

# Manipulation and Active Waste in Public Procurement: Evidence from the Introduction of Discretionary Thresholds

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# Motivation

- Corruption: detrimental to public service provision
- Contracts go to firms offering greatest incentives to officials rather than to firms with best price/quality ratio
- OECD countries: 14% of GDP redistributed through public procurement (OECD 2013)
- For our analysis we use the Czech Republic as a country with high proportion of procurement spending (16% of GDP)
- CR is also known for high prevalence of favoritism and bribery - good laboratory to study corruption mechanisms
- CR is known for high participation of empty shell firms with anonymous owners in procurement (scandals)

# Motivation

- EU countries (including CR) and US use open and transparent auctions above certain legislative thresholds
- Procurements below discretionary thresholds - allocated using restricted auctions - only firms selected by procurement officials can submit their bids
- Aim of the policy: thresholds align the behavior of officials with societal interests of cost-efficient procurement and optimal contract allocation
- Downsize: officials can use too much discretion, procurement below thresholds can provide sizeable opportunities for rent-seeking behavior and corruption

# Aim of the Paper

- Using natural experiment provide evidence showing how these policies (thresholds)
  - create opportunities for avoiding open procurement competition
  - lead to behavioral distortions and active waste (suboptimal choice of suppliers, higher prices)
- Present a novel methodology based on Chetty et al. (2011) for detecting manipulation of procurements and active waste that can be useful for many countries
- Contribute to academic forensic economics by showing how institutions and regulation are an important source of corruption and wasteful behavior

# Institutional Background

- Different legislative thresholds in the anticipated value divide procurements into separate groups - differ in their mandatory requirements on transparency and open access to procurement
- Procuring agencies estimate anticipated value on their own
- The reform of July 2006 introduced a new type of simplified negotiating procedure into the procurement legislation - introduced several new thresholds into the procurement code
- If the anticipated value of procurement was set below the threshold, the officials were allowed to autonomously approach potential contractors themselves
- Thresholds differ for construction work, goods and services

# Institutional Background

- A major controversy: the decision which bidders would be invited was left at the full discretion of the procurement agencies
- The regulation created strong opportunity to engage in manipulations of the anticipated value of procurement contracts.

# Potential Sources of Manipulation after the Reform

- **Efficiency reason:** Avoid transparent open auctions and save the associated time and administrative costs. Pre-select firms with good history of performance, . . .
- **Passive waste:** Avoid the time cost for themselves, which need not be beneficial for the organization, because contractors might not be chosen optimally and/or the final prices of procurement might be higher.
- **Active waste:** Colluded supplier can win, yielding benefits for the involved officials.

We focus on the identification of active waste.

# Identification of Active Waste

- Procuring organizations maximize external rent and minimize the risk of detection
- They need to use non-transparent contract-allocation formats
- Prefer firms with non-transparent ownership structure – firms with anonymous owners
- Provide them with preferential prices of procurements
  
- This is not the only mechanism of rent-seeking

# Identification of Active Waste – Hypotheses

- Thresholds result in manipulations of the anticipated value and bunching of procurements below thresholds
- Changes in winners' characteristics in the proximity of procurement thresholds (anonymous owners)
- Anonymous suppliers should win tenders below thresholds with higher final prices of procurements.
- The extent of manipulation should differ in construction/ services/ goods

# Data

- Data on public procurement contracts from public registry includes characteristics of all procurements awarded in the Czech Republic from 2005 to 2010
- Over 46,000 procurement contracts, the total procurement value CZK 1,043 billion (approximately USD 52.2 billion)
- Characteristics of the procured goods/ services/ construction works, type of contract-awarding process, characteristics of procuring agencies, the anticipated value and the final contractual price of procurements
- Winning suppliers (ownership structure of winners, size - number of workers, capital structure)

# Empirical Strategy for Detecting Manipulation

- Based on the methodology of Chetty et al. (2011) – we focus on repeated cross-sectional density distributions of the anticipated value of procurements
- The identification assumption: density distributions of the anticipated value would be smooth if more restrictive tendering procedures were not prohibited above the thresholds

Our extension:

- relaxes the assumption of the smooth counterfactual density distribution by exploiting the timing of introducing new thresholds into the procurement system
- We assume that the density distribution after the reform would look the same as before the reform, if the reform had not established procurement thresholds

# Empirical Strategy for Detecting Manipulation

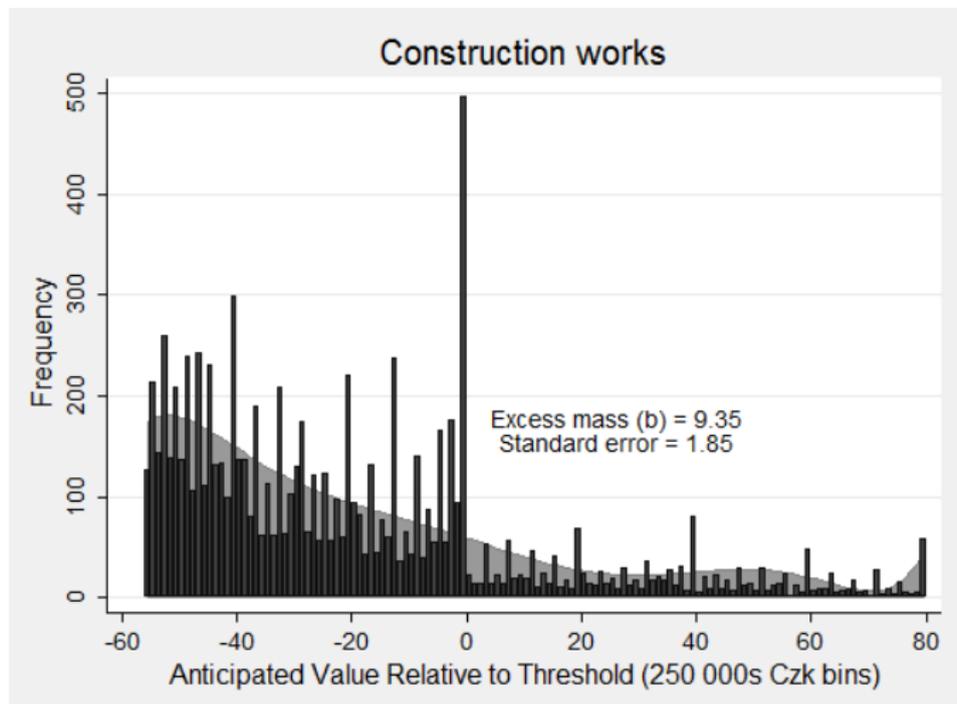
- In line with Chetty et al. (2011), we plot the histogram of the empirical cross-sectional density distribution of the anticipated value
- Fit polynomial to the histogram – exclude a narrow region below  $D$

$$C_j = \sum_{i=0}^q \beta_i \cdot (Z_j)^i + \sum_{i=-R}^0 \gamma_i \cdot 1 [Z_j = i] + \epsilon_j \quad (1)$$

where  $C_j$  is the number of contracts in histogram bins,  
 $Z_j$  is the anticipated value bin relative to  $D$ ,  
 $q$  is the order of the polynomial,  
 $R$  is the width of the excluded region below  $D$ .

- For identification, assume that density distribution would be smooth if restrictive tendering was not banned above  $D$

# Anticipated Value Density Distribution Around the Threshold after the Reform – Cross-sectional view



# Regression Results

**TABLE 1**

Estimated Excess Mass below the Threshold by Year and Main Object

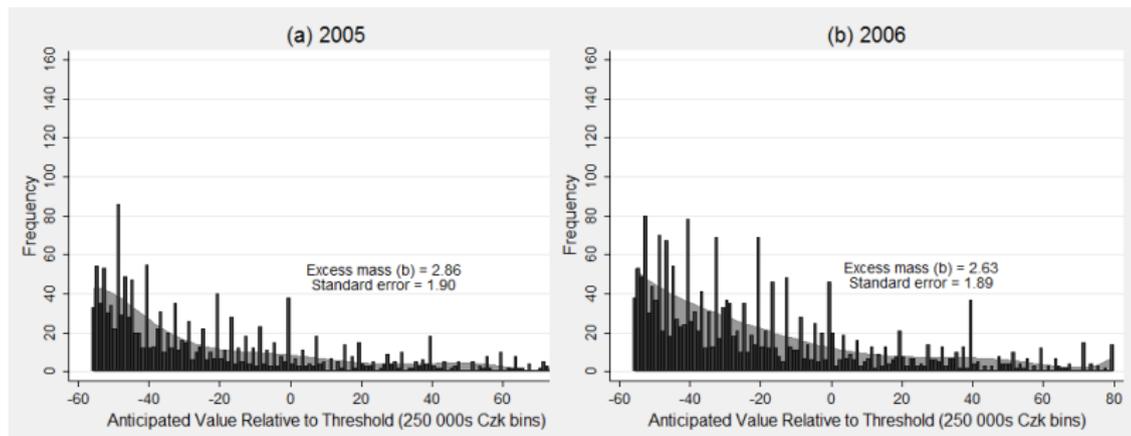
Year	Construction Works		Goods		Services	
	Excess Mass		Excess Mass		Excess Mass	
	Estimates	SE	Estimates	SE	Estimates	SE
2005	2.861	[1.902]	0.410	[0.552]	- 0.025	[0.577]
2006	2.628	[1.891]	1.635***	[0.257]	0.800***	[0.294]
2007	12.100***	[2.697]	1.389***	[0.427]	3.162***	[0.460]
2008	8.965***	[1.651]	1.799***	[0.494]	2.121***	[0.478]
2009	11.190***	[2.504]	1.901***	[0.522]	2.503***	[0.561]
2010	8.954***	[1.990]	2.362***	[0.360]	2.852***	[0.371]

Table 5 shows the estimates of excess masses of contracts bunched by their anticipated value below the thresholds for simplified negotiations, estimated using equation (1). Legislative reform that established new thresholds into the procurement legislation occurred in midyear 2006. A seventh-degree polynomial and CZK 750,000 excluded window located just below the threshold were used to predict the counterfactual density of the anticipated value of procurements. Estimates represent the estimated excess mass of contracts relative to the average density at thresholds. Standard errors are presented in brackets. \*\*\*Estimates significant at the 1% level.

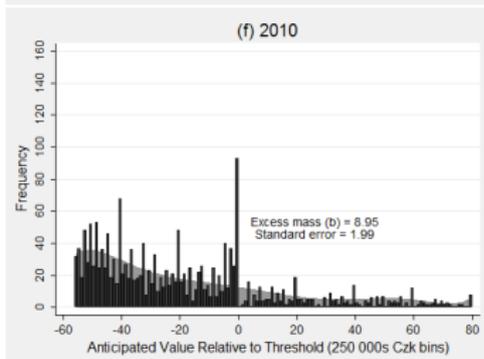
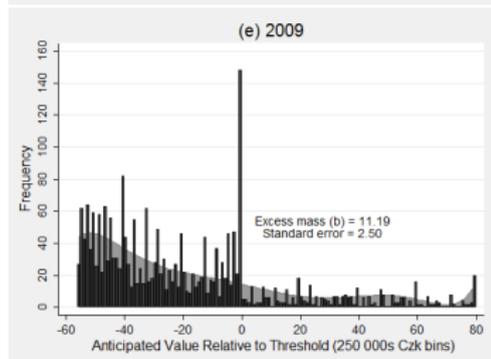
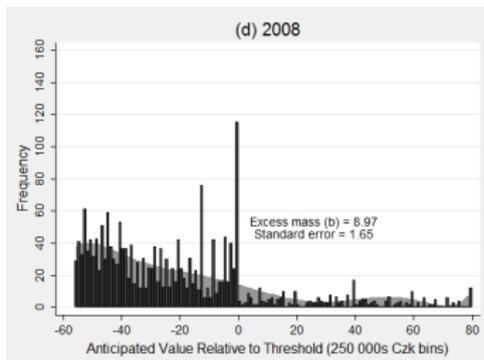
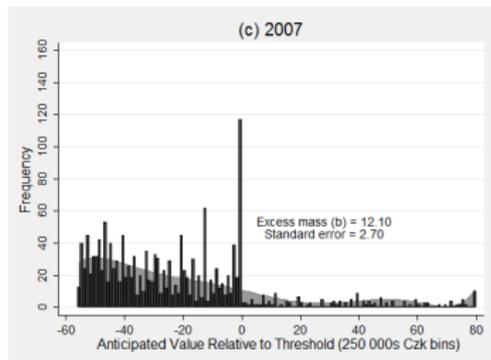
# Anticipated Value Density Distribution around the Threshold – Time variation

- Identification using the policy change

# Anticipated Value Density Distribution around the Threshold – Before Reform



# Anticipated Value Density Distribution around the Threshold – After Reform



# Before–after Regressions

Estimates of Excess Mass below the Threshold Using a Fixed-Effects Strategy

	<b>Construction</b>	<b>Goods</b>	<b>Services</b>
$\hat{\gamma}_{-1}$	0.942*** [0.038]	0.758*** [0.057]	1.037*** [0.064]
$\hat{\gamma}_{-2}$	1.478*** [0.038]	0.295*** [0.057]	0.006 [0.064]
$\hat{\gamma}_{-3}$	1.205*** [0.038]	0.571*** [0.057]	0.188*** [0.064]
Histogram Bin FE	YES	YES	YES
Year FE	YES	YES	YES
N	816	990	996

Table 6 reports the estimates of excess masses of contracts bunched by their anticipated value below thresholds estimated using equation (5) and Poisson conditional fixed-effects QML. The basic unit of observation in all the regressions is a histogram bin from empirical annual distributions of the anticipated value of contracts. The number of contracts awarded in each bin and year serves as the outcome variable that is regressed on the interaction between the indicator for bins located just below the thresholds ( $R=3$ ) and indicator for validity of the 2006 reform. All regressions include histogram bin fixed effects and annual fixed effects. Coefficient estimates are interpreted as  $(\exp(\hat{\gamma}_i)-1)*100$  percentage change. Robust standard errors, clustered at the histogram bin level, are presented in brackets, \*\*\*  $p<0.01$ , \*\*  $p<0.05$ , \*  $p<0.1$

# Manipulation Detection – Discussion

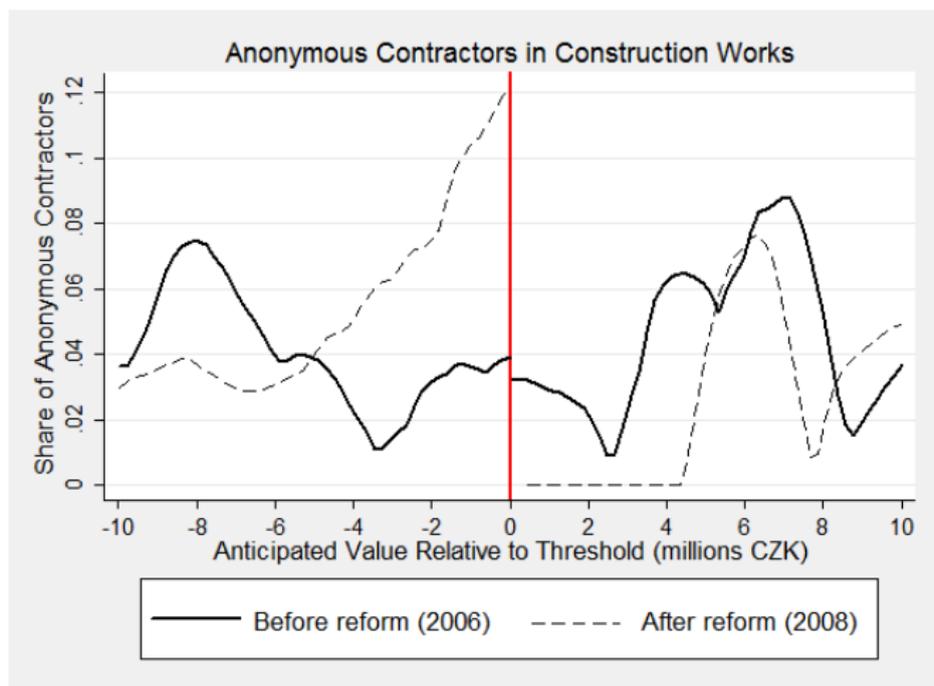
- All methods can reject the lack of bunching of procurements below thresholds
- Several robustness checks support the results
  - inflationary adjusted thresholds
  - placebo thresholds
  - alternative density test
- Size of manipulations: about 11 percents of relevant contracts are manipulated

Key question: What is the impact of manipulation?

## Rest of the Talk: Identification of Active Waste

- Thresholds lead to manipulations of the anticipated value and bunching of procurements below thresholds.
- Changes in winners characteristics in the proximity of procurement thresholds (anonymous owners)
- Anonymous suppliers should win tenders below thresholds with higher final prices of procurements.

# Share of Construction Contracts Awarded to Anonymous Firms, by Year



# The Impact of Manipulation on Choice of Suppliers

## The Impact of Manipulation on Contractor Choice

Outcome variable: Indicator that Contractor is Anonymously Owned

	<b>Construction works</b>		<b>Services</b>		<b>Goods</b>	
Contracts in Bins Just below D x 2006 Reform	.027** [.012]	.029** [.012]	.011* [.006]	.013* [.008]	-.006 [.015]	-.004 [.015]
Histogram Bin FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Procurement Procedure Dummies	NO	YES	NO	YES	NO	YES
Procurement Subject (CPV code) Dummies	NO	YES	NO	YES	NO	YES
R <sup>2</sup>	0.01	0.01	0.06	0.11	0.02	0.04
N	11,863	11,585	7,118	7,017	7,494	7,398

# What Do We Know About Anonymous Firms?

Contractor Characteristics, by Type of Ownership

	All companies	Traceable companies	Anonymous companies	Difference
Capital stock (mill. CZK) <sup>a</sup> (S.D.)	334	396	78.2	- 317.8**
Median year of incorporation <sup>b</sup>	1997	1996	1999	***
Number of employees <sup>c</sup>				
- 0 – 24 employees	28.77	25.04	44.04	+19.0***
- 25 – 99 employees	32.46	34.48	24.19	-10.3***
- 100 – 249 employees	17.36	18.96	10.83	-8.13***
- 250 – 999 employees	12.83	13.49	10.11	-3.38*
- 1000 and more	4.61	5.20	2.17	-3.04**
- not specified	3.97	2.82	8.66	+5.84***

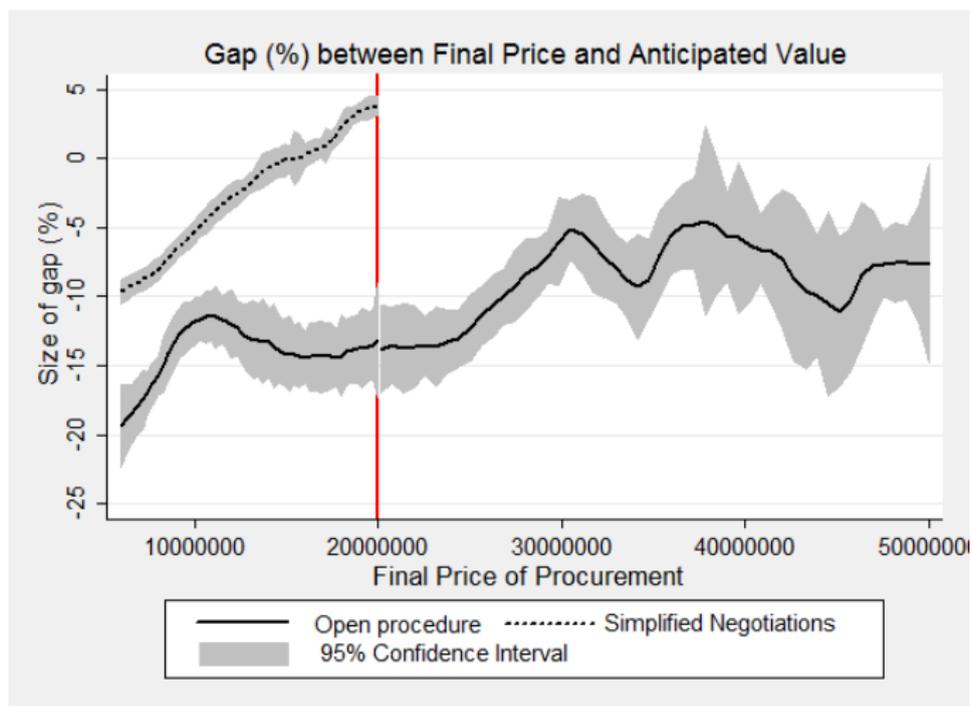
# Impact of Manipulation on the Selection of Suppliers

- Anonymous firms are three times more likely to be selected after the reform in construction
- In line with the active waste hypothesis and potential collusion of supplier and public procurement official
- Hard to explain by efficiency reasons – anonymous firms do not offer higher quality and are more likely empty shells
- No impact of manipulation on selection of suppliers of goods
  - The extent of manipulation is smaller
  - In line with our hypothesis that supplies of goods are much more easy to specify, control and measure

# Does Manipulation and Selection of Suboptimal Suppliers Lead to Higher Price?

- We observe higher prices due to manipulation – does not imply active waste
- How do prices interact with the selection of suppliers?

# Manipulation and the Final (Contractual) Price of Procurement



# Anonymous Firms and the Final Price

## The Impact of Manipulation on the Final Price of Procurement

Outcome variable: Difference Between the Final Price and Anticipated Value of Procurement (in % of Anticipated Value)

	Construction works		Services		Goods	
Contracts in Bins Just below D x Anonymous Firm	.082** [.034]	.089*** [.029]	.084*** [.026]	.063** [.029]	-.066 [.045]	-.051 [.053]
Anonymous Firm	-.016 [.018]	-.014 [.015]	-.000 [.026]	.019 [.024]	.045 [.035]	.033 [.041]
Histogram Bin FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Procurement Procedure Dummies	NO	YES	NO	YES	NO	YES
Procurement Subject (CPV code) Dummies	NO	YES	NO	YES	NO	YES
R <sup>2</sup>	0.01	0.06	0.04	0.05	0.01	0.01
N	8,241	7,976	6,069	5,971	6,051	5,958

## Anonymous Firms and Final Price – Discussion

- Estimated higher price by 9 percentage points for construction, 6.5 for services, no significant results for goods
- In line with previous findings about manipulation and negative selection of suppliers
- We compare prices between just below the threshold for traceable versus anonymous firms
- Assumptions
  - Contracts for traceable have correct prices – no rent seeking
  - Unlikely – other types of corruption can be present – off shoring, costs overrun, etc.
- Our estimates of price are most likely **downward biased**

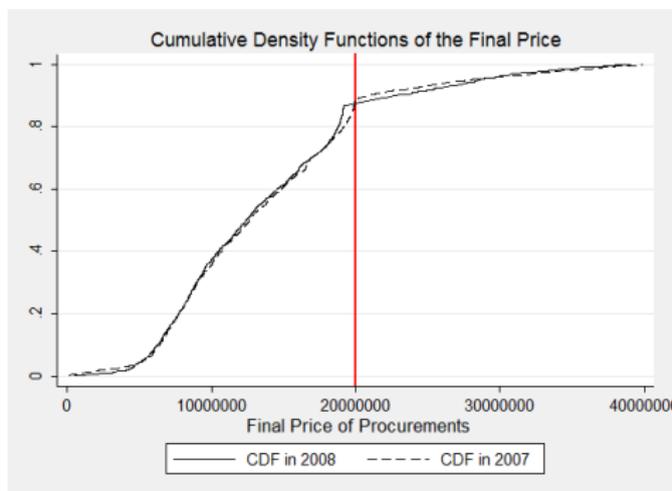
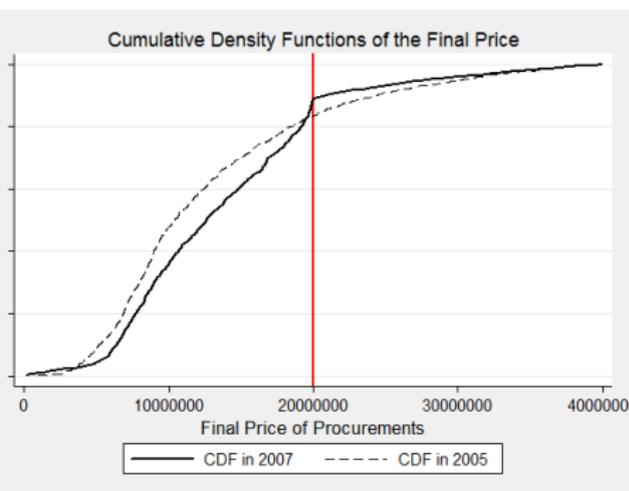
# The Impact of Manipulation

- Negative selection of winning firms (more anonymous owners), often related to corruption scandals
- Anonymous firms obtain higher final price of procurements compared to firms with traceable owners

## Alternative Scenarios – Discussion

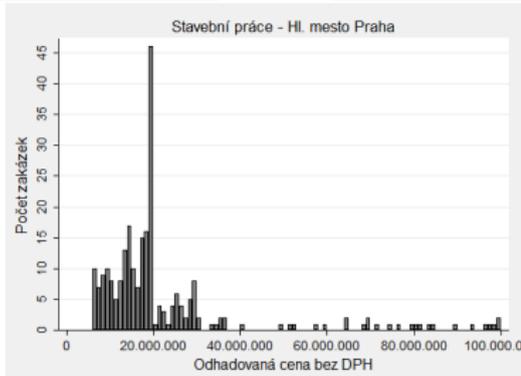
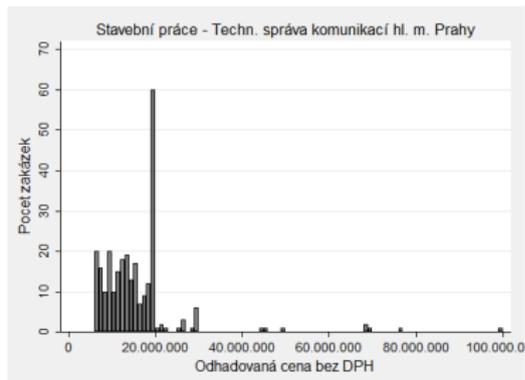
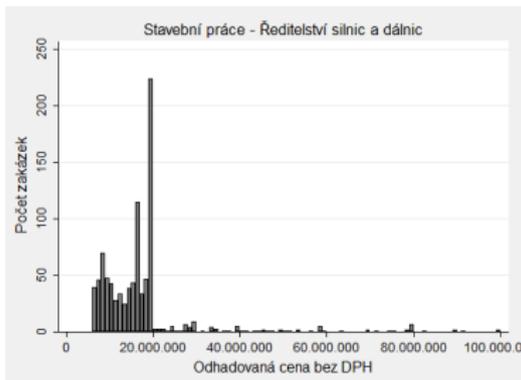
- Anonymous firms win inherently different type of procurements with different content
  - control for CPV code – specify approximate content of procurement
- Anonymous firms are "good" – deliver higher quality in procurement
  - connected to many scandals
  - smaller, shorter history, smaller capital stock
- Findings are unintentional result of other goals (passive waste)
  - How? Officials have full control over observable characteristics when they invite suppliers
- Anticipated value might be undercut – results in smaller observed difference in the final price
  - Where do the manipulated procurements originate?

# How did Manipulation Affect the Aggregate Distribution of the Final Price of Procurement?



- Many contracts originate from the bottom of the distribution of procurements

# Who is manipulating?



# Concluding Remarks and Policy Implications

- We provide methodology for detecting manipulation of public procurement and evidence showing the negative impact of manipulation on contractor selection and final price
- Manipulation led to increase in the allocation of contracts to firms with concealed owners by 8 percentage points and increase in the final price of procurements by 8 percentage points
- Policy implications: we should worry about giving too much discretion to public officials especially when stakes are high
- Open competition leads to more optimal allocation of contracts
- Legislation should not introduce thresholds with substantial differences in the rules above and below

Thank you for your attention

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