

# Intensity of Competition, Corruption Risk and Estimated Direct Social Loss in Public Procurement of Zagreb - 2011-2016

## *Research & Analytical Toolkit*

Tóth, István János & Hajdu, Miklós

October 10th 2017  
CMS-CRCB meeting  
Zagreb

# CRCB

- Non-profit, non-partisan organisation
- From 2013
- recent topics:
  - Measuring corruption risk
  - Analysing corrupt system and kleptocratic state in Hungary with hard data
  - Measuring the quality of legislation with hard data
  - Corruption risks, price distortion & competition at EU level

# MOTIVATIONS

# Public Procurement

- 10-25% of GDP in EU countries [OECD]
- Rising the intensity of competition = a tool to save taxpayers' money
- Public procurement is one of the most important field of *grand corruption*
- Big data & statistical analysis = a tool to detect corrupt activities

# Public Procurement

- Analysis at local level (City of Zagreb & Zagreb Holding)
- Intensity of competition & corruption risk
- Tendencies
- Estimation of direct social loss

# Corruption and lack of Competition

- A lot of suspicious cases
- Only anecdotic evidences / lack of hard data
- The amount of direct social loss is very high

# Bad Examples: Nice Hungarian Cases

# Viewpont: cca. 130,000 euros





# Disabled Acces Lift for only one step: 5,200 euros



2018.02.23.

## "White elephants" : losing EU's taxpayer money (Bicycle Cross Track in Hatvan, closed):



# Our aims

# research & analytical tool

- Analysis of 5,922 contracts of 4,483 public procurement issued by Grad Zagreb and Zagreb Holding
- Period of time: 2011-2016
- 1,197 winner companies

# research & analytical tool

## Database processing tool for Croatian Public Procurement (DCPP)

- Analytical tool to analyse the Croatian Public Procurement
- On-line platform
- PP data and firm level balance sheet and ownership data
- Real time analysis

# Database processing tool for the Croatian Public Procurement (DCPP)

**PUBLIC TENDERS: EDIT CASES**

Issuer: Grad Zagreb

ADD NEW CONTENT

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<b>IZGRADNJA ELEKTROENERGETSKE MREŽE NA IV. ETAPI RADNIČKE CESTE – OD ŽELJEZNIČKE PRUGE DO DOMOVINSKOG MOSTA</b> <i>HEP - operator distribucijskog sustava d.o.o., D.P. Elektra Zagreb - 15.09.2017</i>	
<b>IZRADA IDEJNOG, GLAVNOG I IZVEDBENOG PROJEKTA IZGRADNJE JAVNE ODVODNJE U DIJELU NASELJA JARUN</b> <i>AQUA.OMEGAd.o.o.; TIBORA-EKO d.o.o. - 15.09.2017</i>	
<b>SANACIJA KUHINJE U DJEČJEM VRTIĆU PREČKO</b> <i>TIM-COLOR D.O.O. - 18.09.2017</i>	
<b>IZRADA GLAVNIH I IZVEDBENIH PROJEKATA NOVE ŽIČARE SLJEME SA PRIPADAJUĆOM INFRASTRUKTUROM I GEOMEHANIČKIM ISTRAŽNIM RADOVIMA</b> <i>ELEKTROPROJEKT d.d. - 20.09.2017</i>	
<b>SANACIJA KROVA U DJEČJEM VRTIĆU IVANE BRLIĆ MAŽURANIĆ</b> <i>O.K.I.mont d.o.o. - 26.09.2017</i>	
<b>BOJE I LAKOVI</b> <i>CHROMOS-SVJETLOST d.o.o. - 26.09.2017</i>	

2018.02.23.

# CONCEPTS



# Corruption... as... a black hole

**Without measurement, it is not worth talking about**

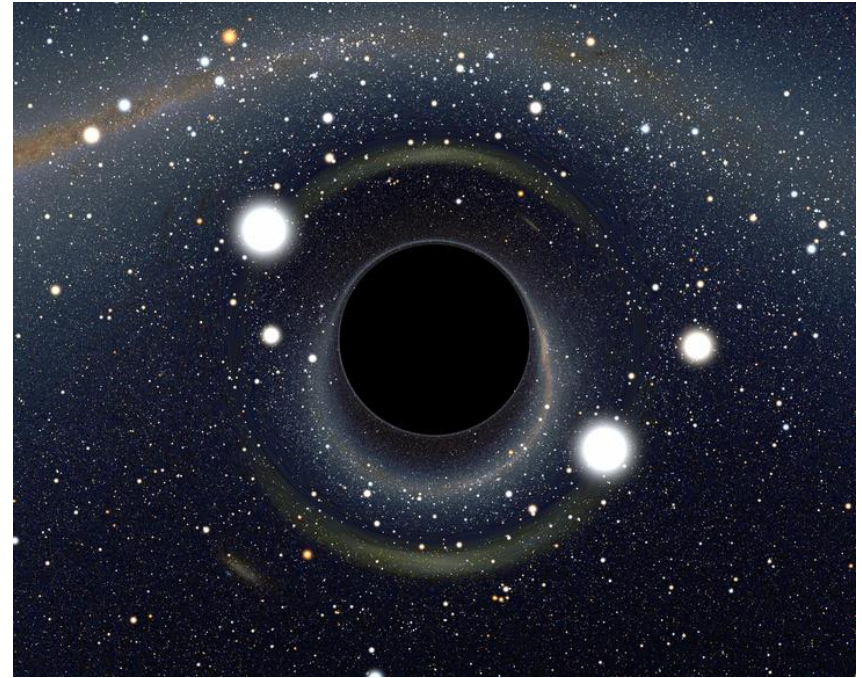
Black hole: not visible but measurable

- weight
- radius
- temperature
- distance

*We are in the same way with corruption*

Corruption could be analogous to the black hole

- Not observable, but
- We can estimate its prevalence
- Where does it happen?
- How much social loss does corruption generate?





# Competition & Corruption

Operationalized concept:

intensity of competition

## Competition & Corruption

**Corruption risk:** => favourable conditions for corrupt activities  
=> outcomes of the corrupt acts  
(=> price distortion / overpricing)

Operationalized concepts:

corruption risk

contract price distortion

## Operationalized concepts

### Competition / intensity of competition

=> number of bids

=> relative price drop (estimated value vs. contract price)

### Corruption

corruption risk => single bid

price distortion => rounded data, Benford's law

### Estimated Direct Social Loss

direct social loss due to low intensity of competition and high corruption risk

# Indicators: Intensity of Competition

ICI: logarithmic function of number of bids

<b>ICI =</b>	if $b = 2$	$ICI = \lg 2$
	if $b = 3$ or $b = 4$	$ICI = \lg[(3+4)/2]$
	if $b = 5$ or $b = 6$	$ICI = \lg[(5+6)/2]$
	if $b = 7$ or $b = 8$	$ICI = \lg[(7+8)/2]$
	if $b > 8$	$ICI = 1$
	if $b = 1$	$ICI = 99$ , missing value

# Indicators: Intensity of Competition

Relative price drop (RPRD):

$$RPRD_i = \frac{(P_i^* - P_i)}{P_i} * 100$$

$P_i^*$  : *estimated value in tender i*

$P_i$  : *contract price in tender i*

# Indicators: Corruption Risk

Single bid (SB) [0,1];

0: tender with competition

1: tender without competition,  
with single bid

## Indicators:

### The Ratio of Estimated Direct Social Loss (EDSLR)

$$RPRD_i = \frac{(P_i^* - P_i)}{P_i} * 100$$

$$EDSLR_i = RPRD_{ideal} - RPRD_{observed}$$

$$EDSLR_i = RPRD_{ideal} - RPRD_i \quad \text{for every } i \text{ tenders}$$

$RPRD_{ideal}$ : reference/benchmark value in case of tenders with low corruption risk and high intensity of competition

# Price distortion: The Benford's Law



# Price distortion / overpricing

fraud analytics, auditing, forensic accounting:

- First digit test (Benford's law)
- First two digit test (Benford's law)
- Last two digit test (rounding data test)
- Recurring data test
- Summation test

# Benford's Law

A set of numbers is said to satisfy Benford's law if the leading digit  $d$  ( $d \in \{1, \dots, 9\}$ ) occurs with probability:

$$P(d) = \log_{10}(d+1) - \log_{10}(d) = \log_{10} \left( \frac{d+1}{d} \right) = \log_{10} \left( 1 + \frac{1}{d} \right).$$

# Benford's Law

digits	$\log(d)$	$\log(d+1)$	$P(d) = \log(d+1) - \log(d)$	cum $[P(d)]$
1	0.000	0.301	0.301	0.301
2	0.301	0.477	0.176	0.477
3	0.477	0.602	0.125	0.602
4	0.602	0.699	0.097	0.699
5	0.699	0.778	0.079	0.778
6	0.778	0.845	0.067	0.845
7	0.845	0.903	0.058	0.903
8	0.903	0.954	0.051	0.954
9	0.954	1.000	0.046	1.000

# Price distortion by First Digit Test (Benford's Law)

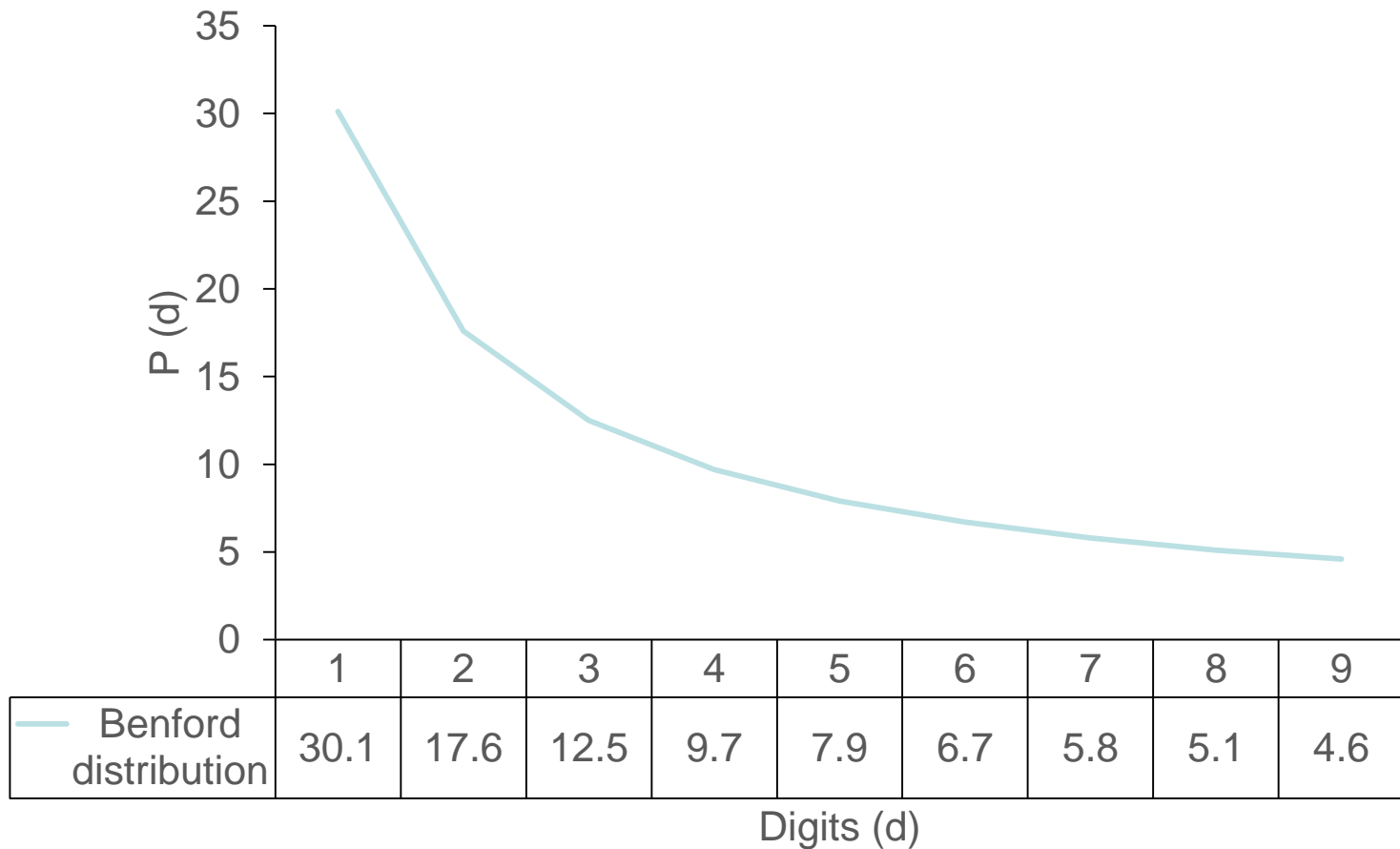
Measurement of the weight of price distortion by Mean Squared Error (MSE):

$$MSE = \frac{1}{n} \sum_{i=1}^n (\hat{Y}_i - Y)^2$$

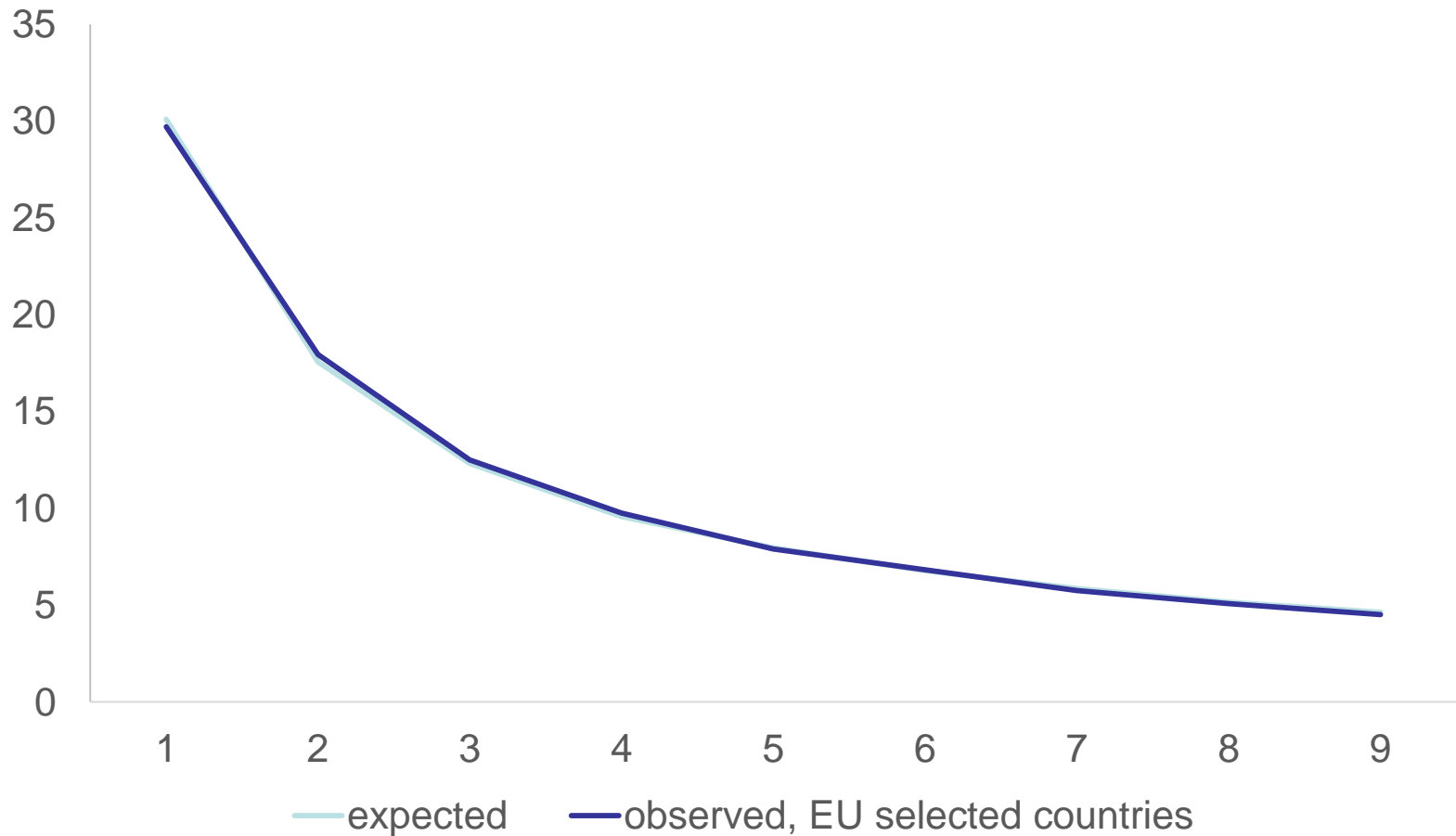
*where  $\hat{Y}$  is the predicted value and  $Y$  is the observed value in percentages.*

# Benford's Law

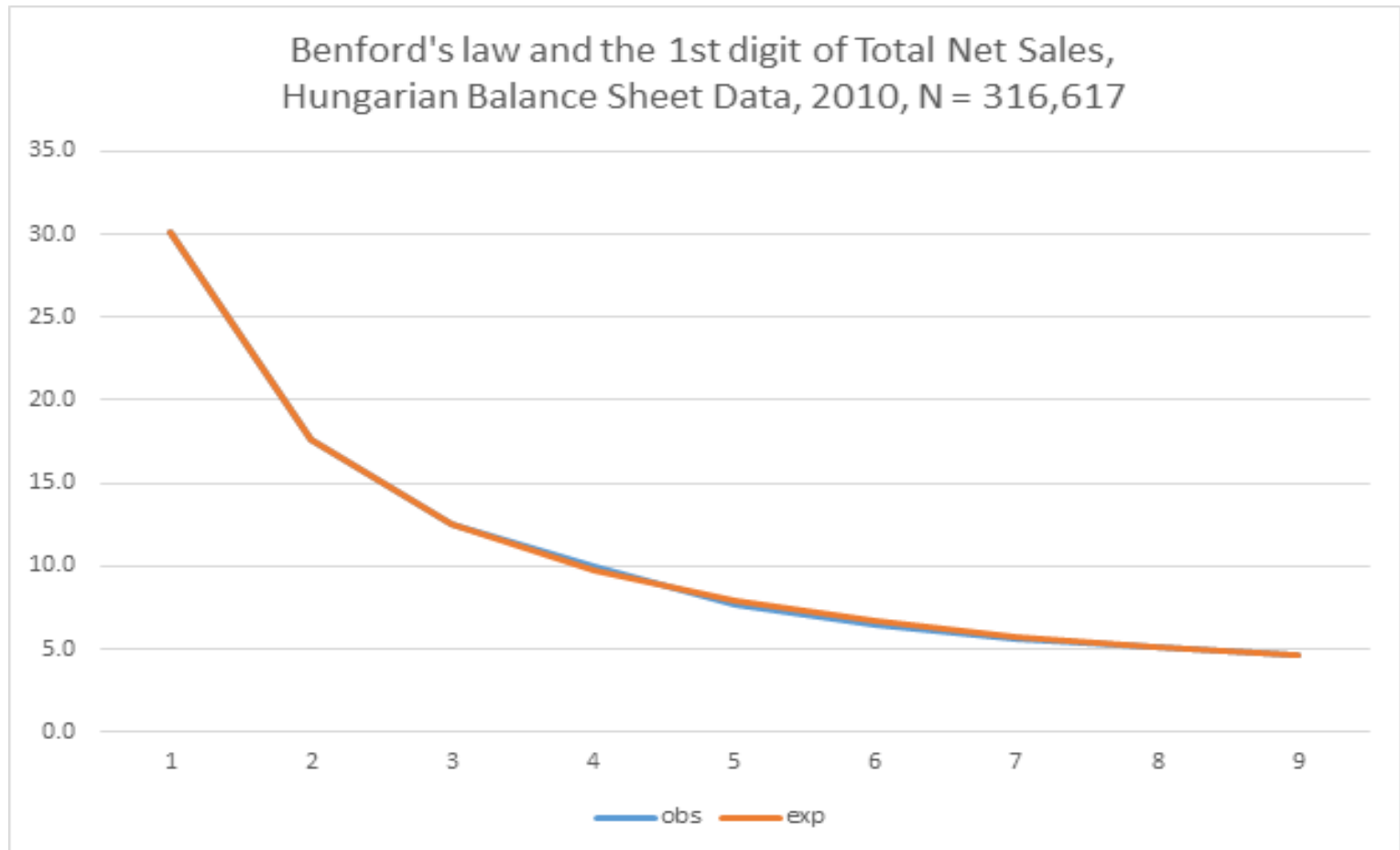
The distribution of first digits, according to Benford's law



# Expected and observed distribution by 1st digits, %: Contract Price of Public Tenders in selected EU Countries, 2006-15, N = 2,164,493



# Expected and observed distribution by 1st digits: Total Net Sales of the Hungarian companies, 2010, N = 316,617



# Benford's law: applications

- Analysis of predictive models in economics [Hal Varian, 1972]
- Fraud detection in sociological research [Dieckman, 2007]
- Administrative surveys, census, USA [Nigrini, 2015]
- Fraud detection at clinical research, USA [Lee et al., 2015]
- Analysis of fraud at elections, Iran [Roukema, 2015]
- Detection of tax evasion, USA [Nigrini, 1992]
- Detection of fraud, embezzlement at company level, USA [Nigrini, 2012]
- Detection of price distortion and corruption at public tenders [CRCB, 2016]



# Indicators: Price Distortion

1. First Digit Test (FDT)
2. Rounded (by 1,000 Kunas) data test

# Intensity of Competition, Corruption Risks & Price Distortion

	intensity of competition	corruption risks	price distortion
intensity of competition	-	Negative	Negative
corruption risks		-	Positive
price distortion			-

# DATABASE BUILDING

# Data source: html or pdf

**Elektronički oglasnik javne nabave RH**

**Tražilica** **Objavljeni dokumenti**

Naručitelj:

Broj objave:

CPV:

Vrsta ugovora:

Datum objave:  -

Naručitelj	Broj objave	Predmet nabave / grupe	CPV	Vrsta ugovora	Datum objave
Grad Zagreb	N-17-M-102688-270112	Građenje javne rasvjete u Ulici Mate Lovraka 13-35	45316000-5	Izvođenje radova	31.01.2012.
Grad Zagreb	N-02-V-102625-270112	Rekonstrukcija Ulice Mije Haleuša - I. faza i Ulice Resnik I - radovi na rekonstrukciji cestovne prometnice s oborinskom odvodnjom	45000000-7	Izvođenje radova	30.01.2012.
Grad Zagreb	N-17-M-102678-270112	Bethovenova ulica - izgradnja rampe za osobe sa invaliditetom	45000000-7	Izvođenje radova	30.01.2012.
Grad Zagreb	N-03-V-102675-270112	Građenje javne rasvjete u Bosanskoj ulici	45316000-5	Izvođenje radova	30.01.2012.
Grad Zagreb	N-03-V-102598-270112	Građenje javne rasvjete prometnica na području gradskih četvrti Sesvete, Peščenica - Žitnjak i Donja Dubrava	45316000-5	Izvođenje radova	30.01.2012.
Grad Zagreb	N-17-M-102629-270112	Dogradnja kanalske mreže u ulici Sjeverna sjeverni odvojak	45231000-5	Izvođenje radova	30.01.2012.
Grad Zagreb	N-02-V-102645-270112	Rekonstrukcija Ulice Mije Haleuša - I. etapa i Ulice Resnik I - radovi na izgradnji kanalizacije	45000000-7	Izvođenje radova	30.01.2012.
Grad Zagreb	N-02-V-102643-270112	Izgradnja spojne ulice između Ulice Zinke Kunec i Ulice Prilavje s komunalnom infrastrukturom	45000000-7	Izvođenje radova	30.01.2012.
Grad Zagreb	N-17-M-102666-270112	Restauracija namještaja, Palača Dverce	45454100-5	Izvođenje radova	30.01.2012.
Grad Zagreb	N-17-M-102360-250112	Rekonstrukcija vodoopskrbnog sjevodova u Okučanskoj ulici od Ojačke do Vukovarske	45231000-5	Izvođenje radova	28.01.2012.

Ukupni broj zapisa koji zadovoljavaju parametre pretrage: 58.

# From this...



Obavijest o sklopljenim ugovorima

## Odjeljak I: Javni naručitelj

### I.1) Naziv, adrese i kontakt(i)

Službeni naziv: Grad Zagreb		OIB: 61817894937
Poštanska adresa: Avenija Dubrovnik 15		
Mjesto: Zagreb	Poštanski broj: 10020	Država: Hrvatska
Služba(e) za kontakt: GRAD ZAGREB-URED ZA JAVNU NABAVU Na pažnju (osoba za kontakt): javna.nabava@zagreb.hr		Telefon: <input type="text"/>
E-pošta: <input type="text"/>		Telefaks: <input type="text"/>
Internetska adresa(e): (ako je primjenjivo) <a href="http://www.zagreb.hr">www.zagreb.hr</a> Glavna adresa javnog naručitelja: (URL) <input type="text"/> Adresa profila naručitelja (kupca): (URL) <input type="text"/> Elektronički pristup podacima: (URL) <a href="https://eojn.nn.hr/SPIN/application/ipn/DocumentManagement/DokumentPodaciFrm.aspx?OznakaDokumenta=2017/S 003-0001549">https://eojn.nn.hr/SPIN/application/ipn/DocumentManagement/DokumentPodaciFrm.aspx?OznakaDokumenta=2017/S 003-0001549</a> Elektronička dostava ponuda i zahtjeva za sudjelovanje: (URL) <a href="https://eojn.nn.hr/Oglasnik">https://eojn.nn.hr/Oglasnik</a>		

### I.2) Vrsta javnog naručitelja

<input type="checkbox"/> Ministarstva i druga državna tijela uključujući i njihove regionalne ili lokalne urede ili jedinice	<input type="checkbox"/> Pravne osobe koje su osnovane za određene svrhe radi zadovoljavanja potreba u općem interesu
<input type="checkbox"/> Državne agencije/uređi	<input type="checkbox"/> Europska institucija/agencija ili međunarodna organizacija
<input checked="" type="checkbox"/> Jedinice lokalne i područne (regionalne) samouprave	<input type="checkbox"/> Ostalo:
<input type="checkbox"/> Lokalne i regionalne agencije/uređi	<input type="text"/>

...to this...

Munkafüzet1										
Képletek Adatok Véleményezés Nézet Fejlesztőeszközök										
Keresés a lapon										
Megosztás										
A1	id									
	A	B	C	D	E	F	G	H	I	
1	id	sid	issuer	doc_id	oib	dscrptn	c_type1	c_type2	nuts_code	c_descr
2	1	1	1		61817894937	Radovi na postavljanju rasvjete na igralište V.Vidriča 7 s postojećom umjetnom travom, MO Gajišća	1	Izvođenje javnih radova	HR	Radovi na postavljanju rasvjete na igralište V.
3	2	1	1		61817894937	DV ZAPRUDE, PO SREDIŠĆE, nabava namještaja i opreme za nove skupine	2	Kupnja	HR	Dječji vrtić Zapruđe, PO Središće, nabava nam
4	3	1	1		61817894937	IZRADA IDEJNOG PROJEKTA ZA ISHOĐENJE LOKACIJSKE DOZVOLE ZA PRODUŽENU BAŠTIJANOVU UI	3		HR	Izrada idejnog projekta za ishođenje lokacijske
5	4	1	1		61817894937	Izrada idejnog projekta za ishođenje lokacijske dozvole za izgradnju Čakovečke ulice s komunalnom	3		HR	Izrada idejnog projekta za ishođenje lokacijske
6	5	1	1		61817894937	ŠKOLA ZA KLASIČNI BALET – IZRADA PROJEKTNE DOKUMENTACIJE ZA SANACIJU OBJEKTA S ISHOĐE	3		HR	ŠKOLA ZA KLASIČNI BALET, izrada projektne d
7	6	1	1		61817894937	Brezovica, Novi Zagreb-zapad, Novi Zagreb-istok, Trnje i Trešnjevka jug	3		HR	stručni nadzor nad uređenjem više prometnic
8	7	1	1		61817894937	OŠ SESVETE, sanacija vanjske stolarije	1	Izvođenje javnih radova	HR	OŠ SESVETE, sanacija vanjske stolarije
9	8	1	1		61817894937	OŠ IVANA CANKARA, sanacija športske dvorane i pratećeg prostora	1	Izvođenje javnih radova	HR	OŠ IVANA CANKARA, sanacija športske dvoran
10	9	1	1		61817894937	OSNOVNA ŠKOLA PAVLEKA MIŠKINE, Sv. Duh 24, Zagreb - izvođenje radova sanacije pročelja škole i	1	Izvođenje javnih radova	HR	Osnovna škola Pavleka Miškine, Sveti Duh 24
11	10	1	1		61817894937	Izrada idjenih projekata za ishođenje lokacijskih dozvola za izgradnju autobusnog stajališta u Ulici V	3		HR	Izrada idjenih projekata za ishođenje lokacijskih
12	11	1	1		61817894937	OŠ LJUBLJANICA, izmjena vanjske stolarije	1	Izvođenje javnih radova	HR	OŠ LJUBLJANICA, izmjena vanjske stolarije
13	12	1	1		61817894937	OŠ A.G. MATOŠA, ZAMJENA STOLARIJE BRAVARIJOM	1	Izvođenje javnih radova	HR	OŠ A.G. MATOŠA, zamjena stolarije bravarij
14	13	1	1		61817894937	Kralj Zvonimir, Pavao Šubić, Petar Krešimir IV, Kralj Petar Svačić, Marin Držić, Sigedica, Mala Mlaka,	2	Kupnja	HR	Nabava namještaja za potrebe Mjesnih odbor
15	14	1	1		61817894937	DV KOLIBRI, sanacija kuhinje i praonice rublja	1	Izvođenje javnih radova	HR	DV KOLIBRI, SANACIJA KUHINGE I PRAONICE RI
16	15	1	1		61817894937	OŠ RUDEŠ, zamjena stolarije (bravarski radovi)	1	Izvođenje javnih radova	HR	OŠ RUDEŠ, zamjena stolarije (bravarski radovi)
17	16	1	1		61817894937	Usluge stručnog nadzora nad radovima uređenja zelenih i drugih javnih površina iz Planova malih k	3		HR	Nabava usluga obavljanja stručnog nadzora n
18	17	1	1		61817894937	Održavanje EMC CLARIION DL 4200	3		HR	Održavanje EMC CLARIION DL 4200.
19	18	1	1		61817894937	DV SUNCANA, izmjena vanjske stolarije na Trgu I. Kukuljevićeva 4	1	Izvođenje javnih radova	HR	DV SUNCANA, izmjena vanjske stolarije na Trg
20	19	1	1		61817894937	PIRODOSLOVNA ŠKOLA VLADIMIRA PRELOGA, sanacija prozora	1	Izvođenje javnih radova	HR	PIRODOSLOVNA ŠKOLA VLADIMIRA PRELOGA
21	20	1	1		61817894937	Izrada prijedloga nacrtu pravilnika o regulaciji biciklističkog prometa i smjernica za projektiranje bic	3		HR	Izrada prijedloga nacrtu pravilnika o regulaciji
22	21	1	1		61817894937	OŠ ANTUNA MIHANOVIĆA, SANACIJA PROČELNIH STIJENA	1	Izvođenje javnih radova	HR	OŠ ANTUNA MIHANOVIĆA, sanacija pročelnih
23	22	1	1		61817894937	Uređenje parkirališta na križanju Kaljske i Rešetarove ulice, iz Plana malih komunalnih akcija Grads	1	Izvođenje javnih radova	HR	Uređenje parkirališta na križanju Kaljske i Reš
24	23	1	1		61817894937	OŠ VOLTINO, hitna sanacija kosog krova	1	Izvođenje javnih radova	HR	OŠ VOLTINO, HITNA SANACIJA KOSOG KROVA
25	24	1	1		61817894937	Izgradnja športsko rekreacijskog centra (višenamjenska dvorana) Siget, iz Plana malih komunalnih z	1	Izvođenje javnih radova	HR	Izgradnja športsko rekreacijskog centra (višen
26	25	1	1		61817894937	Izrada projektno-tehničke dokumentacije za uređenje ulice Štrpet u Brezovici	3		HR	Izrada projektno-tehničke dokumentacije za u
27	26	1	1		61817894937	IZRADA ELABORATA OZNAČAVANJA PODRUČJA GRADA ZAGREBA NA PRILAZNIM CESTAMA	3		HR	Izrada elaborata označavanja područja Grada
28	27	1	1		61817894937	DV MEDO BRUNDO, sanacija zidova i stropova u PO	1	Izvođenje javnih radova	HR	DV MEDO BRUNDO, sanacija zidova i stropova
29	28	1	1		61817894937	DV POTOČNICA, SANACIJA KROVA I PUKOTINA	1	Izvođenje javnih radova	HR	DV POTOČNICA, SANACIJA KROVA I PUKOTINA
30	29	1	1		61817894937	OŠ DR. VINKA ŽGANCA, sanacija prozora (bravarski radovi)	1	Izvođenje javnih radova	HR	OŠ DR.VINKA ŽGANCA, sanacija prozora (bravi
31	30	1	1		61817894937	Izrada projektne dokumentacije za sanaciju krova Društvenog doma Prečko, Prečko 2a iz Plana mal	3		HR	Izrada projektne dokumentacije za sanaciju kr
32	31	1	1		61817894937	OŠ JURE KAŠTELANA, sanacija športske dvorane	1	Izvođenje javnih radova	HR	OŠ JURE KAŠTELANA, sanacija športske dvor
33	32	1	1		61817894937	OŠ ČUČERJE, izmjena parketa u dvorani TZK	1	Izvođenje javnih radova	HR	OSNOVNA ŠKOLA ČUČERJE, IZMJENA PARKETA
34	33	1	1		61817894937	IZRADA PROJEKTNE DOKUMENTACIJE DOPUNE SEMAFORIZACIJE RASKRIŽJA IVANA MAŽURANIĆA –	3		HR	izrada projektne dokumentacije dopune sema
35	34	1	1		61817894937	XII. GIMNAZIJA, sanacija ravnog krova	1	Izvođenje javnih radova	HR	XII. GIMNAZIJA , sanacija ravnog krova.
36	35	1	1		61817894937	DV TRNSKO, SANACIJA VANJSKE STOLARIJE	1	Izvođenje javnih radova	HR	DV TRNSKO, sanacija vanjske stolarije
37	36	1	1		61817894937	ŠKOLA ZA CESTOVNI PROMET, izvedba sustava tehničke zaštite	1	Izvođenje javnih radova	HR	Nabava radova postavljanja umjetne trave n
38	37	1	1		61817894937	Zaštita objekata dječjih vrtića Grada Zagreba putem centralnog dojavnog sustava	3		HR	Zaštita objekata dječjih vrtića Grada Zagreba
39	38	1	1		61817894937	GIMNAZIJA LUCIJANA VRANJANINA, SANACIJA PROZORA	1	Izvođenje javnih radova	HR	GIMNAZIJA LUCIJANA VRANJANINA, SANACIJA



# Database by 7 steps

1. Selection of issuers
2. Manual downloading html files
3. Uploading files to DCPP (Database processing tool for the Croatian Public Procurement)

# Database by 7 steps

4. Data downloading manually from Bisnode database

5. Uploading firm level data to DCPD



# Database by 7 steps

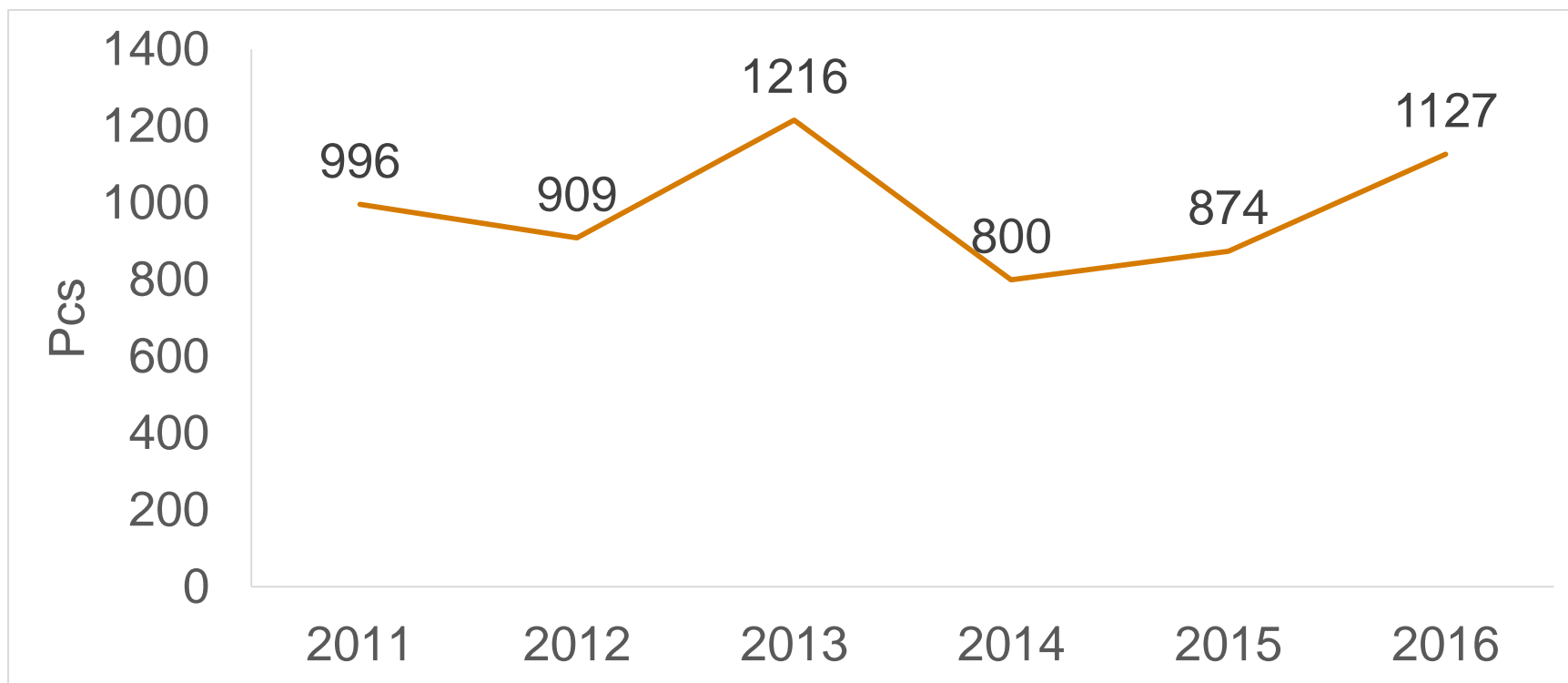
6. Programmed database processing by DCPD

7. Downloading database from DCPD

# ANALYSED DATA: A GENERAL VIEW

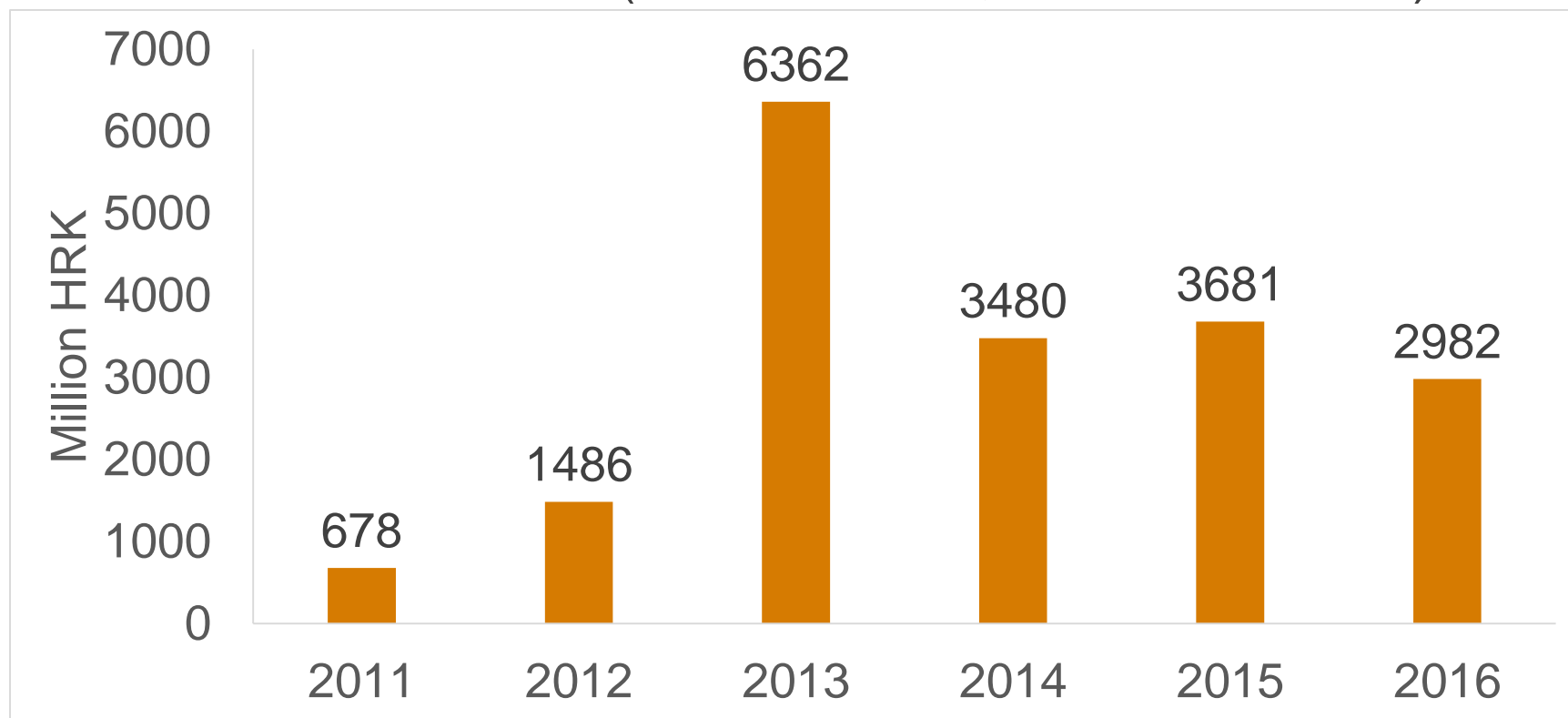
# General tendencies: 2011-16

The total number of contracts was moving between 800 and 1216 per year between 2011 and 2016



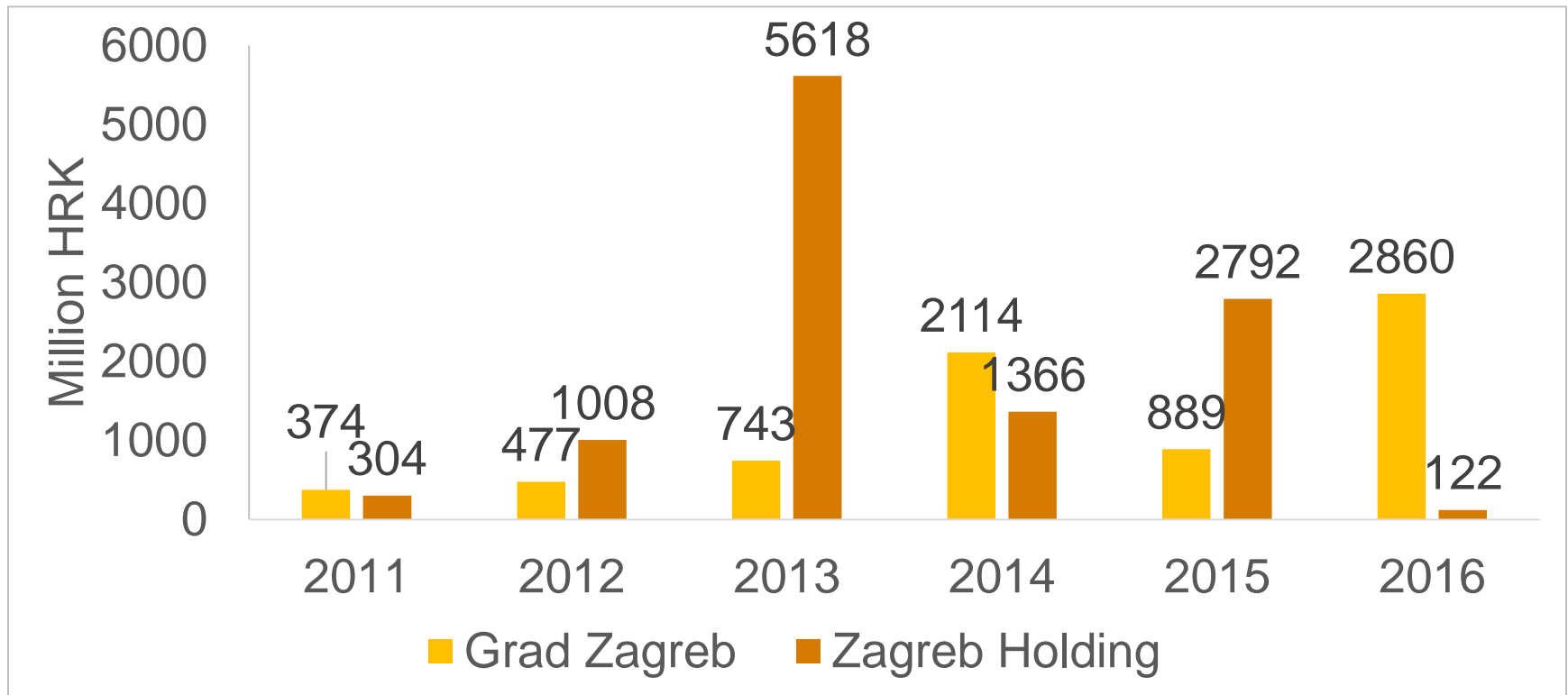
# General tendencies: 2011-16

The total sum of net contract values suddenly increased between 2011 and 2013 (from 678 to 6,362 million HRK)



# General tendencies: 2011-16

The sum of the contract values of Zagreb Holding was much higher than the sum for the contracts of Grad Zagreb in 2013

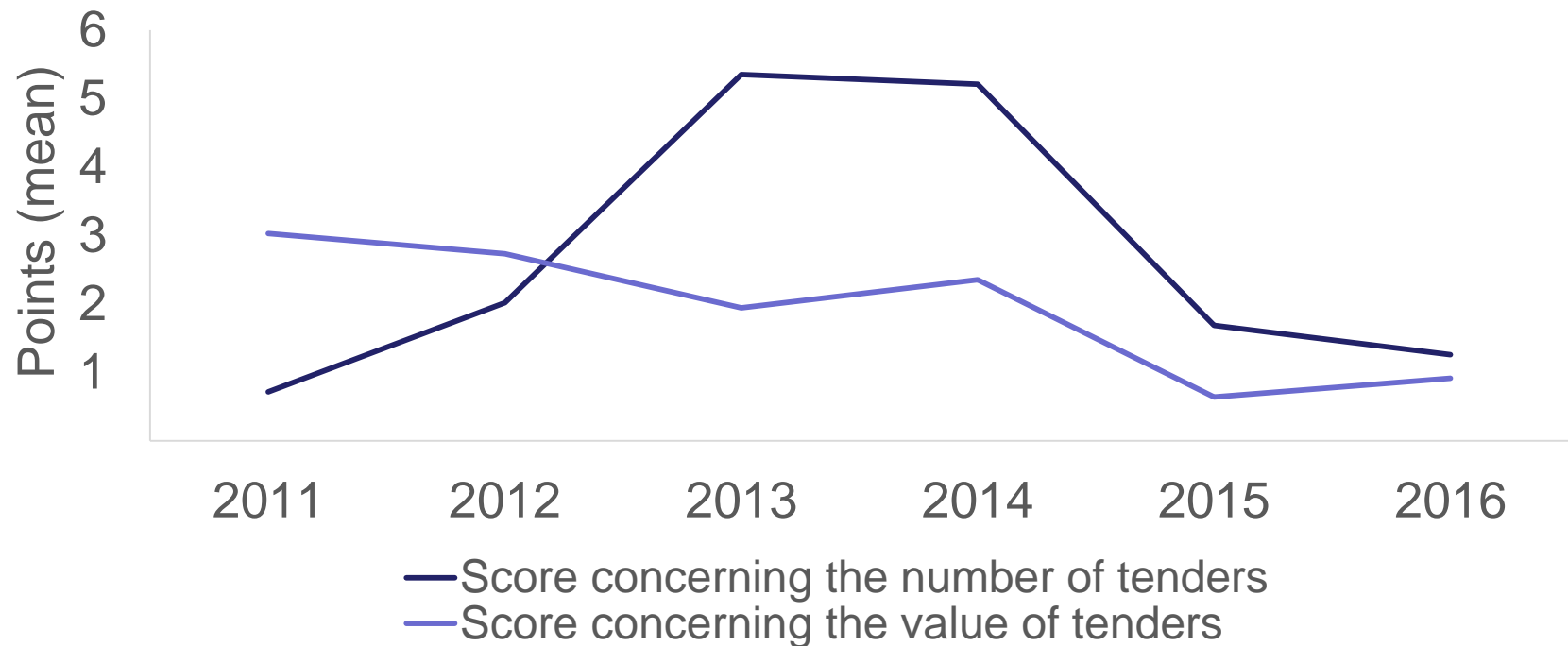


# MAIN RESULTS

# Analysis of the winner companies

1. The winners of the public procurement had become less diverse between 2011 and 2013 based on the number of tenders

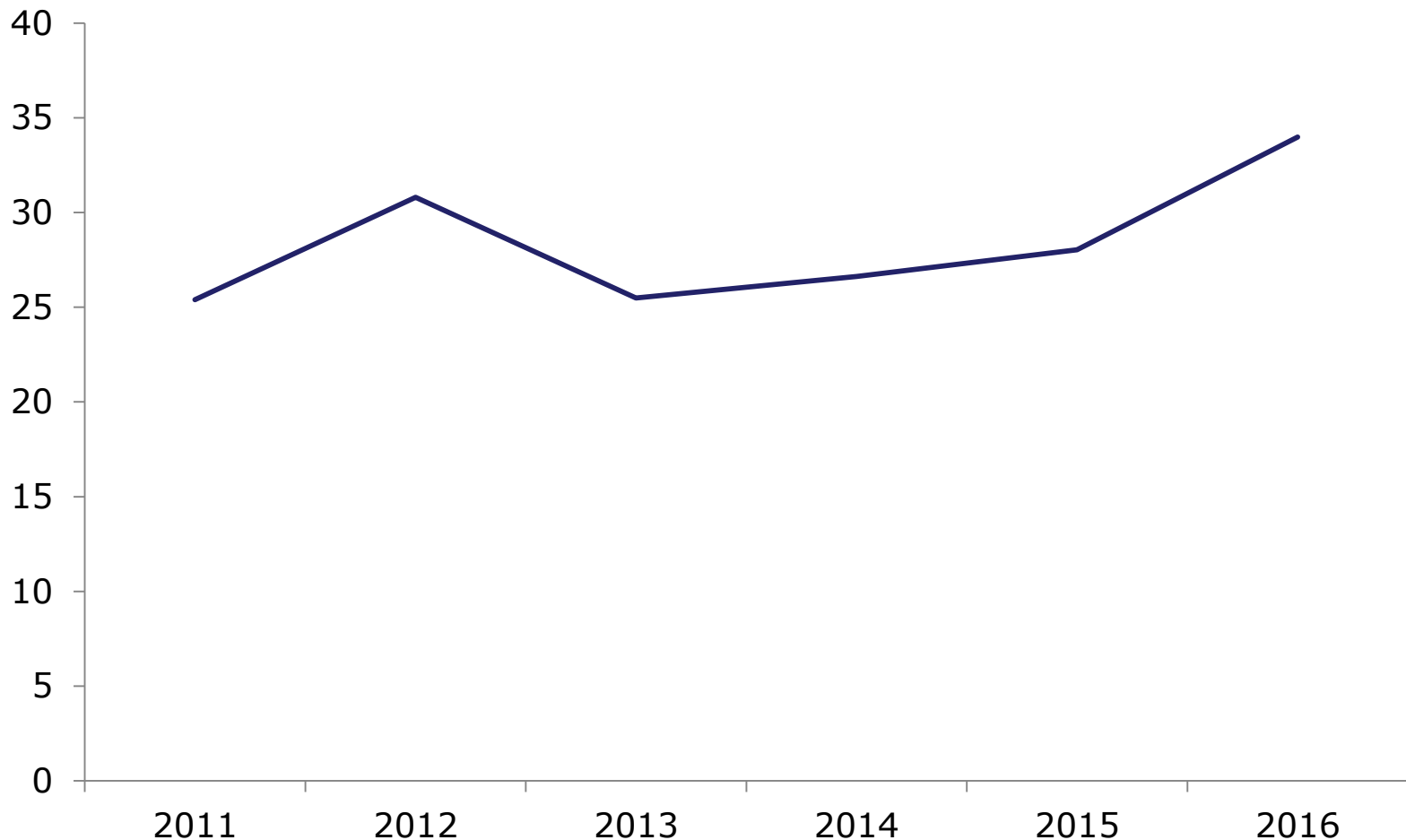
The distribution of the money on the tenders became less concentrated



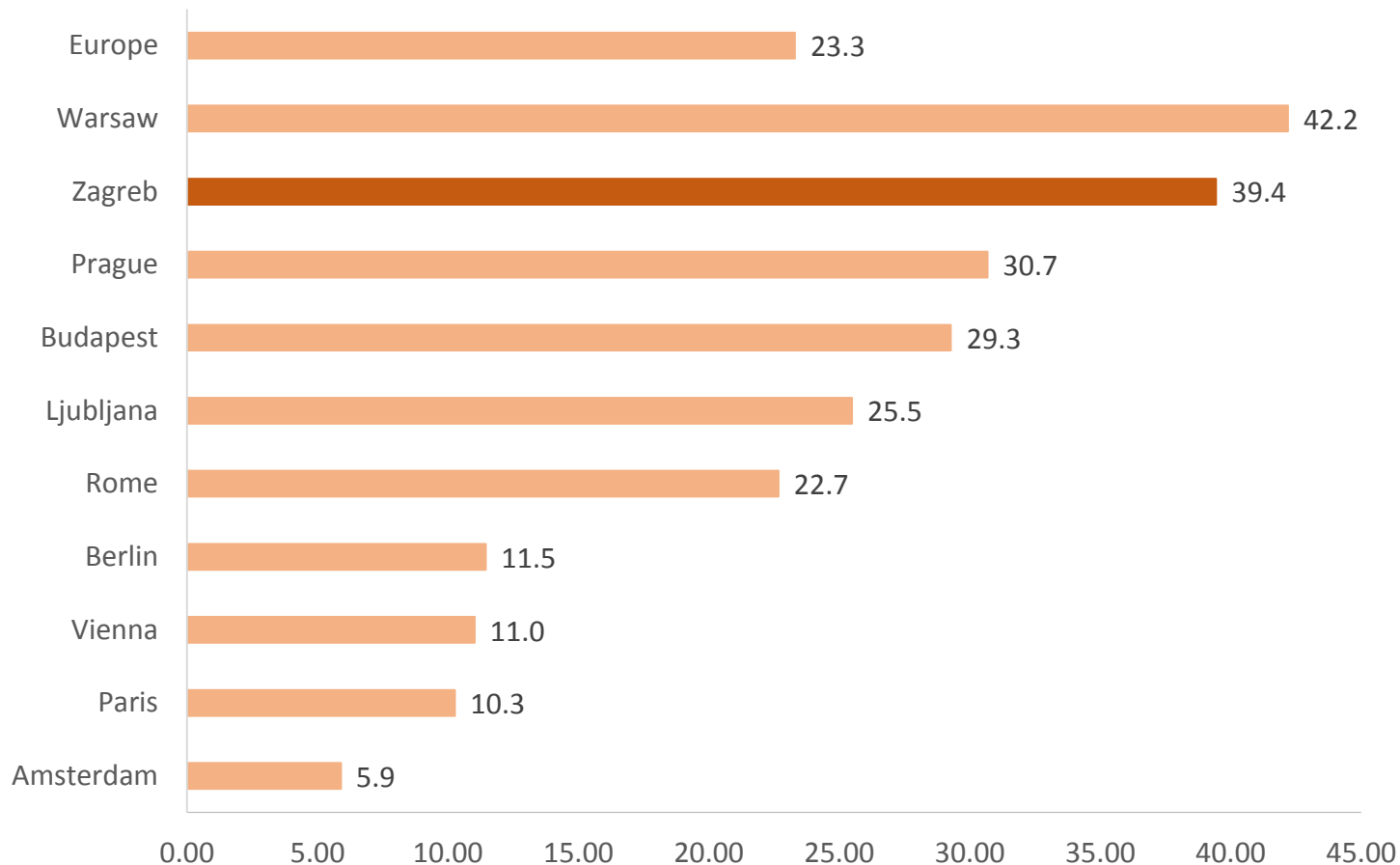
2. The corruption risk of public procurement increased significantly. The share of tenders without competition increased from 25% to 34% between 2011 and 2016



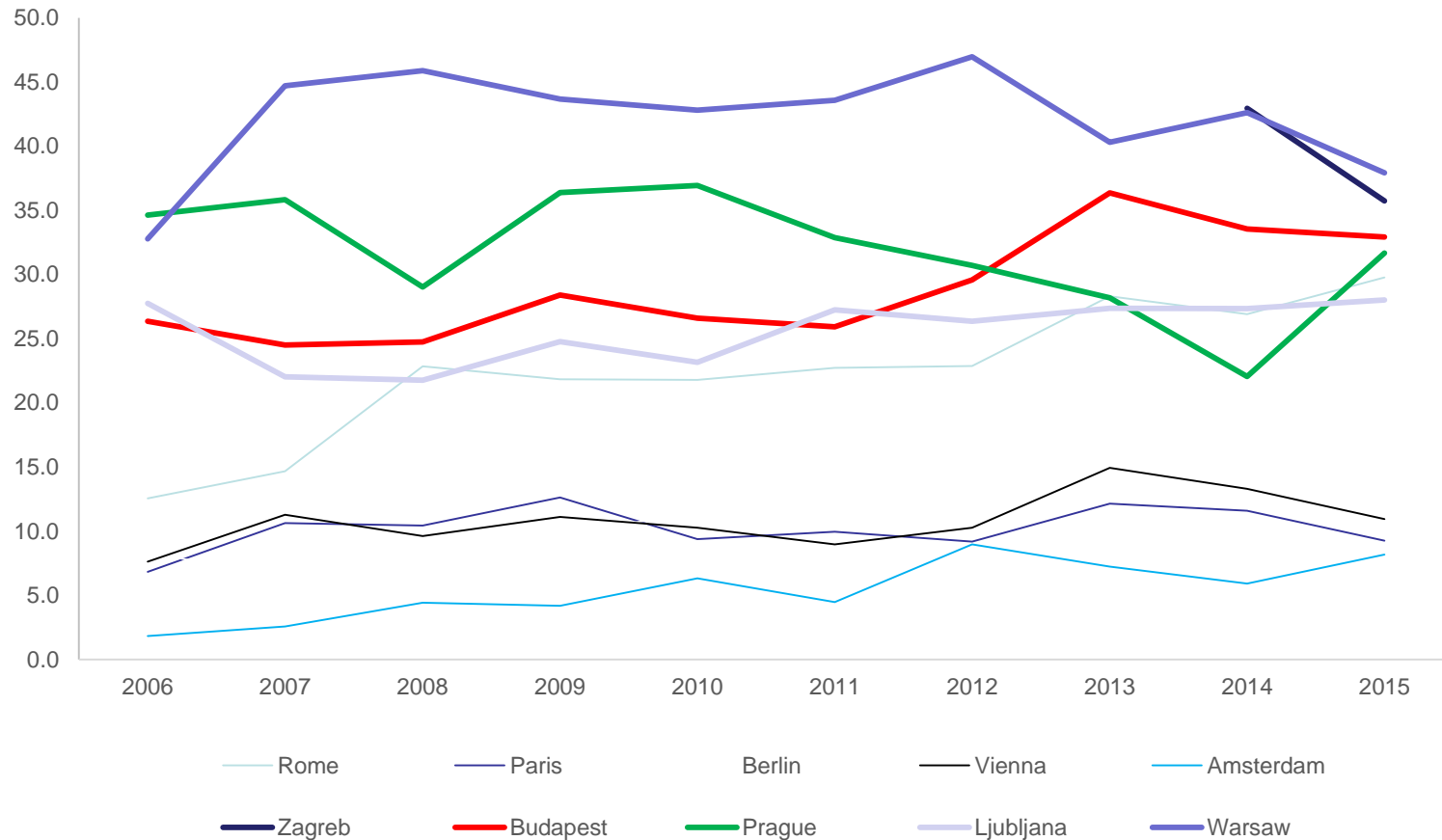
## Share of tenders without competition (SB=1) by year, 2011-16, %, N = 5,922



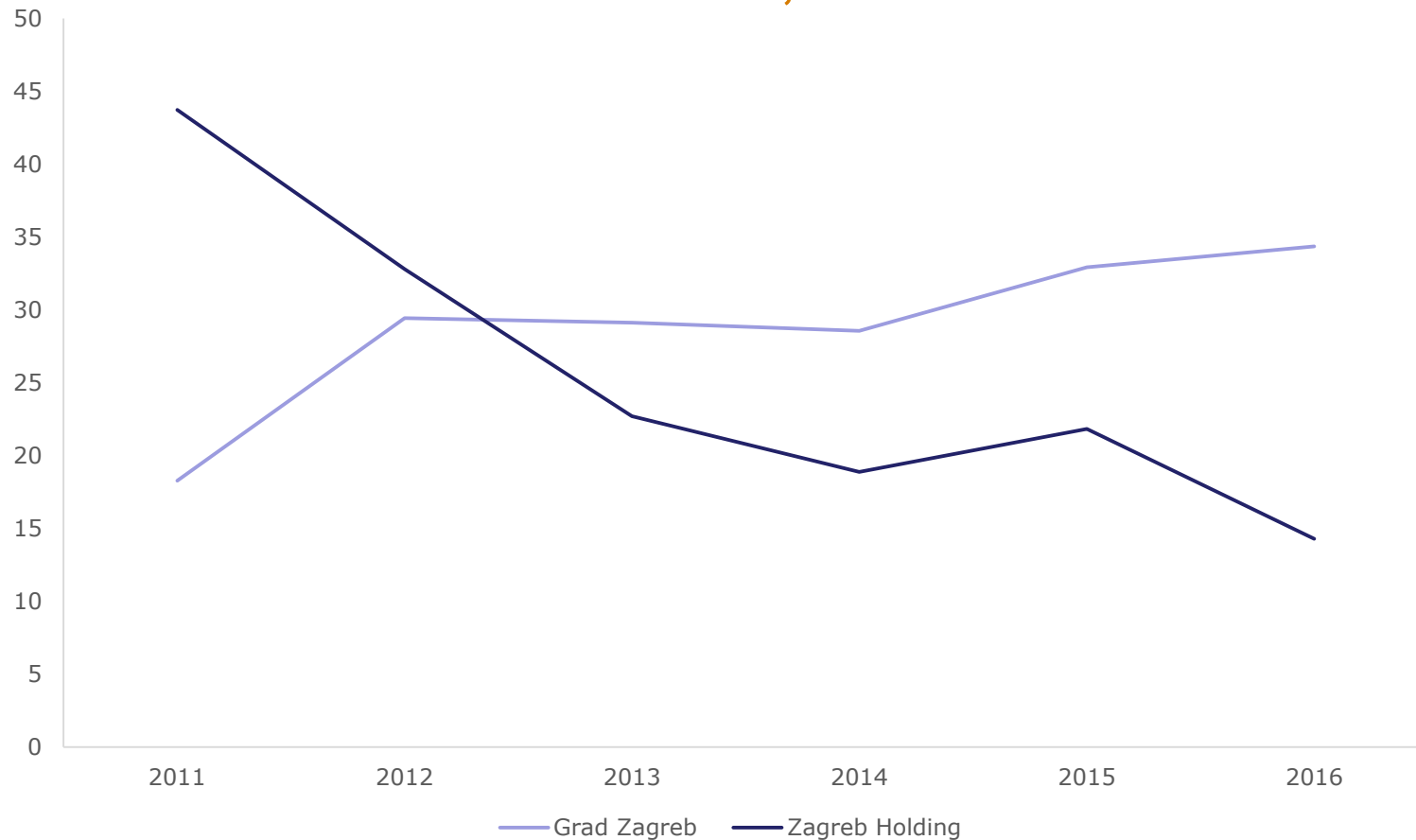
# Share of tenders without competition (SB=1) in selected European capitals, 2006-15, N = 3,407,027



# Share of tenders without competition (SB=1) in selected European capitals, 2006-15, N = 3,407,027



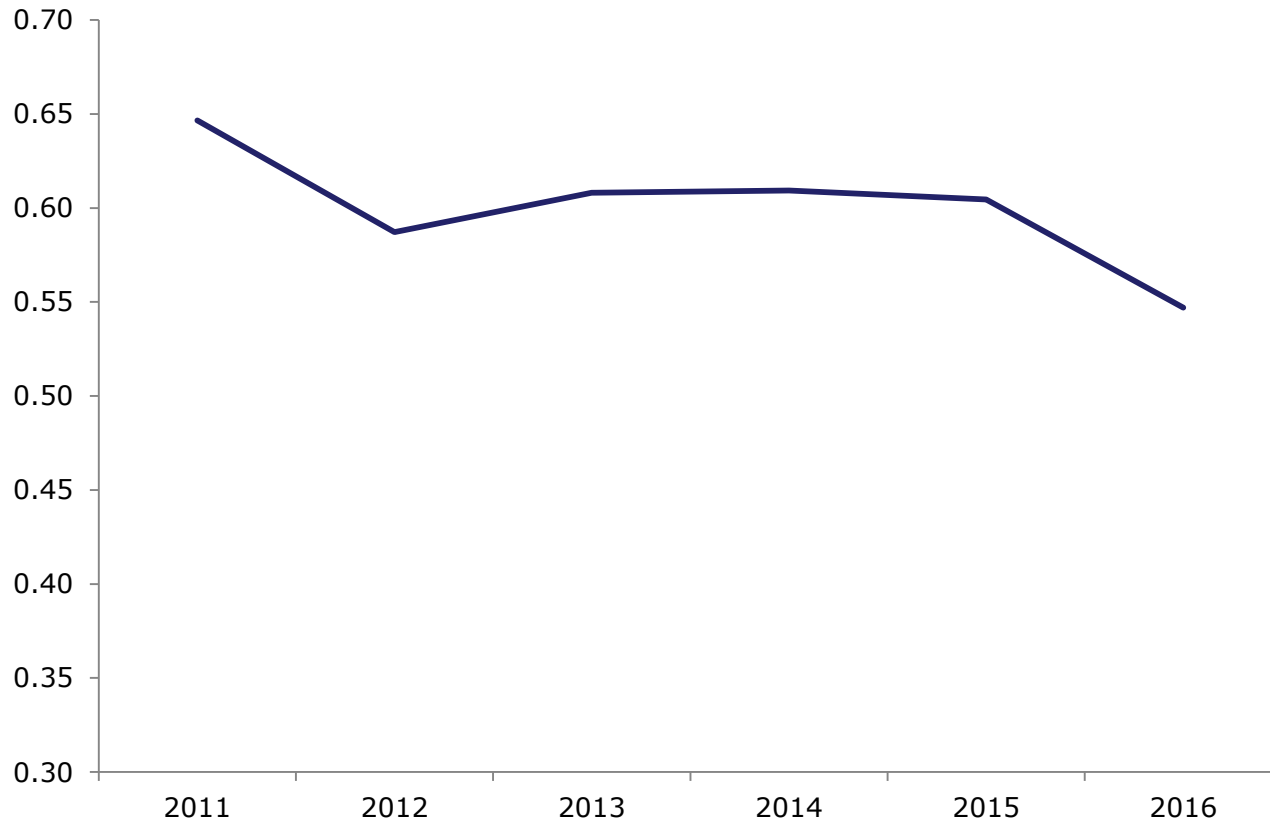
# Share of tenders without competition (SB=1) in City of Zagreb and Zagreb Holding, 2011-16, 2011-16, %, N = 5,922



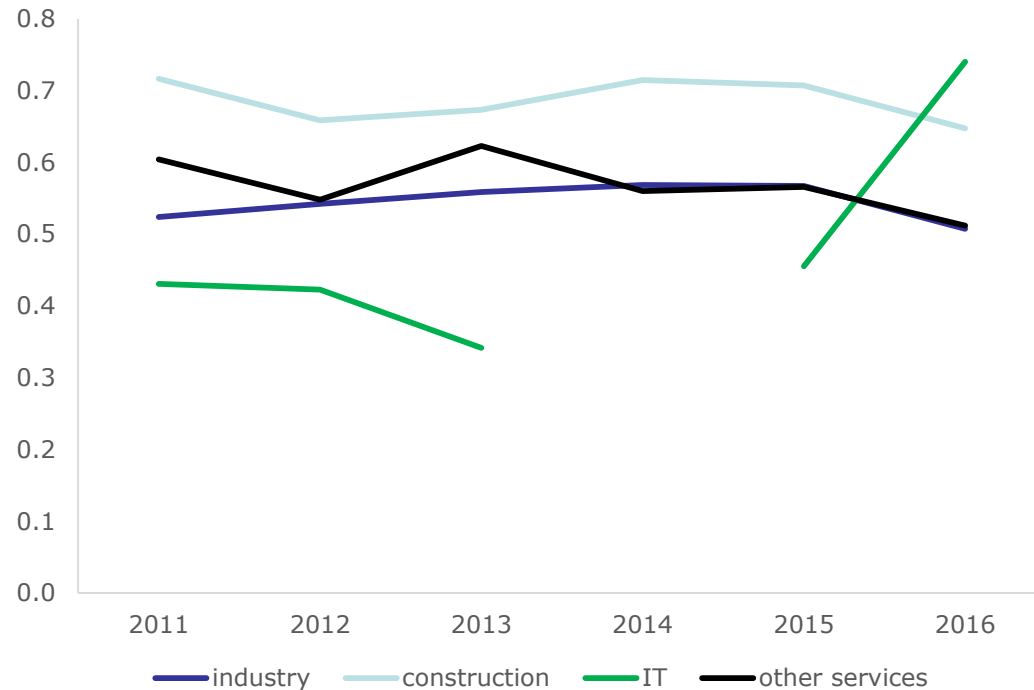
3. The intensity of competition (ICI) decreased considerably from 0.65 to 0.55 points during the period.

$$[0 \leq \text{ICI} \leq 1]$$

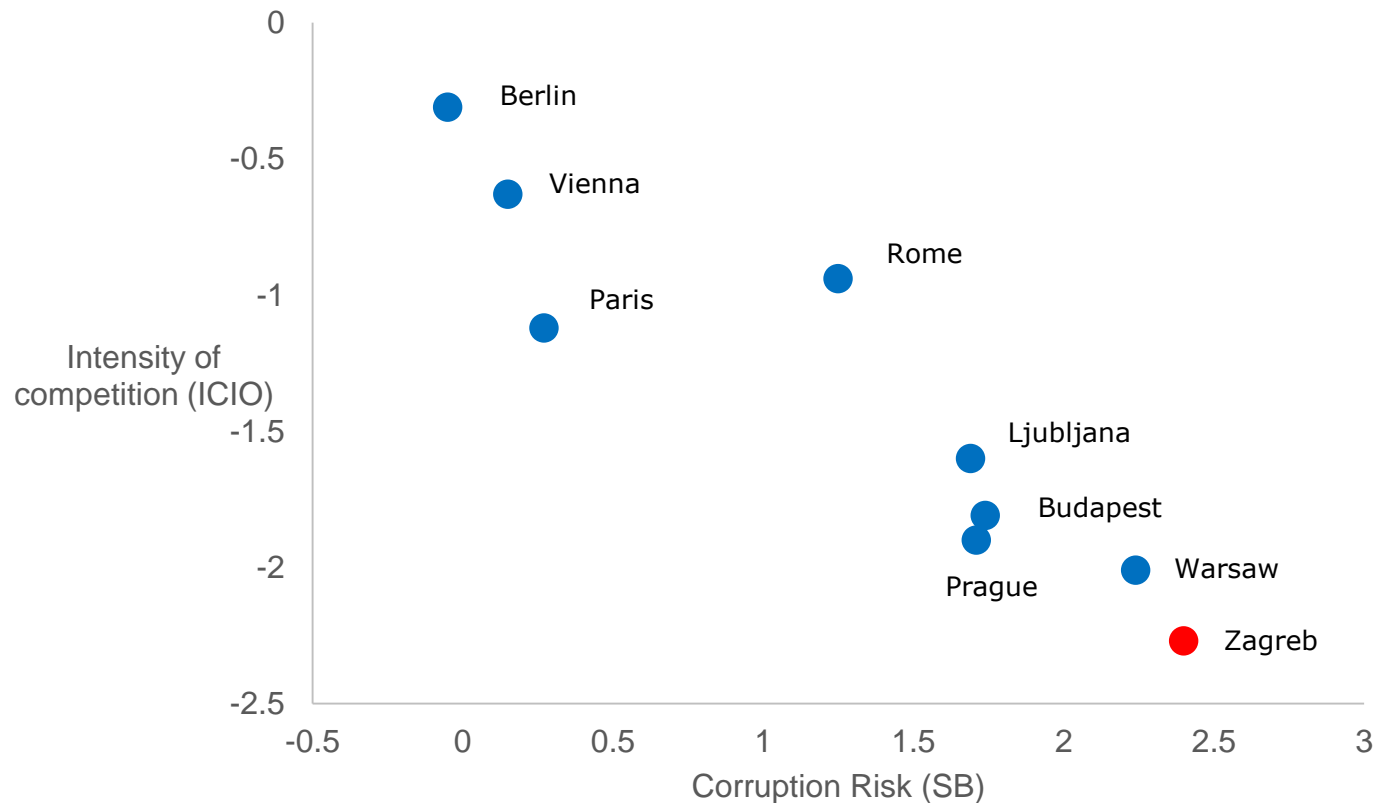
## The average value of Indicator of Competitive Intensity (ICI) by year, 2011-16, N = 4,238



## The average value of Indicator of Competitive Intensity (ICI) by year, 2011-16, N = 4,238



# Intensity of Competition and Corruption Risk in selected European Capitals 2006-15, N = 3,407,027



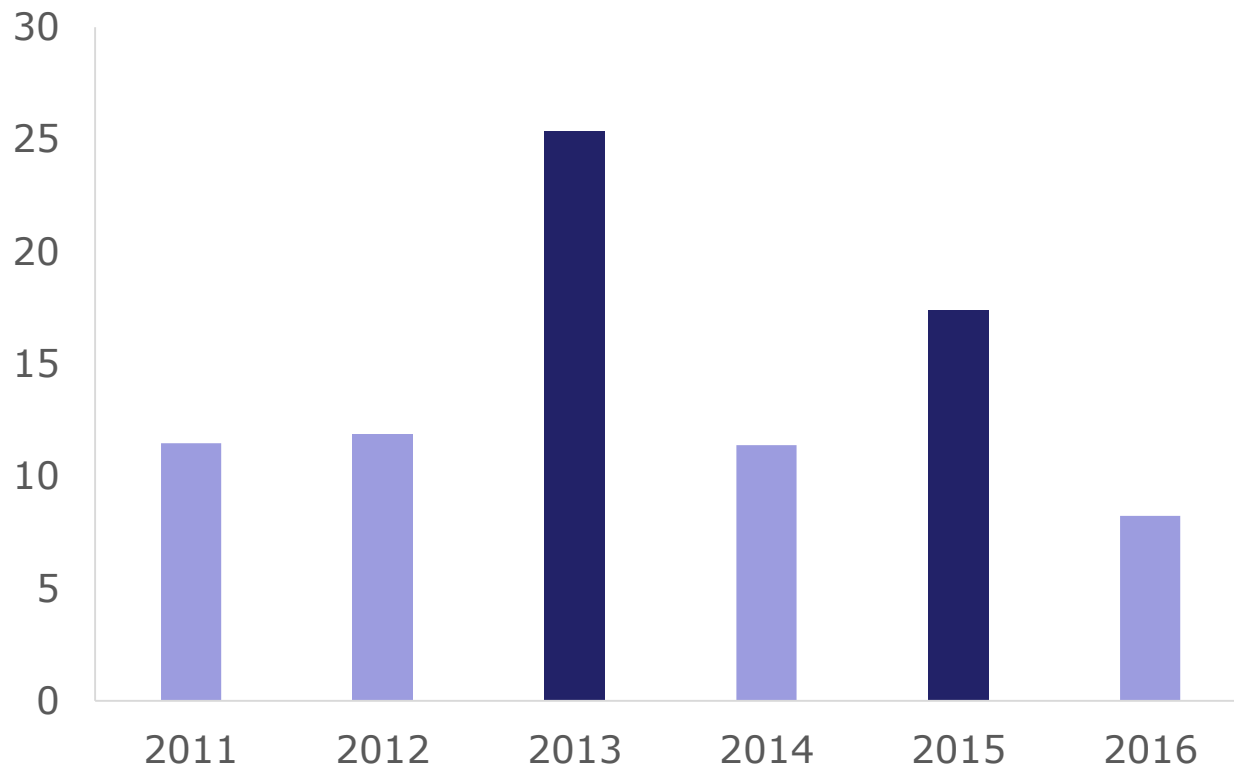
Source: CRCB's own calculation from TED data; values in X and Y axis are coefficients from logit and ordered logit models, reference capital: Amsterdam, controls: year, sector, contract size (ln net contract value).



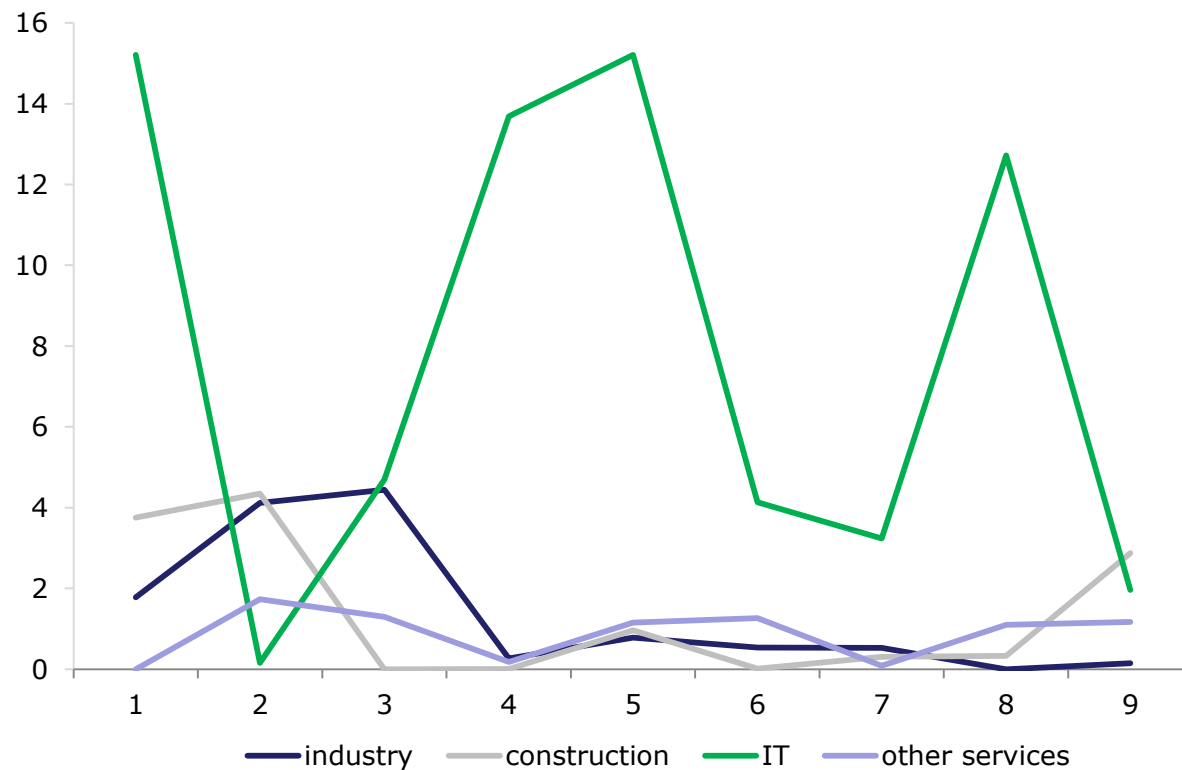
## 4. The price distortion was high in 2013 and in 2015

Share of rounded prices reduced considerably during the period

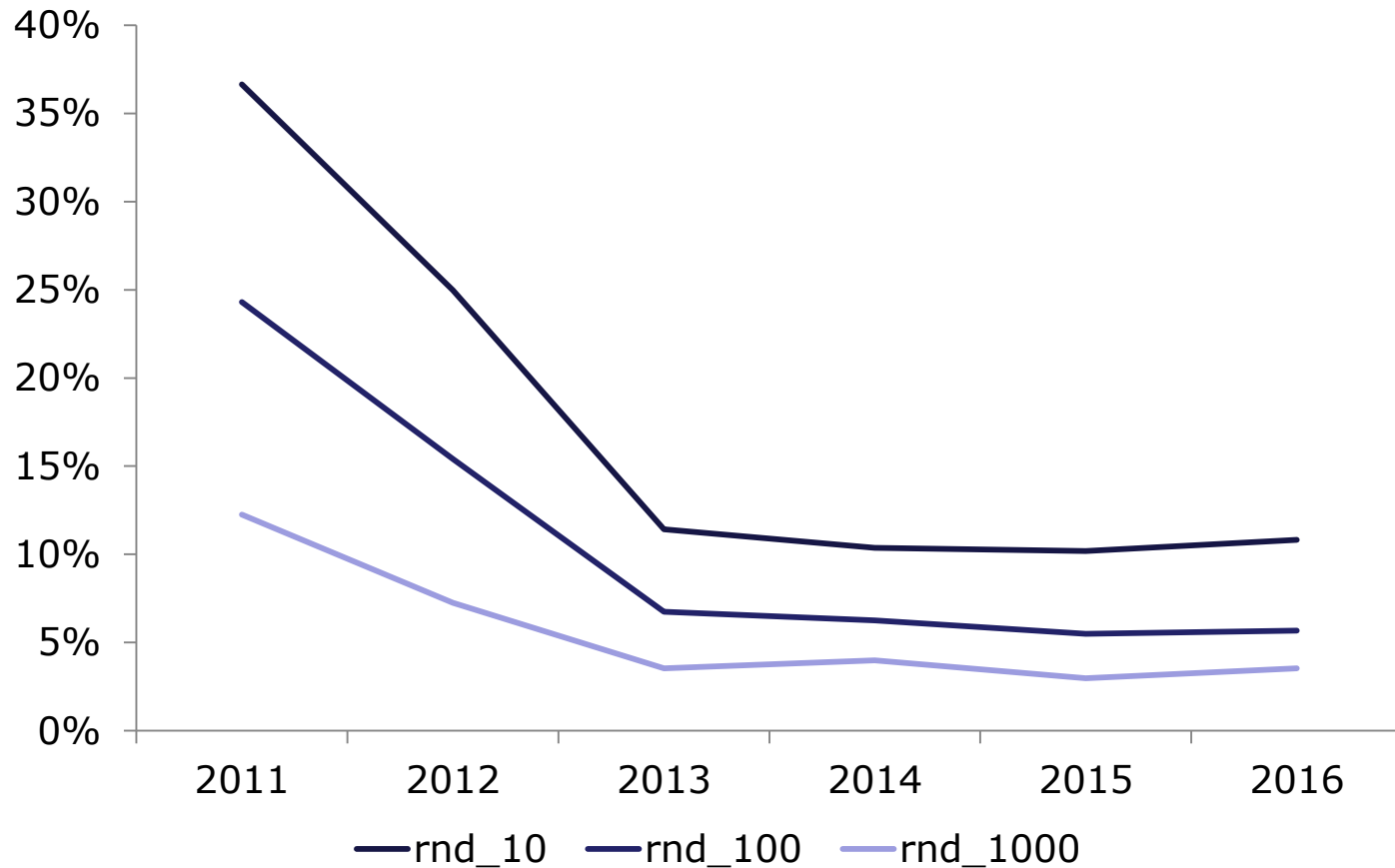
## The weight of price distortion: the squared error (SE) of contract prices of PPZ from the theoretical (Benford's) distribution by year, 2011-16, N = 5,922



# The weight of price distortion: the squared error (SE) of contract prices of PPZ from the theoretical (Benford's) distribution by sectors, 2011-16, N = 5,922



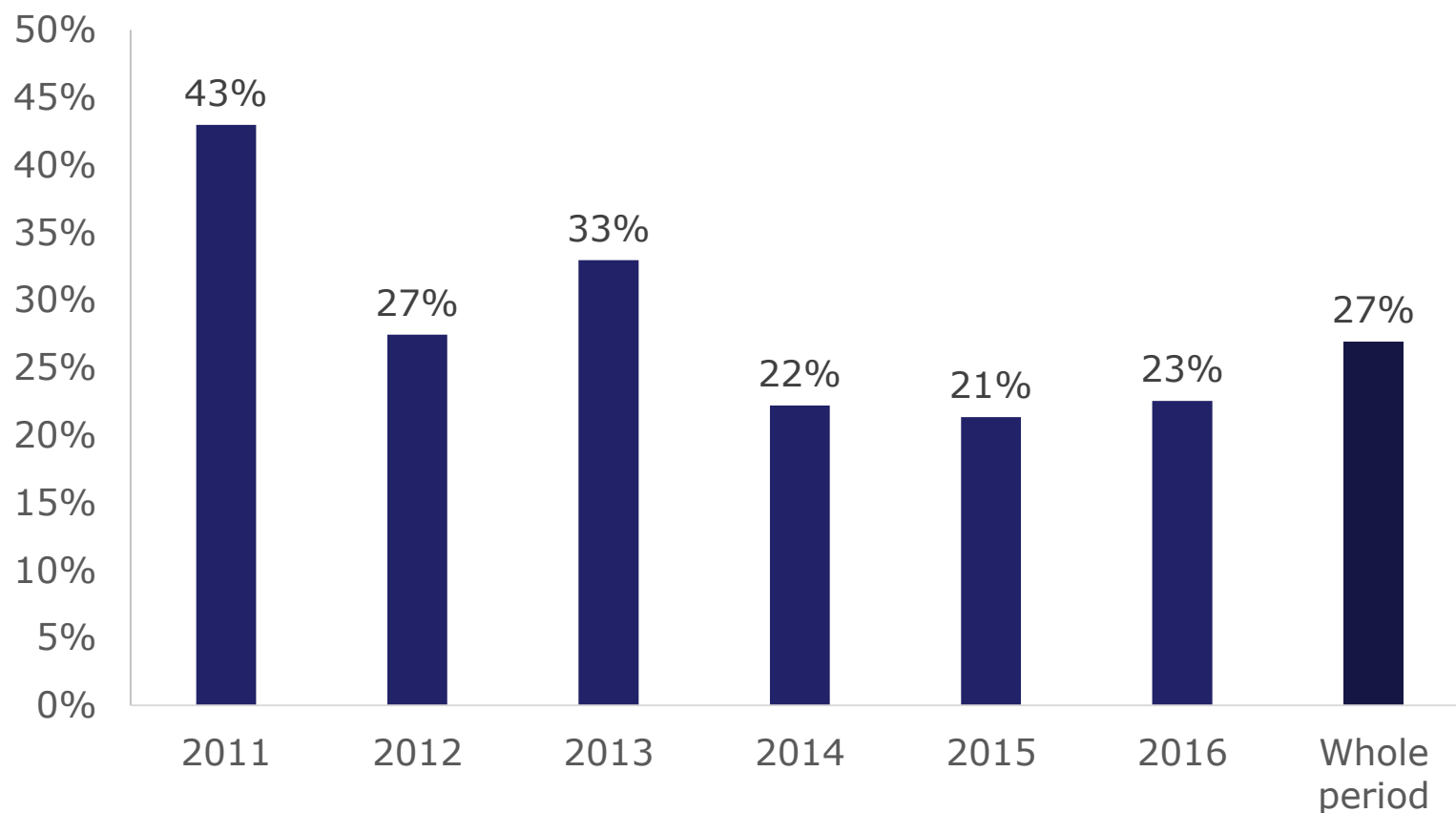
## Share of rounded net contract price by year, % 2011-16, N = 5,922



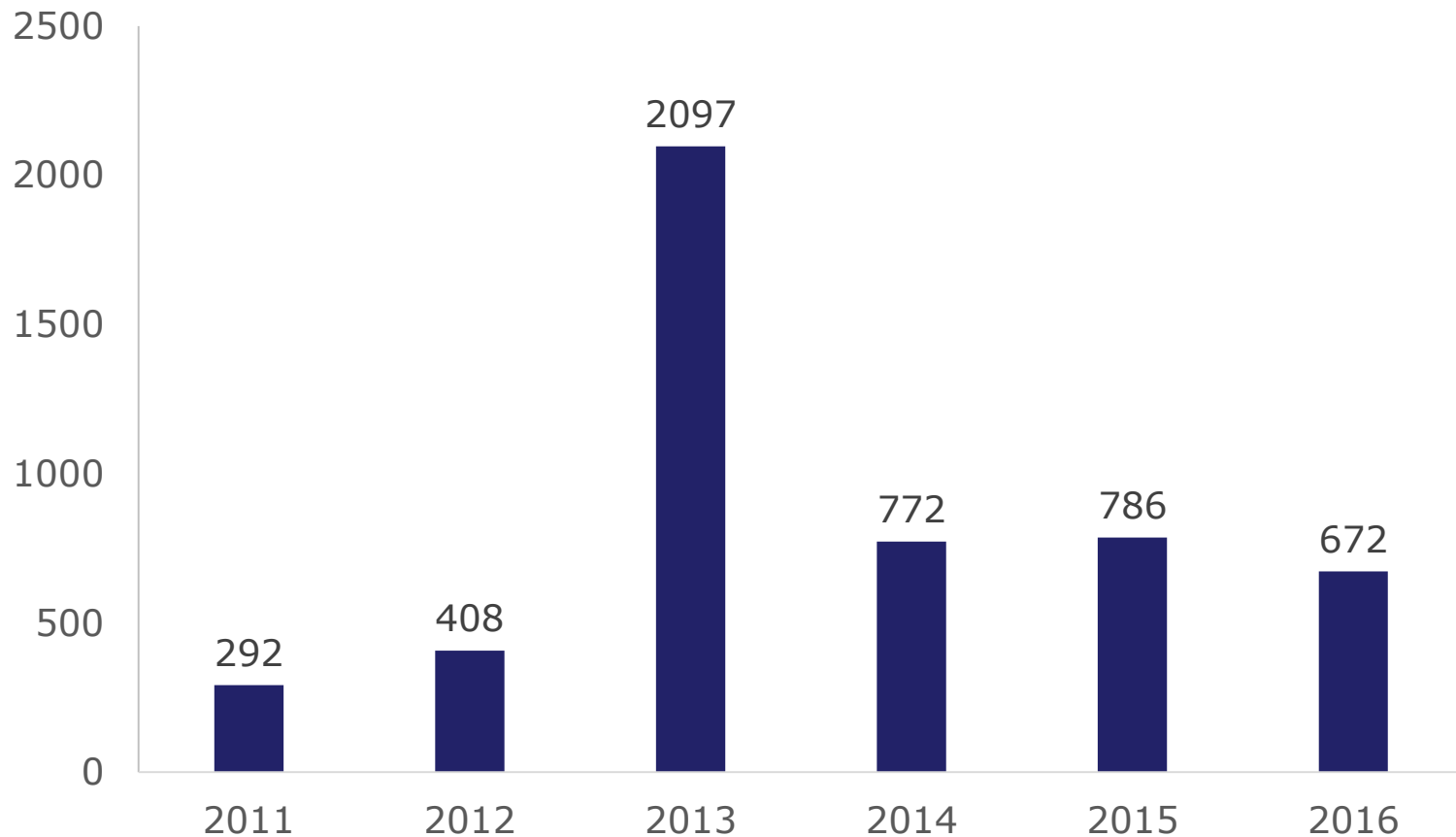
5. 27% of the aggregate contract value was spent without competition.

Between 2011 and 2016 the competition practically did not exist at more than the  $\frac{1}{4}$  of public money spent on public procurement.

## The share of money spent in PPZ without competition, %, 2011-16, N = 5,922



## The sum of the value of PPZ without competition, in million HRK, 2011-16, N = 1,684



6. The median level of estimated direct social loss remained stable during the period and its value has moved between 31-34%



## RPRD, median value, %

Only one bidder 8.2

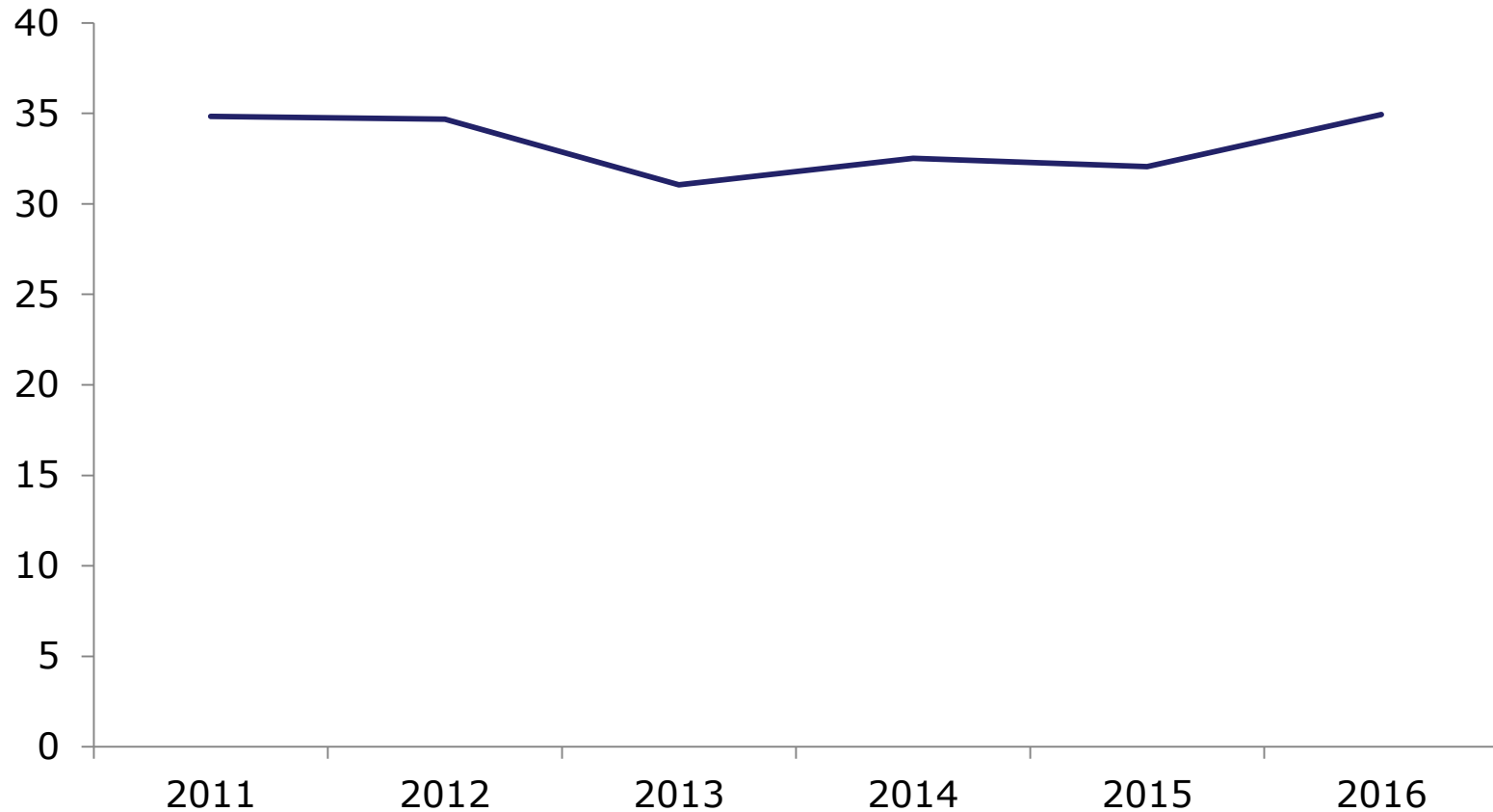
2 bidders 28.2

3-4 bidders 46.1

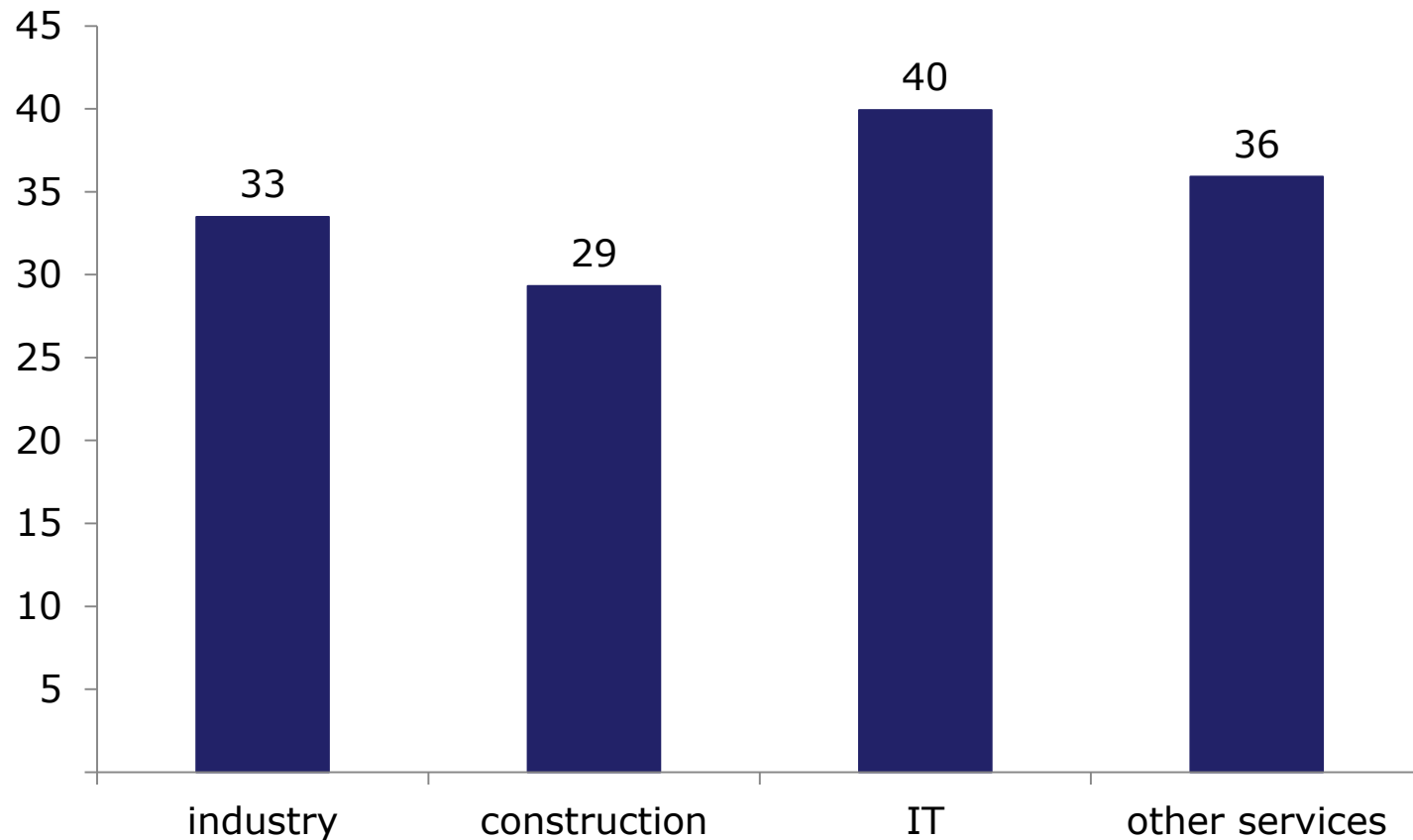
5-6 bidders 59.2

7 or more bidders 106.4

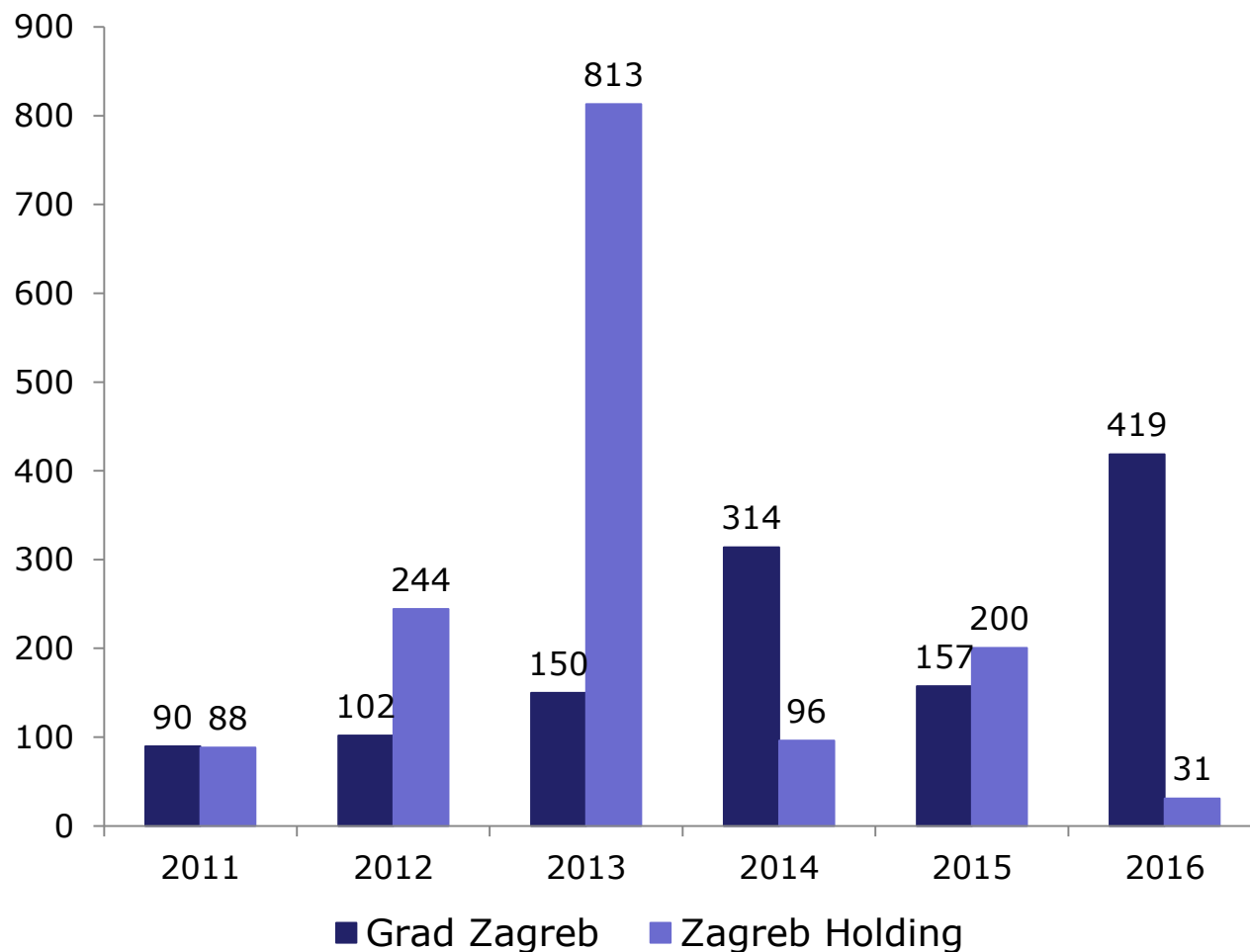
## The median value of the ratio of estimated direct social loss in net contract value by year, %, 2011-16, N = 3,076



## The median value of the ratio of estimated direct social loss in net contract value by sector, %, 2011-16, N = 3,027



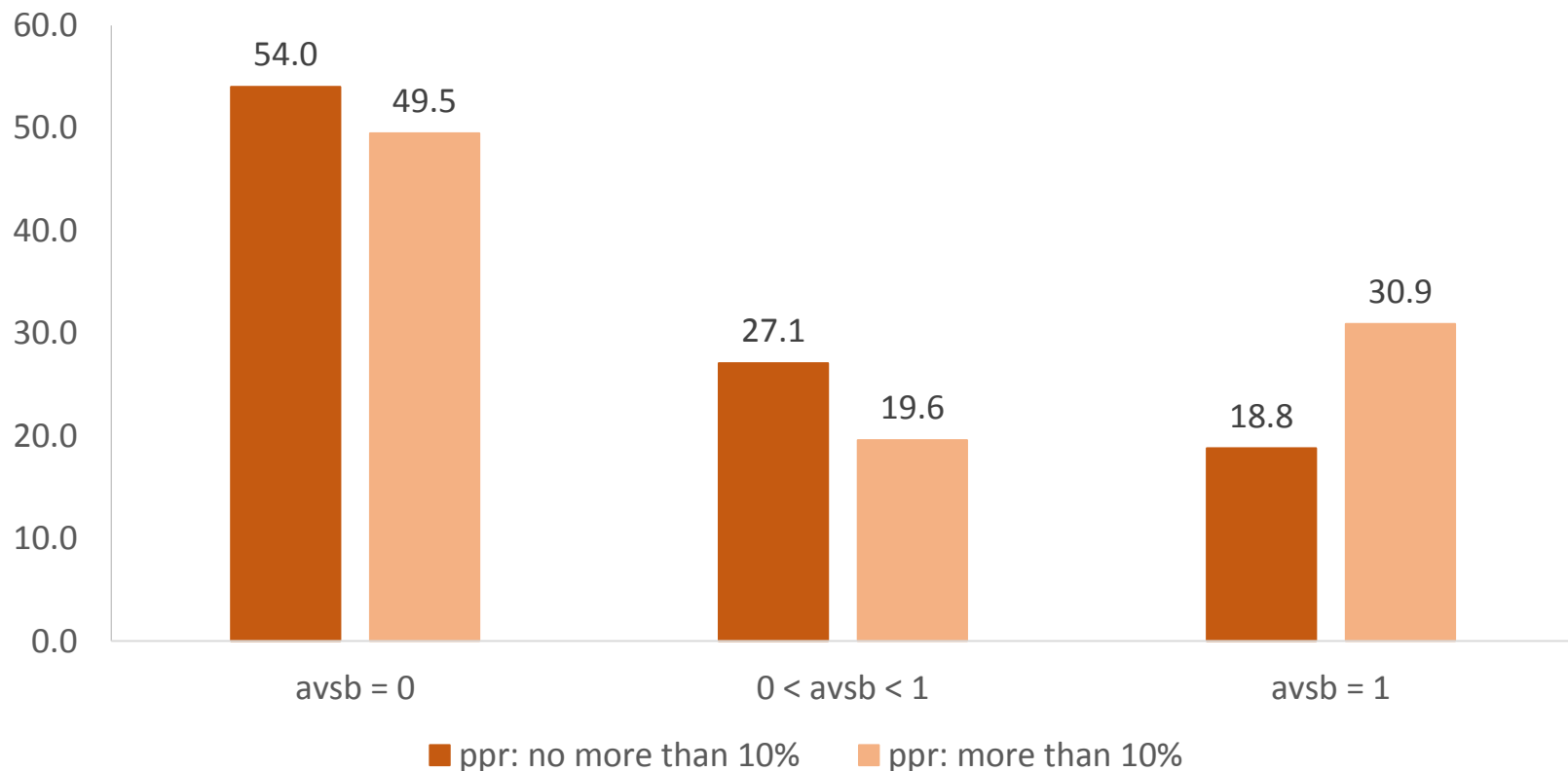
## The estimated direct social loss by issuer, million HRK, 2011-16, N = 3,076



7. The results point to the existence of a positive link between corruption risks of public tenders and its importance in total sales of the company. If the role of the public procurement market is greater within the company's sales, the company typically won public tenders characterized by high corruption risks.

=> institutionalization of corruption (??)

The share of tender won the winner company as single bidder in total number of tender by the weight of total contract value of public tenders in total net turnover of the company %, 2011-15, N = 878



# TFP & Corruption Risk

$$Y = AL^{\alpha} C^{\beta}$$

$$\ln Y = \ln A + \alpha \ln L + \beta \ln C$$

*Y: Total production*

*A: Total Factor Productivity*

*L: Labor*

*C: Capital*

$$\ln A = B + \gamma CR$$

*CR: corruption risk*

*B: constant*

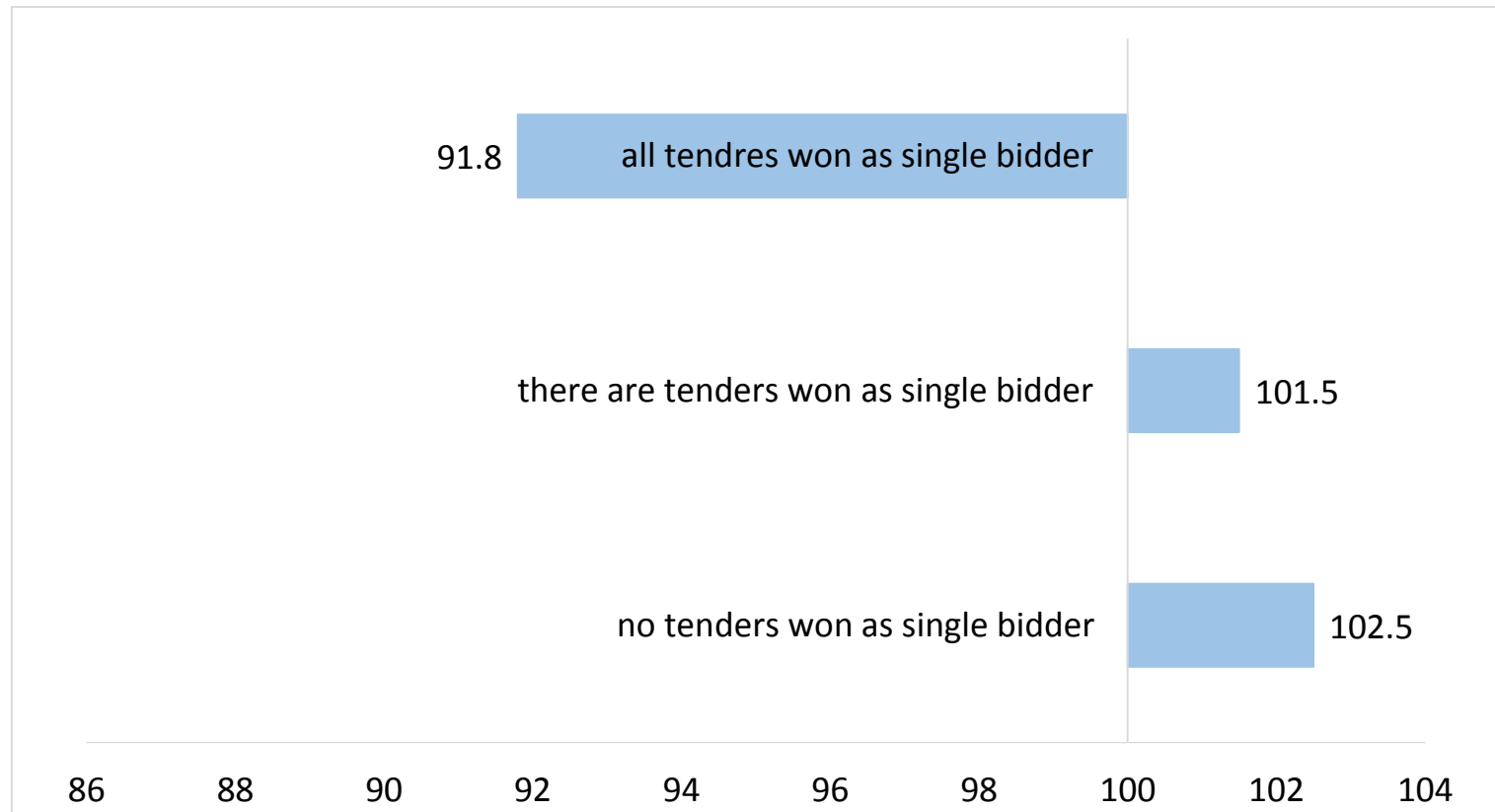
8. Winners with low TFP won tenders at high corruption risk or companies which regularly won tenders at high corruption risk have the worst productivity

High corruption risk creates opportunity for low productive companies

Therefore: high corruption risks tend to reduce productivity



Mean value of total factor productivity (%) in three groups of winner companies by corruption risk in the public tenders in Zagreb, 2011-15,  
Number of winners = 868; Number of tenders = 4,840



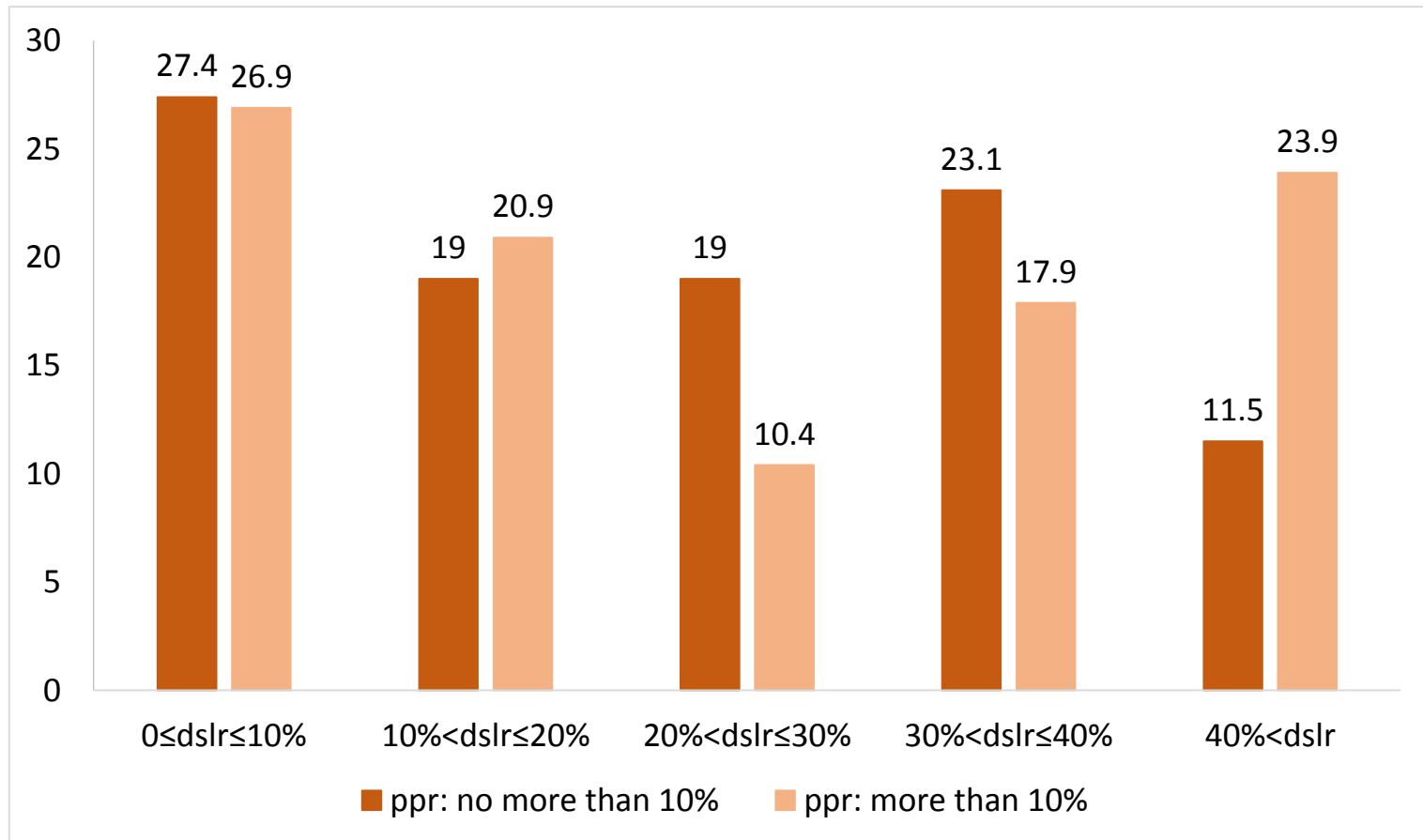
9.

There is significant positive relationship between direct social loss and the importance of public procurement market.

Consequently, the share of wasted money (social loss) is higher in public tenders won by companies strongly connected to the public procurement market.

This phenomenon is clearly related to the weak competition and high corruption risks.

# The rate of direct social loss (DSL<sub>R</sub>) by the weight of total contract value of public tender in total net turnover of the company (PPR), %, 2011-15, N = 625



10.

The results point out that a group of Croatian companies is likely to incorporate the high corruption risk and low intensity of competition of procurement procedures into their expectations.

The tenders with low intensity of competition and high corruption risk play an important role in their business strategy.

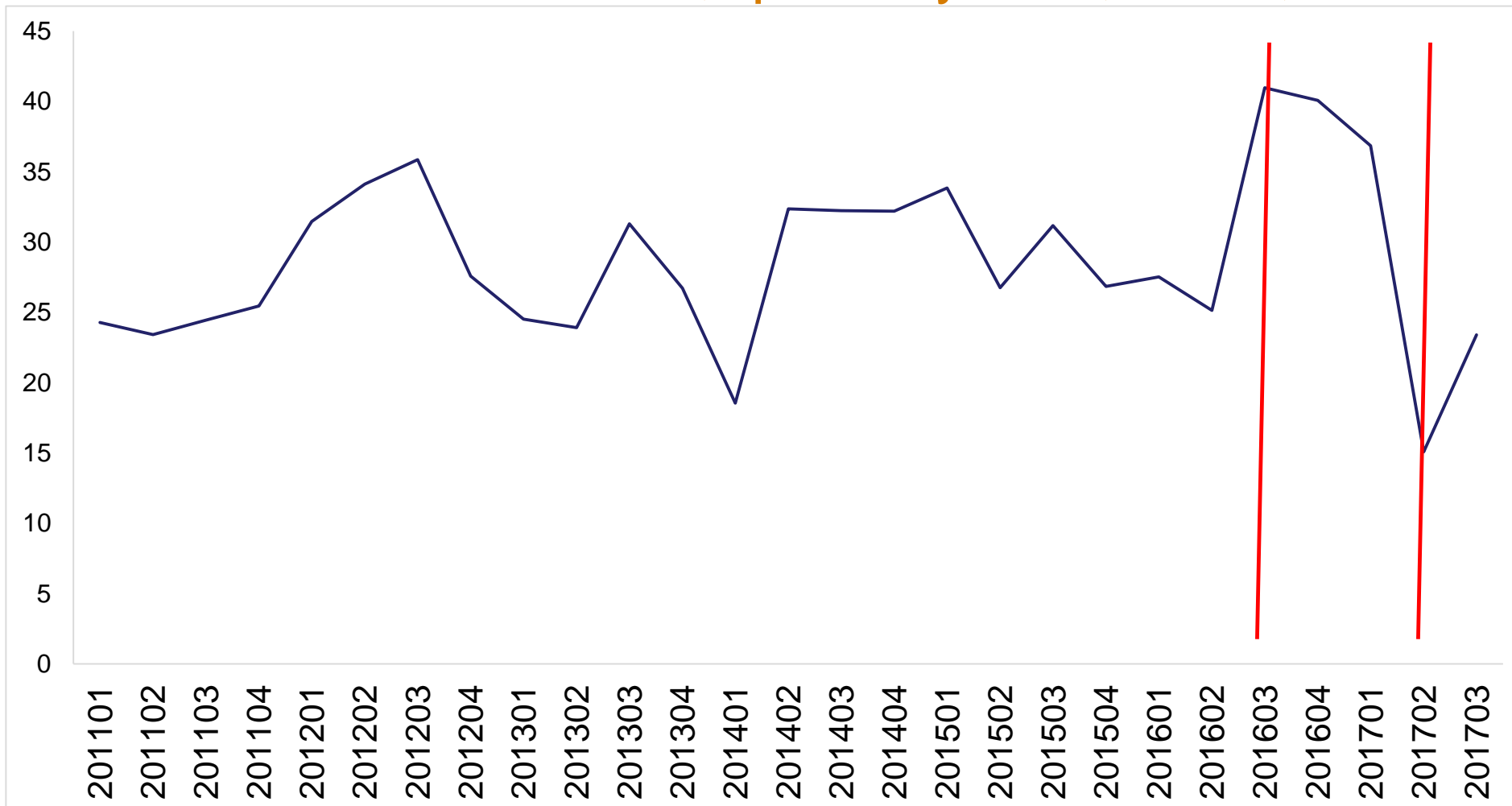
# 11. New Data from 2017.01-2017.09

## Evolution before and after the local election of 2017

before: considerable increase of corruption risks

after: sudden drop

# The share of tender without competition (SB=1) 2011.01. – 2017.09., quarterly data, N = 6,076



# LESSONS

# Lessons

- Low intensity of competition
- High corruption risks
- High level of estimated direct social loss
- Corruption towards institutionalization



# Lessons

- Need for a regular empirical analysis of the intensity of competition, corruption risks and direct social loss of public tenders.
- This is the first step towards increasing of social welfare.

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