Contract Splitting in Public Procurement[†]

Filipe B. Caires[a,‡]   Susana Peralta[b]   Diogo Mendes[c]

[a] European University Institute

[b] NOVA School of Business and Economics

[c] Stockholm School of Economics

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Abstract

We study the role of contract splitting in public procurement. Procurement contracts with price below a threshold can be awarded at discretion, while awards for contracts above it are required to be competitive. Exploiting a reform that reduced the threshold, we find that buyers manipulate projects' price in order to award contracts at discretion. We show that contract splitting, the division of large contracts into multiple smaller parts, is the most important mechanism of manipulation in public procurement in this context. Our evidence suggests that splitting is driven by favouritism rather than efficiency-promoting motives of manipulation: we find *i)* no evidence that splitting is intended to foster non-contractible quality through discretion, *ii)* that split contracts are more likely to be awarded to sellers associated with favouritism, *iii)* less transparent buyers manipulate more, and *iv)* split contracts are associated with slightly worse post-award performance.

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[‡]Corresponding author: `filipe.b.caires@eui.eu`.

1 Introduction

Some rules are bound to be broken. Public procurement bridges public funds and private activity, and is therefore strictly regulated. Rules are tied to contract price, and arbitrary thresholds govern the trade-off between bureaucrat discretion and competition: if a contract's price exceeds the threshold, competitive procedures must be implemented (*auctions*); if it does not, bureaucrats can award the contract at discretion (*direct awards*). These thresholds hold *de jure* but not *de facto*, as buyers manipulate the anticipated price of contracts to enjoy discretion (Palguta & Pertold, 2017; Carril, 2021; Coviello, Guglielmo, Lotti, & Spagnolo, 2022; Szucs, 2023). Manipulation can be achieved by changing the anticipated contract price for a given project (*contract shifting*), or by dividing large contracts into multiple smaller ones (*contract splitting*). Despite the recognition that manipulation plagues public procurement, little is known about how buyers manipulate. Moreover, empirical evidence on how discretion and manipulation affect seller selection and procurement outcomes is still limited and contradictory.

In this paper, we study the role of contract splitting in procurement manipulation. First, we ask whether contract splitting is an important mechanism of manipulation. This question is crucial to evaluate the effectiveness of threshold-based policies, tailor compliance policy, and understand the roles of both discretion and manipulation on procurement outcomes. Then, we ask what motivates buyers to split contracts, and whether that influences the selection of sellers and post-award contract performance. Contract splitting, as a form of manipulation, can be aimed at fostering procurement quality in relational contracts (Calzolari & Spagnolo, 2020; Albano, Calzolari, Dini, Iossa, & Spagnolo, 2006), extracting informational rents (Kang & Miller, 2022), and promoting bureaucrats' initiative, capitalizing on their competence and local knowledge (Kelman, 1990, 2005). On the other hand, discretion increases the risks of corruption and favouritism (Banfield, 1975; Palguta & Pertold, 2017; Titl, De Witte, & Geys, 2021; Baltrunaite, 2020; Szucs, 2023). Different motivations have different implications for the procurement process.

We exploit an unanticipated reform that significantly lowered the threshold for direct awards in Portugal from 2018, thus limiting buyers' discretion: for a range of contract prices where direct awards were previously possible, they are now required to invite at least three firms to submit bids. We combine detailed data on public contracts, scraped from the electronic registry, containing the price with details on the awarding procedure, the parties involved, and measures of post-award performance, with information on buyers, sellers, and the names of elected local politicians.[1] We start by showing that manipulation is large and pervasive across sectors, with a post-reform surge in the number of contracts bunched below the new threshold, formally confirmed via McCrary

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[1] The online availability of information about all public procurement contracts is mandatory since 2009.

(2008) tests and quantified with bunching estimators (Saez, 2010; Chetty, Friedman, Olsen, & Pistaferri, 2011; Kleven & Waseem, 2013; Palguta & Pertold, 2017).

Our empirical strategy leverages the ideal quasi-experimental setup provided by the reform. We identify pairs of buyer and product purchases, which we label *Procurement Needs* (PN) and, employing the within estimator, investigate how the PN-level composition changes following the reform, in terms of yearly total amount purchased, number of contracts, and number and share of contracts close but below the new threshold. Additionally, we develop a measure to compare missing and excess mass around the new threshold. We propose empirical tests of contract splitting based on both these approaches.

The main finding is that contract splitting is the dominant mode of procurement manipulation. We show that buyers who bunch do not change the total value purchased per product, but significantly increase the number of contracts through which they carry out those purchases. We also find that the resulting smaller contracts are not repeatedly awarded to the same sellers, but instead distributed to a larger number of different ones. We also show that missing mass above the threshold in the distribution of contract prices is significantly lower than excess mass below it, while aggregate procured value remains relatively unchanged, indicating that manipulation does not occur only locally around the threshold. Significant spikes in both the number and share of contracts awarded in the bunching region are consistent with a framework in which devising and awarding procurement contracts is costly, but buyers want to manipulate. Hence, they chose the highest contract values that enable discretion. The result is particularly striking given that contract splitting to avoid regulations is explicitly illegal in many countries, including Portugal. Our evidence thus suggests that buyers are not only strategically handling the trade-off between discretion and competition, they are evading procurement rules to do so.

We then analyse buyers's motivations to split contracts, by testing a set of implications derived from competing theories of efficiency-promoting motives *versus* favouritism. We find that split contracts are more likely to be awarded to politically connected and local firms, widely associated with corruption and favouritism (Branco, 1994; Coviello, Guglielmo, & Spagnolo, 2017; Baltrunaite, 2020; Akcigit, Baslandze, & Lotti, 2023; Colonnelli & Prem, 2022). Simultaneously, they are less likely to be repeatedly awarded to incumbent sellers, suggesting that the increase in awards to local firms is not driven by better knowledge of local partners when compared to foreign unreliable firms. Moreover, contract splitting is also present in standardised procurement (Bandiera, Prat, & Valletti, 2009; Brugués, Brugués, & Giambra, 2022), contrary to theoretical predictions on informational and relational advantages of discretion (Calzolari & Spagnolo, 2020; Kang & Miller, 2022). Finally, we find evidence of worsened post-award performance: split contracts benefit from fewer discounts and despite longer expected duration upon contract signing,

exhibit similar delays.[2]

Our main contribution adds to the growing literature on procurement manipulation. Contract splitting as a form of manipulation has received limited attention not only for being explicitly illegal in many countries but also because project indivisibility is believed to translate into contract indivisibility.[3] We are the first to show strong statistical evidence that contract splitting can indeed be the main mechanism of procurement manipulation. In this sense, we diverge from Carril (2021), where real distortions in award value induced by discretion thresholds (*contract shifting*) are a fundamental feature, both theoretically and empirically; and from Coviello et al. (2022), who employ an estimator relying on an assumption of bounded manipulation unlikely to hold in contexts where splitting dominates.

To the best of our knowledge, Carril (2021) is the only other paper to explicitly investigate contract splitting. While he found splitting to be negligible, motivating the analysis of real contract value distortions, some of his findings are consistent with contract splitting. In particular, he finds that bunching is still present when restricting the analysis to office-firm pairs with a single yearly transaction, ruling out splitting in a setting where buyers award the multiple parts to the same seller. However, if large contracts are split among multiple different sellers, bunching and splitting can coexist even under such restrictions. These precise conditions characterize our setting (see Sections 4 and 5.2.2). Coviello et al. (2022) apply the bunching estimator developed by Diamond and Persson (2016) to study the effects of manipulation on procurement outcomes. Bounded manipulation is a key assumption for the method's validity, but fails in contexts where contract splitting is important, as it implies relevant changes in the distribution beyond a narrow window around the threshold (see Section 4). While the authors acknowledge the importance of splitting, they don't explicitly investigate it. Whether splitting or shifting dominates is an empirical question, and our findings highlighting splitting as the key mechanism do not imply its dominance in those contexts, marked by important differences.[4] Nonetheless, this paper emphasizes the importance of testing for contract splitting when its (in)existence is a key feature or assumption, and proposes a general methodology to do so.

Furthermore, we contribute in four additional ways. To begin with, our analysis extends the literature on the relationship between discretion and manipulation. Existing research has focused on the threshold between restricted and open auctions. We study the margin between direct awards and restricted auctions, where the incentives to manipulate are much weaker due

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[2]Discounts occur when final price paid is lower than the anticipated price. Price is most used criterion for choosing sellers in competitive procedures (IMPIC, 2019), and more/higher discounts are associated with more efficient sellers.

[3]Roads and buildings are the most common examples of indivisible projects Coviello et al. (2017, 2022).

[4]First, the threshold in our setting divides the regulation between full discretion and restricted auctions, still considerably discretionary. Second, the thresholds in our setting are significantly lower (€20 000 in our setting *vs.* $100 000 in Carril (2021) *and* €300 000 in Coviello et al. (2022)). Additionally, we explore a threshold reduction while Carril (2021) explores an increase. We argue that a threshold reduction inducing contract splitting does not necessarily imply that a threshold increase must induce contract aggregation.

to buyers' discretion in selecting invited bidders. Yet, we still find robust evidence of strong and pervasive manipulation.

Secondly, our work carries practical policy implications. In many countries, including Portugal, contract splitting is expressly prohibited by law. We show that, even under those legal constraints, it can persist. In doing so, we highlight how motivated legislators should take splitting into account to devise clearer regulation, tailor compliance policy, and guide oversight authorities.

Thirdly, our work has additional implications for research on the role of discretion in public procurement. The validity of RDDs based on discretion thresholds is threatened by selective bunching. We contribute by showing that selective manipulation exists and is more likely to favour politically connected and local firms, simultaneously adding to the existing evidence on the advantages of such firms (Branco, 1994; Fisman, 2001; Khwaja & Mian, 2005; Faccio, 2006; Goldman, Rocholl, & So, 2009; Akcigit et al., 2023), in particular those related to public procurement (Goldman, Rocholl, & So, 2013; Titl et al., 2021; Brogaard, Denes, & Duchin, 2020; Baltrunaite, 2020).[5]

Finally, we contribute to the broad literature on institutions addressing agency problems in the public sector, particularly the links between discretion, manipulation, and procurement performance.[6] Bandiera et al. (2009), Decarolis, Fisman, Pinotti, and Vannutelli (2020), and Fazio (2022) empirically show that discretion can enhance procurement performance and product quality, consistent with Kelman (1990)'s theory. In contrast, Baltrunaite, Giorgiantonio, Mocetti, and Orlando (2021) find that it increases favouritism and awards to less productive firms. This paper is closest to Palguta and Pertold (2017), Szucs (2023), and Coviello et al. (2022), in that manipulation is explicitly taken into account. While Coviello et al. (2022)'s findings suggest that manipulation can enhance outcomes, our results align more with the others, indicating that it hinders procurement performance, particularly benefiting anonymously owned and politically connected firms. We interpret these findings mindful of theories tying the benefits of discretion to institutional quality, particularly public sector capacity and alignment between the agency and bureaucrats (Bosio, Djankov, Glaeser, & Shleifer, 2022; Carril, 2021).

The rest of this paper is organized as follows. Section 2 describes the institutional setting and the procurement reform. Section 3 presents the data, documenting and quantifying manipulation. In Section 4, we describe our strategy to identify contract splitting and discuss the main results. Section 5 addresses the potential motivations to split and the corresponding empirical tests. Section 6 concludes.

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[5]Manipulated contracts have also been shown to be targeted at firms with anonymous owners, and repeatedly to financially less risky sellers (Palguta & Pertold, 2017; Coviello et al., 2022).

[6]On the impact of different institutional and legal characteristics, examples include different types of auctions (Decarolis, 2014, 2018), characteristics of bureaucrats (Coviello & Gagliarducci, 2017; Decarolis, Giuffrida, Iossa, Mollisi, & Spagnolo, 2018), centralized purchase agreements (Bandiera et al., 2009), publicity requirements (Coviello & Mariniello, 2014; Carril, Gonzalez-Lira, & Walker, 2022), or audits (Gerardino, Litschig, & Pomeranz, 2017).

2 Institutional Setting and Procurement Reform

In 2019, public procurement accounted for around 10% of GDP and 20% of general government expenditure in Portugal (OECD, 2021). Despite sharing a common regulatory framework with other European countries, public procurement in Portugal performs poorly, both in terms of practices and procedure transparency (Council and Parliament of European Union, 2014; European Commission, 2020).[7] Additionally, perceptions of corruption and favouritism in procurement are widespread (Eurobarometer, 2019).

Regulatory thresholds in the anticipated price of projects, defined as the maximum price that buyers are willing to pay for the full execution of the contract, determine the awarding rules for procurement contracts, which have implications for time to contract formation and project implementation.[8]

Direct awards, possible when the price is below a given threshold, involve full discretion: buyers can invite a single firm, which they are free to chose, to submit a bid.[9] The procedure is then characterized by a set of simple and speedy steps involving only the buyer and the invited seller, which include clarifications on the project, bid preparation and submission, adjudication, and contract formation. Open auctions, compulsory when the price exceeds the threshold, are competitive procedures associated with extensive bureaucracy and transparency: they have to be published in the Government Gazette (*Diário da República)* or the Journal of the European Union, and any interested firm can submit a bid. The process requires a preliminary evaluation report by a pre-determined jury, hearings, negotiations, and a final evaluation report. We show in Section 3.3 that buyers manipulate the price to self-select into applicable rules.

2.1 The Reform

In a stated effort to combine reduced bureaucratic burden with high transparency and sound use of public funds, the Portuguese parliament approved a procurement reform in August 2017, to be effective as of 2018. The reform reduced the regulatory thresholds for the use of direct awards, thereby reducing the buyers' ability to use full discretion.[10] The value of the thresholds was reduced from €75 000 to €20 000 in Goods and Services, and from €150 000 to €30 000 in Construction works.

In addition to changing the value of the thresholds, the reform (re)introduced the awarding

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[7]The relevant legislation is the Public Procurement Code *(Código dos Contratos Públicos*, PPC), Decree-law nº18/2008, of January 29.

[8]Article 47 of PPC.

[9]Buyers cannot directly award contracts to sellers to whom they have, over the previous two years, awarded contracts in cumulative value exceeding the direct award threshold, as per Article 113 of PPC.

[10]Reform introduced by Decree-Law nº 111-B/2017 of August 31st. The law had three large implementation goals: *(i)* a set of procurement regulations harmonized at the European level, *(ii)* increase flexibility and decrease bureaucratic burden associated with public procurement; and *(iii)* promote transparency and sound use of public funds. Threshold changes were part of goal *(iii)*.

procedure of Restricted Auction (*Consulta Prévia*). This procedure may be used for projects with anticipated value between €20 000 and €75 000 for Goods and Services and between €30 000 and €150 000 for Construction, i.e., between the old and new direct award thresholds.[11] Under restricted auctions, the buyers are required to invite at least three firms to submit bids. The bids are then subject to a formal evaluation by an independent jury, who in turn elaborates reports and recommends a seller. As such, a restricted auction is a procedure with an intermediate degree of discretion, under which buyers can't directly chose who to buy from, as with direct awards, but can freely chose which bidders to invite, unlike in open auctions, where any firm can bid. The associated bureaucracy is larger, and the whole process is required to be public. Table 1 summarizes the procurement regulatory setting and changes introduced by the reform.

Table 1: Reform in Threshold and Awarding Procedures by Project Value

	Direct Award Threshold	Restricted Auction Range	Open Auction Range
Goods and Services			
Pre Reform	€75 000	-	$[€75\,000, \infty[$
Post-Reform	€20 000	$[€20\,000, €75\,000[$	
Construction			
Pre Reform	€150 000	-	$[€150\,000, \infty[$
Post-Reform	€30 000	$[€30\,000, €150\,000[$	

Notes: Reform introduced by Decree-Law nº 111-B/2017 of August 31st, effective from January1st, 2018. Direct awards can be used up to the threshold value, columns 2 and 3 present the price ranges in which the respective procedures represent the minimum competition to be enforced.

3   Data and Preliminary Evidence

3.1   Data

We use data on all electronically registered public procurement contracts in Portugal, web-scraped from *Portal Base*, an e-procurement platform maintained by Institute of Public Markets, Real Estate and Construction (*Instituto dos Mercados Públicos, do Imobiliário, e da Construção - IMPIC*).[12] These data are available since 2009, when the electronic registration of all procurement contracts exceeding €5 000 was made mandatory, and are regularly updated by IMPIC.

The platform includes, for each procurement contract, three main types of information. First, information on the characteristics of the project, including the definition of the procured item according to the complete Common Procurement Vocabulary (CPV) code, the geographic location where it is to be conducted, and the name and tax number of the public administrations who adjudicated the contract (henceforth, the buyer). Second, information on the actual contract,

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[11]Under special conditions, adjudicating entities were able to use the Direct Award in the same price region as before: supplier exclusivity, auctions with no bids, and auctions where other bids have been excluded.

[12]The universe of reported contracts is available at www.base.gov.pt.

including the awarding procedure and the name and tax number of the chosen sellers.[13] Additionally, we know the date of contract signature, its anticipated price and expected duration. If the contract was awarded through an auction, either restricted or open, we also observe the number of bidders and their identities. Finally, there is some information on post-award performance, including price and deadline changes, possibly with justification, and performance characteristics, such as the actual duration of the contract, from which we infer late projects, and the final price, from which we construct measures of discounts and renegotiations. We use the justifications to identify terminated contracts and late contracts.[14]

These data are matched to firm-level information from Bureau van Dijk's Orbis, one of the most complete non-administrative corporate datasets, covering around 800 000 Portuguese firms, the near universe. Procurement sellers are matched to Orbis using the tax identification number, available in both datasets. There is information on the firms' main sector of activity (NACE Rev.2), headquarters's location, and the full list of managers at time of first download, in 2019. The location of the firms was combined with the execution location of procurement contracts, allowing us to define a procurement contract awarded to a local seller if the project is undertaken in the same municipality where the seller is established.[15] Additionally, we rely on the temporal dimension of the data to identify *repeated sellers* in a given year, i.e., firms which received at least one procurement contract over the two previous years.

Finally, firms' managers names are matched with data about the names of all the elected politicians for the two executive and two legislative branches of local government in Portugal, publicly available from the Portuguese National Election Comission (*Comissão Nacional de Eleições - CNE*). We thus define a *politically connected* firm when one of its managers is an elected official at the time of the contract award or has been at least once since the preceding electoral cycle (Khwaja & Mian, 2005; Faccio, 2006). Importantly, until 2020, elected officials could hold corporate positions while serving office, and those firms were allowed to participate in public tenders.[16]

3.2 Sample and Descriptive Statistics

We consider all registered contracts with anticipated values under the open auction threshold for which a formal transaction needs to be registered. These are contracts with at least 20 days of expected duration and anticipated values between €5 000 and €75 000 for Goods and Services, and

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[13]Firms are allowed to sell procurement contracts in consortia (Article 39 of PCC). Therefore, a single contract may be supplied by more than one seller.

[14]Details on the construction of these measures is discussed in further detail in Section 5. For competitive procedures, we do not observe the non-winning bids.

[15]There are 308 municipalities in Portugal, 278 in the Mainland and 30 in the Autonomous Regions of Madeira and Azores. On average, there's 33 000 inhabitants over 260 km^2 in a municipality (INE, 2022).

[16]As long as the elected official did not hold more than 10% of the firm (Organic Law nr1 of 2011, Law nr 52/2019, of July 31st). The law was changed in 2020.

between €10 000 and €150 000 for Construction.[17] We focus on a window of two years before and after the 2017 reform, i.e., we analyse the period between 2015 and 2019. Contracts before 2015 are used to construct the measure of firms with previous and ongoing procurement relationships. We exclude contracts awarded by institutions with particular governance structures, like associations, foundations, and the Central Bank. We also exclude contracts awarded through framework agreements (*Acordo-Quadro*), and public utilities, transports and security companies, religious entities, and by very small organisations, like local clubs and cultural associations with public participation. Finally, we exclude contracts in general health and education, which have particular procurement frameworks, to a large extent centrally negotiated.

Table 2 presents the main descriptive statistics for our sample of procurement contracts, i.e., the yearly average number and value of contracts per type of buyer and awarding procedure, before and after the reform. The last row of the table shows that, following the reform, a pronounced increase $((45\,295 \div 41\,371) - 1 = 9.5\%)$ in the average number of contracts per year is not matched by an increase in the total value procured $((1\,233,6 \div 1\,208,4) - 1 = 2.1\%)$. This empirical observation is consistent with some large contracts being split into multiple smaller ones, such that the total number of contracts increases significantly with negligible changes in the total value procured.

The distribution of contracts among the different type of buyers and sectors is fairly stable. Municipalities are the largest buyer, and Goods and Services account for more than 70% in both number and value, which is a consequence of the low procurement values considered in our analysis. For comparison, non-divisible construction projects like roads and buildings represent a small share of our sample and we find no noticeable increase in the number of contracts for relatively constant total purchased value.

Following the reform, more than 40% of the procurement value shifted from fully discretionary direct awards to restricted auctions, the more competitive and transparent awarding procedure, in line with the policy's goal of increasing transparency while limiting the bureaucratic burden.

3.3 Identifying and Measuring Manipulation

In this section, we *(i)* provide evidence of bunching below the threshold; *(ii)* show that this manipulation is motivated by discretion, as manipulated contracts are more likely to be directly awarded; and *(iii)* measure the extent of the phenomenon with bunching estimators. We show that, despite the fact that buyers are allowed to choose bidders in restricted auctions, giving them considerable influence over the outcome, they still strongly manipulate procurement contracts to use full discretion.

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[17]We excluded contracts below these values, which are exempt from a written agreement and electronic publication (Article 128 of CCP).

Table 2: Descriptive Statistics

	Pre Reform				Post Reform			
	Nr	%	Value (Million €)	%	Nr	%	Value (Million €)	%
Sector								
Construction	7 135	17.2%	416.3	34.4%	5 472	13.1%	333.7	23.6%
Goods	13 144	31.8%	294.9	24.4%	14 657	32.3%	337.2	23.8%
Services	21 092	51.0%	497.2	41.2%	25 167	55.6%	577.7	52.6%
Awarding Procedure								
Direct Award	38 809	93.8%	1100.8	91.1%	26 170	57.8%	507,4	40.8%
Restricted Auction	n/a	-	n/a	-	15 231	33.6%	580.0	46.7%
Open Auction	2 562	6.2%	107.5	8.9%	3 895	8.6%	155.2	12.5%
Buyer Type								
Municipality	20 151	48.7%	663.2	54.9%	25 534	52.0%	686.8	55.7%
Parish	2 285	5.5%	53.1	4.4%	2 095	4.6%	44.0	3.6%
Hospital	5 890	14.2%	128.9	10.7%	5 602	12.4%	129.1	10.5%
Other State Entities	3 444	8.3%	94.1	7.8%	3 996	8.8%	103.0	8.3%
Remaining	9 601	23.3%	269.1	22.3%	10 249	22.5%	270.6	21.9%
Total	124 112	-	3625.2	-	90 951	-	2467.2	-
per year avg	41 371	-	1208.4	-	45 296	-	1233.6	-

Notes: Values are yearly averages. All procurement contracts with anticipated value larger than €5 000 for Goods and Services (€10 000 for Construction) and lower than the open auction threshold are included. Pre-Reform Period: 2015-2017. Post-Reform Period: 2018-2019. Remaining Adjudicating Entities include "Other Firms", "Municipality Associations", "Higher Education", "State", "Justice", "Military", and "Professional Licensing Bodies".

Figure 1 plots McCrary (2008)'s discontinuity test where the common threshold allows us to pool the contracts pertaining to Goods and Services.[18] The blue and red lines plot the test for the pre- and post-reform periods, respectively. The null of continuity of the density below the threshold is not rejected pre-reform, as shown by overlapping confidence intervals on both sides of the threshold. After the reform, a remarkable surge in the number of contracts with prices just below the threshold (henceforth, the bunching region) provides strong evidence of sorting below the new threshold, and shows how the change in the threshold value reveals procurement manipulation. Note that bunching is not driven by the rounding behavior observable in the raw binned distributions (Figures B.2 to B.3 available in Appendix B).[19] Figure B.1 in Appendix shows a similar pattern for contracts in Construction, while the yearly binned distributions, Figures B.4 and B.5, provide evidence that the reform was not anticipated, with no noticeable changes in the distribution in 2017 when compared to remaining pre-reform years.

This bunching behaviour is motivated by the buyers' desire to make further use of discretionary awarding procedures. To illustrate this point, we estimate a linear probability event-study. We define the bunching region as the price range between the new discretion threshold and €1 250 less:

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[18]The test was developed to detect sorting around thresholds in the context of Regression Discontinuity designs.

[19]Rounding refers to the natural tendency to award contracts for reference round numbers, leading to observed spikes in the price distribution at those values.

Figure 1: Graphical McCrary test
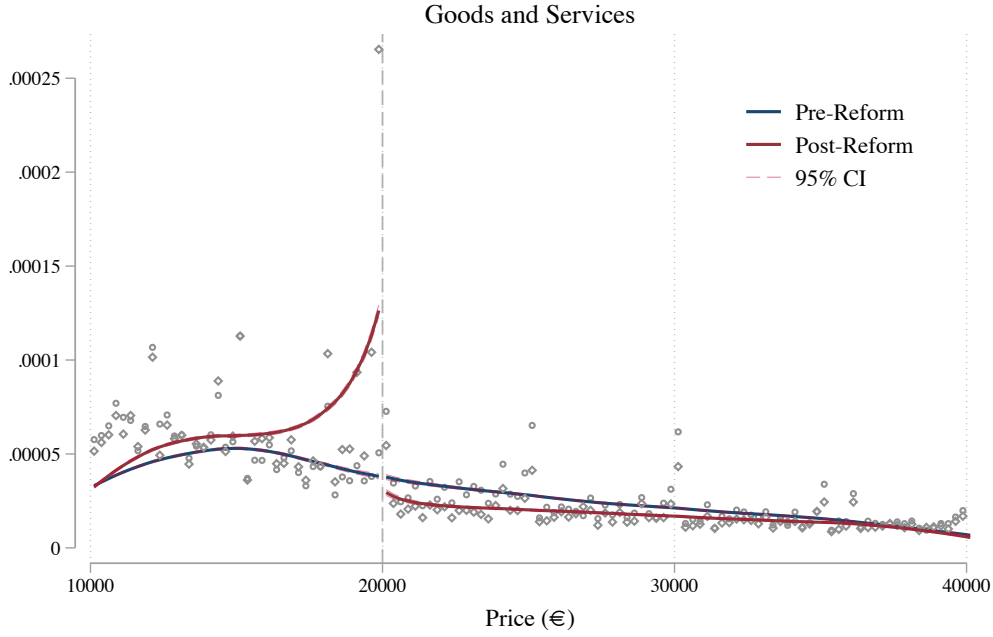
Notes: Graphical evidence of McCrary (2008) tests before and after the reform around the new discretion threshold. Pre-Reform period: 2015-2017, blue series. Post-Reform Period: 2018-2019, red series. Vertical dashed line represents new threshold: €20 000 for Goods and Services, €30 000 for Construction. Small dots represent €250 binned frequencies: circles for pre-reform series, diamonds for post. Solid line is a kernel estimate and dashed lines are 95% confidence intervals. The null of continuity of the density around the threshold is rejected if confidence intervals on both sides of the threshold do not overlap.

[€18 750, €20 000[for Goods and Services and [€28 750, €30 000[for contracts in Construction.[20] The specification reads:

$$DA_{it} = \alpha_t + \eta BR_{it} + \sum_{t \neq 2017} \beta_t \cdot BR_{it} + \mu_b + \eta_{cpv} + \lambda_m + \delta_d + \theta_s + X'_{st}\Gamma + \varepsilon_{it} \qquad (1)$$

where $DA_{it} = 1$ if contract i was directly awarded in year t, BR is a bunching region indicator, β_t are year-specific coefficients, measuring the difference with respect to 2017, the pre-reform reference period, and $\mu_b, \eta_{cpv}, \lambda_m, \delta_d$, and θ_s are buyer type, product code (complete CPV), month, district and seller fixed effects. Additionally, the vector of controls X_{it} includes price and expected duration of the procurement contract. We cluster the standard errors at the complete CPV code level.

This empirical model compares the probability that the direct award procedure is used for contracts in the bunching region *vs* contracts not in the bunching region. We estimate equation (1) using two alternative samples: first, we consider only contracts below the new threshold, i.e., contracts outside the bunching region with direct award compliant price, both before and after

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[20]This is our baseline bunching region because the 5th 250€ bin to the left of the threshold is the second consecutive one with non-significant (at the 5% level) excess contracts for at least one sector, using Palguta and Pertold (2017)'s bunching estimator. Visual inspection of the raw binned distributions in Figures B.2 to B.3 suggests 5 bins as an appropriate reference. All results in the paper are robust to reasonable deviations in this definition.

the reform; then, we consider all contracts outside the bunching region as the comparison group.

Figure 2: Use of Direct Awards in the Bunching Region
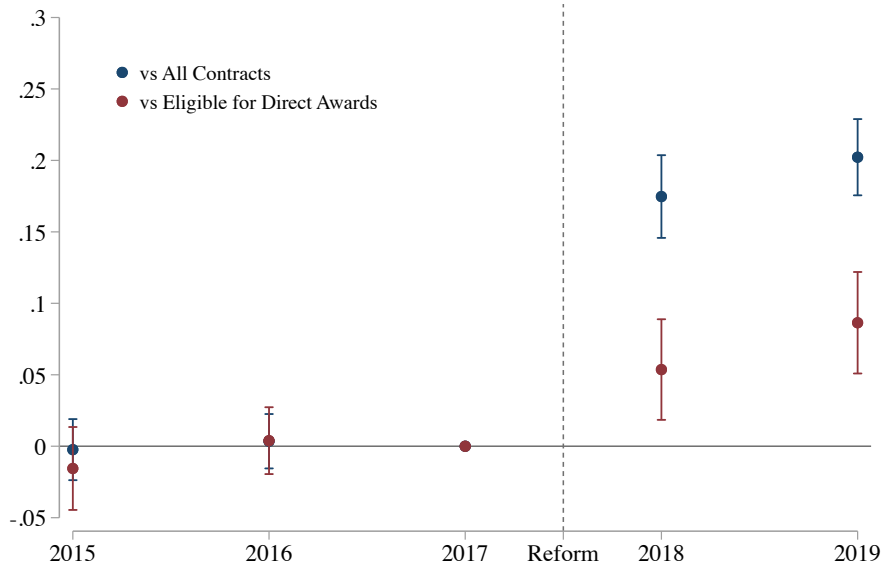
Notes: Circle markers represent yearly estimates β from equation (1). Standard errors are clustered at the complete CPV level and vertical bars represent 95% confidence bands. Blue series uses all contracts outside the bunching region as comparison group. Red series uses only contracts with anticipated value below the new threshold, i.e. in the price range where contracts are eligible for direct awards throughout the whole period.

The estimates of β_t are plotted in Figure 2. The red plot considers contracts eligible for direct awards throughout the whole period as control group. Following the reform, the use of direct awards surges for contracts in the bunching region, when compared to the remaining eligible contracts, indicating that manipulation of procurement contracts is motivated by the use of discretion. There is no pre-trend, and direct awards were not used to a different extent in the manipulation region prior to the reform.[21] The blue plot, that shows qualitatively similar results, considers all contracts as a control group. The magnitude of the coefficient is significantly higher because, following the reform, there is a large range of contract prices for which direct awards are no longer legal.

To quantify the extent of manipulation, we use bunching estimators.[22] The first estimator uses the pre-reform distribution as counterfactual and identifies bunching under the assumption that, absent the threshold change, the distribution would have remained unaltered (Palguta & Pertold, 2017). The estimates, presented in Table A.1, show clear evidence of manipulation, large in magnitude and pervasive across sectors. We estimate an average 284% (resp., 603% and 377%) increase in the number of contracts in Goods (resp., Services and Construction) in the first bin

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[21]The 2017 baseline difference in the use of direct awards for contracts in the manipulation region *vs* outside is not different from 0. Coefficients and standard errors of yearly regressions on direct award use on a bunching region indicator can be found in Table B.1 in Appendix B.

[22]Details are presented in Appendix A.

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below the threshold, in response to the reform. Estimates of excess mass are large but decreasing in bins further away from the threshold, highlighting that prices are manipulated to the largest values that qualify for discretion. Stronger manipulation in Construction and Services may be consistent with projects in these sectors having more distinct parts or specific details that can be adjusted.

These are our preferred estimates of manipulation. The estimator accounts for rounding at the threshold detectable in the raw binned distributions (Figures B.2 and B.3), and the results have a direct intuitive interpretation. For robustness, we confirm strong manipulation resorting to an alternative estimator which constructs a counterfactual distribution under the assumption that, absent the threshold, the price distribution would be smooth around the threshold (Saez, 2010; Chetty et al., 2011; Kleven & Waseem, 2013). The results, presented in Table A.2, show that the excess mass of contracts in the bunching region, $\hat{b}$, is equal to 6.03 (resp., 10.8 and 9.03) times the average counterfactual density for Goods (resp., Services and Construction) in 2018, the first post-reform year. All figures are substantially larger in 2019, suggesting that some buyers may take time to adjust to the new regulations, and further supporting the unanticipated nature of the policy.

4   Contract Splitting

We now turn to the main question addressed by this paper, whether contract splitting is an important mechanism of procurement manipulation.

4.1   Splitting vs. Shifting

Procurement manipulation can be achieved in two ways. First, buyers can directly reduce the price of a given project, qualifying it for discretion – *contract shifting*. Alternatively, buyers can divide large value contracts into multiple smaller ones, each eligible for discretion – *contract splitting*. Manipulation of procurement contracts is motivated by the use of discretion (see Section 3.3), but devising and adjudicating contracts entails non-negligible administrative costs. In that case, buyers have incentives to split contracts into the minimum number of sub-contracts that enables discretion in each individual one, resulting in bunching just below the threshold. Shifting and splitting have different implications for the post-reform contract price distribution. The former implies changes within a narrow window around the threshold, with the excess mass below roughly corresponding to the missing mass above, while the latter is compatible with changes over a wider range of prices, and predicts that excess mass should be larger than missing mass.

The 2017 reform is an ideal setting to find the dominant mechanism of procurement manipulation, by comparing the pre- and post-reform composition of buyers' purchases. If contract

shifting dominates, individual contract prices would decrease following the reform, and so would the total amount buyers spend on each product, while the total number of contracts would remain relatively unchanged. If contract splitting dominates, buyers would purchase a total amount of each product similar to the pre-reform one, through a significantly higher number of contracts.

The literature has focused mostly on contract shifting, while contract splitting has received limited attention, because *(i)* contract splitting is explicitly illegal in various countries, and *(ii)* project indivisibility (often associated with projects such as roads or buildings) is believed to translate into contract indivisibility for logistical reasons and to avoid raising suspicions.[23]

4.2 Empirical Framework

We rely on the bunching estimator proposed by Palguta and Pertold (2017) (see Section 3.3 and Appendix A) to develop measures of net mass difference in the distribution, that we define as the difference between excess number of contracts below the threshold and missing contracts above (absolute net difference), and its weight relative to the total number of contracts in the range (relative net difference). A rough correspondence between excess mass to the left of the threshold and missing mass to its right is consistent with contract shifting, whereas an excess mass exceeding the missing counterpart is consistent with contract splitting (Cengiz, Dube, Lindner, and Zipperer (2019) employ a similar procedure to study the evolution of missing and excess jobs around the minimum wage).

We estimate the number of excess contracts to the left of the threshold, $\hat{E}$, as a function of the estimates $\hat{\gamma}_i$ from (A.1), reflecting the post-reform average percent change in the number of contracts in each of the i bins with bunching, and the pre-reform average number of contracts in each bin, c_i:

$$\hat{E} = \sum_{i=-5}^{0} \hat{\gamma}_i \times c_i$$

Analogously, estimates $\hat{\delta}$ from the following equation are informative about the post-reform $[t > T]$ missing mass to the right of the threshold (recentered to 0):

$$C_{jt} = \alpha_j + \alpha_t + \sum_{i=0}^{10} \delta_i \cdot \mathbb{1}\left[Z_j = i\right] \cdot \mathbb{1}[t > T] + \varepsilon_{jt},$$

where we allow contracts to be missing from ten 250€ bins to the right of the threshold, to be conservative.[25] The measure of post-reform missing contracts to the right of the threshold, $\hat{M}$,

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[23]In Portugal, the legislation states *"a contract's value cannot be partitioned with the purpose of excluding it from any legal requirements".*[24]

[25]Contract shifting implies changes in anticipated prices. By using 10 bins, we are allowing for changes along twice the price range of the bunching region, and price changes up to more than 12.5% of the original contract's price, an arguably large amount to shift.

is defined as:

$$\hat{M} = \sum_{i=0}^{10} \hat{\delta}_i \times c_i$$

Finally, we compute the absolute mass difference, $\hat{D}$, as the difference in the number of excess and missing contracts, and the relative mass difference $\hat{d}$, which equals the absolute difference as a share of average pre-reform number of contracts in the region where the changes occur:

$$\hat{D} = \hat{E} - \hat{M} \qquad and \qquad \hat{d} = \frac{\hat{D}}{(1/3) \times \sum_{y<2018} \mathbb{1}\{year = y\} \times \sum_{i=-5}^{10} c_i}$$

A value of $\hat{D}$ close to 0 indicate there is a rough correspondence between missing and excess mass, in line with contract shifting, whereas positive values of $\hat{D}$ and $\hat{d}$ suggest a pattern consistent with contract splitting.

We then turn to explicit evidence of contract splitting. We define a *Procurement Need* (PN) as a product code procured by a given buyer (complete CPV code × sector × buyer), as to isolate the project-specific procurement requirements of public entities and evaluate whether their composition changes in response to the reform, and, if so, how. Since we are interested in indentifying the most important mechanism of bunching, we restrict our sample to PNs with at least one contract in the bunching region after the reform. Table B.2 in Appendix B shows the main descriptive statistics on PNs in the full and restricted samples.

For each PN, we compute 6 yearly measures: 1) total value purchased (TV), 2) total number of contracts (NC), 3) average contract value (AV), and 4) number of sellers from whom the buyer buys the given product (NS). Additionally, we compute the 5) number (NBR) and 6) share (SBR) of contracts in the bunching region. We then estimate, on the restricted sample:

$$y_{it}^{j} = \delta_i + \gamma^j Post + \epsilon_{it} \tag{2}$$

where y_{it}^{j} each of the $j = 1, ..., 6$ outcomes described above for PN i in year t, δ_i are PN fixed-effects, and $Post$ is the post-reform indicator. Standard errors are clustered at the PN and CPV level.

Since we use the within estimator, $\hat{\gamma}$ reflects how each PN changes its purchase composition in response to the unanticipated reform, on average. If contract shifting is the dominant mechanism of manipulation, we expect $\hat{\gamma}$ to be negative for the yearly total purchased value ($\hat{\gamma}^{TV} < 0$) and zero for the number of contracts ($\hat{\gamma}^{NC} = 0$). Moreover, given that contracts with prices just above the threshold will have a price reduction, we expect a small negative coefficient on the average contract value ($\hat{\gamma}^{AV} < 0$, *small*). If instead contract splitting is the dominant mechanism we expect a non-negative change in total purchases ($\hat{\gamma}^{TV} \geq 0$), and a sharp increase in the number

of contracts ($\hat{\gamma}^{NC} > 0$).[26] Moreover, the negative coefficient on the average contract value should be significantly larger in magnitude ($\hat{\gamma}^{AV} << 0$).

We interpret the joint confirmation of the three hypotheses associated with one of the mechanisms, summarized in Table 3, as strong indication of the dominant role played by the respective mechanism. However, it does not rule out the presence of the alternative mechanism.

Table 3: Test for Mechanisms of Manipulation - Hypothesis

	Mechanism	
	Contract Shifting	Contract Splitting
Δ Total Value Purchased		
$\hat{\gamma}^{TV}$	< 0	≥ 0
Δ Number of Contracts		
$\hat{\gamma}^{NC}$	$= 0$	> 0
Δ Average Contract Value		
$\hat{\gamma}^{AV}$	< 0, *small*	$<< 0$

Notes: Hypothesis for the empirical contract splitting test. $\hat{\gamma}$ are the estimated coefficients from a regression of the respective outcome according to equation (2) for the respective outcome.

Regarding the additional outcomes, a zero coefficient on the number of sellers ($\hat{\gamma}^{NS} = 0$) indicates that potentially split contracts are awarded to the same number of sellers, possibly repeated ones. Positive coefficients on the number and share of contracts in the bunching region ($\hat{\gamma}^{NBR} > 0$ & $\hat{\gamma}^{SBR} > 0$) inform us that buyers manipulate strategically into prices close but below the threshold, possibly to achieve discretion while minimising transaction costs.

4.3 Core Results

The estimates of absolute and relative net excess mass, $\hat{D}$ and $\hat{d}$, are displayed separately for Goods and Services and Construction in Table 4. We estimate that the excess mass of contracts to the left of the threshold, net of the missing mass to its right, is as large as 65% of the pre-reform number of contracts in Goods and Services, and 54% in Construction. Therefore, the null of rough correspondence between missing and excess masses is rejected for both at all conventional levels, and estimates are positive and large. This suggests the prevalence of contract splitting over shifting. The fact that both magnitudes are significantly lower in Construction hints that splitting may be more difficult in the sector, possibly due to higher degree of project indivisibility.

This result has relevant implications for the research about manipulation in public procurement. Contract splitting threatens the validity of key assumptions underlying bunching estimators

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[26]In theory, any non-negative γ^{TV} is compatible with contract splitting, but $\gamma^{TV} = 0$ is consistent with the idea of a change only through the number of contracts.

(the correspondence between missing and excess mass and the assumption of bounded manipulation), and the analysis of impacts of bunching on outcomes (Diamond & Persson, 2016).[27]

Table 4: Net Mass Difference

	Absolute Net MD $\hat{D}$	Relative Net MD $\hat{d}$
Goods and Services	1 486.6***	0.649***
	[49.21]	[0.027]
Construction	181.08***	0.536***
	[21.06]	[0.072]

Notes: Bootstrapped standard errors in parentheses. Second column presents the net mass difference as a share of average pre-reform number of contracts over the whole range where distribution changes occurred: five 250€ bins to left of the threshold and ten to the right. Significance: *** p < 0.01, ** p < 0.05, * p < 0.1

Turning to the explicit evidence of contract splitting, we present the results of the fixed-effects estimation of equations (2) in Table 5. The coefficient associated with the total purchase value, shown in Column (1), is positive but relatively small and not statistically different from zero indicating that, on average, following the reform, PNs did not change the total value purchased per product. The coefficient in Column (2) shows that, following the reform, buyers carried such constant purchases through a significantly larger number of contracts, implying a reduced average contract value, as displayed in Column (3). Our estimates imply an average 18% increase in the number of contracts per product following the reform combined with a much smaller (6%), statistically indistinguishable from 0, increase in total purchased value. Together, they imply a very large and significant 13.5% (€4 000) decrease in the average contract value.

In light of the hypotheses in Table 3, these findings provide strong evidence that contract splitting is the dominant mode of procurement manipulation.

Additionally, we estimate more than a six fold increase in the number of contracts in the bunching region, and a ten fold increase in the share they represent. We interpret these results as evidence that, following the reform, PNs are strategically splitting large contracts into multiple lower price ones, close but below the new discretion threshold. This behaviour suggests that buyers are minimising transaction costs, both administrative and financial while ensuring full discretion. Our finding that contract splitting is the dominant mode of manipulation is particularly striking since doing so is explicitly forbidden according to the Portuguese law. Buyers are not merely using procurement strategically to avoid implementing competitive procedures, they are evading procurement rules in doing so.

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[27]Bounded manipulation refers to the possibility of defining a limited range of the variable of interest over which manipulation occurs.

Table 5: Within-PN Regression Results

	Total Value	Nr Conts	Avg Value	Nr Sellers	Nr Conts BR	% Conts BR
	(1)	(2)	(3)	(4)	(5)	(6)
Post	8 686	0.713***	−3 958***	0.632***	0.792***	0.403***
	[5 289]	[0.128]	[609]	[0.098]	[0.021]	[0.0154]
PN Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Dep. Var mean *pre-reform*	114 098	4.086	29 434	3.350	0.124	0.041
Nr PRs	2 932	2 932	2 932	2 932	2 932	2 932
R^2	0.718	0.763	0.595	0.792	0.453	0.507
Observations	9 132	9 132	9 132	9 132	9 132	9 132

Notes: Procurement Needs (PN) defined as a buyer-product-sector combination. Standard errors clustered at the PR and CPV group (3-digit) level in brackets. Unit of observation is a PR - year. All PNs with at least one contract in the bunching region (BR) were considered. BR is defined as the interval between the post-reform threshold and 1250€ below. Outcome of each regression indicated on top of each column. Buyers with more than 15x percentile 99 of number of contracts were excluded. Significance levels: 0.1* 0.05** 0.01***

We also estimate a significant increase in the number of sellers of around 17% of the baseline mean, indicating that buyers are awarding the partitioned contracts to multiple different sellers, which may reflect an effort to stay under the radar of oversight authorities, since the law is clear in restricting repeated, same-buyer, direct awards if the cumulative value exceeds the thresholds.

It is interesting to investigate who the new sellers are. First, they may be recently established firms created by old suppliers, in which case one would expect to observe an increase in the number of contracts awarded by these PNs to recently created firms. Second, they may involve firms that bid jointly as a consortium, pre-reform. Indeed, to stimulate small firm participation in public procurement, the law allows the creation of firm consortia to submit joint bids or jointly supply a directly awarded contract. If larger contracts involve these consortia, pre-reform, a straightforward way to split them is to award them to the firms in the consortium, but separately. In this case, we expect to observe a decline in the number of contracts awarded to consortia of firms, or a decrease in the average number of firms per consortium.[28] Luckily, our data allows us to identify the contracts awarded to consortia, and all the firms that compose them.

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[28] A third possibility is that the new sellers belong to the same corporate group as the previous ones, and hence our findings reflect an administrative re-organization with no real changes. Unfortunately, we cannot identify corporate groups in the data.

Table 6: Split Contracts - Sellers

| | Young Seller | | Consortium Seller | | |
| | Number | Share | Number | Share | Nr Firms *per* |
	(1)	(2)	(3)	(4)	(5)
Post	-0.0041	-0.0006	0.0247*	-0.0034	0.2180
	[0.0044]	[0.0006]	[0.0134]	[0.0041]	[0.3141]
PN Fixed Effects	Yes	Yes	Yes	Yes	Yes
Dep. Variable mean *pre-reform*	0.014	0.002	0.176	0.048	3.337
Nr PRs	2 934	2 934	2 934	2 934	6
R^2	0.722	0.514	0.568	0.409	0.330
Observations	9 143	9 143	9 143	9 143	19

Notes: Procurement Needs (PN) defined as a buyer-product-sector combination. Standard errors clustered at the PN and CPV group (3 digit) level in brackets. Unit of observation is a PN - year. All PRs with at least one contract in the bunching region (BR) were considered. BR is defined as the interval between the post-reform threshold and 2250€ below. Outcome of each regression indicated on top of each column. Buyers with more than 15x percentile 99 of number of contracts were excluded. Significance levels: 0.1* 0.05** 0.01***

To test these hypotheses, we run versions of specification (2) on the number and share of recently incorporated sellers (2 years or less) that each PN buys from, the number and share of contracts awarded to consortia of firms, as well as the number of firms per consortium. The results, shown in Table 6, do not provide evidence to support either of these hypotheses. The estimates are small and not statistically different from 0. The fact that very few contracts are awarded to consortia (5%) implies that the number of observations to estimate the effect about the number of firms per consortium is very small, and the coefficient on Column (5) is particularly imprecise.

4.4 Robustness

The main result is robust to different variations in the analysis. First, we restrict the analysis to PNs for which there exist purchases every year, reflecting a continued needs of buyers. The results are shown in Table 7 and corroborate strong evidence of contract splitting, with a non statistically significant increase in the overall purchases per product, accompanied by a significant increase in the number of contracts. The growth in the number of contracts (10.8% of pre-reform mean) is more than 4× higher than the (non-significant) growth in total purchase value (2.5%). Strategic splitting into the bunching region is also evident, as we estimate 3.5 and 5.9 fold increases in the number and share of contracts in the bunching region.

A second robustness exercise restricts the analysis to procurement contracts with relatively short expected duration (1 year or less). If contract splitting is dominated by large, multiple-year contracts, being split into (renewable) yearly contracts, restricting the analysis to short-term contracts should not show contract splitting. Moreover, these contracts have relatively low anticipated prices, which qualifies them for discretion to start with. The results in Table 8

show that contract splitting is still the dominant mode of procurement manipulation. We find a statistically insignificant 5% increase in the total value of purchases accompanied by an 18% increase in the number of contracts. Strategic splitting into the bunching region is also strong, with a 7.7 and 11.8 fold increase in the number and share of contracts awarded in the bunching region.

Table 7: Recurrent Procurement Relationships
Yearly

	Total Value	Nr Conts	Avg Value	Nr Sellers	Nr Conts BR	% Conts BR
	(1)	(2)	(3)	(4)	(5)	(6)
Post	5 181	0.795**	−2 209***	0.812***	0.716***	0.195***
	[13 959]	[0.336]	[671]	[0.265]	[0.053]	[0.011]
PN Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Dep. Var mean *pre-reform*	206 308	7.311	29 397	5.836	0.208	0.033
Nr PRs	503	503	503	503	503	503
R^2	0.705	0.755	0.633	0.796	0.428	0.370
Observations	2 515	2 515	2 515	2 515	2 515	2 515

Notes: Procurement Needs (PN) defined as a buyer-product-sector combination. Standard errors clustered at the PN and CPV group level in brackets. Unit of observation is a PR - year. PNs with at least one contract in the bunching region (BR) and at least one yearly purchase were considered. BR is defined as the interval between the post-reform threshold and 1250€ below. Outcome of each regression indicated on top of each column. Buyers with more than 15x percentile 99 of number of contracts were excluded. Significance levels: 0.1* 0.05** 0.01***

Table 8: Short-Term Contracts
1 Year

|	Total Value	Nr Conts	Avg Value	Nr Sellers	Nr Conts BR	% Conts BR
	(1)	(2)	(3)	(4)	(5)	(6)
Post	6 626	0.726**	−4 273***	0.575***	0.793***	0.400***
	[7 481]	[0.163]	[886]	[0.105]	[0.024]	[0.017]
PN Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Dep. Var mean *pre-reform*	121 601	4.082	30 396	3.210	0.103	0.034
Nr PRs	1 861	1 861	1 861	1 861	1 861	1 861
R^2	0.676	0.727	0.615	0.757	0.438	0.512
Observations	5 725	5 725	5 725	5 725	5 725	5 725

Notes: Procurement Needs (PN) defined as a buyer-product-sector combination. Standard errors clustered at the PN and CPV group level in brackets. Unit of observation is a PR - year. Contracts with expected duration lower than 1y and PNs with at least one contract in the bunching region (BR) are considered. BR is defined as the interval between the post-reform threshold and 1250€ below. Outcome of each regression indicated on top of each column. Buyers with more than 15x percentile 99 of number of contracts were excluded. Significance levels: 0.1* 0.05** 0.01***

Figure 3: Contract Splitting - Estimates Sensitivity to BR
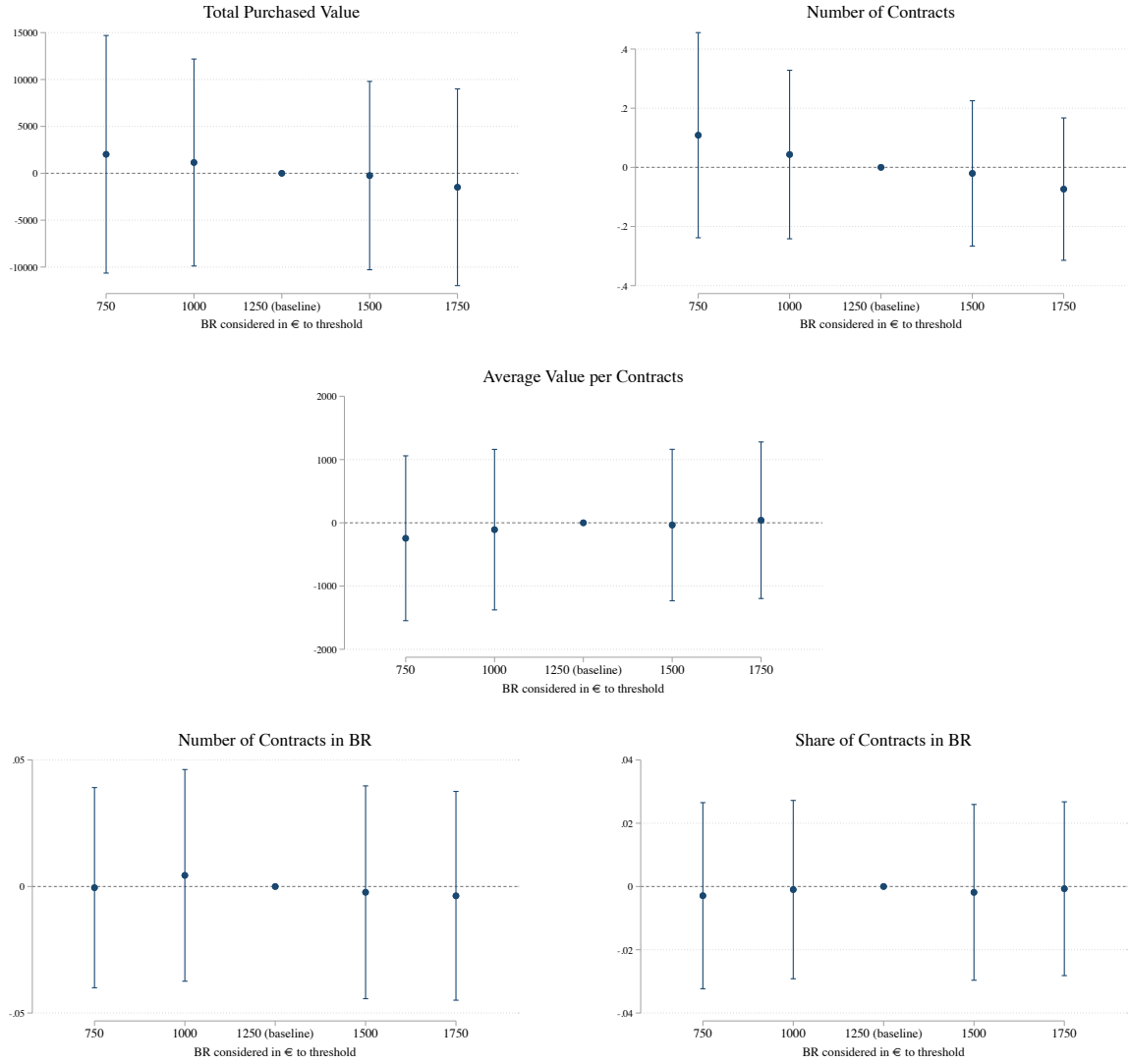
Notes: Results of estimation of equations (2) for varying bunching windows BR, represented in the x axis as € below new discretion threshold. New discretion thresholds: €20 000 for Goods and Services, €30 000 for Construction. The plotted coefficients are $\widehat{\gamma_w} - \widehat{\gamma_w}$, where $\widehat{\gamma_w}$ is the estimated coefficient considering a BR of window w measures in € to to the new threshold and $\widehat{\gamma_w}$ is the baseline. The markers represent point estimates and the vertical bars represent 95% confidence intervals. Standard errors clustered at the CPV and buyer type level in each regression.

Finally, we show that the results resist different definitions of the bunching region. The results for the re-estimation of equation (2) for regions where visual inspection of the anticipated price distribution (Figures B.2 to B.3 in Appendix B) plausibly shows bunching is shown in Figure 3. The dots represent, for the corresponding BR, the deviation of the estimated coefficient from the baseline one in Table 5, normalized to 0 in the graph. The patterns of contract splitting are robust to any reasonable variation in the bunching region definition, as no coefficient is statistically different from the baseline choice.

5 What Motivates Contract Splitting?

Discretion-seeking contract splitting has very different welfare implications depending on whether it is driven by efficiency-promoting motivations, which improve the sound use of public funds and public good provision, or favouritism, which contributes to resource misallocation.

In this section, we propose a set of testable implications to distinguish between those different motivations, derived from the contrasting theories on the role of discretion in procurement. Then, relying on the threshold changing reform, we empirically test those implications.

5.1 The Competing Hypotheses

Contract splitting, as a form of manipulation for discretion, can be used to promote project quality by overcoming inefficiencies in the procurement process or to better incentivise the involved agents. We call this set of motivations *efficiency-promoting motives.*

Discretion can play a fundamental role in fostering procurement quality in contexts where the latter is important, but non-contractible (Albano et al., 2006; Calzolari & Spagnolo, 2020). Buyers can rely on contract splitting to issue direct awards, protecting sellers from competition and thereby increasing the relational value, so long as sellers consistently deliver the desired quality. In such contexts, long-term relationships with positive impact on procurement quality would arise between buyers and sellers (Spagnolo, 2012). By keeping relations with a small set of sellers, buyers are able to extract valuable informational rents (Kang & Miller, 2022).

Discretion is also effective at circumventing lengthy, often inefficient, bureaucratic procedures (Bandiera, Bosio, Spagnolo, & CEPR, 2021; Szucs, 2023). In fact, excessive payments in procurement seem to be driven by inefficiencies rather than corruption (Bandiera et al., 2009). In Portugal, the elapsed time between tender and contract signature is significantly higher for auctions than direct awards (IMPIC, 2019). In addition, discretion allows procurement agencies to promote bureaucrats' initiative and engagement, capitalizing on their expertise, experience, and local knowledge to select better sellers. These forms of knowledge cannot easily be coded into rules in all their dimensions, but leveraging them can have positive effects on procurement outcomes, including reduced prices without adverse consequences for quality or fewer project delays with limited impact on corruption (Kelman, 1990, 2005; Bandiera, Bosio, et al., 2021; Coviello et al., 2017; Decarolis et al., 2020; Bandiera, Best, Khan, & Prat, 2021; Bosio et al., 2022).

These efficiency-promoting motives deliver three testable implications. First, if contract splitting is implemented to, via discretion, preserve or enhance the relational advantages that incentivize the delivery of non-contractible quality, we expect not to detect (or detect to a far lesser extent) splitting in contracts for standardised, homogeneous products, for which quality is contractible to a larger extent. Additionally, such model predicts that buyers would keep pro-

curement relationships with a small set of frequent, loyal suppliers (Calzolari & Spagnolo, 2020; Spagnolo, 2012). Second, if contract splitting is using discretion to promote efficiency, we expect potentially split contracts to be awarded to better sellers and exhibit improved post-award performance, such as more discounts and fewer delays and renegotiations renegotiations.

On the other hand, discretionary power can be abused by bureaucrats and public administrations to pursue private interests (Banfield, 1975; Palguta & Pertold, 2017; Bosio et al., 2022), a set of motivations we refer to as *favouritism.*

Buyers can split contracts in order to protect their favoured sellers, henceforth *special interest groups* (SG), from competition. We consider two categories in SG. First, local firms, who are more likely to win procurement contracts. These can be preferred to non-local firms in procurement as they enter the local welfare function, can create connections to procurement buyers, and hold social and political capital, e.g., because they employ voters Branco (1994); Coviello et al. (2017); Coviello and Gagliarducci (2017).[29] Second, we consider politically connected firms. The political involvement of firms has been shown to influence their procurement activity across different contexts and periods, via connections, campaign contributions, or political donations (Goldman et al., 2013; Brogaard et al., 2020; Szucs, 2023; Baltrunaite, 2020; Titl et al., 2021). Politically connected firms have also been associated with several forms of favouritism and corruption, with no upside for innovation or productivity (Akcigit et al., 2023; Colonnelli & Prem, 2022).

Note that buyers can choose bidders for projects with price above the threshold. Therefore, contract splitting for discretion pays off only if the chosen sellers are particularly poor candidates, who would not win the (restrictive) competitive procedures. This a problem that transcends adverse selection in procurement, as contract splitting becomes a symptom of buyers consciously choosing worse sellers.

A theory of favouritism-driven splitting delivers different implications. In that case, split contracts should be awarded differentially to special interest groups of firms, local and politically connected. In addition, through the favouritism selection mechanism, we might see a deterioration of post-award procurement performance.

To the extent that best practices of buyers can speak to their motivations, we ask whether observable integrity and transparency measures of buyers correlate with how much they manipulate. Stronger manipulation by less transparent buyers points towards favouritism rather than efficiency-motivated manipulation. Table 9 summarizes the testable implications of the competing hypotheses.

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[29]Awards to local firms are often interepreted as clientelism, but those can be preferred to "foreign" firms as the later as plausibly less known and thus less reliable. While we cannot know with certainty which effect dominates, the analysis on awards of split contracts to repeated sellers can be informative. If buyers choose local firms because they have more information and experience and how they work, one would expect an analogous relative increase in awards of split contracts to repeated sellers.

Table 9: Splitting Motivations - Testable Implications

| | Motivations | |
	Efficiency-Promoting	**Favouritism**
Splitting in Standardised Procurement	*less or none*	$\sim$
Seller Selection		
Local Firms	$\sim$	$+$
Politically Connected Firms	$\sim$	$+$
Repeated Sellers	$+$	$\sim$
Buyers Integrity		
Corr(Manipulation, Transparency)	*negative or none*	*positive*
Post Award Performance	*improved*	*worsened*

Notes: Testable implications on the different motivations to split contracts. Implications on seller selection and post-award performance reflect expected effect on potentially split contracts. $\sim$ refers to no implication on the direction of the effect.

5.2 Empirical Tests

5.2.1 Standardised Procurement

The first set of testable implications involves investigating contract splitting in standardised procurement, a set of homogeneous, generic goods or services bought by many public bodies and for which quality is largely contractible (Bandiera et al., 2009; Brugués et al., 2022).

Our definition of standardised procurement follows directly from Bandiera et al. (2009), who define standardised procurement products based on three criteria: i) homogeneity, ie, comparable products whose price is a direct function of observable characteristics (contractible quality); ii) diffusion, the share of public authorities purchasing the product; and iii) relevance, whether the product takes up a sizable share of the public authority's budget. For each good or service selected by Bandiera et al. (2009), we assign corresponding CPV codes. For example, a "Lunch Voucher" corresponds to CPV code 30199770-8 "Luncheon voucher", and a "Refuse Bin" corresponds to CPV code 34928480-6 "Waste and rubbish containers and bins". The detailed correspondence is shown in Table B.3 in Appendix B.

We analyse the presence of contract splitting in standardised procurement by *(i)* running (2) only on the subset of standardised procurement contracts, and *(ii)* including all procurement contracts while interacting the *Post* dummy with a standardised procurement indicator ($SP_i = 1$):

$$y_{it}^j = \delta_i + \beta_0 Post_t + \beta_1 SP_i + \gamma^j Post_t \times SP_i + \epsilon_{it} \qquad (3)$$

The first specification is informative about the presence of contract splitting in standard-

ised procurement, and the second shows whether contract splitting exists to different extents in standardised and non-standardised procurement.

The results are presented in Table 10. The first column under each outcome refers to the specification without interactions while the second includes the interaction. Overall, the results show that the patterns consistent with contract splitting are also present in standardised procurement. Considering those projects, following the reform, there is a non-significant 3.5% increase in the overall amount spent by buyers [Column (1)], but such constant overall amount is purchased through significant 13.5% higher number of contracts. Consistently with the splitting patterns uncovered for the full sample, the number and share of contracts awarded in the bunching region increase significantly, both economically and statistically.

The regressions including the interaction show that the overall amount purchased by buyers is lower in standardised than in non-standardised procurement, and the increase in the total number of awarded contracts is also lower (13.2% vs 17.6% of baseline mean). The number of contracts awarded in the bunching region is lower, but the within-group share is higher. However, none of these differences are significant, indicating that, statistically, we do not find evidence for different splitting patterns between standardised and not standardised procurement.

Table 10: Standardised Procurement
Within-PN Regression Results

	Tot Val		Nr Conts		Avg Val		Nr Conts BR		% Conts BR	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Post	4 097	8 648	0.546**	0.719***	-7 762***	-3 852***	0.742***	0.794***	0.511***	0.398***
	[6 722]	[5 481]	[0.215]	[0.133]	[2594]	[629]	[0.057]	[0.022]	[0.061]	[0.014]
Post × SP		-4 699		-0.18		-3 946		-0.061		0.108*
		[8 424]		[0.245]		[251]		[0.056]		[0.063]
PN Fixed Effects	Yes		Yes		Yes		Yes		Yes	
Dep. Var mean *pre-reform*	114 098	114 496	4.086	4.087	29 434	29 535	0.124	0.124	0.041	0.041
Nr PRs	147	2 934	147	2 934	147	2 934	147	2 934	147	2 934
R^2	0.672	0.719	0.701	0.763	0.536	0.595	0.458	0.453	0.483	0.508
Observations	386	9 143	386	9 143	386	9 143	386	9 143	386	9 143

Notes: Procurement Needs (PN) defined as a buyer-product combination. Standard errors clustered at the procurement need and CPV group level in brackets. Unit of observation is a procurement need - year. Standardised Procurements defined according to (Bandiera et al., 2009). All Standardised PNs with at least one contract in the bunching region (BR) were considered. BR is defined as the interval between the post-reform threshold and 1250€ below. Outcome of each regression indicated on top of each column. Buyers with more than 15x percentile 99 of number of contracts were excluded. Significance levels: 0.1* 0.05** 0.01***

As robustness, we use an alternative measure of standardised procurement based on the diffusion criterion, the only of the three we can measure. For each CPV code, we compute the share of buyers that buy the product at least twice a year, on average, and select the products with the 25% highest shares. The results for this alternative measure, shown in Table B.5 of Appendix B, corroborate the findings of the main standardised procurement measure: the patterns consistent

with contract splitting remain present in standardised procurements. Additionally, the interactions do not capture any statistically significant differences in splitting between standardised and non-standardised procurement, although the increase in the share of contracts in the BR is significantly lower for standardised procurements.[30]

5.2.2 Seller Selection

The second set of testable implications relates to the self-selection of buyers who split and the selection of sellers for potentially split contracts, with price in the bunching region. We investigate selective manipulation for three groups of special interest sellers (SG): local firms, politically connected firms, and repeated sellers.

We define a firm as local if it is established in the same municipality where works are to be conducted. A firm can therefore be local for some contracts and non-local for others. We define a firm as politically connected if one of its managers is an elected politician, or has been in the previous electoral term. The definition hinges on the idea that businesses leverage having executives in positions of power to create advantageous networks that transcend party affiliation and persist over time (Faccio, 2006; Khwaja & Mian, 2005; Colonnelli & Prem, 2022). We leverage the institutional feature that, until 2020, allowed such firms to participate in procurement tenders. Finally, we define a firm as repeated seller in a given year if they received at least one public procurement contract in the previous two years. Panel A of Table B.6 shows the aggregate prevalence of each SG, before and after the reform. There is strong persistence in relationships to the government: over 80% of procurement contracts are sold to sellers who have been awarded a contract at least once in the previous two years.

We estimate difference-in-differences type selection equations, where the treatment is defined as an indicator $SG_{f,t} \in \{Local_{i,f,t}, PC_{f,t}, Repeated_{f,t}\}$ for whether the firm f supplying contract i in year t belongs to each SG group in turn, and the outcome is $BR_{i,t} = 1$ if the contract was awarded with price in the bunching region:

$$BR_{i,t} = \alpha + \xi SG_{f,t} + \boldsymbol{\beta} Post_t \times SG_{i,t} + \lambda_t + \mu_b + \eta_{cpv} + \zeta_p + \theta_m + \delta_c + X'_{st}\Gamma + \epsilon_{it} \qquad (4)$$

The specification includes multiple dimensions of fixed-effects: year, type of buyer, CPV code, procedure, month, and execution council. This allows to investigate how the allocation of the same types of contracts changes with the discretion rules. We control for expected project duration and cluster the standard errors at the CPV code and buyer type levels. The selection

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[30]Another difference worth mentioning is that in the specification that considers interactions, the increase in total purcahsed value is statistically significant. The increase in the number of contracts is higher, and these patterns are still more consistent with contract splitting than contract shifting (see Section 4 for a discussion).

equation is estimated on both the full sample and on the subsample of direct awards.

The coefficients of interest are the corresponding β's. Non-zero values of β indicate that sellers being directly awarded split contracts are selected along the respective dimension. A positive value of β indicates that the probability that a firm belonging to the special interest group receives a potentially split contract is distinctively higher after the reform (*Post*), when splitting for discretion is the main mode of manipulation. Positive β for local and politically connected firms are interpreted as evidence for favouritism, while positive β for repeated sellers can be consistent with efficiency-promoting motives.

The results in Table 11 show evidence consistent with favouritism-driven selection. The first column for each SG considers all procurement contracts, while the second column considers only direct awards. We find that both local and politically connected firms are differentially more likely to receive potentially split contracts. The result is particularly strong for direct awards. Considering repeated sellers, we find no statistically significant difference in the relative probability that these receive a potentially split contract, and, if anything, there is an (imprecisely estimated) decrease in such probability. This finding opposes for example that of Coviello et al. (2022), who find that manipulation increases repeated awards. Taken together, the increase in awards of split contracts to local firms and the unchanged awards to repeated sellers suggest that better knowledge of local firms does not solely drive their being preferred, particularly if previous business partnerships are relevant inputs for buyers to assess sellers' competence.

Table 11: Selective Manipulation

	Local		Politically Connected		Repeated Sellers	
	(1)	(2)	(3)	(4)	(5)	(6)
SG	-0.0039*	-0.0042*	-0.0030	-0.0031	0.0036	0.0034
	[0.0015]	[0.0017]	[0.0018]	[0.0019]	[0.0016]	[0.0025]
Post $\times$ SG	0.0140**	0.0195**	0.0108***	0.0155***	-0.0182	-0.0232
	[0.0043]	[0.0057]	[0.0009]	[0.0005]	[0.0078]	[0.0107]
Sample	All	Direct Awards	All	Direct Awards	All	Direct Awards
Year FE		Yes		Yes		Yes
Buyer Type FE		Yes		Yes		Yes
CPV code FE		Yes		Yes		Yes
Awarding Procedure FE		Yes		Yes		Yes
Execution Council FE		Yes		Yes		Yes
Observations	163 037	129 913	198 722	162 345	198 694	162 331

Notes: SG is the special interest group under consideration in the regression, indicated on top of each column. Sample indicates whether all contracts were used, or only Direct Awards. Standard errors clustered at the CPV code and buyer type level in brackets. Outcome in all regressions is indicator for contract in the BR, defined as the interval between the post-reform threshold and 1250€ below. Significance levels: 0.1* 0.05** 0.01***

Interestingly, the share of contracts received by SGs is unchanged (see Panel A of Table B.6), implying a contract allocation change: there was no change in the quantity, but there were significant changes in the type of contracts awarded to SG contractors. In particular, following the reform, the groups associated with favouritism were significantly more likely to get contracts

for prices just below the threshold, potentially split to be directly awarded.

Figure 4 shows that these results are robust to reasonable changes in the width of the bunching region. The baseline BR is highlighted in gray, and we consider variations to narrower (to its left) and wider (to its right) BRs. The magnitude of all estimates is very stable across different BRs, with narrower bunching regions entailing precision losses. This reassures our findings regarding seller selection.

5.2.3 Buyers' Integrity

In addition to seller selection, we investigate whether the extent to which buyers manipulate correlates with their integrity and transparency levels. For that purpose, we zoom in on municipalities and rely on the Municipal Transparency Index (MTI), an index intended to use internationally comparable criteria to assess transparency in municipalities, developed and published by Transparency International Portugal, an anti-corruption ONG. It is composed of more than 75 individual criteria, aggregated into 7 dimensions, one of which is specifically related to public procurement.[31] We used data on the 2017 index, the last year pre-reform.

In order to assess whether manipulation correlates with pre-reform transparency measures, we use two approaches. First, in our contract-level approach, we restrict the sample to contracts i bought by municipalities m and run versions of equation (4) interacting the post indicator with the transparency measure of interest ($Transp$). We consider 3 transparency measures in turn: 1) the transparency index (MTI); 2) The public procurement component of the index (MTI Procurement); and 3) an indicator for municipalities with top 10% best scores for procurement transparency. The standard errors are clustered at the CPV, buyer, year, and district levels, and statistical significance does not change when using Huber-White standard errors. The specifications read:

$$BR_{i,m,t} = \alpha + \xi Transp_m + \boldsymbol{\beta_{ca}} Post_t \times Transp_m + \lambda_t + \eta_{cpv} + \zeta_p + \theta_m + \delta_d + \varepsilon_{it} \qquad (5)$$

Additionally, we use a municipality-level approach. For each municipality and year, we compute the share of contracts in the bunching region and regress them on each of our transparency measures interacted with a post reform indicator. The specification reads:

$$Sbr_{m,t} = \alpha + \xi Transp_m + \boldsymbol{\beta_{ma}} Post_t \times Transp_m + \lambda_t + \epsilon_{it} \qquad (6)$$

where $Sbr_{m,t}$ is the share of contracts in the BR awarded by municipality m in year t, and λ_t are

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[31]The 7 dimensions are: 1) Organization, Social Composition, and municipality functioning; 2) Plans and Reports; 3) Taxes, Tariffs, and Regulations; 4) Relations with Society; 5) Public Procurement; 6) Financial and Economic Transparency; 7) Transparency in Urbanism. To know more about the index and its construction, visit transparencia.pt.

Figure 4: Selective Manipulations - Estimates Sensitivity to BR
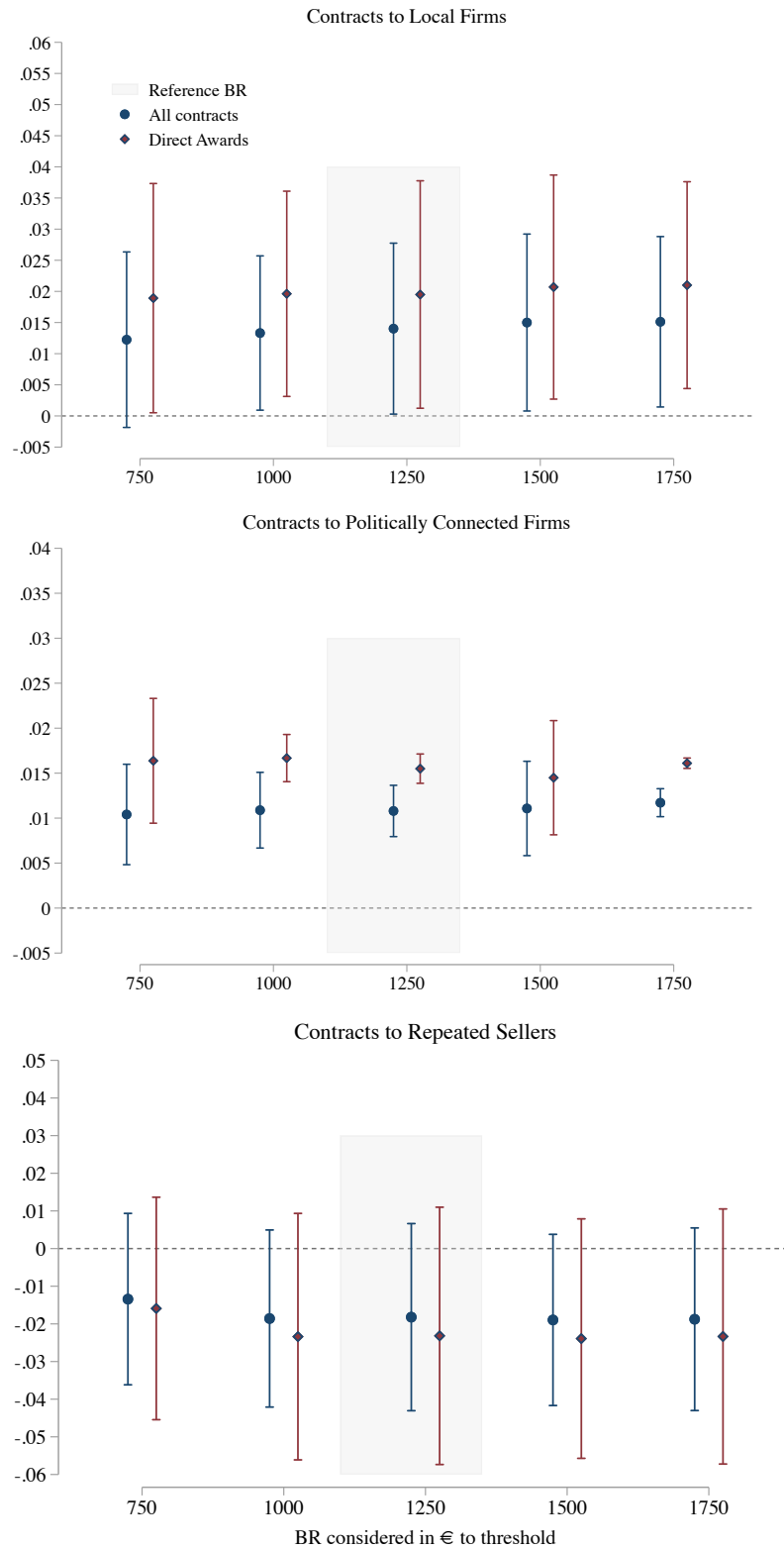
Notes: Results of estimation of equation (4) for varying bunching windows BR, represented in the x axis as € below new discretion threshold. New discretion thresholds: €20 000 for Goods and Services, €30 000 for Construction. The plotted coefficients are $\widehat{\beta}$. The markers represent point estimates and the vertical bars represent 95% confidence intervals. Standard errors clustered at the CPV and buyer type level. Shaded region represents the baseline bunching region in our analysis. Blue represents all contracts, and red considers only direct awards. First Panel has *Local* as special interest group, second has politically connected, *PC*, while the third has *Repeated*, firms who have been awarded at least one procurement contract over the previous two years.

year fixed effects.

The coefficients of interest are β_{ca} in the contract level approach (equation 5) and β_{ma} in the municipality approach (equation 6). In the former, a negative coefficient means that a potentially split contract is less likely to be awarded by a more transparent municipality. Similarly, a negative coefficient in the second approach means that more transparent municipalities award lower shares of split contracts. The results are displayed in Tables 12 and 13, respectively.

Table 12: Buyer Selection - Contract Level Analysis

	MTI		MTI Procurement		MTI Procurement: Top 10% indicator	
	(1)	(2)	(3)	(4)	(5)	(6)
Transparency	-0.0000	-0.0001	-0.0000	-0.0000	0.0019	0.0001
	[0.0000]	[0.0001]	[0.0001]	[0.0000]	[0.0029]	[0.0030]
Post × Transparency	-0.0002***	-0.0003***	-0.0001	-0.0001	-0.0125*	-0.0211*
	[0.0000]	[0.0000]	[0.0000]	[0.0001]	[0.0048]	[0.0095]
Sample	All	Direct Awards	All	Direct Awards	All	Direct Awards
Post-Reform Outcome Mean	0.078	0.111	0.078	0.111	0.078	0.111
Transparency SD	16.25	16.25	32.15	31.91		
Observations	101 649	81 491	101 649	81 491	101 649	81 491

Notes: Transparency is the transparency measure under consideration in the regression, indicated on top of each column. Sample indicates whether all contracts were used, or only Direct Awards. All regressions include year, month, CPV code, awarding procedure and execution district fixed-effects. Standard errors clustered at the CPV code, buyer, district, and year in brackets. Outcome in all regressions is indicator for contract in the BR, defined as the interval between the post-reform threshold and 1250€ below. Significance levels: 0.1* 0.05** 0.01***

More transparent muncipalities manipulate significantly less, as higher MTI indices are associated with relatively lower likelihood of a contract being awarded in the bunching region after the reform. Focusing on the MTI in the contract-level approach (Columns (1) and (2) of Table 12), we see that a one standard deviation increase in the MTI is associated with a $(16.25 \times 0.002) = 0.33\%$ reduction in the probability of awarding a contract in the bunching region, around $(0.0033 \div 0.0780) = 4.2\%$ of the post-reform outcome mean. The magnitude is slightly larger when considering only direct awards, and the coefficients are significant at the 1% significance level. Focusing on the procurement component of the MTI, we also find negative coefficients, but statistically not different from 0. Municipalities with top 10% scores in the procurement component of the MTI are 1,25% less likely to award a contract in the bunching region, and the figure increases to 2,11% when considering direct awards only.[32]

These results are largely corroborated by a municipal approach. On the results displayed in Table 13, one standard deviation increase in MTI is associated with a reduction in manipulation of $((16.9 \times 0.0003) \div 0.074 = 7\%)$ the post-reform outcome mean. Focusing on the procurement dimension of the MTI, one standard deviation increase in the index is associated with a reduction in manipulation accounting for 11% of the post-reform outcome mean. These results are statistically significant at the 5% level and robust to different bunching region bandwidths. Mu-

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[32]The results for the baseline bandwidth are only significant at the 10% level but are robust to all variations of the bandwidth and slight variations in the baseline bandwidth (e.g. €1 000 instead of €1 250) deliver statistical significance at the 5% level.

nicipalities in top 10% score of transparency in procurement manipulate, after the reform, 20% less than the average outcome mean.[33]

Table 13: Buyer Selection - Municipality Level Analysis

	MTI	MTI Procurement	MTI Procurement: Top 10% *indicator*
	(1)	(2)	(3)
Transparency	0.0001	0.0000	0.0035
	[0.0001]	[0.0000]	[0.0025]
Post × Transparency	-0.0003**	-0.0002***	-0.0164*
	[0.0001]	[0.0000]	[0.0065]
Post-Reform Outcome Mean	0.074	0.074	0.074
Transparency SD	16.90	39.90	
Year FE	Yes	Yes	Yes
Observations	1 539	1 539	1 539

 Notes: Transparency is the transparency measure under consideration in the regression, indicated on top of each column. Standard errors clustered at the year and municipality level in parenthesis. Outcome in all regressions is share of contracts in the BR, defined as the interval between the post-reform threshold and 1250€ below. Significance levels: 0.1* 0.05** 0.01***

Taken together, the empirical tests for seller selection and the evidence for who manipulates support favouritism rather than efficiency-promoting motivations. The final set of testable implications aim to assess whether such selection bears any implications for the performance of procurement contracts.

5.2.4 Post-Award Performance

We consider three dimensions of post-award performance: expected duration of works, delays, and price changes, which are further divided into a renegotiation indicator, associated with substandard procurement performance, and a discount indicator, associated with procurement efficiency (OECD, 2015).

Expected duration is measured in days and considered an *ex-ante* outcome, in that it is part of the contract and not the actual works. All else equal, a higher expected duration of works is associated with lower work efficiency and higher leniency of buyers, also in line with the idea that a principal can contrast a reduction in quality by shortening contract duration (Calzolari & Spagnolo, 2020).

The second outcome are delays. We classify a project as late if the date of conclusion is after the original deadline established in the contract. We also classify a project as late if the justification for deadline change explicitly mentions delays, and classify it as not late if the justification explicitly mentions early conclusion.[34] Higher share of delays is associated with worse procurement performance.

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[33]The result for the baseline bandwidth is only significant at the 10% level but is robust to all variations of the bandwidth and slight variations in the baseline bandwidth (e.g. €1 000 instead of €1 250) deliver statistical significance at the 5% level.

[34]To avoid classifying marginal deviations as late contracts, we classify a project as late only if the date of work conclusion is beyond the agreed deadline by at least 10% of the duration of works. The full list of expressions used in the alternative classification can be found in Panel A of Table B.4 in Appendix B.

Finally, we consider a price change indicator, equal to one if the buyer paid a price different from the one anticipated in the contract. Detrimental reasons for revised or renegotiated prices include delays in construction and services which may directly require additional costs, or early contract termination leading the buyer to pay a final price significantly lower than anticipated. Both these deviations reflect anomalies in the procurement process: while the former means higher costs for a given set of works, the latter implies non-delivery of the procured public good, and often the need to hold a new tender. Price changes can also be associated with increased efficiency. The anticipated price of a project is defined as the maximum the buyer is willing to pay for the full set of works (see Section 2). In competitive procedures, potential buyers compete by bidding values lower than the anticipated price, and this difference is the main criterion for choosing the winning bidder. Some sellers ask for less than (but close to) the anticipated price even in direct awards. Such deviations in favour of the buyer reflect efficiency gains in procurement: lower expenditure for the same procured projects. We refer to these as discounts.

In order to further understand the mechanisms at play, we divide the price change variable into three indicators: a renegotiation indicator, capturing the procurement anomalies associated with project delay or cost-inflating price revisions, taking value 1 if the final price is larger than the anticipated price by 25% or more; an incomplete project indicator, capturing terminated contracts and incomplete projects, which takes value 1 if the price paid is lower than the anticipated value by more than 25% or if there is a payment change justification with explicit mention of either contract termination or fewer works than initially procured [35]; and a discount indicator, capturing relatively small price differences arising from efficient sellers charging less than the anticipated price, taking value 1 if the price paid is lower than, but higher than 90% of, the anticipated price.

Panel B of Table B.6 shows the aggregate descriptive statistics for the post-award performance measures, before and after the reform. There are significant changes in the post-award performance measures. The share of late contracts increases significantly, even though the expected duration also increases. Additionally, there is a small reduction in price changes, driven by a strong reduction in the prevalence of discounts. Renegotiations and incomplete projects also fall, but the former are overall very rare and the later fall very little.

We complement the aggregate descriptive evidence of Section 3.2 with an analysis of how procurement outcomes evolved in the bunching region. We first compare the outcome for contracts in the bunching region with the remaining contracts subject to the same regulations, i.e., those eligible for discretion both before and after the reform. We regress the outcome of interest, y_{it}, on indicator variables for the bunching region, BR_{it}, year fixed-effects, λ_t, and an interaction term between BR_{it} and the post-reform indicator, $Post_t$. We also include fixed effects for complete

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[35]The full list of expressions used in the classification of incomplete projects can be found in Panel B of Table B.4 in Appendix B.

CPV code, buyer, execution council, month, and procedure.

$$y_{it} = \alpha + \beta BR_{it} + \boldsymbol{\delta} BR_{it} \times Post_t + \lambda_t + \mu_b + \eta_{cpv} + \zeta_p + \theta_c + X'_{st}\Gamma + \varepsilon_{it} \tag{7}$$

We control for project's anticipated price for precision and cluster the standard errors at complete CPV code and buyer type level. The coefficient of interest is δ, measuring the difference-in-differences evolution of post-award performance measure y_{it}. The reform changes the effective regulation for projects with anticipated values above the new threshold, requiring restricted auctions to be held. In order to describe the relative evolution of post-award performance of contracts generally below the threshold and hence eligible for discretion ($Bel = 1$), when compared to those required to bid in auctions, we modify equation (7) to further include a comparison with contracts for values above the threshold:

$$\begin{aligned} y_{it} = \ & \alpha + \beta_0 Post_t + \beta_1 Bel_{it} + \beta_2 BR_{it} + \beta_3 Bel_{it} \times Post_t \\ & + \delta BR_{it} \times Post_t + \mu_b + \eta_{cpv} + \zeta_p + \theta_c + X'_{st}\Gamma + \varepsilon_{it} \end{aligned} \tag{8}$$

In equation (8), β_0 measures the aggregate time-trend in post-award performance measure, β_3 measures the evolution in outcomes of contracts eligible for discretion but not in the bunching region, relative to that of restricted auction contracts, and δ, the main coefficient of interest, is defined as before.

Table 14 shows the results. The first row confirms the general negative time trend detectable in the aggregate descriptive statistics. After the reform, there is a significant increase in delays, despite a large significant increase in the works' expected duration. Additionally, a significant reduction in price changes is driven by fewer discounts: buyers are more often paying the maximum amount they are *ex-ante* willing to. The second row shows how contracts eligible for discretion, but less influenced by the selection brought about by splitting, evolve relative to projects awarded trough restricted auctions. There is suggestive evidence that discretion may be beneficial: the aggregate increase in expected duration of procurement contracts is significantly lower for contracts awarded at discretion, with no repercussions on late deliveries, renegotiations, or incomplete projects.

Turning to the relative evolution of potentially split contracts, we find that, when compared to the remaining contracts eligible for discretion, these are expected to take significantly longer. The value of a contract is intimately tied to its quantity and expected duration, and all else equal contracts with lower values usually take shorter. Contract splitting then implies shorter contracts. However, when compared to similar contracts (same product and price) before splitting, potentially split contracts take significantly longer. This results further support the idea that splitting is not meant for fostering quality, since shorter contract duration is a way for buyers to contrast

Table 14: Post-Award Performance

	Expected Duration		Late		Price Changes		Renegotiations		Discounts		Incomplete Projects	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Post	-	18.63***	-	0.074***	-	-0.024*	-	-0.003	-	-0.019***	-	-0.003
		[4.34]		[0.009]		[0.013]		[0.002]		[0.006]		[0.006]
Bel × Post	-13.64***	-13.59***	-0.011	-0.011	-0.003	-0.002	-0.000	-0.000	0.006	0.006	-0.003	-0.003
	[4.25]	[4.21]	[0.017]	[0.017]	[0.009]	[0.009]	[0.000]	[0.000]	[0.005]	[0.005]	[0.004]	[0.004]
BR × Post	8.64**	8.56*	0.018	0.018	-0.016***	-0.016***	0.001	0.001	-0.007***	-0.007***	-0.003	-0.003
	[4.00]	[4.06]	[0.015]	[0.015]	[0.003]	[0.003]	[0.002]	[0.002]	[0.002]	[0.002]	[0.003]	[0.003]
Year FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
N	198 153		60 594		198 153		198 153		198 153		198 153	

Notes: Uneven columns include year fixed-effects, while even columns include the *Post* dummy.
Standard Errors clustered at the complete CPV and buyer type level. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

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reductions in non-contractible quality, if it is important (Calzolari & Spagnolo, 2020). Moreover, despite such longer expected duration, these contracts do not exhibit fewer delays. In fact, the coefficient associated with *Late* projects is even positive, although statistically indistinguishable from zero at any of the conventional levels.

Tthere are additionally significantly fewer price changes, but the effect is fully driven by fewer discounts in potentially split procurement contracts. Buyers are significantly more likely to pay the full anticipated price, and there is no detectable effect neither in the share of renegotiated contracts or incomplete projects. We take this as suggestive evidence of a particularly strong post-reform declining performance of procurement for potentially split contracts.

We acknowledge that δ cannot be interpreted as the causal effect of the reform-induced selection on outcomes. Beyond the assumption of common trends, such interpretation would require that 1) the effect of discretion on outcomes is independent of price, and that 2) splitting is bounded from below. We don't find either of these assumptions to be realistic and prefer to interpret this evidence as a correlation. The benefits of discretion for outcomes are likely to vary according to the type and size of each project, intimately connected to their anticipated price. In that case, the dif-in-dif specification does not net out the effect of discretion. Moreover, while tenders are costly and buyers split contracts into the highest values that still enable them to use discretion, it is unreasonable to assume that no split contract is awarded for price below the bunching region, as not all contract values are divisible by values close to the threshold.

Revisiting the hypotheses summarized in Table 9, our evidence strongly supports favouritism rather than efficency-promoting motives for contract splitting, even though we interpret our evidence on post-award performance as correlational. First, we find evidence that contract splitting is present in standardised procurement. If contract splitting was aimed at fostering non-contractible quality, we would expect it to either not occur, or occur to a much lower degree in homogeneous procurement products where non-contractible dimensions of quality are less relevant. Moreover, such relational quality would imply continued relationships with a small set of loyal sellers. To the contrary, we find no evidence of potentially split contracts particularly awarded to repeated sellers - if anything, they target new sellers. Second, we find that contract splitting has strong implications for seller selection: potentially split contracts are significantly more likely to be awarded to groups associated with favouritism, local and politically connected sellers. Third, we find suggestive evidence that potentially split contracts, through the selection of sellers, are associated with worse post-award performance. When compared to other contracts eligible for discretion, potentially split contracts do not exhibit fewer delays despite being expected to take longer, and buyers are more likely to pay the maximum amount established by contract, reflecting fewer discounts and likely less efficient, or more rent-extracting, sellers.

6 Conclusion

This paper investigates whether contract splitting is a relevant mode of procurement manipulation. We study the phenomenon in the context of a public sector reform in Portugal that lowered the value of the threshold for procurement contracts awarded at discretion. We find that the threshold-reducing policy reveals discretion-motivated manipulation in the anticipated procurement values, and that contract splitting is the most important mechanism of manipulation in this context. While buyers do not significantly change the overall amount of procurement products they purchase, they significantly increase the number of contracts through which they undertake such purchases, and significantly increase the number and share of contracts they award for values close but below the threshold.

Although we find contract splitting to be the dominant mode of procurement manipulations, our results do not imply that contract shifting, as an alternative mechanism of manipulation, is not present in this context, nor that it can't be the dominant mode of manipulation in other settings. Instead, we highlight how it is possible that contract splitting prevails and the important implications it has both for compliance policy and research aimed at studying the effect of discretion and manipulation in public procurement. We provide a methodology to test contract splitting applicable across different institutional contexts.

We provide evidence that favouritism is motivating buyers to split contracts. Aggregate stability in the composition of sellers hides reallocation of procurement contracts: following the reform, potentially split contracts are much more likely to be awarded to groups of sellers associated with favouritism. Contracts manipulated into discretion values do not exhibit improved post-award performance. If anything, we find that the reallocation of contracts both in terms of prices and sellers is associated with similar delays despite higher expected duration, and fewer discounts. Additionally, we find no evidence supporting a theory of using splitting to promote (non-contractible) quality. The fact that the drawbacks of discretion seem to dominate in this setting while its advantages are more relevant in others is consistent with Bosio et al. (2022): advantages of discretion depend crucially on context and institutions.

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Appendix A Bunching Estimators and Estimation

A Pre-Reform Counterfactual: Palguta and Pertold (2017)

The second estimator uses the pre-reform price distribution as counterfactual. The assumption is that, absent the threshold-changing reform, the price distribution would not have changed.

We estimate

$$C_{jt} = \alpha_j + \alpha_t + \sum_{i=-R}^{0} \gamma_i \cdot \mathbf{1}\left[Z_j = i\right] \cdot \mathbf{1}[t > T] + \varepsilon_{jt} \tag{A.1}$$

where C_{jt} is the number of contracts in bin j and year t, α_j are bin fixed-effects, α_t are year fixed-effects and T denotes the reform approval year, 2017. The remaining notation is as before. The model is estimated by Poisson conditional fixed-effects quasi-maximum-likelihood, suitable for count data.

This estimator improves upon the counterfactual density estimation in two relevant dimensions: first, while the excess mass of the previous estimator, defined as the excess number of contracts over the average counterfactual density, does not have an intuitive interpretation, the coefficients of interest in this estimation, $\widehat{\gamma_i}$, have a direct and simple interpretation after appropriate transformation.[36]

Moreover, estimation of equation (A.1) does not require the assumption of a smooth distribution around the threshold, being flexible enough to accounts for price rounding through α_j, the bin fixed effects. Figures B.2 to B.3 in Appendix B show clearly that rounding at the the new thresholds was an important feature of the distributions even before the threshold reform, although in magnitude no different than rounding at other reference values. We refer to Palguta and Pertold (2017) and Wooldridge (1997) for details on the econometric method and further advantages.

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[36]Coefficient estimates can be interpreted as $[exp(\widehat{\gamma_i} - 1) \times 100]$ percentage change, on average, with respect to the pre-reform period.

Estimated Counterfactual: Chetty et al. (2011)

The estimator computes the excess mass by comparing the observed distribution to an estimated counterfactual. To estimate the counterfactual distribution, we split the distribution in (€250) bins and normalize the relevant threshold to 0. We set the manipulation window to $R = 5$ bins, and we fit an order $q = 7$ polynomial excluding the manipulated region from $-R$ to 0, according to

$$C_j = \alpha + \sum_{i=0}^{q} \beta_i \cdot (Z_j)^i + \sum_{i=-R}^{0} \gamma_i \cdot \mathbf{1}\left[Z_j = i\right] + \varepsilon_j^0 \tag{A.2}$$

where C_j is the number of contracts in bin j, $Z_j = \{..., -1, 0, 1, ...\}$ is the running bin variable, measured in bin distance to the threshold, and γ_i are dummies for the R bins within the bunching region.[37] The counterfactual density is assumed to be smooth around the threshold and obtained using the predicted values of (A.2), i.e.,

$$\widehat{C}_j = \hat{\alpha} + \widehat{\beta}_i \cdot (Z_j)^i \tag{A.3}$$

The counterfactual distribution in the excluded region interpolates the predicted values from (A.2) to the excluded region from bin $-R$ to 0 and we compute the excess number of contracts as

$$\widehat{B} = \sum_{j=-R}^{0} C_j - \widehat{C}_j = \sum_{i=-R}^{0} \widehat{\gamma}_i, \tag{A.4}$$

The excess mass, measured as the excess number of contracts as a share of the average counterfactual density, is given by

$$\widehat{b} = \frac{\widehat{B}}{\sum_{j=-R}^{0} \widehat{C}_j / R} \tag{A.5}$$

The standard errors for the estimate are obtained through a bootstrap procedure.

The results, presented in Table A.2, show that the excess mass of contracts in the bunching region, $\hat{b}$, is equal to 5.8, 12, and 10.1 times the average counterfactual density, for Goods, Services, and Construction, respectively, for the year 2018. Note that there is also positive excess mass, albeit of a much lower magnitude, in the years before the reform, possibly due to rounding.

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[37]The presence of strong and significant bunching is robust to different bunching windows and the polynomial orders.

Bunching Estimation Results

Table A.1: Bunching Estimation
A Pre-Reform Distribution Approach

	Bin_{-1}	Bin_{-2}	Bin_{-3}	Bin_{-4}	Bin_{-5}
Construction	3.77 (0.07)	1.61 (0.04)	1.02 (0.03)	0.44^{+} (0.02)	0.35^{+} (0.02)
Goods & Services	4.88 (0.07)	2.07 (0.04)	0.54 (0.02)	1.40 (0.03)	0.65 (0.02)
Goods	2.84 (0.04)	0.99 (0.02)	0.30 (0.01)	0.62 (0.02)	0.54 (0.02)
Services	6.03 (0.11)	2.79 (0.06)	0.70 (0.03)	1.76 (0.04)	0.71 (0.03)

Notes: Coefficients shown as $exp(\widehat{\gamma}_i) - 1$ and are interpreted as average post reform % increase in number of contracts in bin i. Bins have width of €250. Standard errors clustered at the bin level in parentheses. All specifications include year and bin fixed effects. All coefficients significant at the 1% level. + untransformed coefficients not significant at the 5% level.

Table A.2: Bunching Estimation
A Counterfactual Distribution Approach

	Goods & Services			Goods		Services		Construction		
	$\widehat{b}$	se	$\widehat{B}$	$\widehat{b}$	se	$\widehat{b}$	se	$\widehat{b}$	se	$\widehat{B}$
Pre-Reform										
2015	0.53	(0.21)	76	0.63^{+}	(0.34)	0.50^{+}	(0.28)	1.26^{+}	(0.65)	23
2016	0.18^{+}	(0.20)	28	0.26^{+}	(0.33)	0.13^{+}	(0.25)	2.09	(0.59)	45
2017	0.81	(0.20)	143	1.50	(0.34)	0.40^{+}	(0.24)	1.46	(0.51)	35
Post-Reform										
2018	9.19	(0.32)	1727	6.03	(0.49)	10.84	(0.44)	9.03	(1.00)	155
2019	13.20	(0.38)	2407	7.82	(0.51)	16.12	(0.52)	12.86	(1.14)	230

Notes: First column of each sector shows the estimates of excess mass over average counterfactual mass as in equation (A.5). Third column shows the estimate of excess number of contracts below the threshold, as in equation (A.4). Bootstrapped standard errors in parentheses. $^{+}$ statistically not different from 0 at the 5% level.

Appendix B Tables and Figures Appendix

Figure B.1: Graphical McCrary test
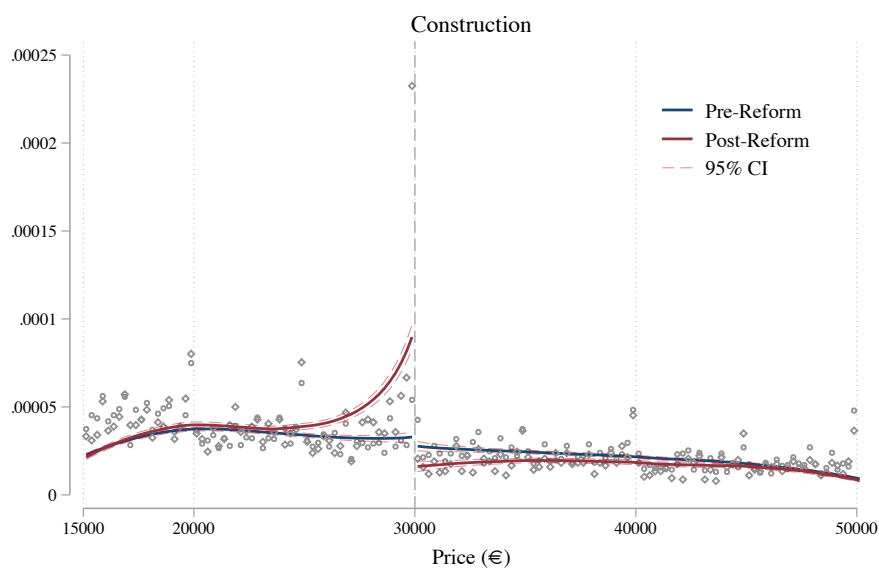
**Notes:** Graphical evidence of McCrary (2008) tests before and after the reform around the new discretion threshold. Pre-Reform period: 2015-2017, blue series. Post-Reform Period: 2018-2019, red serires. Vertical dashed line represents new threshold: €20 000 for Goods and Services, €30 000 for Construction. Small dots represent €250 binned frequencies: circles for pre-reform series, diamonds for post. Solid line is a kernel estimate and dashed lines are 95% confidence intervals. The null of continuity of the density around the threshold is rejected if confidence intervals on both sides of the threshold do not overlap.

Figure B.2: Anticipated Price Distribution
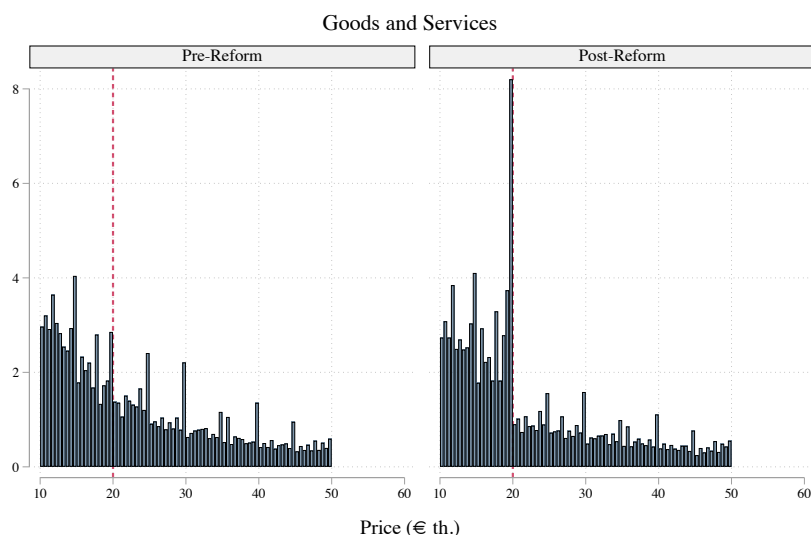
Notes: The plots pool the years in the pre-reform period (2015-2017) and the post-reform period (2018-2019) separately and show the distribution of contractual prices for the Goods and Services sectors around the new discretion threshold. Blue bars represent density in €250 bins and the red dashed line is a kernel density estimate. Dashed vertical line represents new threshold: €20 000 for Goods and Services, €30 000 for Construction.

## Figure B.3: Anticipated Price Distribution
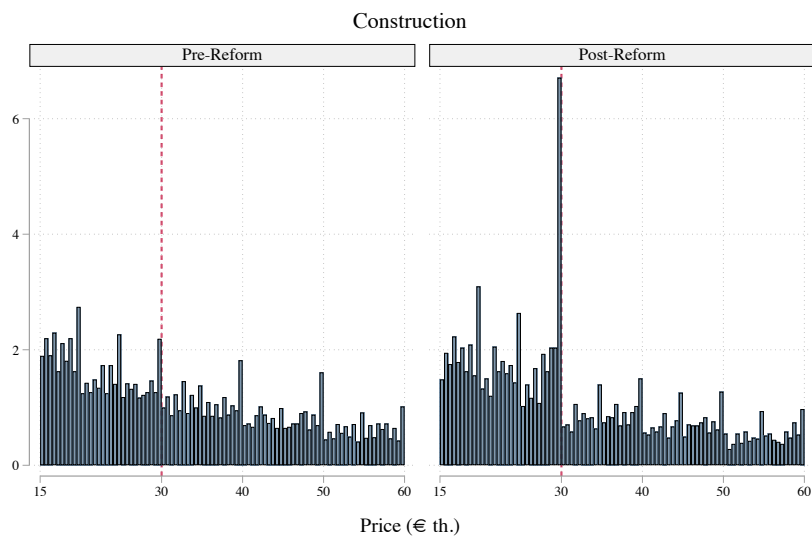
Construction

Notes: The plots pool the years in the pre-reform period (2015-2017) and the post-reform period (2018-2019) separately and show the distribution of contractual prices for the Goods sector around the new discretion threshold. Blue bars represent density in €250 bins and the red dashed line is a kernel density estimate. Solid vertical line represents new threshold: €20 000 for Goods and Services, €30 000 for Construction.

Figure B.4: Contractual Price Yearly Distribution
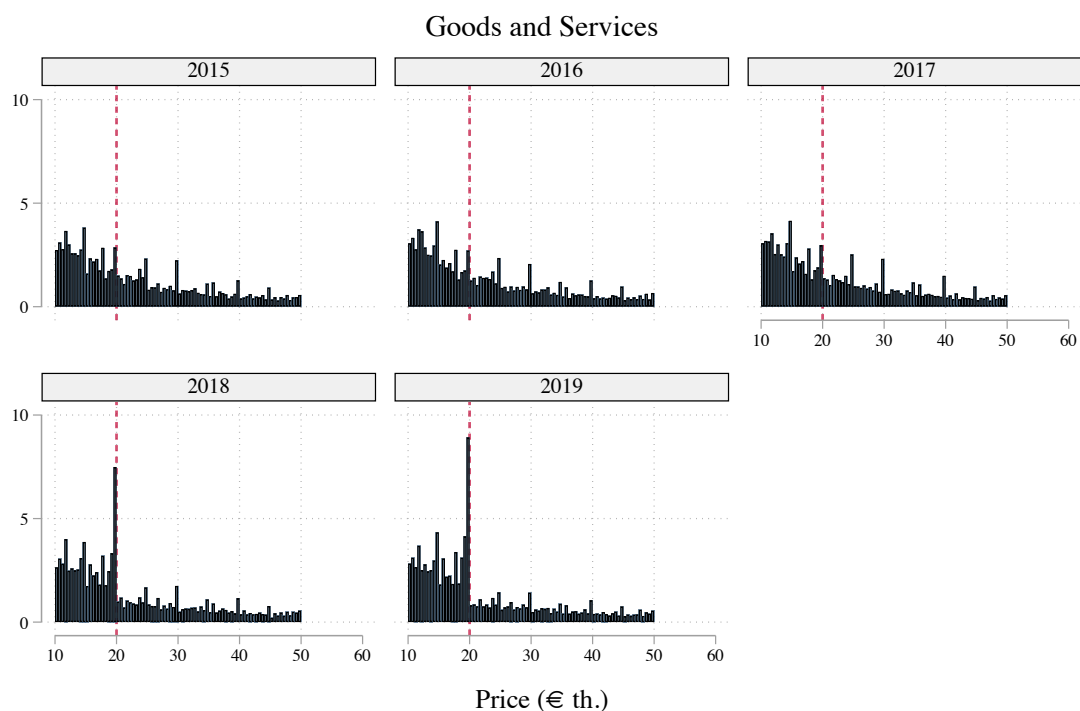
Goods and Services

Notes: The plots show the yearly distribution of contractual prices for the Goods sector around the new discretion threshold. Blue bars represent density in €250 bins and the red dashed line is a kernel density estimate. Solid vertical line represents new threshold: €20 000 for Goods and Services, €30 000 for Construction.
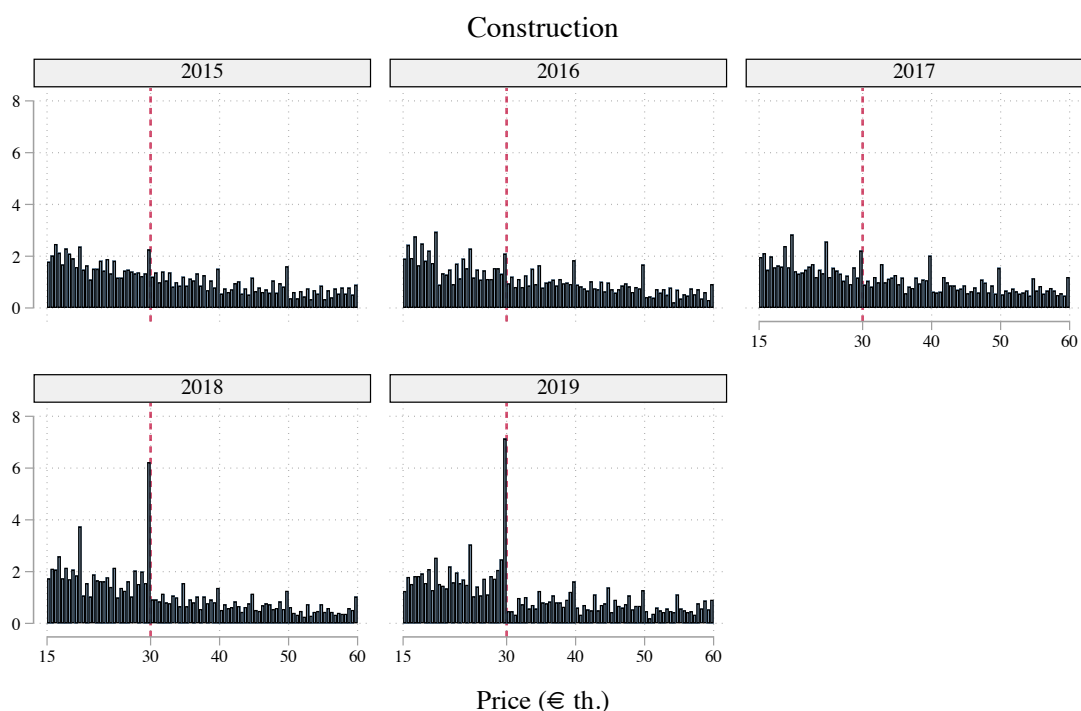
Figure B.5: Contractual Price Yearly Distribution

Construction

Notes: The plots show the yearly distribution of contractual prices for the Goods sector around the new discretion threshold. Blue bars represent density in €250 bins and the red dashed line is a kernel density estimate. Solid vertical line represents new threshold: €20 000 for Goods and Services, €30 000 for Construction.

Table B.1: Yearly Regressions on the Use of Direct Awards

	Pre-Reform			Post-Reform	
	2015	2016	2017	2018	2019
A. *vs All Contracts*					
$\mathbb{1}$\{Bunching Region\}	0.0005	0.0064	0.0029	0.178***	0.205***
	(0.0109)	(0.0098)	(0.0084)	(0.0148)	(0.0136)
N	24 617	27 389	31 771	28 046	26 020
B. *vs Eligible for Direct Awards*					
$\mathbb{1}$\{Bunching Region\}	-0.0090	0.0105	0.0066	0.0602***	0.0930***
	(0.0148)	(0.0119)	(0.0114)	(0.0179)	(0.0181)
N	11 409	12 856	14 081	13 902	13 158

Notes: Coefficients from estimation of yearly versions of equation (1), where $\mathbb{1}$\{Bunching Region\} is the coefficient on the Bunching Region indicator. A contract is defined to be in the Bunching Region if its value is in the range [€18 750, €20 000[for Goods and Services and [€28 750, €30 000[for Construction. All regressions include seller, complete CPV product code, type of buyer, month, and execution district fixed effects. Controls include price and expected duration of works. Standard Errors clustered at the complete CPV code level. Panel A uses all contracts as control group, Panel B uses only contracts in the price range eligible for discretion throughout the whole period, i.e. contracts with price below the post-reform threshold. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table B.2: PN Descriptive Statistics

Procurement Needs	Full Sample		Restricted Sample	
	Nr	%	Nr	%
Total	83532		5217	
Goods and Services	70771	84.7	4727	90.6
Construction	12761	15.3	490	9.4
Every Year	1814	2.2	504	9.7
Number Contracts	1.65		3.44	
Number Sellers	1.50		2.89	
Largest CPV Divisions				
45 - Construction Work	12121	14.5	467	9.0
79 - Law and Business Consultancies	8420	10.1	872	16.7
71 - Architecture, Engeneering	6368	7.6	632	12.1
72 - Information Technologies	4982	6.0	345	6.6
50 - Repair and Maintenance	4547	5.4	258	4.9

Notes: Procurement Needs defined as complete CPV *times* sector × buyer group. Restricted Sample includes only those PNs with at least one contract in the Bunching Region, refined as the interval between the new threshold - €20 000 for Goods and Services and €30 000 for Construction - and €1 250 less. Number of contracts and number of sellers indicate the average number of contracts and sellers per PN. Every Year indicates the number of PNs with contracts every year. Divisions are defined as the first two digits in the CPV code. The shown divisions are the most prevalent.

Table B.5: Standardised Procurement - Alternative Measure
Within-PN Regression Results

	Tot Val		Nr Conts		Avg Val		Nr Conts BR		% Conts BR	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Post	907	10 829***	1.1135***	0.586***	-2 903***	-4 353***	0.860***	0.437***	0.478***	0.398***
	[17 959]	[3 422]	[0.390]	[0.127]	[755]	[434]	[0.072]	[0.013]	[0.011]	[0.008]
Post × SP		-9 922		0.528		1 450*		0.090		-0.317***
		[15 288]		[0.505]		[801]		[0.065]		[0.012]
PN Fixed Effects	Yes		Yes		Yes		Yes		Yes	
Dep. Var mean *pre-reform*	254 526	114 496	8.880	4.087	30 479	29 535	0.240	0.124	0.025	0.041
Nr PNs	436	2 934	436	2 934	436	2 934	436	2 934	436	2 934
R^2	0.672	0.720	0.701	0.760	0.536	0.590	0.458	0.450	0.483	0.308
Observations	1 924	9 143	1 924	9 143	1 924	9 143	1 924	9 143	1 924	9 143

Notes: Procurement Needs (PN) defined as a buyer-product combination. Standard errors clustered at the procurement need and CPV group level in brackets. Unit of observation is a procurement need - year. Standardised Procurements defined according to diffusion criterion: codes within the top 25% most purchased, with at least two yearly purchases, on average. All standardised PNs with at least one contract in the bunching region (BR) were considered. BR is defined as the interval between the post-reform threshold and 1250€ below. Outcome of each regression indicated on top of each column. Buyers with more than 15x percentile 99 of number of contracts were excluded. Significance levels: 0.1* 0.05** 0.01***

Table B.3: Standardised Products to CPV correspondence

Standardised Procurement (Bandiera et al., 2009)	CPV Codes
Car Rental	6017- ; 6018-
Photocopier	3012- ; 50313100- ; 50313200- ; 79521000-2
Laptop & Desktop	30000000-9 ; 302-
Office Desk	39121000-6 ; 39121100-7 ; 39121200-8 39122000-3 ; 39122100-4 ; 39122200-5 39130000-2 ; 39263000-3 ; 39263100-4
Office Chair	39112000-0 ; 39113100-8 ; 39113000-7 39113700-4
Landline Contract	64200000-8 ; 6421 -
Projector	30191200-6 ; 38652100-1 ; 38652110-4 38652120-7
Switch Network	6422- ; 32552330-9 ; 32400000-7 ; 3241 - 32500000-8
Cable Network	3242- ; 3243- ; 3244- ; 3251- ; 3252- 3255- ; 3256- ; 3257- ; 3258- ; 48200000-0
Heating Diesel	091-
Motoroil	0921-
Lunch Voucher	30199770-8
Refuse Bin	34928480-6
Paper	33772000-2 ; 301997- ; 30199330-2 30194320-4 ; 30197-
Paper Products	30199- ; 22420000-0 ; 30194320-4
Mobile Phone Contracts	32250000-0 ; 64212-
Software	4821- ; 4822- ; 4830- ; 4831- ; 4832
Printer	30125110-5 ; 30232100-5 ; 30232110-8 30232120-1 ; 30232130-4 ; 30232140-7 30232150-0 ; 48824000-0
Server	48810000-9 ; 48820000-2 ; 48821000-9 48219700-3 ; 48222000-0 ; 48800000-6 48822000-6 ; 48823000-3 ; 48824000-0 48825000-7
Car Purchase	341-* ; 50100000-6 ; 50110000-9 50111000-6 ; 50111100-7 ; 50111110-0 50112000-3 ; 50112100-4 ; 50112200-5 50112300-6
Fax	30192340-6 ; 50314000-9 ; 32581200-1 32581210-4

Notes: "-" Indicates that all procurement codes starting with the digits indicated before the hyphen are included in the category. * except 34121000-1, 34121100-2, 34121200-3, 34121300-4, 34121400-5, 34144910-0, 34150000-3, 34151000-0, 34152000-7.

Table B.4: List of Expressions for Late and Incomplete Classifications

| | **A. Late** | |
	Original Expression	Translation
Included in the Definition	Atraso, Atrasos	Delay, Delays
	Prorrogação, Prorrogações, Prorrogado	Extension, Extensions, Extended
	Prolongado	Extended
	Incumprimento dos Prazos	Deadline not met
Excluded from the Definition	Conformidade, Normalidade, Normalmente	In accordance
	Nao existe alteração	No changes
	Concluida no prazo contratualmente estabelecido No Prazo Contratual, No Prazo Previsto	Finished within the contract deadline
	Antes do Prazo, Antecipação, Antes do Previsto, Concluidos Antes, Terminou Antes, Concluidos Antes, Prazo Inferior, Inferior ao Previsto, Antes da Data	Before the deadline
	Mais Rápido	Faster
	Prazos Cumpridos, Cumprido o Prazo, Dentro do Prazo	Deadline was met

| | **B. Incomplete Projects** | |
	Original Expression	Translation
Included in the Definition	Rescisão, Rescindido,	Termination, Terminated
	Revogação, Revogado	Termination, Terminated
	Abaixo do valor esperado, Inferior ao previsto Realizou menos, Abaixo do estimado, Redução Consumos, Consumo efetivo inferior, Quantidades Fornecidas Inferiores,	Below the expected value
	Não foram realizadas as horas previstas	Scheduled hours not carried
	Quantidade adjudicada não fornecida Não foram fornecidas Não foram prestados, Realizou menos	Contracted quantity not supplied
	Cessou antes do término	Ceased before the end

Notes: List of Expressions used to complement the definitions of *Late* and *Incomplete Projects*. List of expressions for *Late* variable extracted from justifications to deadline changes. List of expressions for *Incomplete Projects* extracted from justifications to payment changes.

Table B.6: Descriptives - Splitting Motivations

	Pre Reform			Post Reform		
	mean	SD	N	mean	SD	N
A. Seller Selection						
Local *(%)*	28.67	45.22	102 589	27.95	44.88	73 663
Politically Connected *(%)*	8.60	28.04	124 112	8.23	27.48	90 591
Repeated Seller *(%)*	81.59	38.14	124 091	81.59	38.75	90 584
B. Post-Award Performance						
Expected length *(days)*	245.09	349.54	124 112	269.77	366.78	90 591
Late *(%)*	32.41	46.80	39 687	45.13	49.76	26 216
Price changes *(%)*	8.84	28.39	124 112	6.48	24.62	90 591
Renegotiations *(%)*	0.62	7.85	124 112	0.38	6.05	90 591
Incomplete Projects *(%)*	2.96	16.94	124 112	2.43	15.39	90 591
Discounts *(%)*	3.09	17.28	124 112	1.94	13.78	90 591

Notes: Values are yearly averages. Pre-Reform Period: 2015-2017. Post-Reform Period: 2018-2019. **Seller selection:** A seller is classified as *Local* if established in the same municipality where procurement project is to be carried. *Politically Connected* sellers have one current or ex-elected official as manager. *Repeated sellers* have received at least one procurement contract over the previous two years. **Post-Award Performance:** *Expected length* is the number of days for project delivery established by contract. *Late* is an indicator for whether project conclusion is after the deadline established by contract, or whether the contract publication includes explicit references to delays in works. *Price changes* is an indicator taking the value one if the total price paid by the buyers differs from the project's anticipated price. *Renegotiations* equals one if the price change is large ($\geq 125\%$) and positive. *Incomplete projects* equals one if the final price is significantly lower ($< 75\%$) than the anticipated price or if there is explicit mention of contract termination. *Discounts* takes value 1 if final price paid is smaller but close to original price ($\geq 90\%$).