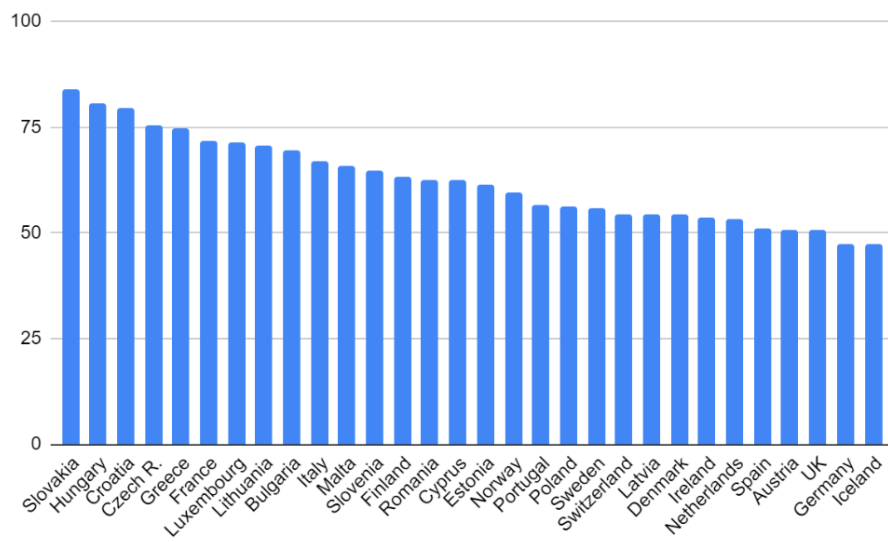
Source: DigiWhist EuroPam country scores

Figure 2. World Bank Public Procurement Scores of MENA Countries

3. The Tenders Electronic Daily (TED) Database

In the analysis that follows, we use the World Bank and Digiwhist information on the quality of PP regulation and PP contract award data for 31 European countries. Contract data are sourced from the TED database, which contains information on all tender opportunities as well as information on contract awards made by procuring entities in the European Economic Area (EU28, Iceland, Lichtenstein and Norway), Switzerland, and the Former Yugoslav Republic of Macedonia.[11] In addition to calls for tenders, TED is a depository of information on PP outcomes, i.e., which firms win contracts.

Data in TED pertain to the three main categories of PP distinguished in EU law – services, supplies (goods) and works (construction and infrastructure-related projects). Data are reported on the number and value of contracts issued by procuring entities for each of these three categories, as well as the procurement procedure that applies. These include open (competitive) bidding, restricted procedures and so-called competitive dialogue. The first two account for most procurement. Under open procedures, contracting authorities are required to publish procurement opportunities in the Official Journal of the EU, specify the technical criteria that bidders must satisfy and evaluate bids and allocate contracts on the basis only of the bids received. Restricted procedures, used for higher-value contracts, involve a process where contracts are awarded based on competition between pre-qualified suppliers that express interest in participating. Some 85 percent of PP contracts is allocated through open procedures EU, accounting for about three-fifths of total PP by value (Kutlina-Dimitrova and Lakatos. 2016).[12]

TED data are available online in CSV format for years 2006-2017.[13] The EU extracts the data from the contract notice and contract award notice standard forms filled in by the authorities.[14] Public authorities are obliged to publish calls for tenders on TED for all contracts exceeding EU public procurement thresholds.[15] Contract awards below the threshold are also reported in TED since authorities are not prevented from publishing call s for tender in TED even if the contract value is below

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[11] Djankov et al. (2017) do not have public procurement regulation scores for Liechtenstein and Malta. The TED data set contains 311 contracts for Liechtenstein and 2,518 for Malta. As these are very small countries their exclusion does not affect the empirical analysis.

[12] Negotiated procedures have the same transparency requirements as open and restricted tendering but permit the contracting entity to negotiate with potential bidders. The use of this procedure is circumscribed and in principle is limited to complex projects where there may be alternative technical solutions or the procuring authority is unable to determine ex ante how best to define its needs and to attain its objectives.

[13] We use the contact award notices csv files available at: https://data.europa.eu/euodp/data/dataset/ted-csv.

[14] The standard forms of the EU are available at http://simap.ted.europa.eu/web/simap/standard-forms-for-public-procurement.

[15] For the period under analysis the main thresholds were €135,000 for public sector supply and service contracts issued by central government entities (€209,000 for other authorities); €387,000 for utility supply and service contracts; €80,000 for small lots within a project above the services threshold; €5,225,000 for public sector and utility works and services concession contracts.

the threshold defined in EU law. For each contract, the TED data has information on estimated and contract price, the detailed CPV code for what is being procured, the procurement method used, the type of contracting authority and detailed names and locations of both procuring agencies and the winning bidders. The sector of each contract can be identified from the first two digits of the CPV code.

The TED database includes information on SME participation in 207,242 contracts for the years 2016 and 2017.[16] A total of 187,532 of these contracts were awarded using open procedures (first price auctions); 3,927 involved electronic procurement mechanisms.[17] Some 60 percent of contracts (124,614 contracts) have estimated costs that are above the thresholds that determine if EU procurement regulations apply (i.e., publication notices of planned procurement; transparent processes; etc.). In the sample, 165,276 tenders involve division of a larger project into smaller lots. As mentioned, it is important to note that TED includes PP awards that fall below the various thresholds established in EU law. This feature of the database permits analysis of contracts that fall below threshold values. The empirical analysis examines the contracts issued in 2016 and 2017 that include information on SME participation.

4. Empirical analysis

We addresses the following questions in what follows: (1) the effect of PP regulation quality on SME participation in tenders, (2) whether better PP systems affects the probability of winning a contract; (3) the impact on SME participation and the probability of success of dividing larger projects (contracts) into smaller lots; and (4) whether more timely payments are associated with more participation by SMEs.

4.1 SME Participation

We start with the economic factors that affect participation of SMEs in PP tenders, using the ratio of SME bidders to total bidders for a contract *c* as the dependent variable. SMEs are defined as by the OECD and EU (firms with 250 workers or less). We estimate the following regression equation:

$$Ratio_c = \beta_1 PPQ_c^i + \beta_2 PM_c + \beta_3 above_c + \beta_4 divided_c + \sum_{z=1}^{9} \beta_{z+4} PA_c^z +$$
$$\sum_{s=1}^{44} \beta_{s+13} Sector_c^S + \varepsilon_c \qquad (1)$$

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[16] These contracts account for 22 percent of all contracts awarded in these two years. There is no information reported on whether SMEs participated in the PP tenders for the remaining 740,822 contracts in 2016 and 2017. TED does not include information on SME participation for the pre 2016 period. Information on SME participation is provided for 31,145 contracts awarded in 2016 and 176,097 contracts awarded in 2017. Analysis reported in the Appendix (Tables A.6 and A.7) using data on contracts awarded in 2016 generates similar results to those reported in Section 4, in which we pool data for 2016-17. Thus, results found are robust to sample selection.

[17] The low share of e-procurement may reflect slow take-up of such mechanisms in the EU. The latest revisions of EU procurement regulation requiring that all communication and information with bidders, including tender submissions be performed using electronic means, only came into effect on 18 October 2018.

where $Ratio_c$ is the ratio of bids by SMEs and total number of bids submitted for each contract. PPQ_c^i is the public procurement quality score *i*, where *i* identifies whether the World Bank Overall Benchmarking Public Procurement score or the DigiWhist EuroPAM country scores are used. PM_c is a dummy variable for the use of open procurement methods and PA_c^z is a dummy variable denoting the type of public procurement authority that issued a call for tenders. $Sector_c^S$ is a vector of 44 sector fixed effects. In addition, we use dummy variables for whether estimated costs exceed the legal thresholds above which EU procurement law applies, $above_c$, and whether the contract is divided into smaller lots, $divided_c$. All estimations use robust standard errors.

The PP quality scores may be endogenous due to unobserved factors that affect both the number of bidders, the number of SME bidders and quality scores. In that case, the error term of the regression equation, ε_c, will contain these unobserved factors. The quality scores will be correlated with the error term and this endogeneity problem will distort the empirical results. We employ two alternative instrumental variable (IV) GMM methodologies to consider possible endogeneity of PP quality score variables. One is to use lagged GDP per capita as an IV. The other is to construct valid IVs using the Lewbel (2012) heteroscedasticity-based (HB) identification strategy to identify structural parameters when valid IVs do not exist. Lewbel (2012) constructs valid IVs that are independent of the error term using the heteroscedasticity structure of the error term. Column 2 of Table 2 reports the IV-GMM results; Column 3 the HB-IV GMM estimation results.

The results reveal that countries with better public procurement quality scores attract significantly more SME bidders and achieve higher levels of competition. Good procurement practices do not favour large firms disproportionately – to the contrary. The same holds for the use of open procedures to award contracts. The coefficient estimate for the dummy variable for use of 'open procedures' is statistically significant and positive in sign, implying that the ratio of SME to total bidders is higher when authorities use open (competitive) PP procedures. As expected, larger contracts are associated with lower participation of SMEs: contracts that are above the legal thresholds established in EU law are less likely to induce participation by SMEs.

There are 81,832 (28%) contracts (out of 294,183) that are divided into smaller lots. In assessing the potential effect of such sub-division on SME participation, we specify a 'Divided Lots' dummy that equals one if a contract is divided into more than one lot and is zero otherwise. This variable is constructed using information from public notices and contract identification numbers – if there is more than one contract number assigned to a notice this indicates that the contract was sub-divided. When we also consider contracts where procuring entities divided an overall project in smaller lots,

we find a positive effect on SME participation. This suggests that smaller contracts attract greater participation by SMEs, consistent theoretical arguments (e.g., Timmermans and Zabala-Iturriagagoitia, 2013) that dividing contracts into smaller lots promotes SME participation. In Section 4.3 we attempt to identify the critical value threshold for the 'smallness' of contracts.

Table 2. Effect of Public Procurement Regulation on SME Participation

(Dependent Variable: Ratio of SME bidders to total number of bidders)

	OLS	IV-GMM	HB-IV GMM
	World Bank BPP Measure		
World Bank PP Score	0.14	0.21	0.12
	(9.18)**	(5.61)**	(5.30)**
Open Procedure	0.07	0.07	0.07
	(19.66)**	(19.46)**	(19.70)**
Above Threshold	-0.03	-0.03	-0.03
	(17.11)**	(15.83)**	(17.22)**
Divided Lots	0.02	0.02	0.02
	(7.10)**	(7.24)**	(7.03)**
Constant	0.57	0.53	0.59
	(31.24)**	(17.53)**	(27.61)**
Observations	207,242	207,242	207,242
Authority FE	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
	Digiwhist EuroPAM Public Procurement Score		
Country Score	0.001	0.001	0.001
	(10.40)**	(5.61)**	(3.41)**
Open Procedure	0.07	0.07	0.07
	(19.87)**	(19.86)**	(19.92)**
Above Threshold	-0.04	-0.04	-0.04
	(18.57)**	(18.56)**	(18.59)**
Divided Lots	0.02	0.02	0.02
	(6.61)**	(6.59)**	(6.67)**
Constant	0.62	0.61	0.65
	(39.15)**	(32.11)**	(38.16)**
Observations	207,242	207,242	207,242
Authority FE	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes
Year Fe	Yes	Yes	Yes

Notes: * $p<0.05$; ** $p<0.01$. Robust z-statistics in parentheses. IV-GMM uses lagged per capita GDP as an IV.

These results are robust to using the World Bank or EuroPAM indicators and to considering potential endogeneity of PP quality scores. Estimates using the two IV-GMM approaches are similar in size and significance to the OLS results.

4.2 Probability that an SME Wins a Contract

In this section, we examine only the contracts where an SME submitted a bid and investigate whether public procurement regulation quality affects the probability that an SME wins a contract. We employ two alternative regression specifications. First, we estimate the following logit equation:

$$Prob(SME\_Winner_c = 1|x) = F(x'_{irt}\beta) \tag{2}$$

where SME_Winner_c is a dummy variable that equals 1 if an SME wins the public procurement contract and is 0 otherwise. $F(x'_{irt}\beta)$ is a logit probability function of $x'_{irt}\beta$. x'_{irt} and X' contains the explanatory variables described in the previous section. The coefficient of PPQ^i_c gauges the impact of PP regulation quality on the probability that an SME wins the contract. Given that quality scores may be endogenous, we also estimate a linear probability model using IV-GMM and lagged GDP per capita as an IV. Lewbel (2018) shows that a linear probability model can be estimated using heteroscedasticity-based instrumental variables in instances where the dependent variable is binary and an explanatory variable is potentially endogenous. Accordingly, we correct for possible endogeneity of the PPQ^i_c variables by implementing the IV GMM methodology of Lewbel (2012) in estimating the following linear probability model:

$$SME\_Winner_c = \beta_1 PPQ^i_c + \beta_2 PM_c + \beta_3 above_c + \beta_4 divided_c + \sum_{z=1}^{9} \beta_{z+4} PA^z_c +$$
$$\sum_{s=1}^{44} \beta_{s+13} Sector^s_c + \varepsilon_c \tag{3}$$

Table 3 reports the results of estimating equations 2 and 3 using logit, IV and HB-IV GMM regression specifications. The coefficient estimates for the overall PP regulation quality scores are statistically significant and positive, suggesting that the likelihood that a SME will win a public procurement contract is higher when a country has better public procurement regulation. As is the case with the participation analysis in the previous section, above threshold calls for tender are associated with a lower likelihood that SMEs win contracts. The coefficient estimates for the use of open procedures and subdivision of lots are negative and statistically significant.

These results suggest that good procurement practices encourage more SME participation and that this is rewarded with more contracts being awarded to SMEs. But they also reveal that competition (use of open procedures) and measures to increase the scope for SMEs to win contracts (subdivision of lots) may not do so. That large firms are more likely to benefit from open procedures (open competition) is not surprising. That SMEs do not tend to benefit from decisions to subdivide lots is more surprising. In the next subsection we conduct threshold regression analysis to examine the impact of lot size on the probability that SMEs win contracts. Specifically, we hypothesize that dividing contracts into smaller lots increases the chances of an SME winning only when lots are 'small enough'.

Table 3. Effect of Public Procurement Regulation Quality on Probability of SME Winning a Contract

	Logit	Linear Probability Model		
		OLS	IV-GMM	HB-IV GMM
		World Bank BPP Measure		
World Bank PP Score	3.47	0.40	0.61	0.22
	(22.59)**	(23.16)**	(24.41)**	(8.91)**
Open Procedure	-0.15	-0.02	-0.02	-0.02
	(4.99)**	(5.20)**	(6.24)**	(4.82)**
Above Threshold	-0.15	-0.02	-0.01	-0.02
	(8.80)**	(9.47)**	(5.56)**	(11.28)**
Divided Lots	-0.13	-0.01	-0.01	-0.02
	(5.69)**	(5.99)**	(5.37)**	(6.45)**
Constant	-0.29	0.61	0.47	0.74
	(1.75)	(32.72)**	(20.31)**	(32.60)**
Observations	160,697	160,697	160,697	160,697
Authority FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
Year Fe	Yes	Yes	Yes	Yes
		EuroPAM Public Procurement Score		
Country Score	0.01	0.001	0.003	0.002
	(13.87)**	(14.58)**	(22.51)**	(10.18)**
Open Procedure	-0.13	-0.01	-0.02	-0.01
	(4.28)**	(4.53)**	(5.34)**	(4.55)**
Above Threshold	-0.22	-0.02	-0.02	-0.02
	(13.35)**	(13.78)**	(11.77)**	(13.76)**
Divided Lots	-0.15	-0.02	-0.02	-0.02
	(7.00)**	(7.19)**	(7.37)**	(7.20)**
Constant	1.40	0.81	0.71	0.81
	(10.23)**	(53.76)**	(42.84)**	(49.07)**
Observations	160,697	160,697	160,697	160,697
Authority FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
Year Fe	Yes	Yes	Yes	Yes

Notes: * $p<0.05$; ** $p<0.01$. Robust z-statistics in parentheses.

4.3 Multiple Lot Procurement and Procurement Lot Size: Threshold Regression Analysis

We implement the following threshold regression specification:

$$SME\_Winner_c = \beta_1 PPQ_c^i + \beta_2 PM_c + \beta_3 above_c + + \sum_{j=0}^{m} 1_j(lotsize_j, \gamma)dividedlots\beta_{dl} + $$
$$+ \sum_{z=1}^{9} \beta_{z+4} PA_c^z + \sum_{s=1}^{44} \beta_{s+13} Sector_c^s + \varepsilon_c \qquad (4)$$

where $1_j(lotsize_j, \gamma)$ takes the value 1 if the expression that $\gamma_j \leq lotsize_j \leq \gamma_{j+1}$ is true. Therefore, the coefficient of the *dividedlots* variable, β_{dl}, can differ across values of the threshold variable, lot size.

Table 4 reports the results of fitting this threshold model to equation 4. The regression identifies a critical lot size threshold for smaller contracts, focusing on the subset of contracts that are below

€250,000 in value. When lot sizes are smaller than €23,469, the coefficient estimate on the *dividedlots* variable is positive and statistically significant. Dividing procurements into smaller lots increases the probability that an SME wins the contract. For lots with larger contract values, SMEs are less competitive and less likely to win public procurement contests even if contracts are subdivided. The threshold contract value is very small in absolute magnitude raising an empirical (and practical) question how many such contracts are observed in a country in a given year. In the case of the EU data used for the analysis, there were over 90,000 contracts with a value below the estimated threshold, suggesting some scope for a sub-division policy to have a positive effect in enhancing SME participation in procurement.

Table 4. Effect of Public Procurement Regulation Quality on Probability of SMEs Winning a Contract

	LOTSIZE < EURO 23,468.55 (N= 91,907)	
Divided Lots	0.009	0.009
	(3.31)**	(3.09)**
	23,468.55 ≤ LOTSIZE < 250,000 (N=27,694)	
Divided Lots	-0.03	-0.03
	(9.39)**	(10.22)**
	LOTSIZE ≥ 250,000 (N=21,119)	
Divided Lots	-0.13	-0.14
	(26.26)**	(28.62)**
WB PP Score	0.32	
	(20.32)**	
Country Score		0.001
		(8.19)**
Open Procedure	-0.019	-0.017
	(5.42)**	(4.89)**
Above Threshold	-0.008	-0.013
	(3.90)**	(6.67)**
Authority FE	Yes	Yes
Sector FE	Yes	Yes
Year Fe	Yes	Yes

Notes: Threshold regression of linear probability model. Only tenders in which an SME submitted a bid are examined, i.e., number of SME offers > 0. * $p<0.05$; ** $p<0.01$.

4.4 Timeliness of payments

The timeliness of payment of suppliers awarded procurement contracts is a potentially important factor determining SME participation as payment delays can reduce cash flows and affect the ability to implement contracts and realize the expected benefits of undertaking government projects. Djankov et al. (2017) construct an indicator covering several aspects related to payment of suppliers

by procuring authorities, including "the procedures required to request payments, the timeframes for processing and disbursing payments, and how delayed payments are handled" (p. 7). We use this indicator to examine the effect of payment scores on SME participation and the probability of winning a contract using the regression specifications in section 4.1 and 4.2. Tables A.4 and A.5 in the Appendix report the results. Payment quality performance has a positive and statistically significant impact on the SME participation ratio. Accordingly, better payment practices improve SME participation in public procurement. The same result obtains for the probability that an SME wins a contract.

4.5 E-procurement

As noted above, in a subset of 3,927 contracts it is reported that electronic procurement mechanisms were used. As mentioned above, the low share of e-procurement may reflect slow implementation by EU member states of e-procurement-related legislation, but as e-procurement is generally regarded as a way to reduce participation costs for smaller firms, we report the results of estimating equations (1) – (3) including a dummy variable for use e-procurement in the Appendix. Perhaps counterintuitively the results suggest that e-procurement has a negative effect on participation by SMEs in the set of contracts for which we have data. This is a finding that calls for additional analysis.

5. Potential Policy Implications for MENA Countries

In this section, we examine the potential impact of public procurement reforms in MENA countries on participation by SMEs in public procurement opportunities, using the results from the analysis based on the European data. Figure 2 above reveals that PP regulation in MENA countries is substantially weaker than in the European countries that were the basis of the empirical analysis. The difference is summarized in Table 5, which reports summary statistics for the overall PP regulation quality scores for the European countries included in the foregoing empirical analysis and for countries in the MENA region. MENA scores are significantly lower, both in terms of the mean and overall distribution of scores. Note that the best performing country in MENA is still below the European average.

Table 5. World Bank BPP Scores: Summary Statistics for European and MENA Countries

	Mean	Standard Dev.	Min.	Max
EU	0.73	0.09	0.58	0.9
MENA	0.48	0.11	0.27	0.67

Source: World Bank (2017).

Table 6 reports the results of a simple counterfactual analysis to quantify the potential effects on SME participation in government procurement in MENA countries if governments were to reform their PP regimes to achieve the European average. We employ the empirical findings of Tables 3 and 4 to calculate the impact of an increase in public procurement quality score on SME participation and the probability that an SME wins a contract. We do so by taking the difference between the public procurement quality score of a MENA country and the average EU score (0.73) and calculating the counterfactual values using the OLS coefficient estimates reported in tables 2 and 3. While a mechanical and purely illustrative exercise, the results demonstrate that MENA countries could promote both SME participation in public procurement and SME win probabilities by simply improving general PP practices, independent of complementary measures that aim at increasing the share of total government procurement contracts awarded to SMEs such as subdivision of lots.

Table 6. Potential Effect on SME Participation of PP Reform in MENA Countries

Counterfactual Results for Attaining EU Average Procurement Score

Country	PP quality score	Change in SME participation ratio (% points)	Change in SME win probability (% points)
Algeria	0.48	4	10
Bahrain	0.55	3	7
Djibouti	0.30	6	17
Egypt	0.59	2	6
Iran	0.60	2	5
Iraq	0.51	3	9
Jordan	0.37	5	14
Kuwait	0.44	4	11
Lebanon	0.47	4	10
Mauritania	0.46	4	11
Morocco	0.67	1	2
Oman	0.49	3	10
Qatar	0.35	5	15
Saudi Arabia	0.48	4	10
Sudan	0.27	7	18
Tunisia	0.58	2	6
UAE	0.55	3	7

6. Conclusion

Public procurement constitutes a major source of economic activity in virtually all countries. The processes used to define needs, design projects and allocate contracts to maximize value for money are important. The basic elements of generally accepted good practice in this area of public administration are well established. They involve mechanisms to ensure transparency, limit discretion, and constrain rent-seeking and corrupt practices. Competition is a key feature of good public procurement regulation.

Many governments are concerned that open, competitive procurement mechanisms may bias participation in procurement contests away from smaller companies towards large firms and/or benefit international bidders over domestic ones. In this paper we use a large dataset of procurement contracts issued by European countries that includes information on whether SME participated in bidding and on their success in obtaining contracts. We find that good procurement practice is good for SMEs: countries with higher PP regulation quality scores are associated with a larger ratio of SME participation and higher probability that SMEs win contracts. However, controlling for PP regulation quality, the use of open competitive tendering methods tends to benefit large firms more than SMEs, with larger contracts more likely to go to large firms.

This finding may help to explain why many governments, including in the MENA region, are interested in adopting measures that help SMEs participate in public procurement. Such measures may involve earmarking a share of procurement for small firms or other forms of preferences that target small firms. The EU, Japan, South Korea and several other countries have implemented a policy that encourages subdivision of contracts into smaller lots as a way of encouraging greater participation by SMEs. In the MENA region, Egypt has adopted such a provision. This paper offers the first evidence on the effects of such a policy. We find that it bolsters participation by SMEs but does not increase the probability of SMEs winning contracts. Threshold regression analysis suggests this result is a function of the absolute value of lot sizes. If lots are small enough – around €25,000 – the likelihood that SMEs win procurement contracts improves significantly. Our counterfactual simulations suggest that insofar as governments are interested in enhancing participation by SMEs in public procurement auctions the focus should be on improving the quality of PP regulation. Although outside the purview of our empirical analysis, improving PP regulation is also likely to be a precondition for effectively implementing policies such as subdivision of procurement contracts.

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Appendix

Table A.1: Effect of Public Procurement Regulation Quality on SME Participation

Dependent Variable: Ratio=number of SME bidders/Total number of bidders
Regressions with Electronic Procurement Explanatory Variable

	OLS	IV-GMM	HB-IV GMM
	World Bank BPP Measure		
World Bank PP Score	0.147	0.215	0.10
	(9.52)**	(5.83)**	(4.55)**
Open Procedure	0.068	0.067	0.068
	(19.99)**	(19.80)**	(20.08)**
Electronic Procurement	-0.046	-0.048	-0.045
	(7.27)**	(7.40)**	(7.13)**
Above Threshold	-0.033	-0.032	-0.034
	(16.99)**	(15.67)**	(17.30)**
Divided Lots	0.018	0.019	0.018
	(7.21)**	(7.36)**	(7.08)**
Observations	207,242	207,242	207,242
Authority FE	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
	EuroPAM Public Procurement Score		
Country Score	0.001	0.001	0.0003
	(10.90)**	(5.83)**	(2.48)*
Open Procedure	0.068	0.068	0.068
	(20.22)**	(20.21)**	(20.27)**
Electronic Procurement	-0.048	-0.048	-0.045
	(7.50)**	(7.50)**	(7.04)**
Above Threshold	-0.036	-0.036	-0.036
	(18.49)**	(18.48)**	(18.52)**
Divided Lots	0.017	0.017	0.017
	(6.70)**	(6.68)**	(6.80)**
Observations	207,242	207,242	207,242
Authority FE	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes
Year Fe	Yes	Yes	Yes

Notes: * $p<0.05$; ** $p<0.01$. Robust z-statistics in parentheses. IV-GMM employs lagged GDP per capita as an instrumental variable.

Table A.2: Effect of Public Procurement Regulation Quality on Probability of SME Winning a Contract

Only Tenders that an SME has submitted a bid are examined. Number of SME offers >0
Regressions with Electronic Procurement Explanatory Variable

	Logit	Linear Probability Model		
		OLS	IV-GMM	HB-IV GMM
World Bank BPP Measure				
World Bank PP Score	3.504	0.401	0.616	0.217
	(22.89)**	(23.34)**	(24.53)**	(8.79)**
Open Procedure	-0.139	-0.015	-0.018	-0.014
	(4.55)**	(4.75)**	(5.83)**	(4.37)**
E-Procurement	-0.518	-0.063	-0.063	-0.062
	(10.36)**	(8.76)**	(8.67)**	(8.59)**
Above Threshold	-0.146	-0.016	-0.010	-0.020
	(8.70)**	(9.32)**	(5.43)**	(11.21)**
Divided Lots	-0.122	-0.014	-0.012	-0.015
	(5.52)**	(5.79)**	(5.18)**	(6.27)**
Observations	160,697	160,697	160,697	160,697
Authority FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
EuroPAM Public Procurement Indicators				
Country Score	0.013	0.001	0.003	0.001
	(14.23)**	(14.79)**	(22.64)**	(9.98)**
Open Procedure	-0.116	-0.013	-0.016	-0.013
	(3.84)**	(4.09)**	(4.92)**	(4.10)**
E-Procurement	-0.503	-0.062	-0.063	-0.062
	(10.13)**	(8.63)**	(8.73)**	(8.64)**
Above Threshold	-0.217	-0.024	-0.020	-0.024
	(13.30)**	(13.67)**	(11.66)**	(13.65)**
Divided Lots	-0.151	-0.017	-0.017	-0.017
	(6.85)**	(7.01)**	(7.19)**	(7.01)**
Observations	160,697	160,697	160,697	160,697
Authority FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes

Notes: * $p<0.05$; ** $p<0.01$. Robust z-statistics in parentheses. IV-GMM employs lagged GDP per capita as an instrumental variable.

Table A.3: Summary Statistics: World Bank and Payment Quality Indicator

	Mean	Standard Dev.	Min.	Max
Payment	0.69	0.14	0.5	1

Table A.4: Effect of Payment of Suppliers Quality Score on SME Participation

	OLS	IV-GMM	HB-IV GMM
	World Bank BPP Measure		
Payment Quality Score	0.05	0.44	0.03
	(4.83)**	(5.59)**	(2.21)*
Open Procedure	0.07	0.07	0.07
	(19.91)**	(19.13)**	(19.93)**
Above Threshold	-0.03	-0.02	-0.04
	(17.79)**	(8.55)**	(18.00)**
Divided Lots	0.02	0.03	0.02
	(7.10)**	(8.60)**	(6.93)**
Observations	207,242	207,242	207,242
Authority FE	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Notes: * *p*<0.05; ** *p*<0.01. Robust z-statistics in parentheses. IV-GMM employs lagged GDP per capita as an instrumental variable.

Table A.5: Effect of Payment of Suppliers Quality Score on Probability of SME Winning a Contract

	Logit	Linear Probability Model		
		OLS	IV-GMM	HB-IV GMM
Payment Quality Score	1.87	0.21	0.95	0.06
	(19.90)**	(20.34)**	(29.80)**	(4.28)**
Open Procedure	-0.13	-0.01	-0.02	-0.01
	(4.39)**	(4.56)**	(5.40)**	(4.41)**
Above Threshold	-0.16	-0.02	0.00	-0.02
	(9.86)**	(10.43)**	(2.04)*	(12.83)**
Divided Lots	-0.11	-0.01	0.00	-0.02
	(4.90)**	(5.24)**	(0.72)	(6.49)**
Observations	160,697	160,697	160,697	160,697
Authority FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	

Notes: * *p*<0.05; ** *p*<0.01. Robust z-statistics in parentheses. IV-GMM employs lagged GDP per capita as an instrumental variable.

Table A.6: Effect of World Bank Public Procurement Regulation Quality Score on SME Participation

Analysis with 2016 contracts only

	OLS	IV-GMM	HB-IV GMM
	World Bank BPP Measure		
Payment Quality Score	0.11	0.59	0.19
	(3.35)**	(8.75)**	(4.17)**
Open Procedure	0.09	0.08	0.08
	(11.13)**	(10.41)**	(10.70)**
Above Threshold	-0.08	-0.07	-0.08
	(14.88)**	(12.35)**	(14.51)**
Divided Lots	0.01	0.02	0.00
	(2.04)*	(2.73)**	(0.70)
Observations	31,140	31,140	31,140
Authority FE	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes

Notes: * *p*<0.05; ** *p*<0.01. Robust z-statistics in parentheses. IV-GMM employs lagged GDP per capita as an instrumental variable.

Table A.7: World Bank PP Regulation Quality Score and SME Contract Winning Probability

Analysis with 2016 contracts only

		Linear Probability Model		
	Logit	**OLS**	**IV-GMM**	**HB-IV GMM**
Payment Quality Score	1.44	0.19	0.45	0.27
	(4.64)**	(4.94)**	(8.26)**	(5.98)**
Open Procedure	-0.25	-0.03	-0.03	-0.03
	(3.75)**	(3.99)**	(4.09)**	(4.07)**
Above Threshold	-0.56	-0.06	-0.05	-0.06
	(11.61)**	(12.29)**	(10.62)**	(11.87)**
Divided Lots	-0.23	-0.03	-0.03	-0.03
	(4.64)**	(4.67)**	(4.52)**	(4.56)**
Observations	22,741	22,741	22,741	22,741
Authority FE	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes

Notes: * *p*<0.05; ** *p*<0.01. Robust z-statistics in parentheses. IV-GMM employs lagged GDP per capita as an instrumental variable.