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Competitive Intensity and Corruption Risks in the Hungarian Public
Procurement 2009-2015

Main Findings & Descriptive Statistics

May 2016

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Competitive Intensity and Corruption Risks in the Hungarian Public Procurement 2009-2015. Main Findings & Descriptive Statistics /
Versenyerősség és korrupciós kockázatok a magyar közbeszerzéseknél 2009-2015.
Fontosabb eredmények és leíró statisztikák.

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„When you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind...”

Lord Kelvin

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Abstract

This short report examines data from Hungarian public procurement between 2009-2015. The data from 127,776 contracts and 135,300 awardees were used for the analysis. The data were downloaded from the website of the Hungarian Public Procurement Authority (<http://www.kozbeszerzes.hu/>). The Public Procurement Bulletin available online interface was used for data collection, and after data clarification procedures, the data were structured into a database. The data of analysed public tenders are downloadable from the website managed by CRCB (<http://tendertracking.eu/>).

The paper basically uses descriptive statistics and it reviews aspects of the contracts awarded in Hungary between the years of 2009-2015. The analysis primarily focuses on information regarding the competitive intensity, price distortion, and corruption risks. Based on these data we examine the trends of the public procurement procedures in different groups (type of procedure, EU funding and non EU funding, the size of contract value, market type, industrial differences). We also deal with the appearance of crony capitalism in Hungarian public procurement procedures. Price distortion was analysed using the Benford's Law.

The results show that between 2009-2015 the Hungarian public procurement are characterised by a reduction in competition, and increase in the number of procurements without competition, reduced transparency, and rising tendency toward price distortion and corruption risks.

The EU funded procurements have worse performance in case of corruption risks, competitive intensity, and transparency, compared with Hungarian-funded ones. The former ones are characterised by weaker competition, lower transparency, a higher level of price distortion, and higher corruption risks. The result points out the effects of crony capitalism on weakening competition and increasing price distortion, especially in EU funded public procurement.

According to our results in Hungary, the EU funds – besides their positive influence on the development of the Hungarian economy – have a special and perverse effect: they foster the practice of political favouritism and fuel crony capitalism.

Keywords: public procurement, corruption, competitive intensity, price distortion, crony capitalism, Benford's law, big data

Introduction

This brief report examines the competition intensity, the corruption risks and the price distortion of public procurement contracts in Hungary using the available data between 2009 and 2015. The data pertaining to 127,776 contracts and those of 135,300 awardees downloaded from the website of the Hungarian Public Procurement Authority and from the online version of the Public Procurement Bulletin were used for the analysis¹. These data were cleansed and then structured into a statistical database². Most significant data are available on and downloadable from our database, a continuously updated application started by CRCB on December 8th 2014 <http://tendertracking.eu/>³

The database⁴ allows us to statistically analyse the Hungarian public procurement data, on the one hand, to learn when, how much, on what, and how the Hungarian state institutions spent money. On the other hand, it also allows us to monitor and study the impacts of the changes in public procurement regulations on those concerned in public procurement, the patterns of public money spending, the existence of competition, procurement prices, and the nature of corruption frequently accompanying public procurement. Furthermore, a special focus is given to how these phenomena have changed during the years.

All these researches serve the interests of the European – among them the Hungarian – citizens.

The report surveys public procurements for the period of 2009 – 2015 by using descriptive statistics, and by certain points of emphasis demonstrated in 43 figures and 6 tables. Primarily, we focus on information pertaining to competition intensity and corruption risks, and we provide correlations based on our database.

The study of corruption risks is the study of the conditions of corruption.

¹ See <http://www.kozbeszerzes.hu/>

² In order to accomplish this study seven years were needed, exactly the same time span that our analysis of the results of public procurement encompasses. Seven years with numerous enthusiastic colleagues, volunteers, IT experts, system administrators, lawyers, procurement experts, sociologists, economists, mathematicians, journalists, and about fifty university students and professionals to record and to cleanse the data, research assistants whose contribution to this analysis was indispensable. We would like to express our thanks for their enthusiasm, accuracy and tireless efforts.

³ The 'Microdata', a group of researchers at CEU, has also elaborated on and published data on Hungarian public procurement. Their cleansed data for the period of 1997-2013 are available at <http://kozbeszerzes.ceu.hu/about.xhtml>.

⁴ The database (MaKAB) used in the analysis was sponsored by funds from the European Union (ANTICORRP project, grant agreement no: 290529), by individuals volunteer work, by donations from Hungarian companies and, by the CRCB's financial resources.

If somebody wants to cheat (to be corrupt), then he/she sets up conditions to generate cheating. Corruption risk means that these conditions for cheating exist in the examined public procurement. But it is also true that conditions favourable for corruption and the existence of these do not necessarily indicate corruption. It is possible that these conditions are either 'accidentally' present, or that these conditions appear without any intention for corruption. It may also happen that after creating these conditions the corrupt actor does not make use of them, and in the end backs out of corruption. This latter form is an atypical result that contradicts the original corrupt plans of the actor, and could be extremely rare.

The most significant hurdle in achieving our planned goals is the quality of the data provided by the Hungarian government. The Hungarian public procurement data, and the setup procedures of the public procurement database administered by the Hungarian government, reveal fundamental errors, and above all, they have some minor or major deficiencies, some of which cannot be remedied⁵. While sorting and cleansing the data, it became evident that a significant part of the data of about 170-180,000 contracts of the Hungarian public procurement from 1997 can no longer be found or fixed. While sorting and cleansing the data, it became evident that a significant part of the data pertaining to 170-180,000 contracts of the Hungarian public procurement from 1997 is missing or incompatible. Consequentially, that part of the original database was unusable⁶. The database we use for our statistical analysis is the result of our data cleaning and data reconstruction activity. We have a database with fewer errors and inconsistencies than the database of the Public Procurement Authority with its partially organised data.

This report is meant to be the first step of an analysis of relationships amongst competition intensity, corruption risks, and price distortion over time.

In the following, the most significant results will be given, and then figures related to the findings will be presented.

⁵ We have already drawn attention to these issues, and we have also analysed the roots of these errors in several reports. See in Hungarian [1](#), [2](#), [3](#), [4](#), [5](#), [6](#), and via volunteer work we have also made proposals how to fix and improve the setup procedures that create the public procurement database [7](#).

⁶ The more problems we faced during data cleansing (a part of which we managed to solve), the more problems this phenomenon generated at the next step of our study. We did not succeed in finding any solution to these problems because of the lack of data or because of data inconsistency. (See the Annex 2.)

1. Main Findings

1. The analysis of 127,776 Hungarian public procurement contracts demonstrate that between 2009 and 2014 the competition intensity of public procurement significantly decreased (F2.2.1., F2.2.2.). This tendency seems to stagnate in 2015.
2. The level of transparency of the Hungarian public procurement deteriorated during the years examined (F2.3.1., F2.3.2.). As a result of the modification of the public procurement law in 2010, from 2011 onward there were fewer announcements before public procurements than earlier.
3. The rate of successful public procurements without competition (with one bidder only) was above 30% between 2009-2010; later that rate declined (26-27%), and in 2014-2015 it started to increase again (31-32%) (F2.4.1., F2.4.2.).
4. The lack of competition was highly represented in public procurements targeting *IT services and products* among product markets between 2009-2010. 64-68% of these won without any competition with just one bidder in the tender. Among the product markets the level of transparency was the lowest in IT tenders during these two years (F2.4.3.).
5. The corruption risk index defined by the level of transparency and single bidders indicate that the Hungarian public procurement for the period of 2009-2014 was wholly characterized by raising tendency of corruption risk. This tendency stopped in 2015, when some improvement can be observed (F2.5.1. F2.5.2.).
6. We analysed the price distortion in the Hungarian public procurement by the distribution of the first digit in the contract prices based on Benford's law.

According to Benford's law (also known as the First-Digit Phenomenon) in a non-artificially generated set of numbers (in any numeral system) the first digits in each, local values are distributed neither arbitrarily nor uniformly ; the distribution instead follows the distribution set by Benford's law⁷. The distribution of first digits in the decimal system (1,..,9) according to Benford's law is in Table 1.1.

⁷ A set of numbers is said to satisfy Benford's law if the leading digit d (in 10 digit system, $d \in \{1, \dots, 9\}$) occurs with probability: $P(d) = \log_{10}(d+1) - \log_{10}(d) = \log_{10}(1 + 1/d)$. See https://en.wikipedia.org/wiki/Benford%27s_law

Table 1.1. The distribution of first digit according to the Benford's law in the decimal system

First digit	%
1	30.1
2	17.6
3	12.5
4	9.7
5	7.9
6	6.7
7	5.8
8	5.1
9	4.6

The economist Hal Varian first suggested in 1972 that Benford's law could be used to detect possible fraud in socio-economic data, and that it the performance of forecasting models could be evaluated⁸. Mark Nigrini pointed out 25 years later that Benford's Law is useful in forensic accounting and auditing as a tool to detect fraud and collusion⁹. Ever since, Benford's Law has been common and it is a widely used method in several areas of social research for fraud detection¹⁰.

For the analysis of irregularities in public procurement, we can use the information on procurement prices because these are public (a); and as such these may carry information on the process of price formation (b). Our research questions related to the price formation are the followings: whether the price formation differs significantly amongst different group of public procurement created by competitive intensity (i), the level of transparency (ii); the risks of corruption (iii), and the existence of political relations of the bidders (iv).

We examine these relationships with comparison of observed first digit's distribution to theoretical (Benford's) distribution of contact prices of tenders in

⁸ See Varian, H. R (1972): Benford's law, *The American Statistician*, 26. Vol. no.3. pp. 65–66.

⁹ See See Nigrini, M. J. (1996): A taxpayer compliance application of Benford's law, *Journal of the American Taxation Association*, Vol. 18. no 1. pp. 72–91; Drake, P. D. – Nigrini, M. J. (2000): Computer assisted analytical procedures using Benford's law, *Journal of Accounting Education*, Vol. 18. no. 2. pp. 127-146; see also Durtschi, C. - Hillison, W.- Pacini, C. (2004): The Effective Use of Benford's Law to Assist in. Detecting Fraud in Accounting Data, *Journal of Forensic Accounting*, Vol V. pp. 17-34, <http://bit.ly/1QSUOER>

¹⁰ See Nigrini, M. J. (ed.) (2012): *Benford's Law. Applications for Forensic Accounting, Auditing, and Fraud Detection*, John Wiley & Sons, Hobonken, New Jersey, USA and S. J. Miller (ed.) (2015): *Benford's Law: Theory and Applications*, Princeton University Press, Princeton & Oxford, New Jersey, USA.

several analysed groups of the Hungarian public procurement.

7. The analysis of first digits indicates that the contract prices of all Hungarian public procurement fits into the theoretical distribution for the whole period (2009-15) (F2.6.1 and T2.6.1).

8. There are crucial differences in price distortion among the contract prices in each year. Price distortion was increasing throughout the whole period; while in 2009 and 2010 contract prices fitted well into the theoretical distribution, after those years the ratio of price distortion got more and more significant (F2.6.2., F2.6.3.). Our assumption is that this phenomenon indicates the frequency and the growing tendency of overpricing, which also signifies the weakening of competition and the increasing corruption risks.

9. Our results points out that the strength of price distortion decreases as competition intensity becomes more significant (F2.6.7.). The prices of public procurement are remarkably distorted when there is no competition and the level of transparency is low compared to those successful tenders with competition and transparency (F2.6.6., F2.6.8.). Our results indicate that the strength of price distortion increases significantly with the increase of corruption risk (F2.6.9.).

10. The transparency of public procurement projects funded by the EU deteriorated even more during the period, and after 2011 the level of transparency was much lower than the level of transparency in public procurement financed domestically (F2.3.5).

11. In 2009-2011 the rate of public procurements without competition was higher among EU projects, in 2012-2013 this rate got lower and in 2014-2015 the rate did not significantly differ from the rate of domestic projects. For the whole period there was no competition in 31% of the public procurements funded by the EU (F2.4.5.).

12. Except for 2009 the level of corruption risk was continuously higher in public procurements funded by the EU than those financed domestically (F2.5.5.).

13. Between the years 2009 and 2014 the pace of corruption risks accelerated in EU funded projects compared to domestically financed ones (F2.5.5.).

14. We assume that in 2015 the decrease in corruption risks could be attributed to the tendency change in purely EU funded projects.

15. Throughout the period, the price distortion of projects funded by the EU was stronger than that of the non-EU projects (F2.6.5.).

16. While the prices of projects financed domestically loosely fit into the theoretically expected distribution, those financed by the EU do not fit at all. Therefore, the phenomenon of overpricing could be much more frequent or it could have a much wider scale in EU funded public procurements than in case of other public procurements (T2.6.1.).

17. All of the findings suggest that in Hungary between 2009-2015 public

procurements financed with EU funds compared to non-EU financed ones were delivered at a higher corruption level (F2.5.5.).

18. It can be observed how the way the EU funds were spent in Hungary had a negative impact on the Hungarian economy in three fields in the period of 2009-2015. Public procurements financed by the EU

- (i) increased the corruption risks of public procurement;
- (ii) they decreased competition intensity;
- (iii) they enhanced the rate of overpricing within the Hungarian public procurement.

19. The public procurement data provided the opportunity to examine some aspects of crony capitalism in Hungarian public procurement¹¹. To analyse this we have chosen four businessmen close to the Hungarian Prime Minister, Viktor Orbán. These four people have very close friendship or relationship with Orbán: Lőrincz Mészáros, the mayor in Felcsút (the village where Orbán was a child) and a close friend from their childhood¹²; István Garancsi, a close friend of Orbán¹³; István Tiborcz, the son-in-law of Orbán¹⁴; and finally Lajos Simicska¹⁵, formal university roommate of the Hungarian PM.

To analyse the possible effect of politically connected individuals on public procurement, in our database we constructed a dummy variable (CRONY_MGTS) which has value of 1 if one of the four persons' company won a contract during the examined period (2009-2015), and 0 otherwise. First we collected names of all the companies owned by the CRONY_MGTS group and then we coded this information into our database¹⁶. We found a total of 66 companies owned at least by one person of the CRONY_MGTS group (Table A3.1.) And those companies won altogether 441 contracts during the whole period (Table A2.1.).

According to our null-hypothesis the contracts won by the CRONY_MGTS group have the same characteristics that other public procurement contracts have in terms of competitive intensity, price distortion, and EU funding. This means that political favouritism cannot be detected between 2009-2015 in the Hungarian

¹¹ For the first analysis of the existence of political favouritism in the Hungarian public procurement see Koren, Miklós – Szeidl, Ádám (2014): *Bebizonyítjuk a közbeszerzési mutyit* (We demonstrate the corruption in public procurement). <http://bit.ly/1UBE5wB> and Fazekas, Mihály – Tóth, István János (2014): *Egyet előre, kettőt hátra, avagy ilyen a korrupció Magyarországon* (Step forward, two steps backwards, or such is the corruption in Hungary) <http://bit.ly/21zZW8I>. See also Kondor Péter–Koren Miklós–Pál Jenő–Szeidl Ádám (2014): *Cégek kapcsolati hálózatainak gazdasági szerepe* (The economic role of the networks of connections possessed by firms), *Közgazdasági Szemle*, Vol. LXI. November, 2014, pp. 1341–1360. <http://bit.ly/1rwj2A3> and Fazekas, M. – Tóth, I. J. (2016): *From Corruption to State Capture A New Analytical Framework with Empirical Applications from Hungary*, *Political Research Quarterly*, March 24, 2016 (under publication).

¹² See <http://bit.ly/21zN0Qc> and <http://bit.ly/1q1Mf4A>.

¹³ See <http://bit.ly/24zC9rn>.

¹⁴ See <http://bit.ly/1C6RxRo>.

¹⁵ See <http://econ.st/1y5dvvW>.

¹⁶ We would like to thank the help of Direkt36's team in the work of data collection.

public procurement with these indicators and in case of the CRONY_MGTS group. The largest number of public procurement won by the CRONY_MGTS' companies have occurred in the period 2009-2014 (0.5% of the total number of contracts). In 2015 the number of public procurement won by the Simicska's group significantly decreased compared to other companies of the CRONY_MGTS group– a result of the fact that Simicska and Orban broke up in February 2014¹⁷ and then the Hungarian government began to force Simicska's firms out of the markets in which they had a significant share until then. This year the companies owned by Tiborcz (Orbán's son-in-law) have been the most successful subgroups in the CRONY_MGTS's companies (F2.7.1., F2.7.2.)

20. The results show that the CRONY_MGTS' companies like to apply for and to win public procurement supported by the EU (F2.7.6). During the whole period the share of EU funded public procurement in all procurement won by this group was significantly higher (50-71%) than tenders won by other companies (30-40%) in the public procurement.

21. The analysis of competitive intensity shows that in tenders won by CRONY_MGTS firms during the whole period had weaker competition than in tenders won by other companies (F2.7.3.). When the CRONY_MGTS companies won a tender, they generally would be able to win at a lower competitive intensity.

On the one hand, the lower competitive intensity at tenders won by cronies is a sign of political favouritism. It is not merely because of chance that the competition intensity was low in a public procurement where MGTS_CRONY companies were involved, but because the low competitive intensity was created during the tender procedure precisely because the crony companies could more likely to be able to win.

On the other hand, the crony companies were significantly more frequent winners at tenders, which are characterized by the lack of competition (tenders with single bidder). It also provides evidence for the presence of political favouritism (F.2.7.4.).

Finally, the analysis of contract prices shows that a slightly higher price distortion is observed in contracts won by crony companies than by other ones (F2.6.1.).

22. Therefore, based on our results of the analysis of public procurement tenders in the period 2009-2019 we should reject our initial hypothesis about the lack of political favouritism in the Hungarian public procurement.

23. We detected some negative characteristics of public procurement financed by the EU (high probability of lack of competition, less competitive intensity, less transparency and consequently higher corruption risks, and finally greater level of price distortion); we also discovered that the crony companies liked to get involved in and win public procurement financed by the EU; and the public procurement won by crony companies (CRONY_MGTS companies) can be

¹⁷ See <http://econ.st/1y5dvvW>

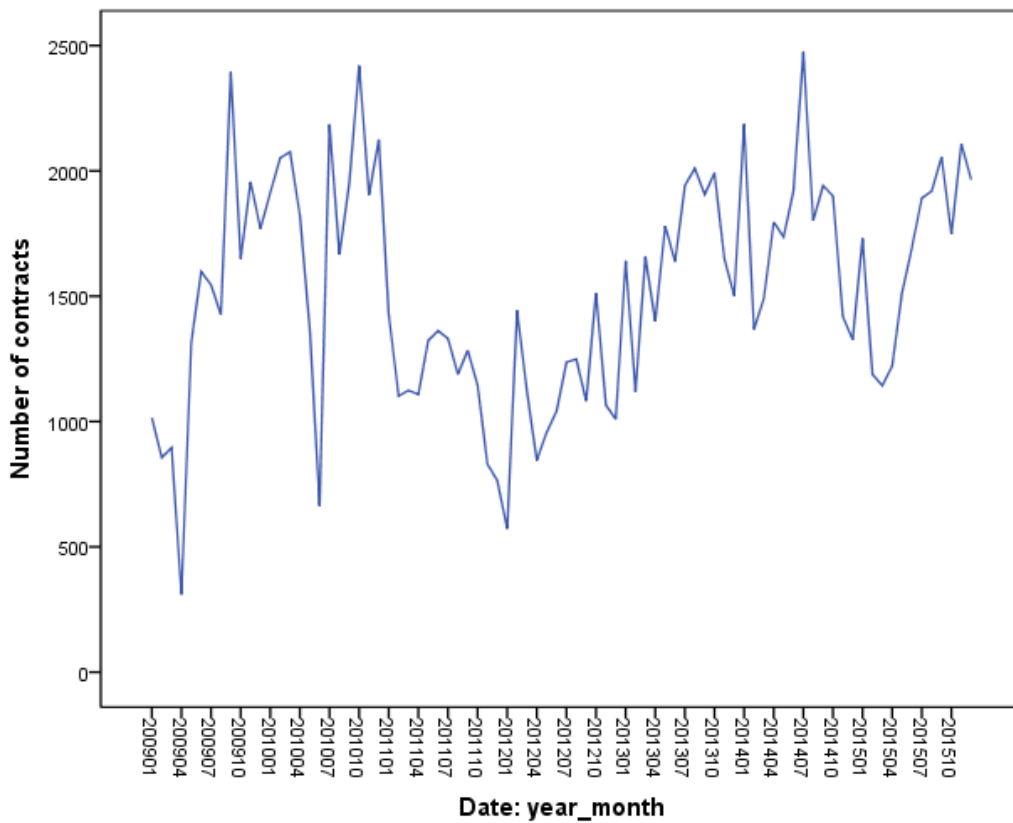
described with similar characteristics, such as the EU financed ones.

These results indicate a very special scenario: the practice of spending of the EU funds by public procurement in Hungary has probably a positive effect, i.e. it helps the convergence of the Hungarian economy with the EU countries, but - as a perverse effect - it results in the emergence and reinforcement of the economic model of crony capitalism as well.

2. Tables & Figures

2.1. Hungarian Public Procurement 2009-2015 – main statistics

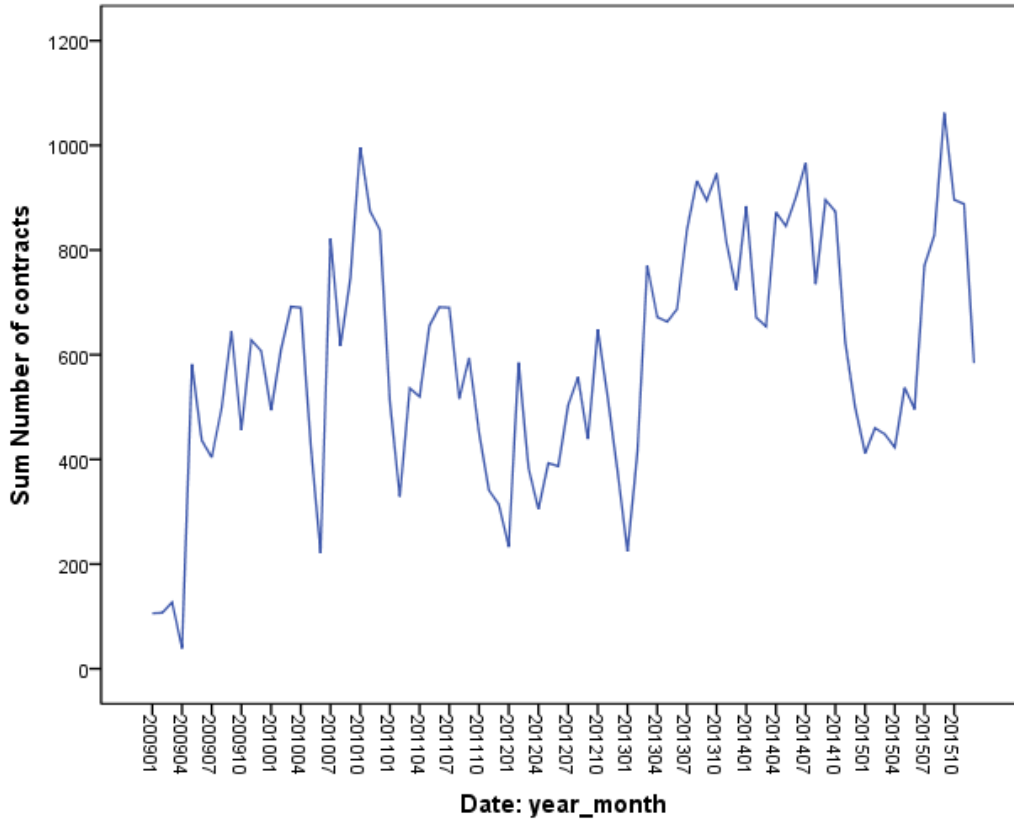
Figure 2.1.1.: Number of public procurement announcements in Hungary 2009-2015, N = 127,776



Note: data are filtered by goodc15

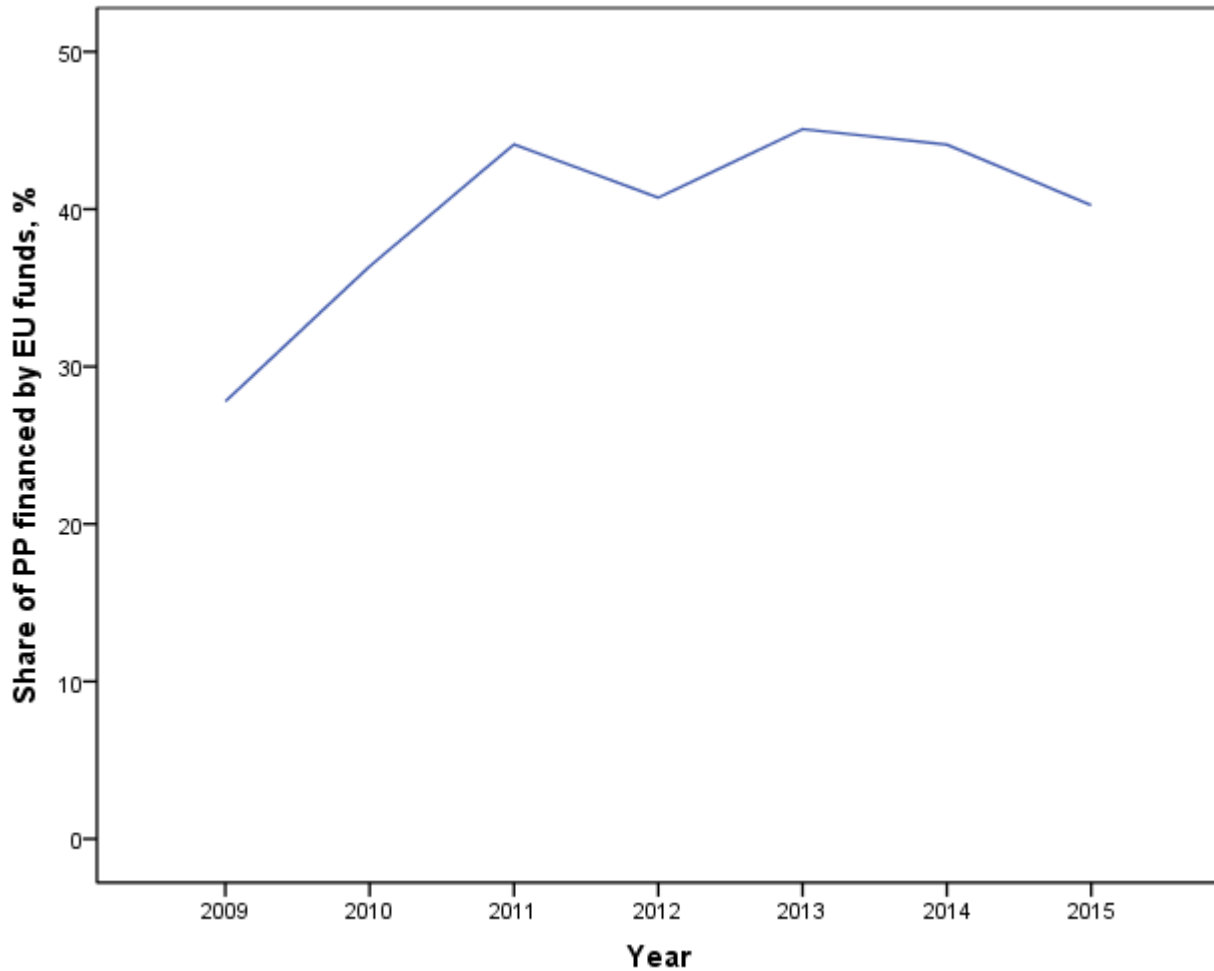
Source: CRCB

Figure 2.1.2.: Number of public procurement announcements in Hungary financed by the EU, 2009-2015, N = 49,946



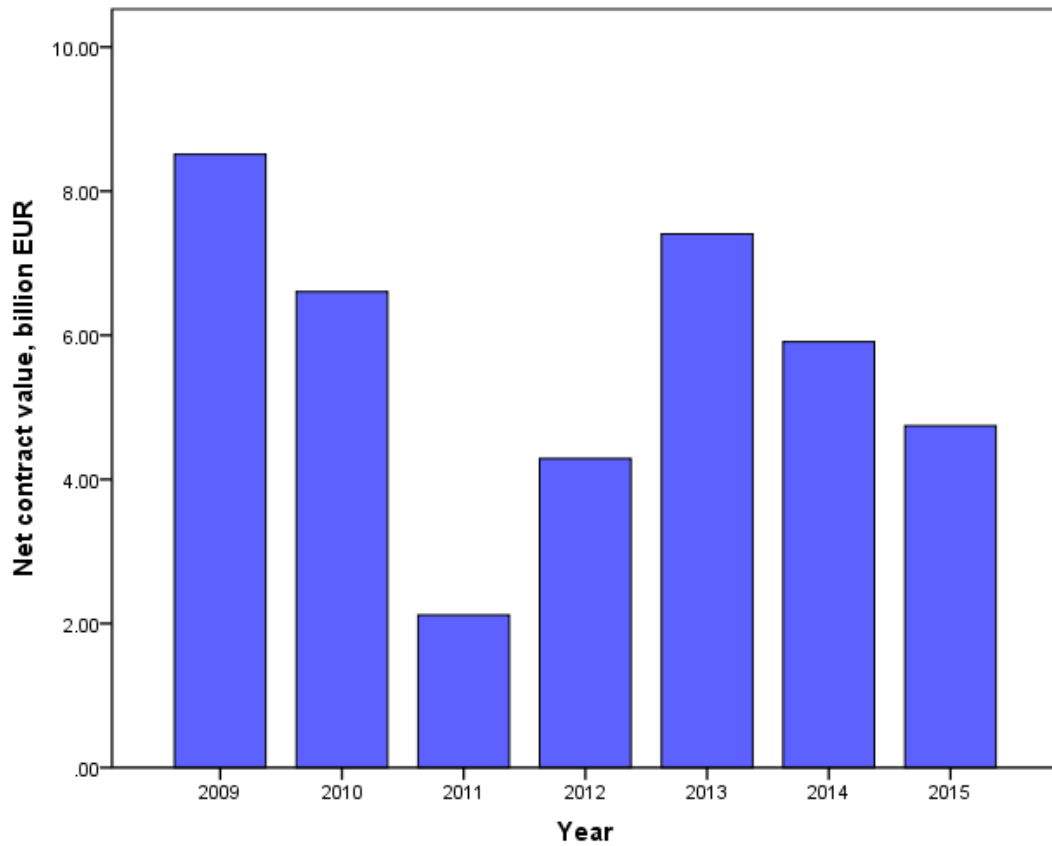
Note: data are filtered by goodc15
Source: CRCB

Figure 2.1.3.: Share of EU financed public procurement tenders in total Hungarian public procurement tenders, %, 2009-2015, N = 125,555



Note: data are filtered by goodc15
Source: CRCB

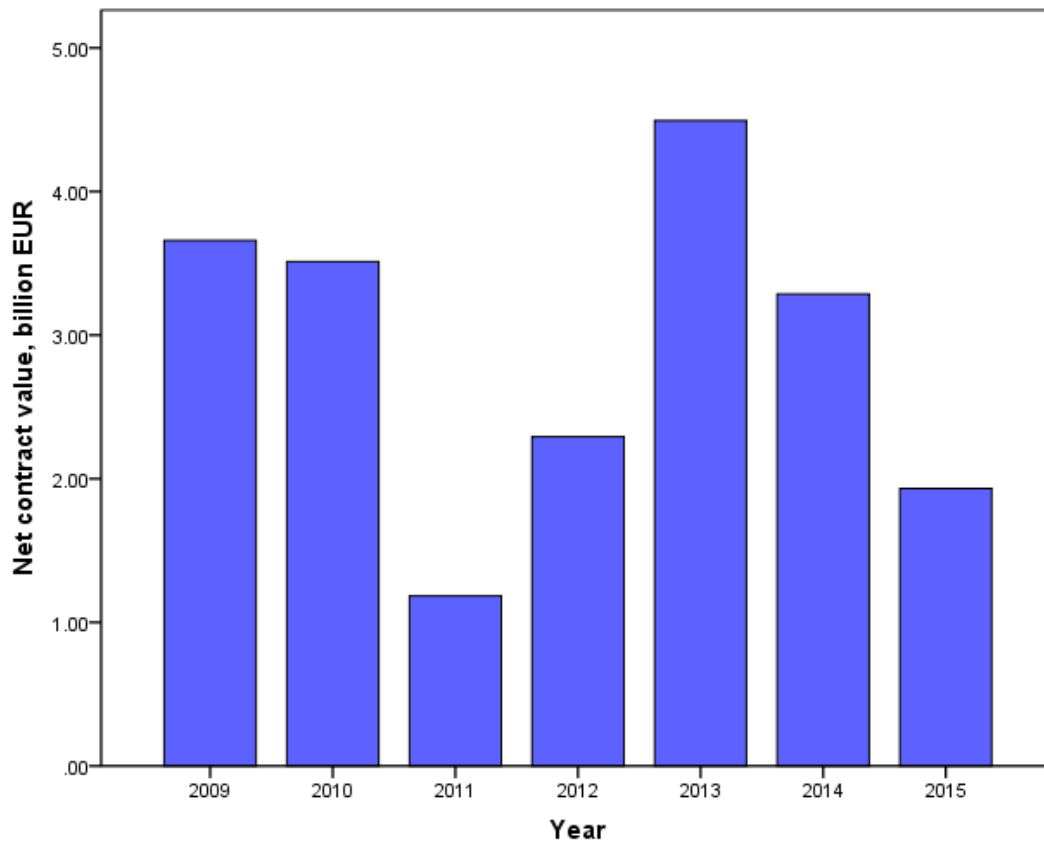
Figure 2.1.4.: Net contract value of Hungarian public procurement by year, in billion EUR, 2009-2015, N = 123,224



Note: data are filtered by goodc15; we excluded the contracts with unit prices and framework agreements

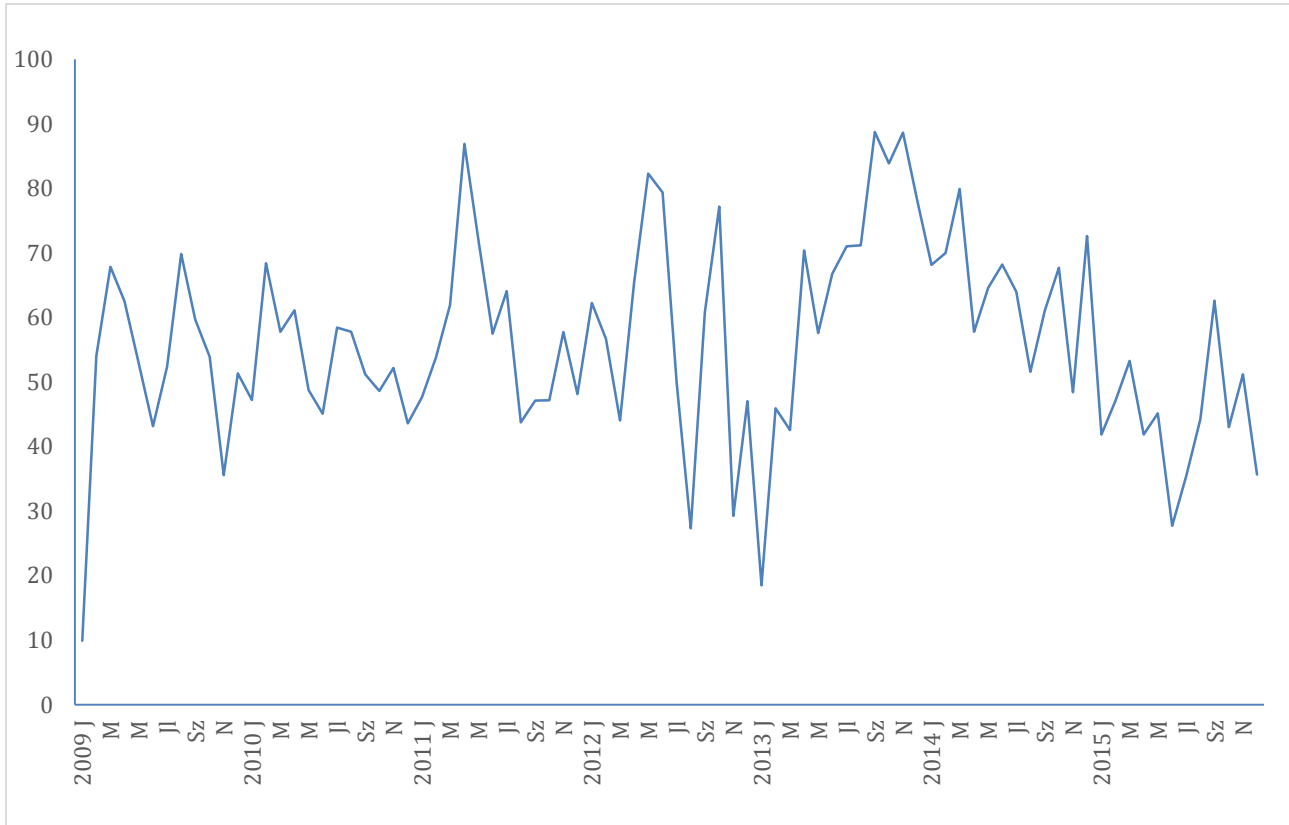
Source: CRCB

Figure 2.1.5.: Net contract value of Hungarian public procurement financed by EU, in billion EUR, 2009-2015, N = 49,946



Note: data are filtered by goodc15; we excluded the contracts with unit prices and framework agreements
Source: CRCB

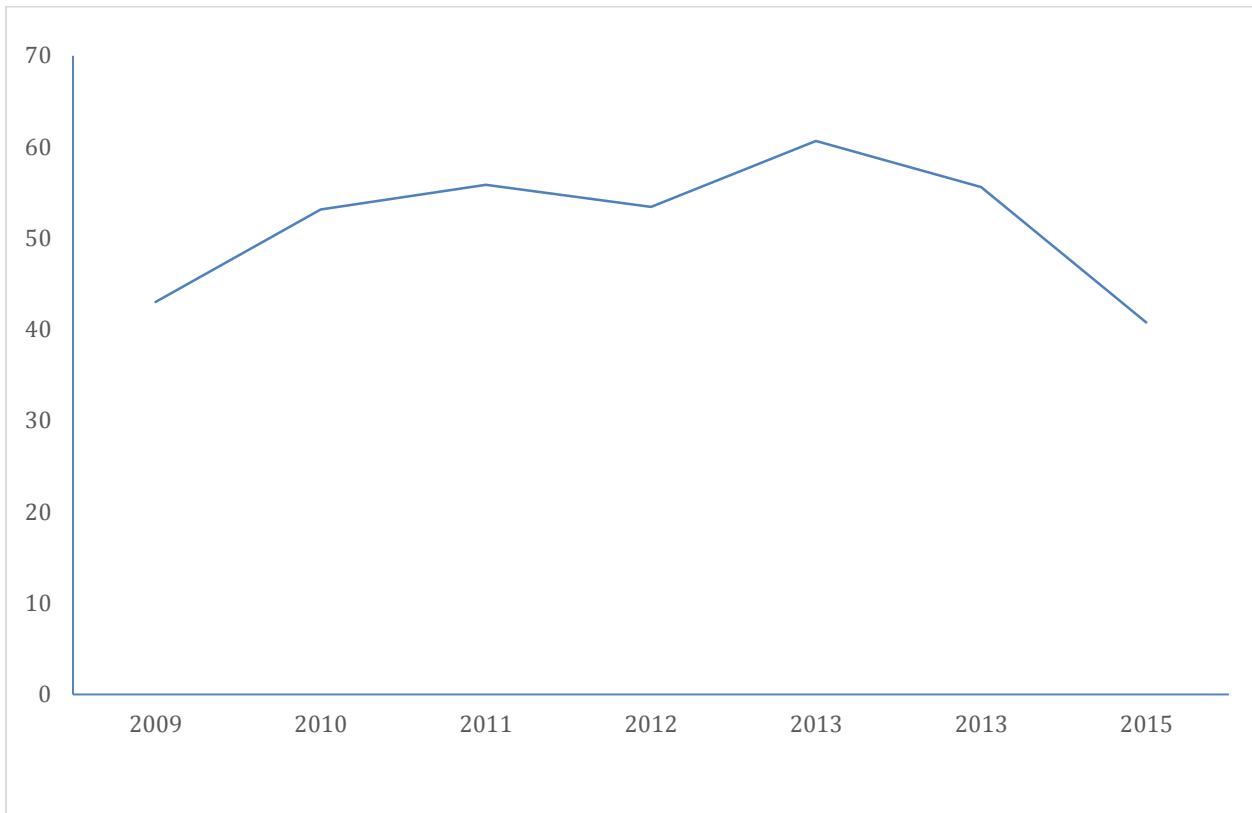
Figure: 2.1.6.: Share of net contract value of PP financed by the EU in total contract value, %, monthly data, 2009-2015, N=123,224



Note: data are filtered by goodc15; we excluded the contracts with unit prices and framework agreements

Source: CRCB

Figure 2.1.7.: Share of net contract value of public procurement financed by the EU in total contract value by year, %, 2009-2015, N=123,224



Note: data are filtered by goodc15; we excluded the contracts with unit prices and framework agreements

Source: CRCB

Table 2.1.1a.: Hungarian Public Procurement, 2009-2015, summary statistics

Groups of contracts	2009	2010	2011	2012	2013	2014	2015	Total
Number of record in the entire dataset	23442	31124	18668	19156	27620	29357	29143	178510
Total number of winners (goodw15=1)	17486	22919	14472	14017	21866	22895	21645	135300
Total number of contracts (goodc15=1)	16733	22145	13989	13134	20235	21360	20180	127776
Number of contacts with high transparency (goodc15=1 & TI=1)	13708	17899	6130	6114	8809	7974	7434	68069
Number of contracts financed by EU (goodc15=1 & eufund =1)	4635	8028	6149	5330	8578	9420	7806	49946
Number of contract in construction (goodc15=1)	4157	6144	4504	3310	4789	6125	5265	34294
Number of framework agreement (frwaggr=1)	3145	3647	1855	2556	2876	3335	4547	21961
Number of contracts with unit price (uprice=1)	120	183	165	296	256	209	188	1417
Number of contracts won by companies in countryside (goodc15=1)	8632	14235	9256	7770	11677	12757	11216	75543
Number of contract with single bidder (goodc15=1 & sb = 1)	5194	7197	3652	3470	5203	6770	6287	37773

Source: CRCB

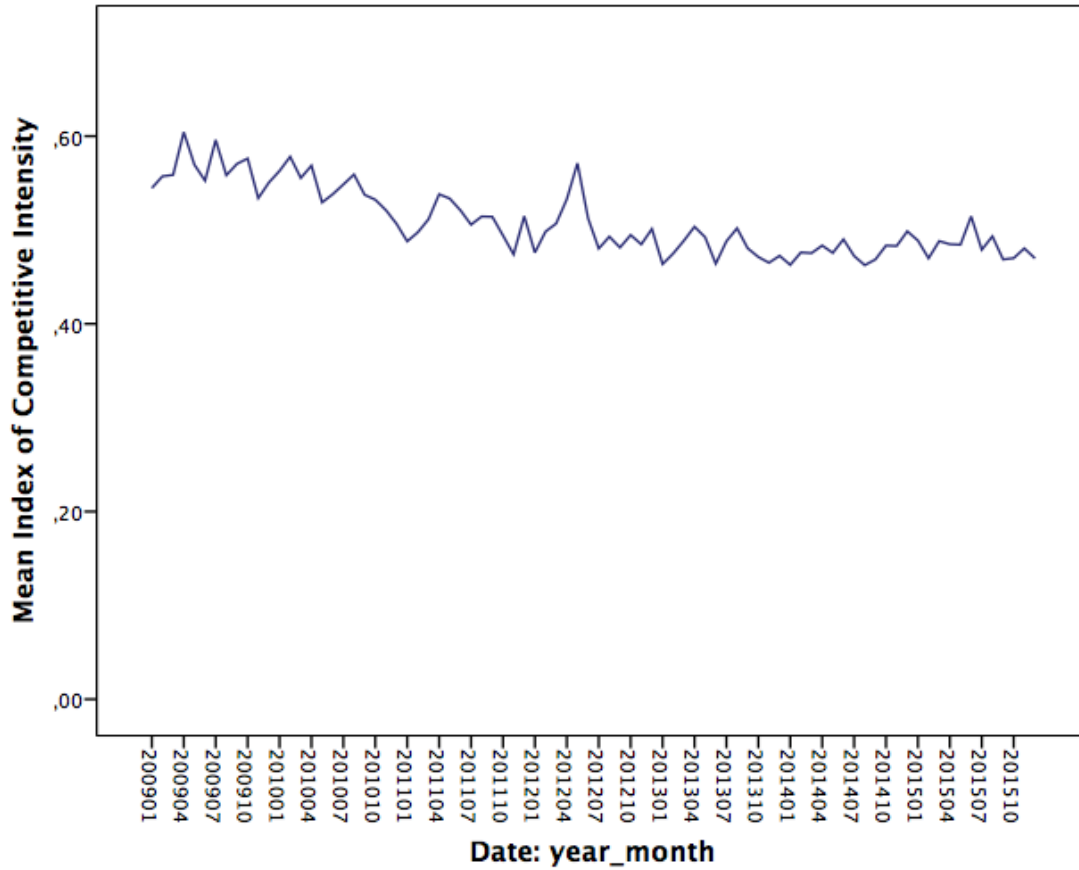
Table 2.1.1b.: Hungarian Public Procurement 2009-2015, summary statistics

	2009	2010	2011	2012	2013	2014	2015	Total
Total net contract value (net, bill. EUR, goodc15=1)	2638	2048	657	1330	2296	1832	1470	12271
Total net contract value with transparent procedures, (bill. EUR, goodc15=1)	2286	1690	465	997	1909	1402	954	9703
Total net contract value in pp financed by EU (bill. EUR, goodc15=1)	1134	1089	367	711	1393	1018	599	6311
Total net contract value in construction (bill. EUR, goodc15=1)	1278	1065	368	660	1330	967	671	6338
Total net contract value in procedures with single bidder (net, bill. EUR, goodc15=1)	1003	645	174	473	711	634	482	4122

Source: CRCB

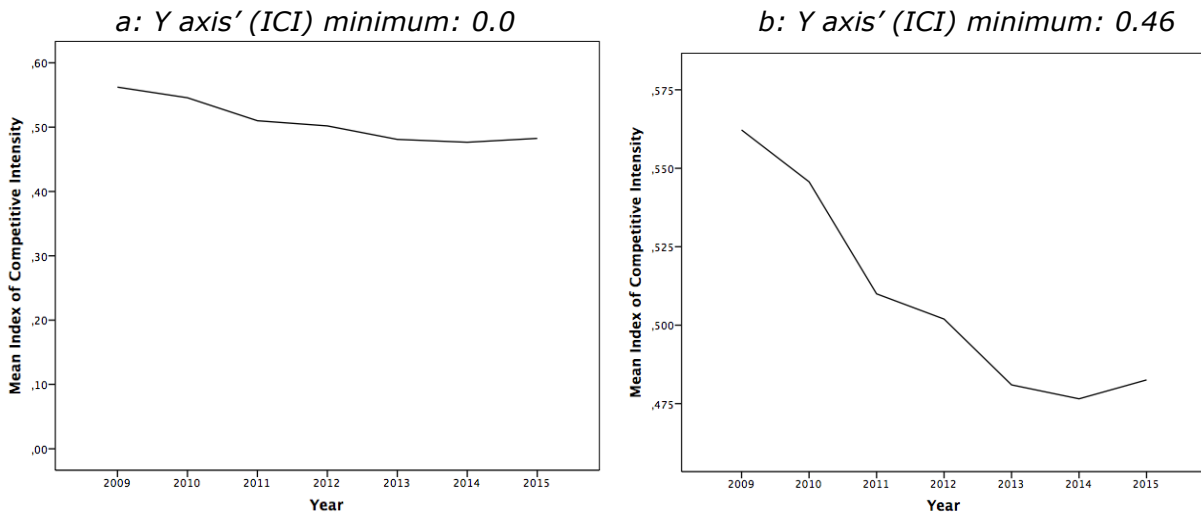
2.2. The Index of Competitive Intensity (ICI)

Figure 2.2.1.: The Index of Competitive Intensity in Hungarian public procurement, monthly data, 2009-2015, N = 88,254



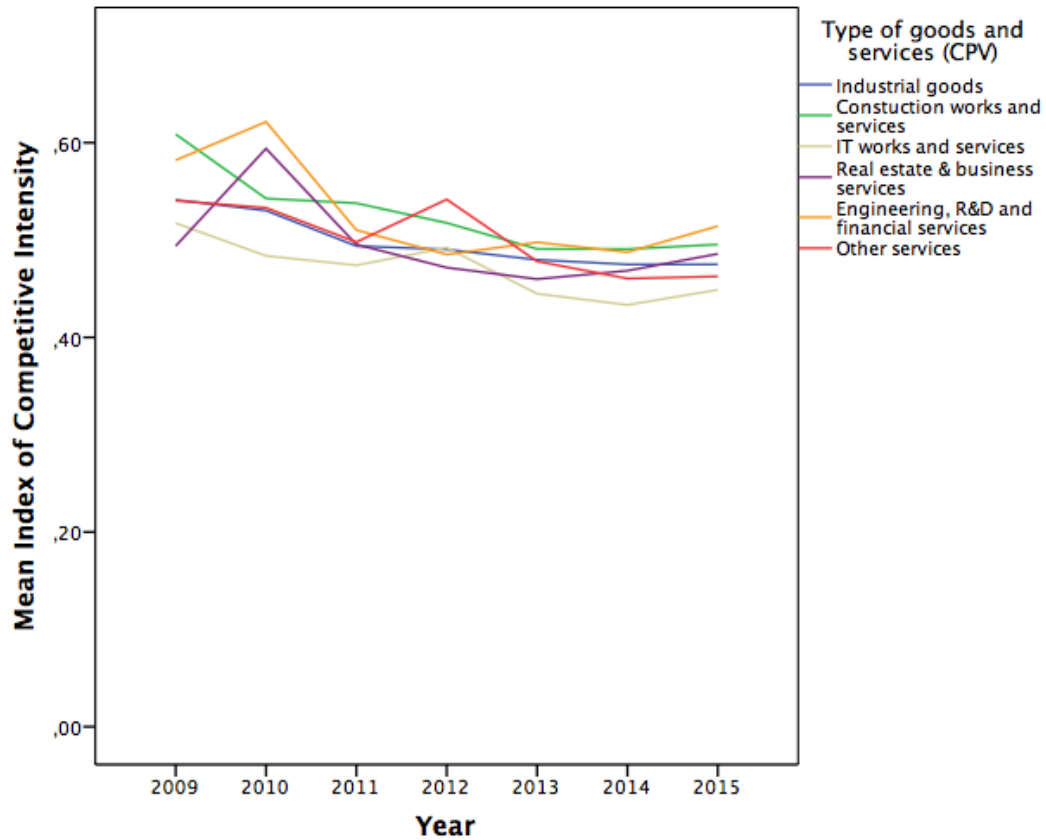
Note: data are filtered by goodc15;
 Source: CRCB

Figure 2.2.2.: The Index of Competitive Intensity (ICI) in the Hungarian public procurement, 2009-2015, yearly data, N = 88,254



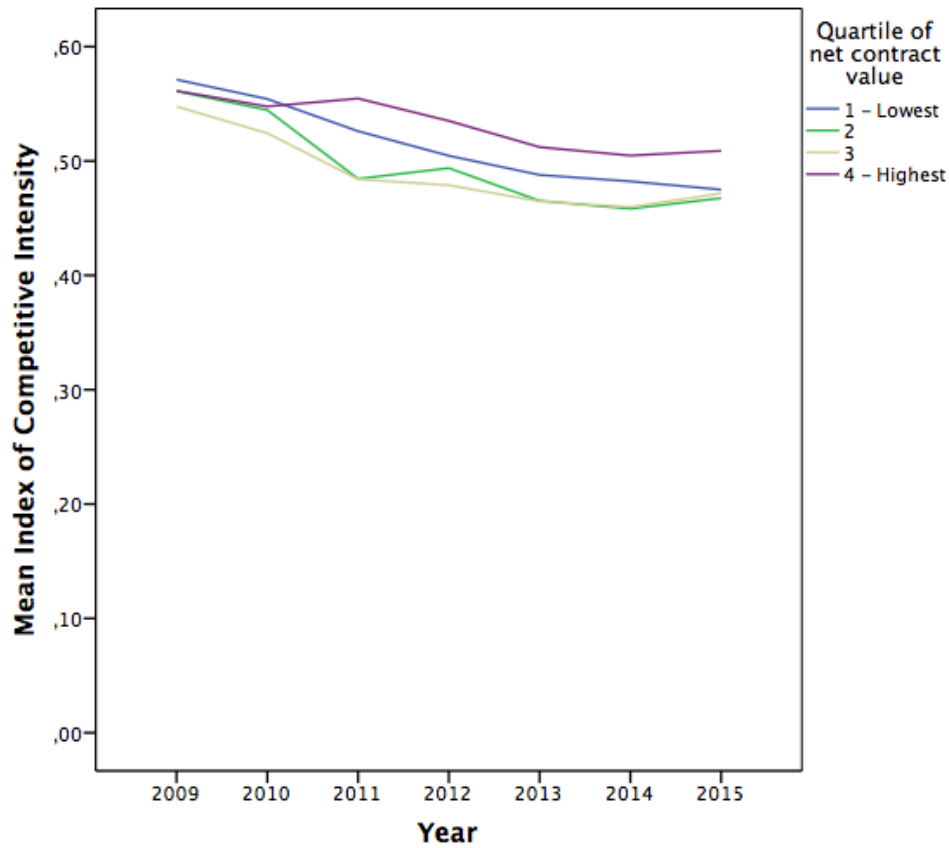
Note: data are filtered by goodc15;
Source: CRCB

Figure 2.2.3. The Index of Competitive Intensity (ICI) in Hungarian public procurement by industry, 2009-2015, yearly data, N = 87,980



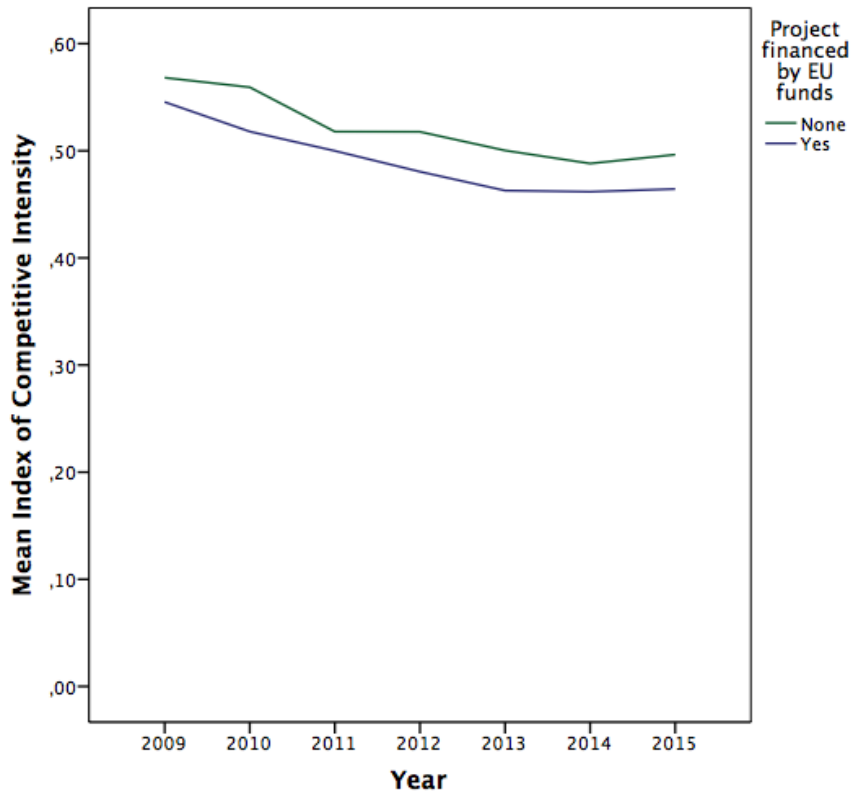
Note: data are filtered by goodc15;
Source: CRCB

Figure 2.2.4.: The Index of Competitive Intensity (ICI) in Hungarian public procurement by quintiles of contract value, 2009-2015, yearly data, N = 81,951



Note: data are filtered by goodc15;
 Source: CRCB

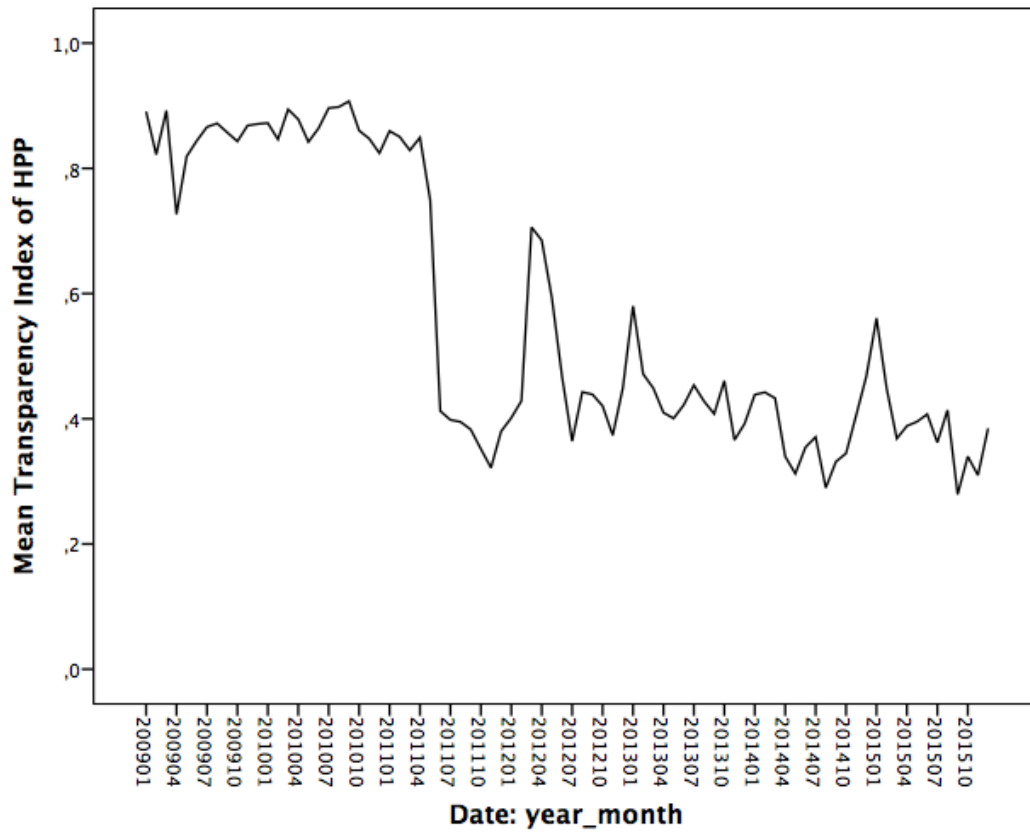
Figure 2.2.5.: The Index of Competitive Intensity (ICI) in Hungarian public procurement in EU funded and non-EU funded tenders, 2009-2015, yearly data, N = 86,722



Note: the data are filtered by goodc15;
Source: CRCB

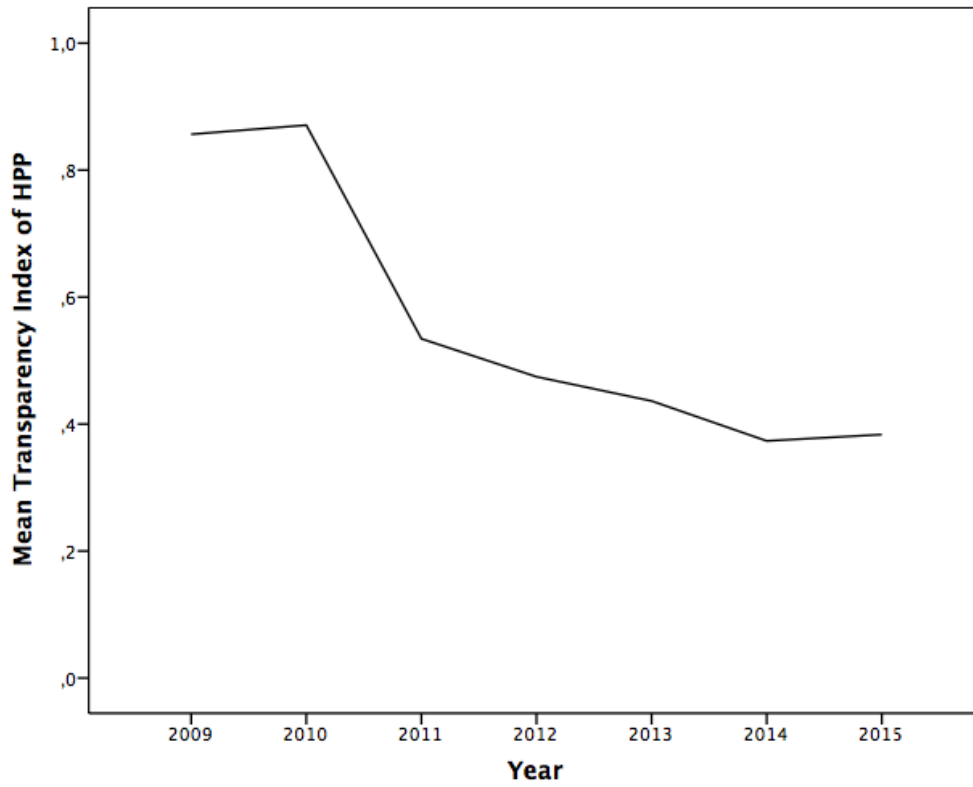
2.3. Transparency of Hungarian Public Procurement

Figure 2.3.1.: The Transparency Index (TI) of Hungarian public procurement, 2009-2015, monthly data, N = 121,849



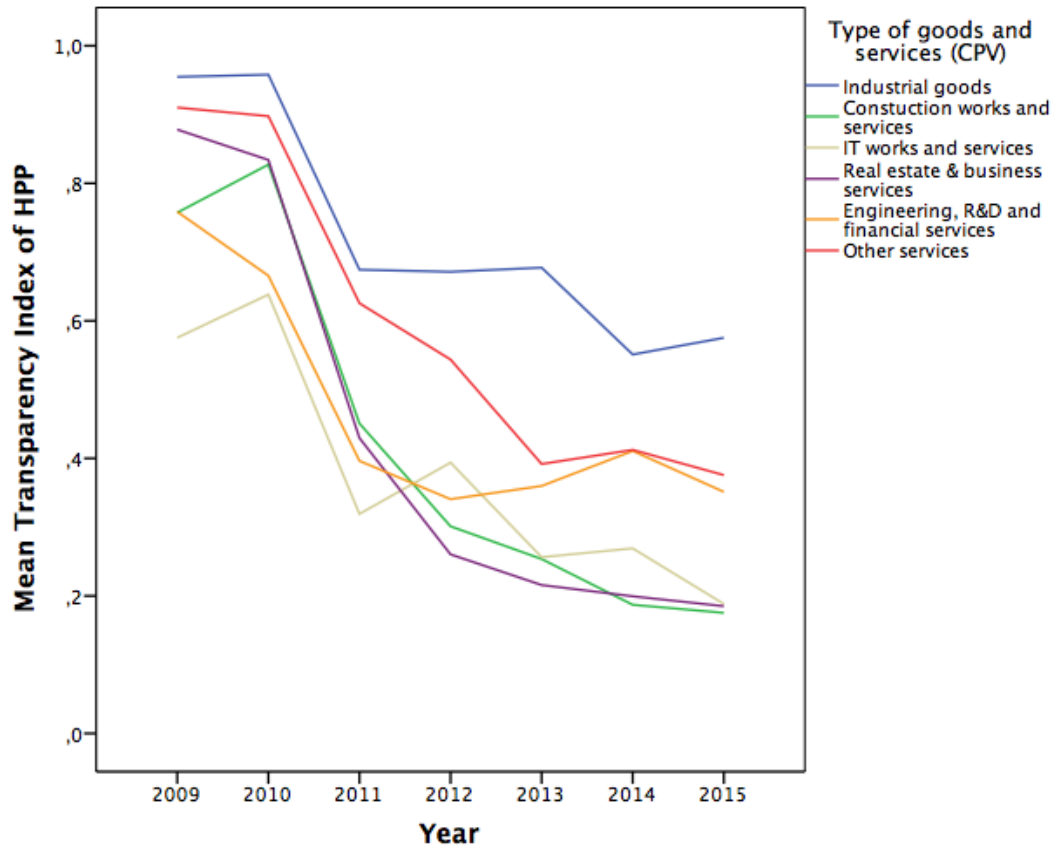
Note: data are filtered by goodc15;
Source: CRCB

Figure 2.3.2.: The Transparency Index (TI) of Hungarian public procurement, 2009-2015, yearly data, N = 121,849



Note: data are filtered by goodc15;
Source: CRCB

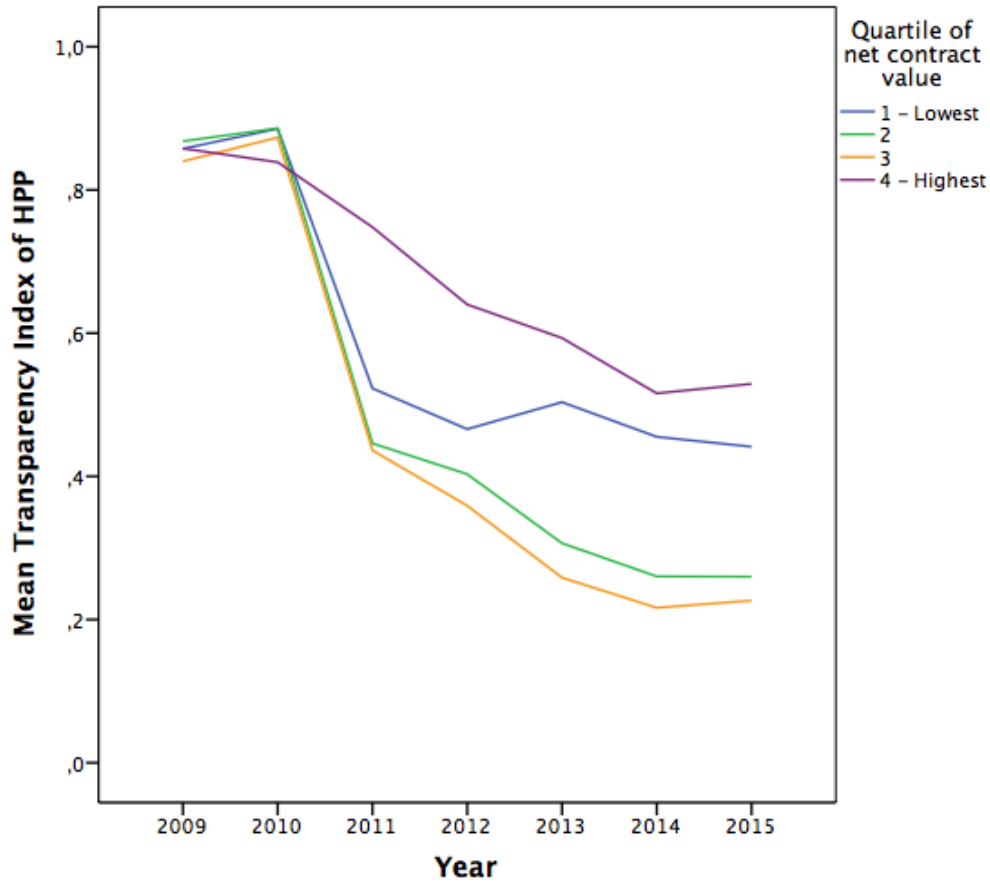
Figure 2.3.3.: The Transparency Index (TI) by industry 2009-2015, yearly data, N = 121,536



Note: data are filtered by goodc15;

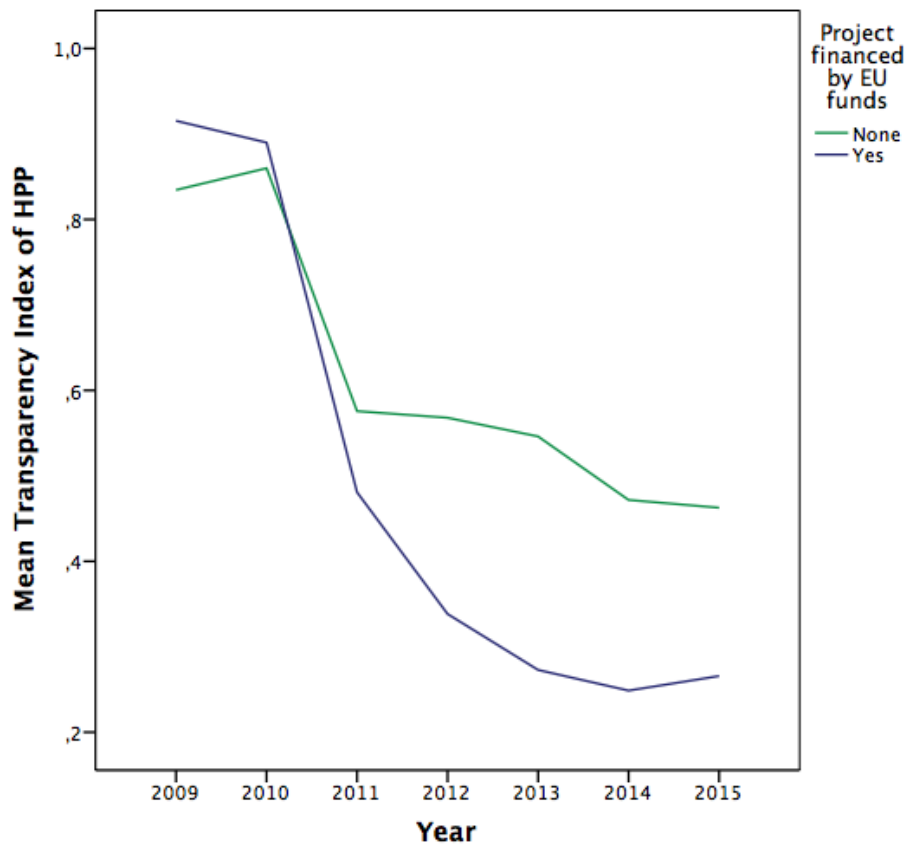
Source: CRCB

Figure 2.3.4.: The Transparency Index (TI) in Hungarian public procurement by quintiles of contract value, 2009-2015, yearly data, N = 111,761



Note: data are filtered by goodc15;
Source: CRCB

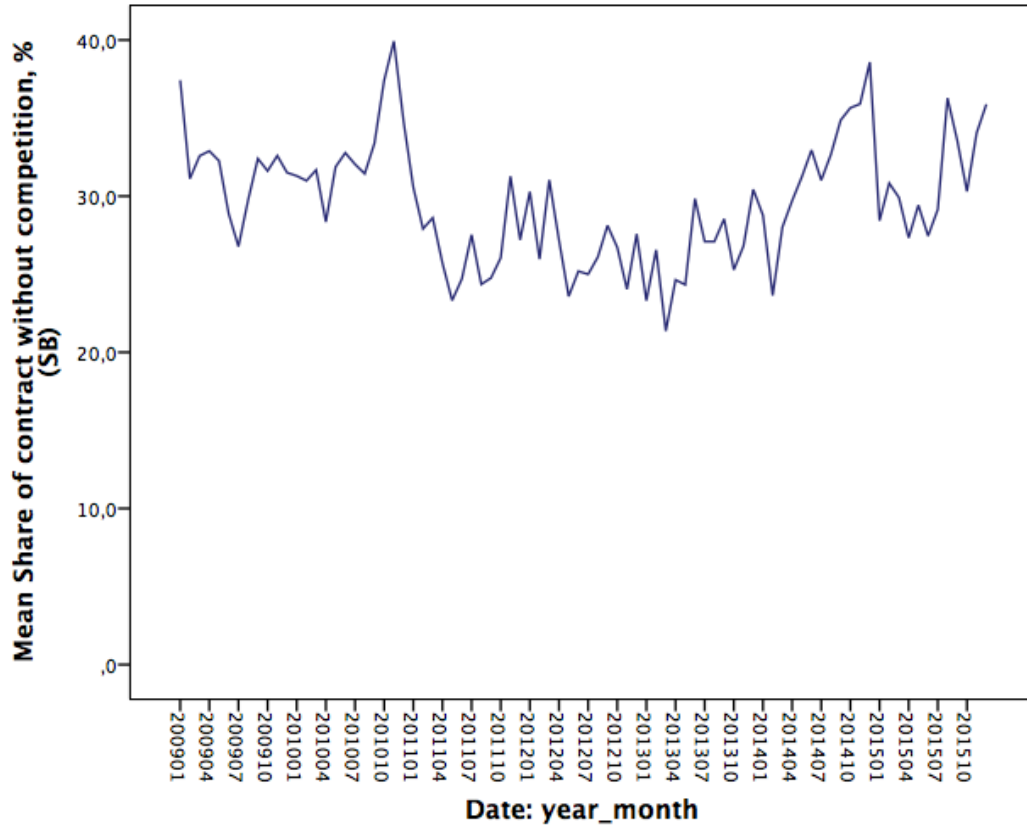
Figure 2.3.5.: The Transparency Index (TI) in Hungarian public procurement in EU funded and non-Eu funded tenders, 2009-2015, yearly data, N = 120,432



Note: data are filtered by goodc15;
Source: CRCB

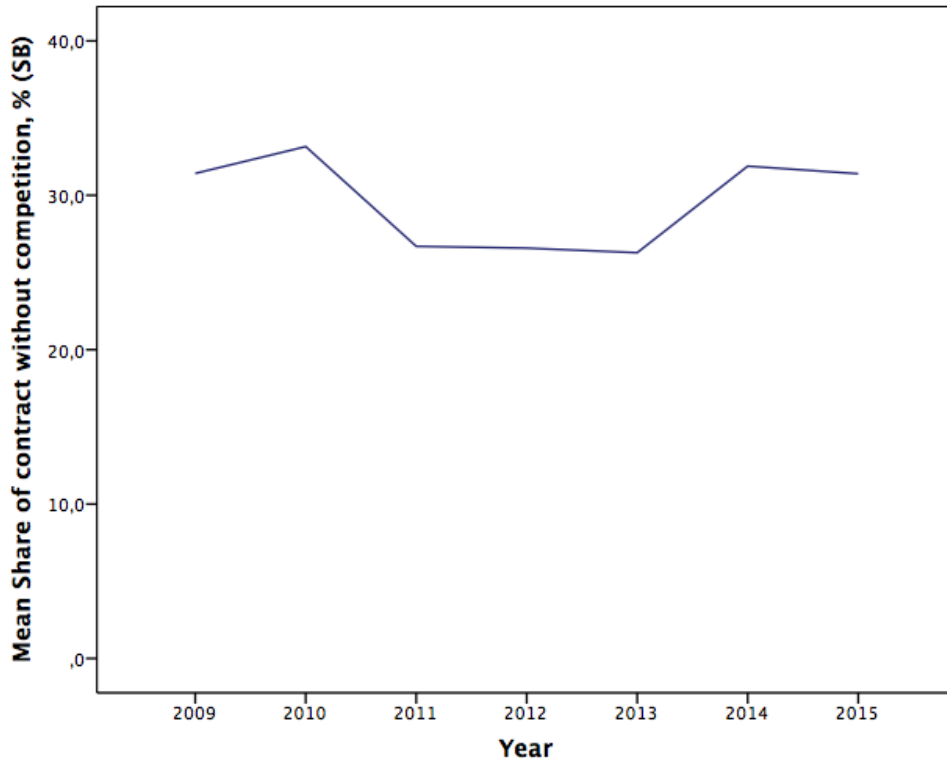
2.4. Procurement without Competition: the Single Bidder (SB)

Figure 2.4.1.: Share of public procurement tenders with Single Bidder (SB) in total number of tenders, 2009-2015, monthly data, N = 127,776



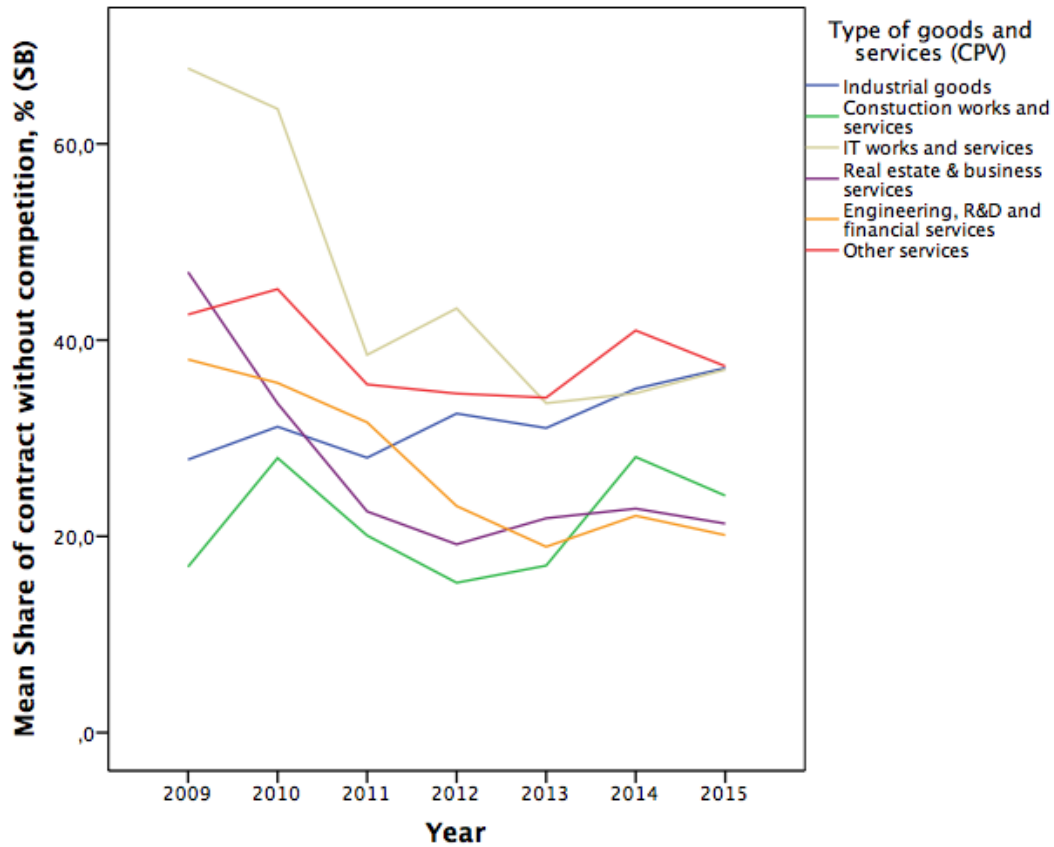
Note data are filtered by goodc15;
 Source: CRCB

Figure 2.4.2.: Share of public procurement tenders with Single Bidder (SB) in total number of tenders, 2009-2015, yearly data, N = 127,776



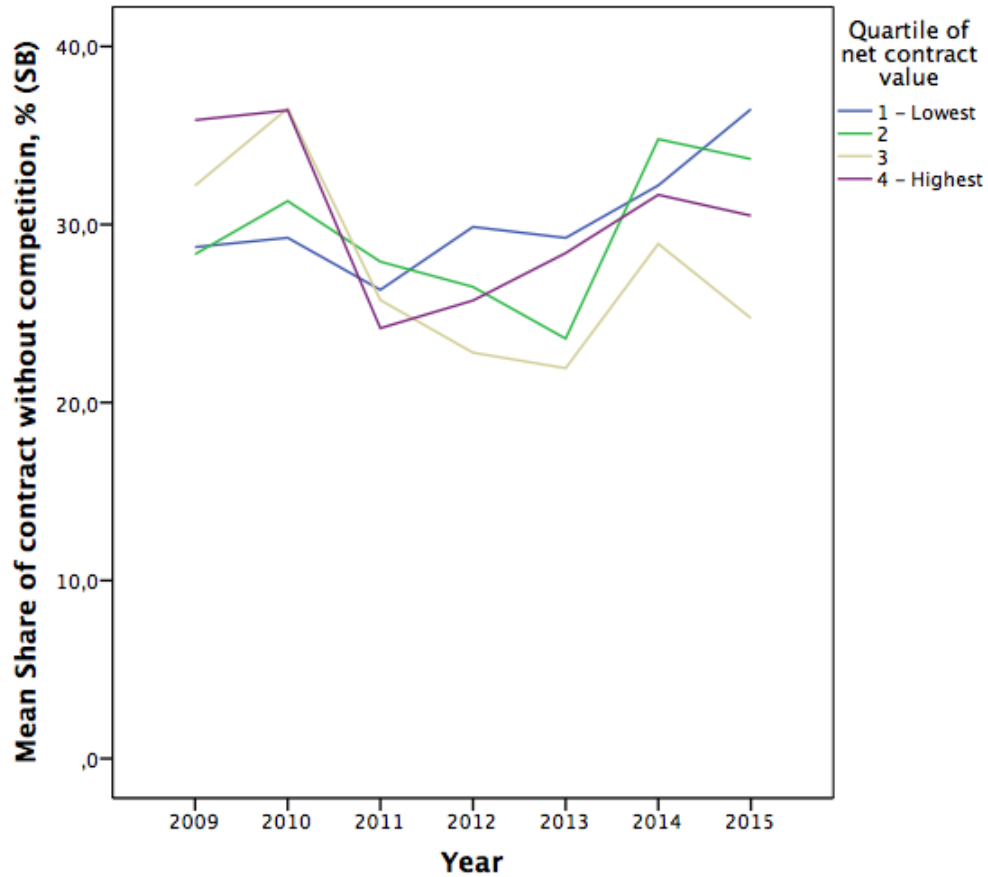
Note: data are filtered by goodc15;
Source: CRCB

Figure 2.4.3.: Share of public procurement tenders with Single Bidder (SB) in total number of tenders by Industry, 2009-2015, yearly data, N = 133,069



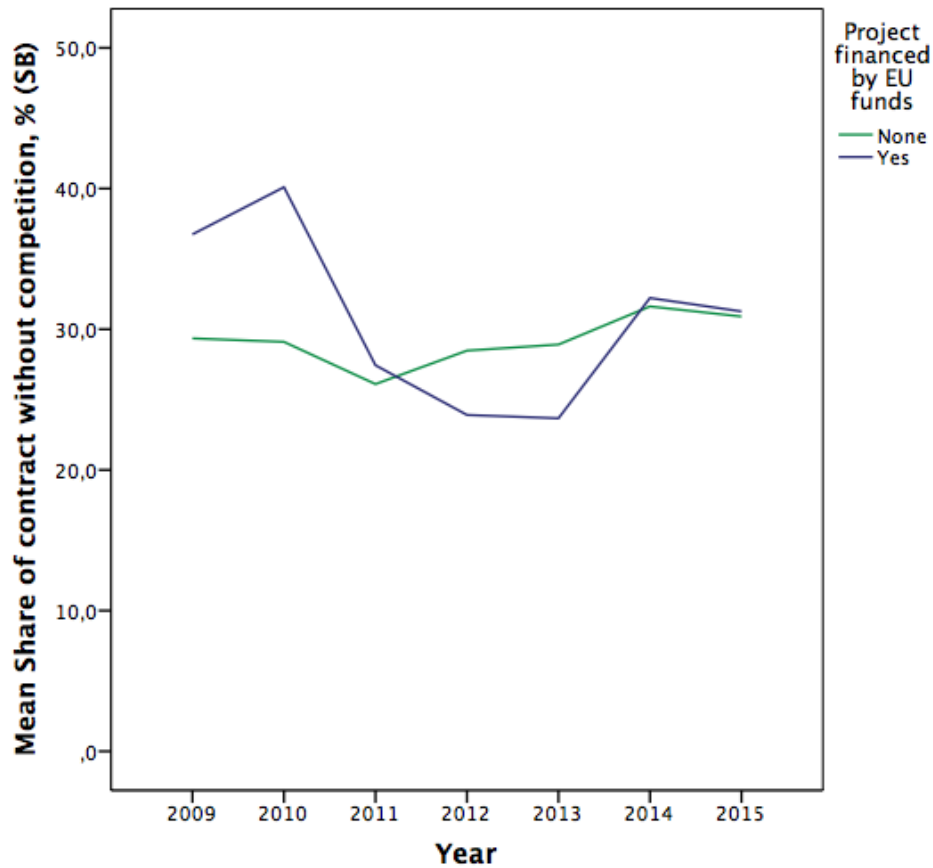
Note: data are filtered by goodc15;
Source: CRCB

Figure 2.4.4.: Share of public procurement tenders with Single Bidder (SB) in total number of tenders by quintiles of contract value, 2009-2015, yearly data, N = 129,888



Note: data are filtered by goodc15;
Source: CRCB

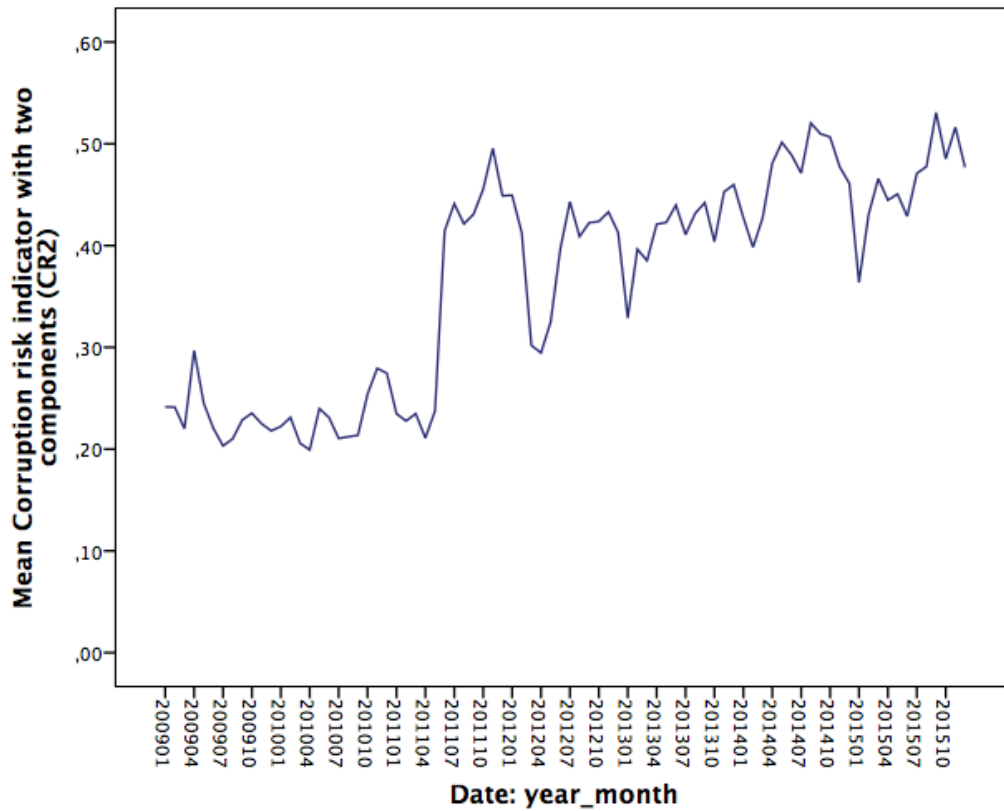
Figure 2.4.5.: Share of public procurement tenders with Single Bidder (SB) in Eu funded and non-EU funded tenders, 2009-2015, yearly data, N = 131,208



Note: data are filtered by goodc15;
Source: CRCB

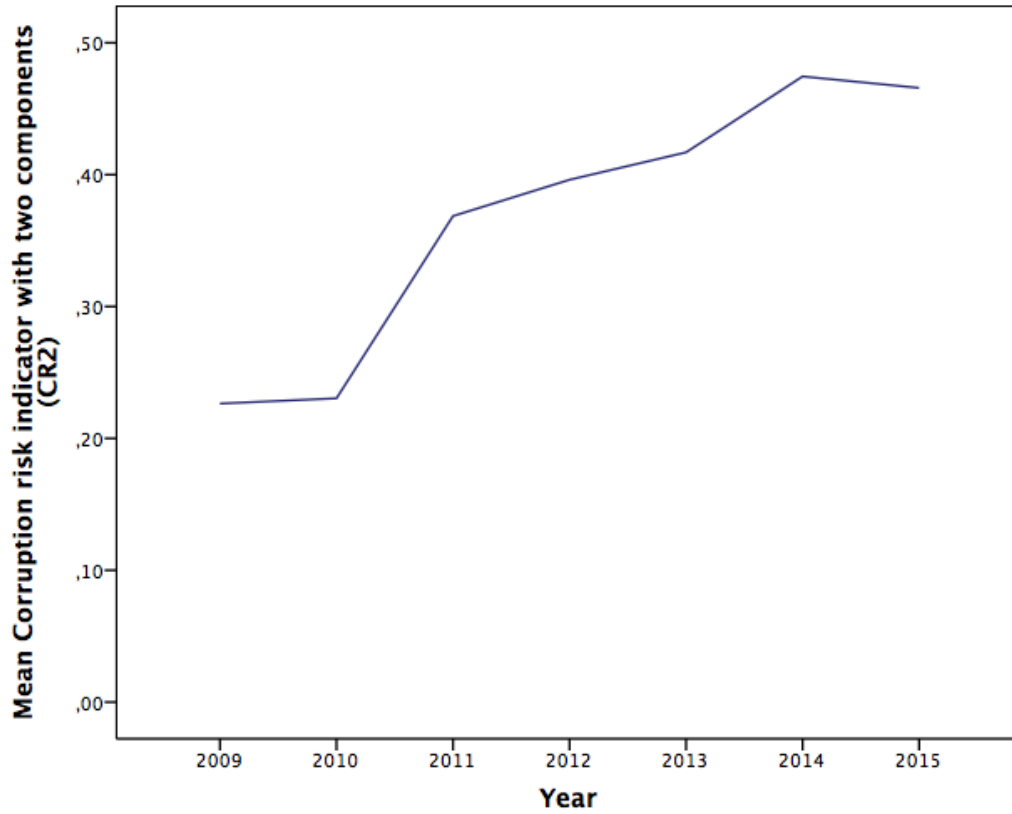
2.5. Corruption Risk Indicator (CR2)

Figure 2.5.1.: The Corruption Risk Indicator (CR2) in Hungarian public procurement (CR2), 2009-2015, monthly data, N = 120,221



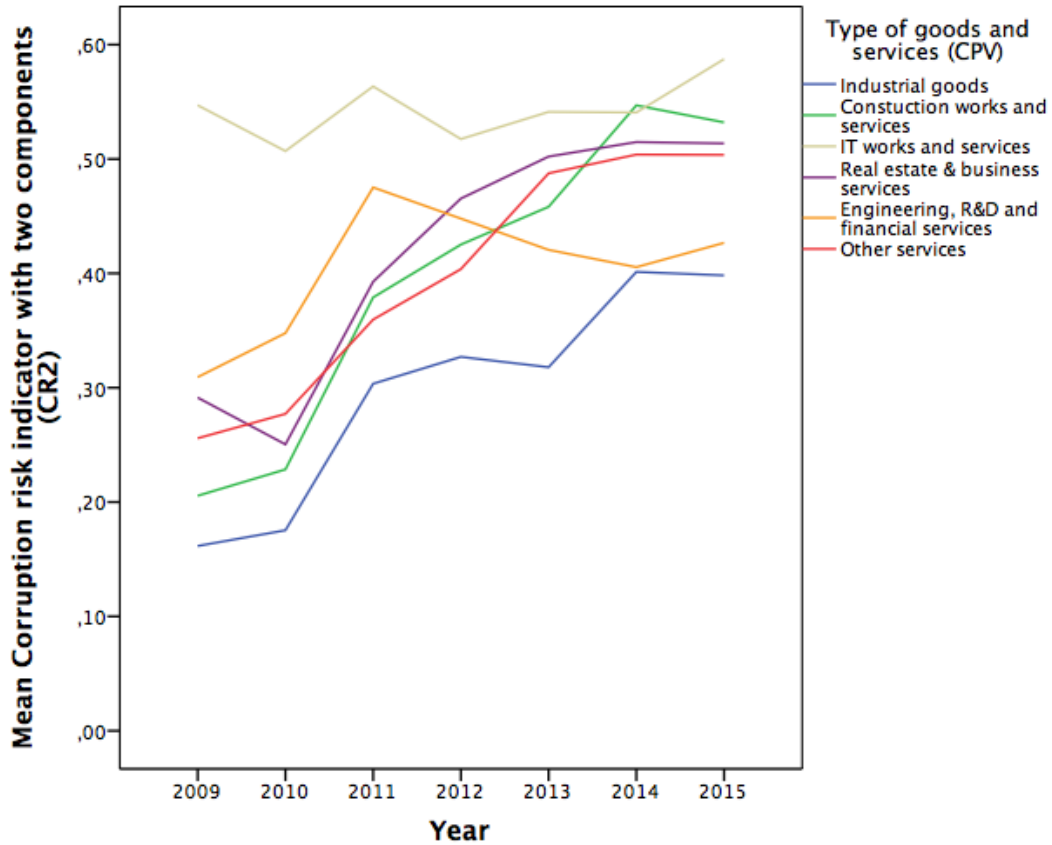
Note: data are filtered by goodc15;
 Source: CRCB

Figure 2.5.2.: The Corruption Risk Indicator (CR2) in Hungarian public procurement (CR2), 2009-2015, yearly data, N = 120,221



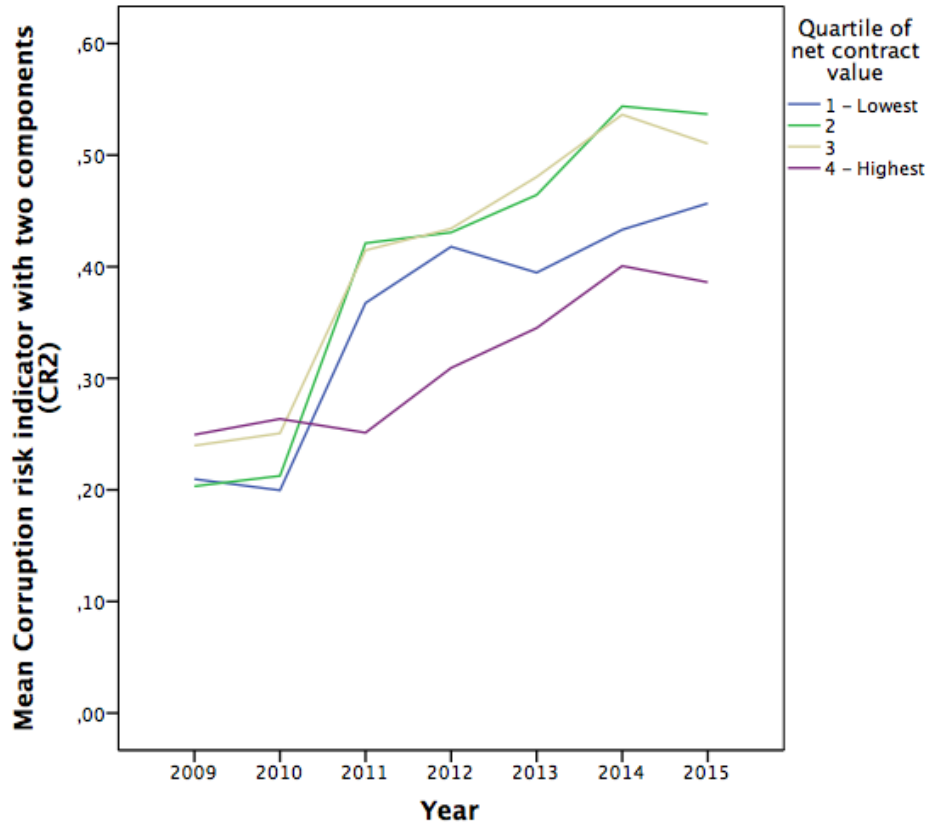
Note: data are filtered by goodc15;
Source: CRCB

Figure 2.5.3.: The Corruption Risk Indicator (CR2) in Hungarian public procurement (CR2) by Industry, 2009-2015, yearly data, N = 119,916



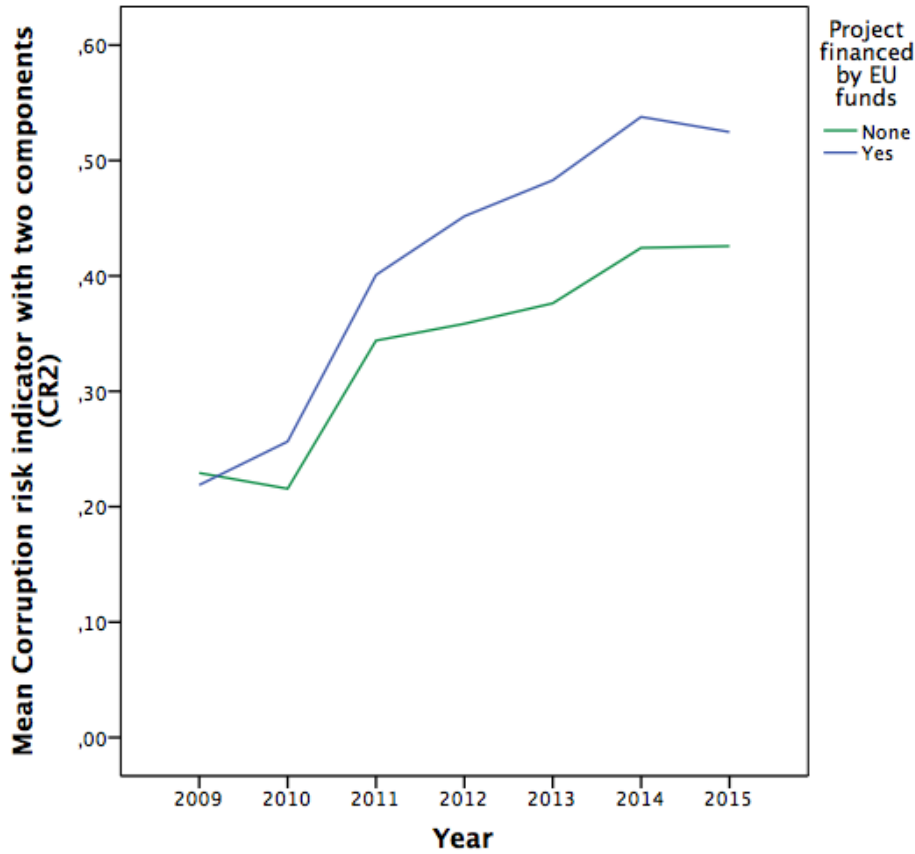
Note: data are filtered by goodc15;
Source: CRCB

Figure 2.5.4.: The Corruption Risk Indicator (CR2) in Hungarian public procurement (CR2) by quintiles of contract value, 2009-2015, yearly data, N = 111,180



Note: data are filtered by goodc15;
Source: CRCB

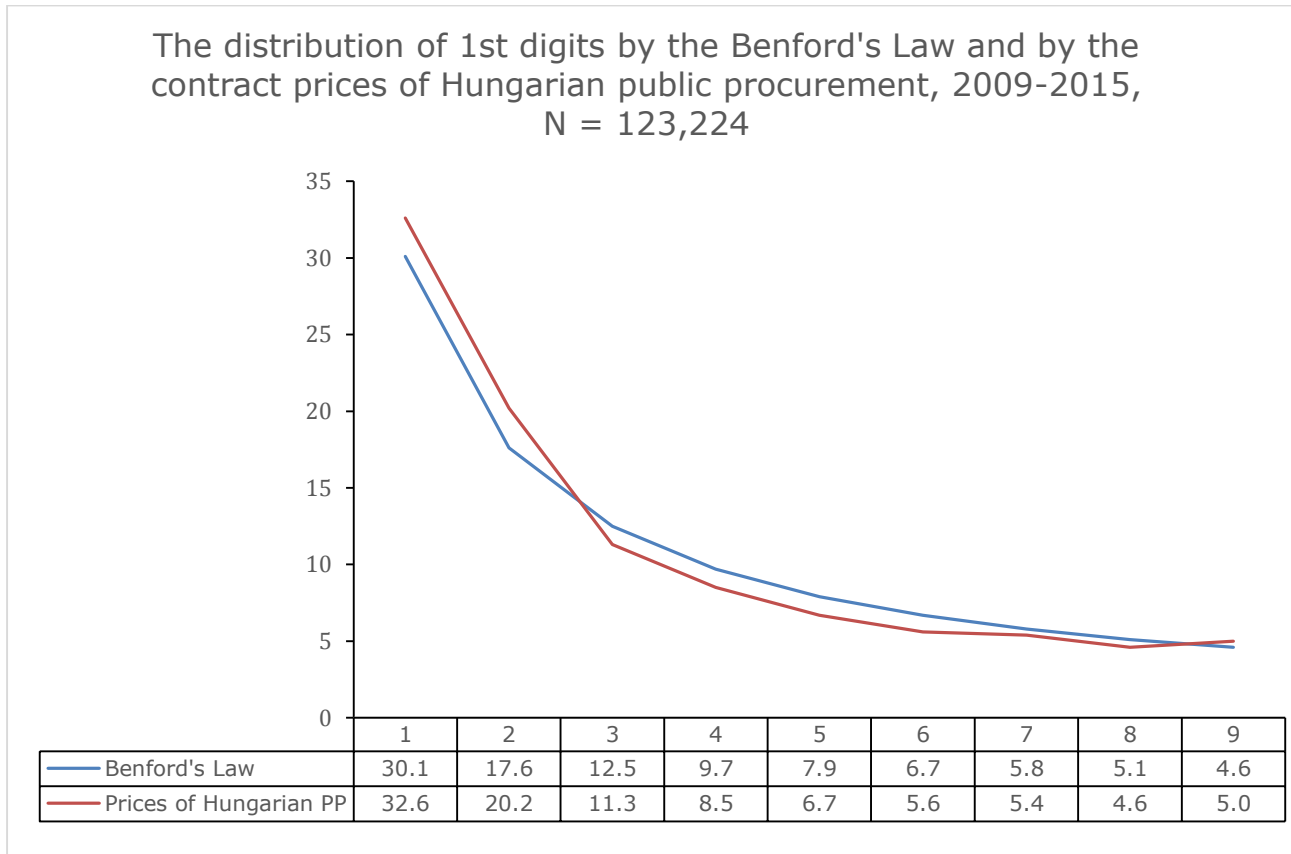
Figure 2.5.5.: The Corruption Risk Indicator (CR2) in Hungarian public procurement (CR2) in EU funded and non-EU funded tenders, 2009-2015, yearly data, N = 118,843



Note: data are filtered by goodc15;
 Source: CRCB

2.6. Price Distortion and Overpricing

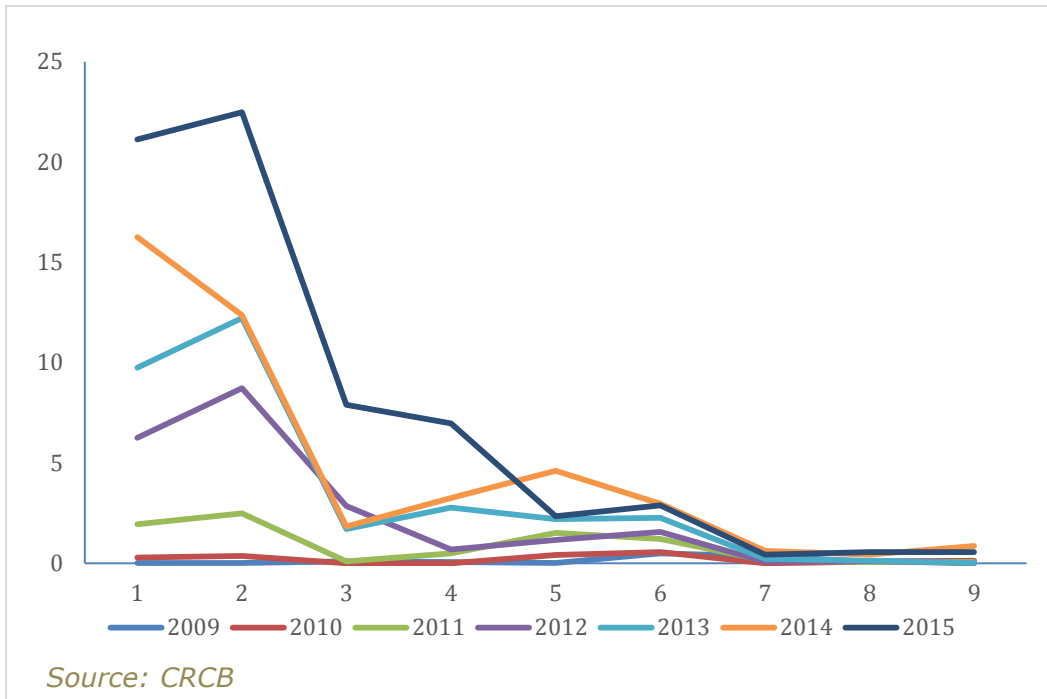
Figure 2.6.1.: The distribution of first digits by the Benford's Law and by the contract prices of Hungarian public procurement, 2009-2015, N = 123,224



Note: Data are filtered by goodc15

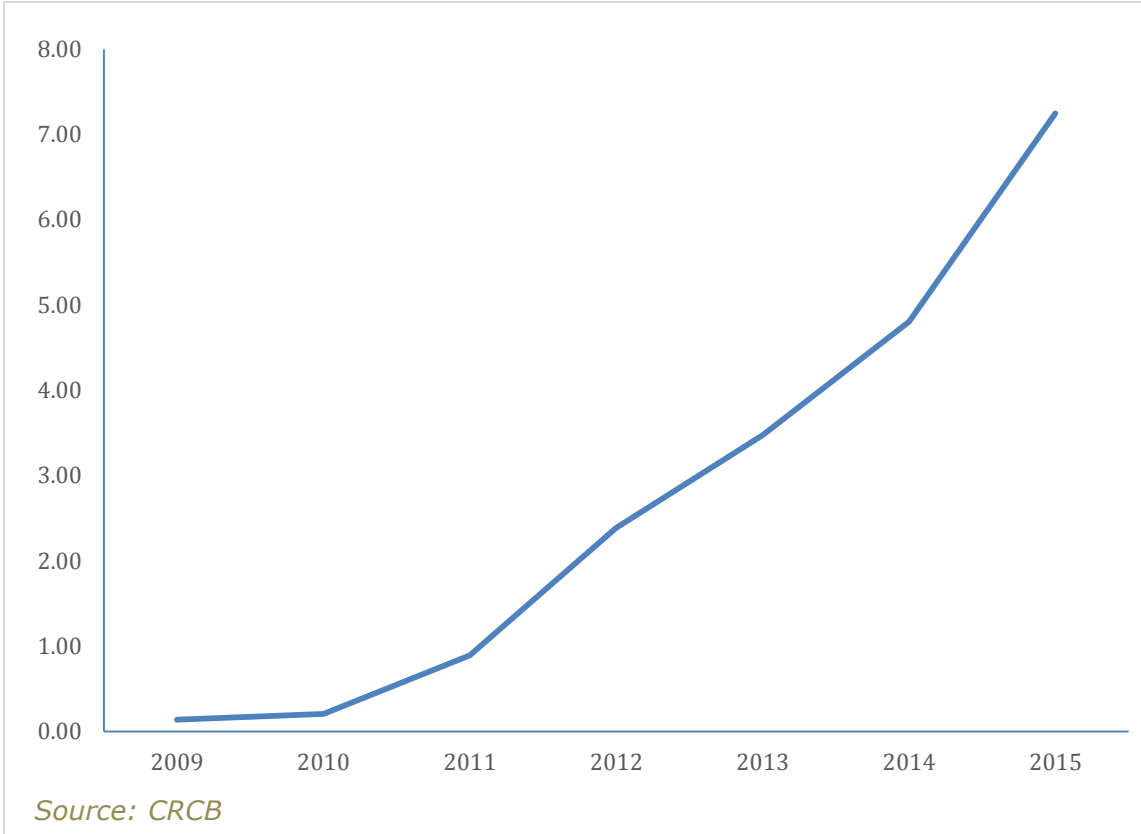
Source: CRCB

Figure: 2.6.2.: The squared difference between the Benford's distribution and the contract prices of Hungarian public procurement by the first digits, 2009-2015, N = 123,224



Note: Data are filtered by goodc15. On the Y axis are the squared difference between the theoretical (Benford's) and observed (from contract prices of HPP) distribution.
Source: CRCB

Figure 2.6.3.: The mean squared error (MSE) of contract prices of HPP from the theoretical (Benford's) distribution by year, first digits, 2009-2015, N = 123,224



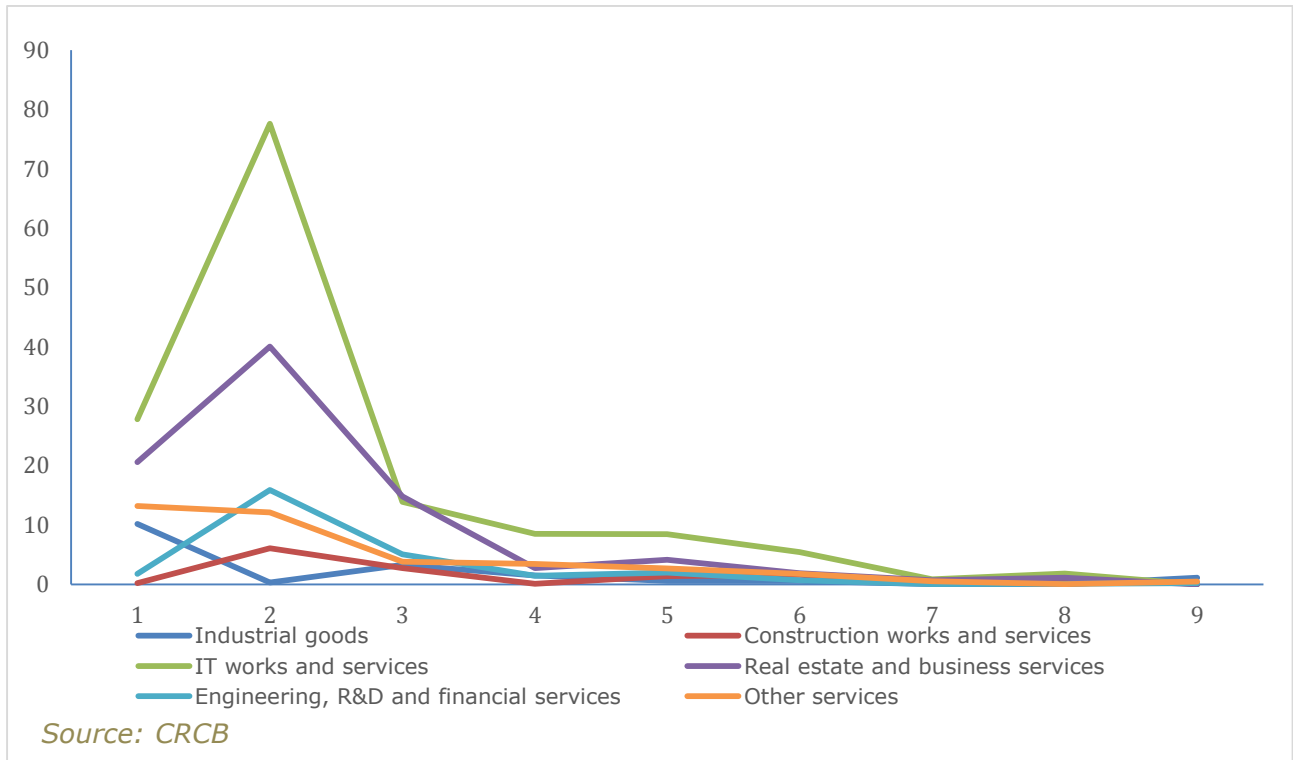
Note: Data are filtered by goodc15

$MSE = \frac{1}{n} \sum_{i=1}^n (\hat{Y}_i - Y)^2$ where \hat{Y} is the predicted value and Y is the observed value in percentages.

On the Y axis are the MSE values by year.

Source: CRCB

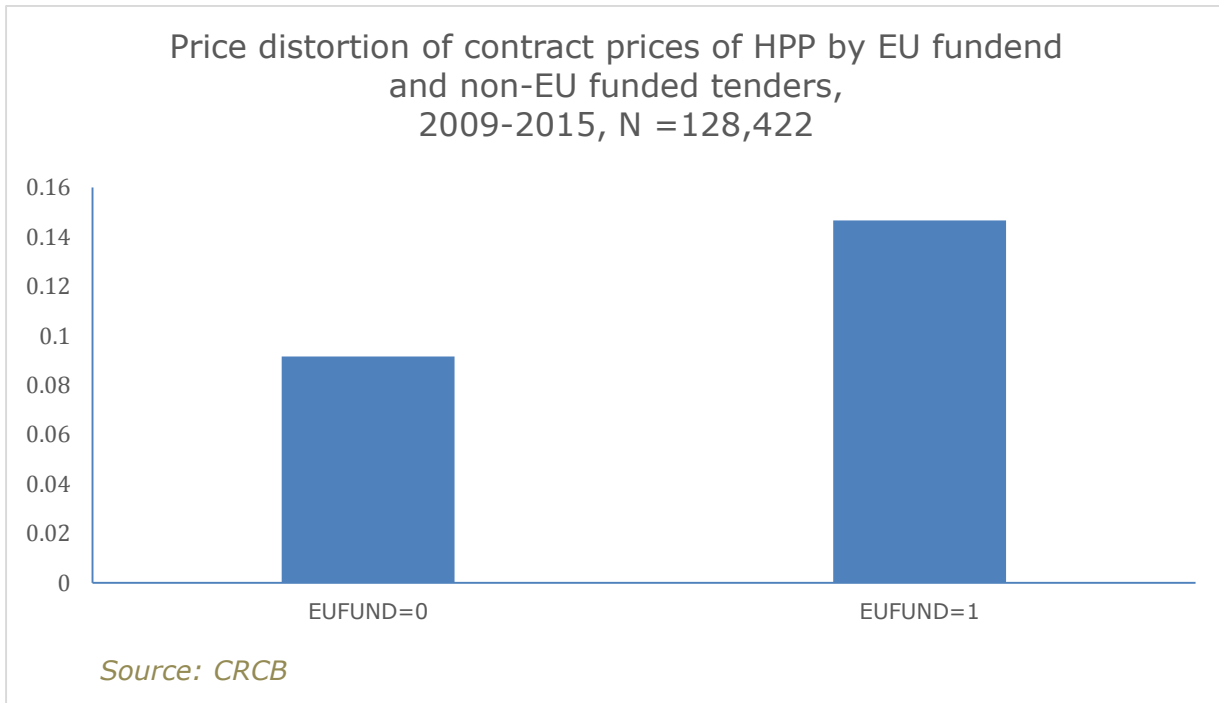
Figure 2.6.4.: The squared difference between the Benford's distribution and the contract prices of Hungarian public procurement by digits and by Industry, 2009-2015, N = 123,224



Note: Data are filtered by goodc15. On the Y axis are the squared difference between the theoretical (Benford's) and observed (from contract prices of HPP) distribution.

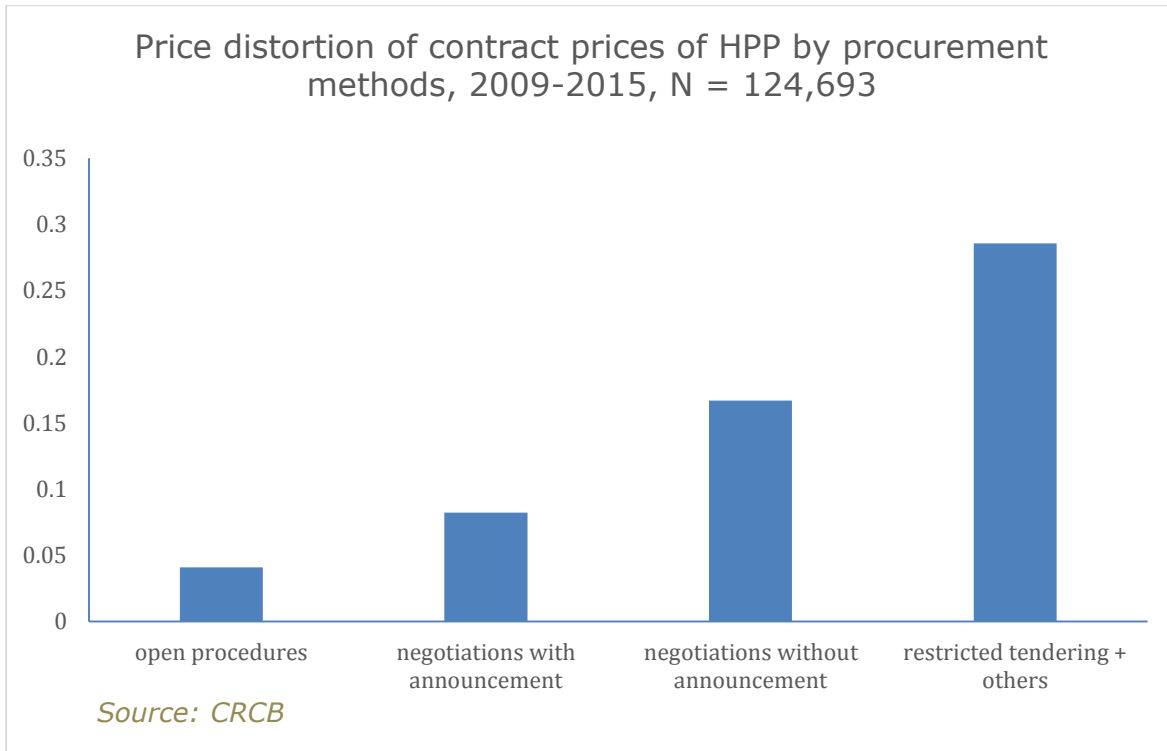
Source: CRCB

Figure 2.6.5.: Price distortion of contract prices of Hungarian public procurement by EU funded and non-EU funded tenders, 2009-2015, N = 128,422



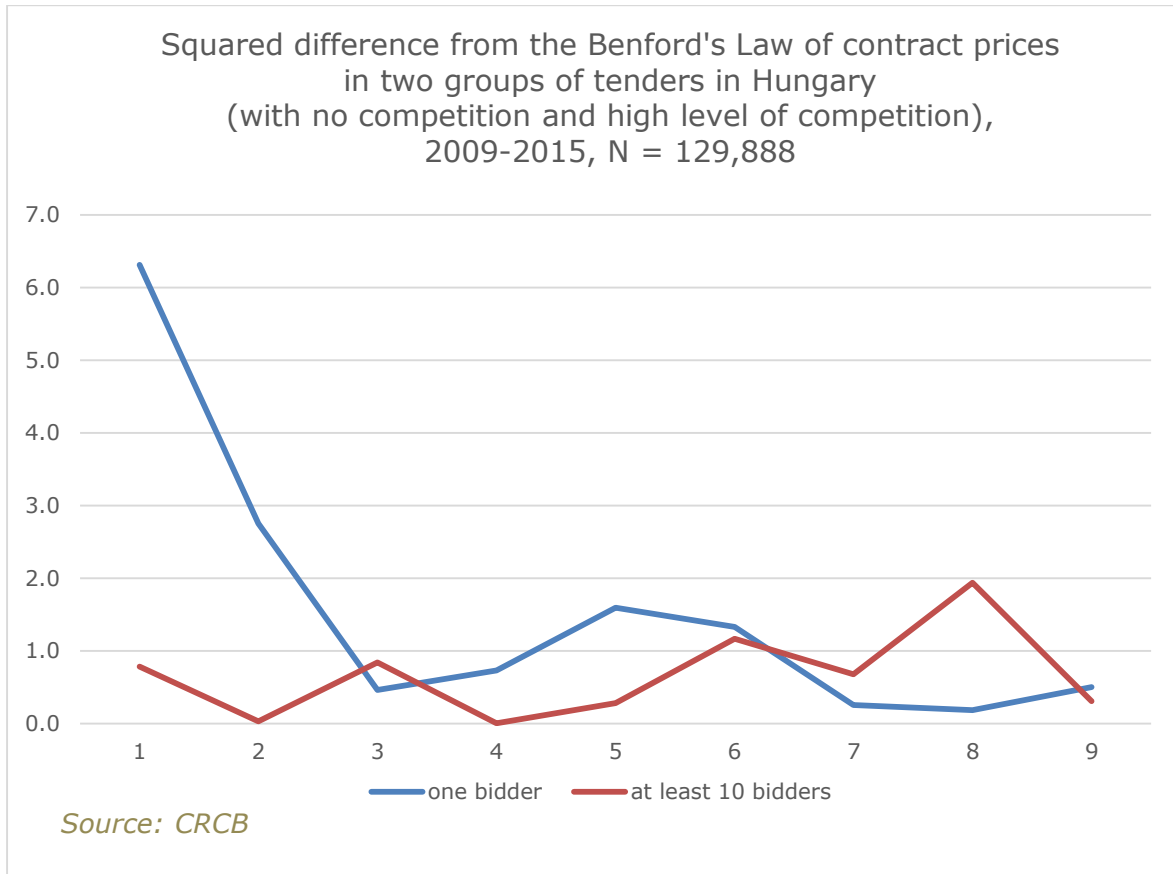
Note: Data are filtered by goodc15=1, The Cramer's V values are on the Y axis.
Source: CRCB

Figure 2.6.6.: Price distortion of contract prices of Hungarian public procurement by procurement methods, 2009-2015, N = 124,693



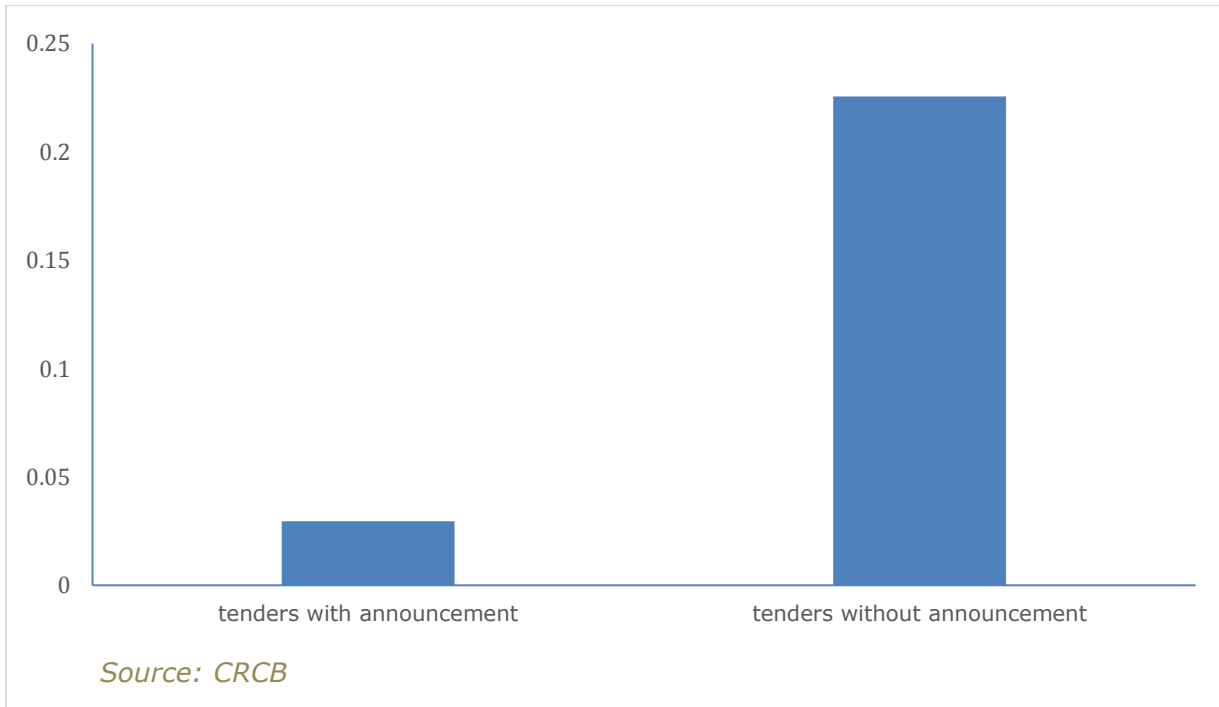
Note: Data are filtered by goodc15=1, The Cramer's V values are on the Y axis.
 Source: CRCB

Figure 2.6.7.: Price distortion in Hungarian public procurement by the competitive intensity, 2009-2015, N = 129,888



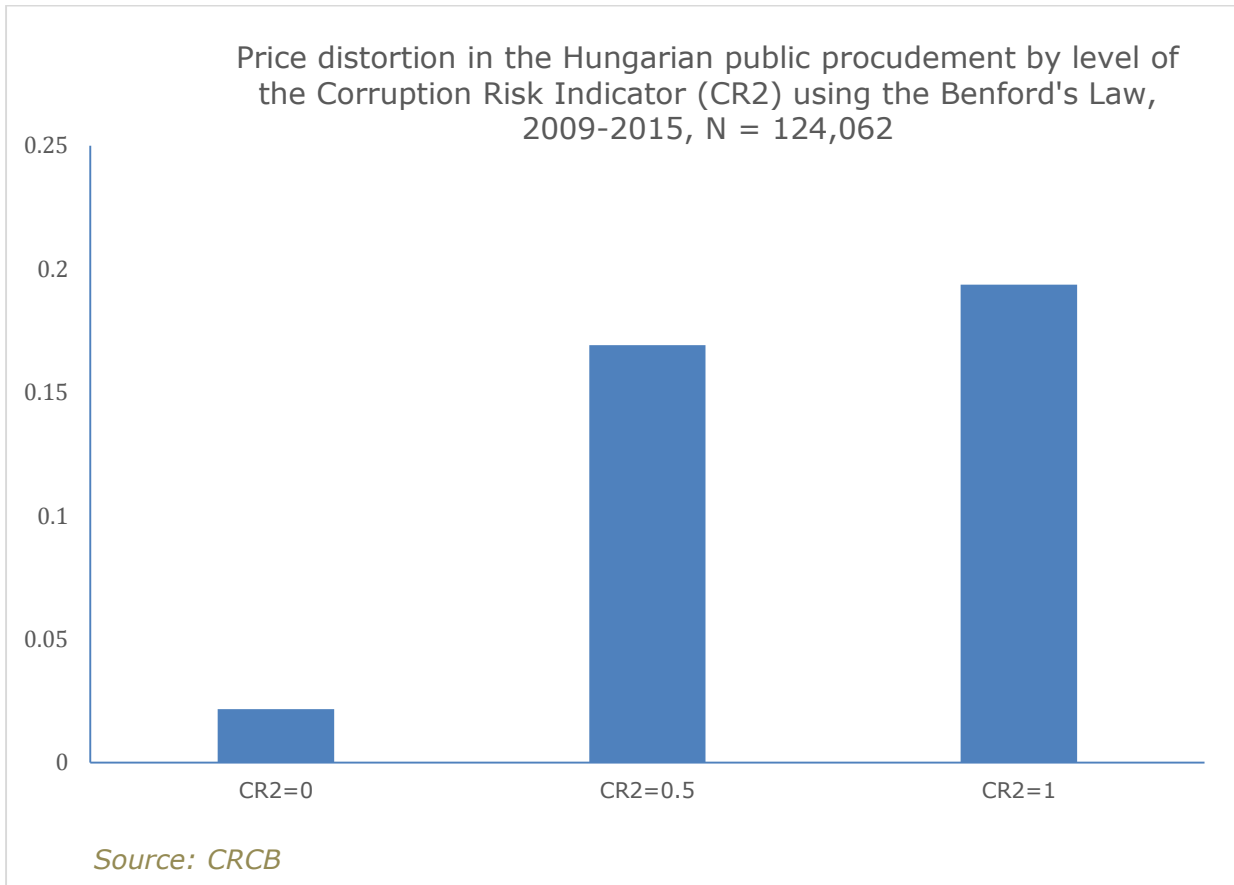
Note: Data are filtered by goodc15, On the Y axis are the squared difference between the theoretical (Benford's) and observed (from contract prices of HPP) distribution.
Source: CRCB

Figure 2.6.8.: Price distortion in Hungarian public procurement by level of the transparency, 2009-2015, N = 124,693



Note: Data are filtered by goodc15=1, The Cramer's V values are on the Y axis.
Source: CRCB

Figure 2.6.9.: Price distortion in the Hungarian public procurement by level of the Corruption Risk Indicator (CR2), 2009-2015, N = 124,062



Note: The Cramer's V value are on the Y axis.

Source: CRCB

Table 2.6.1.: Price distortion of contract price in Hungarian public procurement by several tender subgroups 2009-2015

tender subgroups	chi2	Cramer's V	MAD	N
Industrial goods [SECTOR6=1]	559,7231	0,1085	0,0107	47582
Construction works and services [SECTOR6=2]	426,0375	0,1082	0,0098	36406
IT works and services [SECTOR6=3]	438,2328	0,3051	0,0308	4708
Real estate and business services[SECTOR6=4]	603,6278	0,2341	0,0239	11014
Engineering, R&D and financial services [SECTOR6=5]	213,4399	0,1297	0,0125	12696
Other services [SECTOR6=6]	477,1312	0,1638	0,0176	17776
10 or more bidders [X11=1]	36,0084	0,0931	0,0071	4152
2009	32,9524	0,0439	0,0032	17112
2010	45,7192	0,0459	0,0037	21678
2011	96,4456	0,0832	0,0080	13948
2012	196,3701	0,1192	0,0122	13812
2013	442,4965	0,1458	0,0151	20823
2014	701,3961	0,1770	0,0188	22386
2015	909,4062	0,2088	0,0224	20850
minimal corruption risk [CR2=0]	22,7685	0,0216	0,0019	48626
CR2=0.5	1680,6321	0,1691	0,0175	58760
maximal corruption risk [CR2=1]	625,8054	0,1937	0,0209	16676
EUFUND=0	635,8625	0,0917	0,0096	75685
EUFUND=1	1135,0194	0,1467	0,0150	52737
open procedure [PTYPE=4]	105,2030	0,0410	0,0037	62618
negotiation with announcement [PTYPE=3]	63,5620	0,0822	0,0077	9409
negotiation without announcement [PTYPE=2]	837,1757	0,1670	0,0174	30014
restricted and other procedures [PTYPE=1]	1849,5806	0,2857	0,0310	22652
mgts = 1	10,3966	0,1537	0,0152	440
without announcement [PTRANS=0]	2810,3491	0,2256	0,0241	55210
with announcement [PTRANS=1]	61,1593	0,0297	0,0027	69483
GOODW15=1	1636,061	0,11192	0,0113	130609

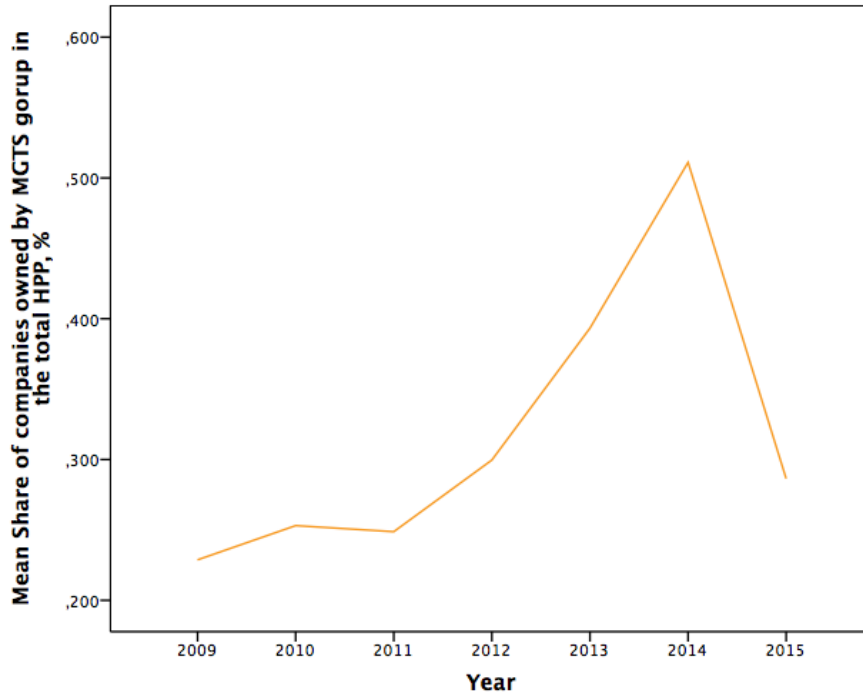
Note: MAD: The sum of absolute values of the difference between the theoretical (Benford's) and observed distribution – indicator suggested by Nigrini, 2000. If $MAD < 0.006$ there is good fit; $0.006 \leq MAD < 0.012$ is acceptable fit; $0.012 \leq MAD < 0.015$ is weak fit; and $0.015 \leq MAD$ shows the lack of fit. See Nigrini, 2012, p. 160. Table 7.1.

The dark green cells show the good fit, the cells with light green show good and acceptable fit. The white cells show the lack of fit, in these groups the contract prices are distorted.

Source: CRCB

2.7. The CRONY_MGTS Group

Figure 2.7.1.: Share of tenders won by companies owned by CRONY_MGTS group in total number of tenders, 2009-2015, %, N = 135,300



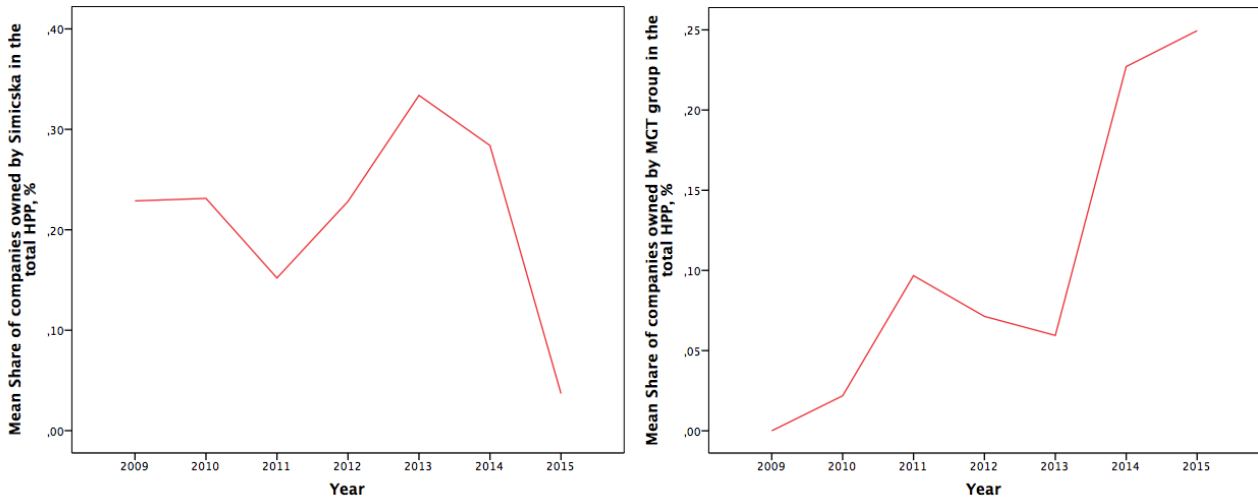
Note: Data are filtered by goodw15

Source: CRCB

Figure 2.7.2.: Share of tenders won by companies owned by Simicska and MGT group in total number of tenders, 2009-2015, %, N = 135,300

(a) S companies

(b) MGT companies



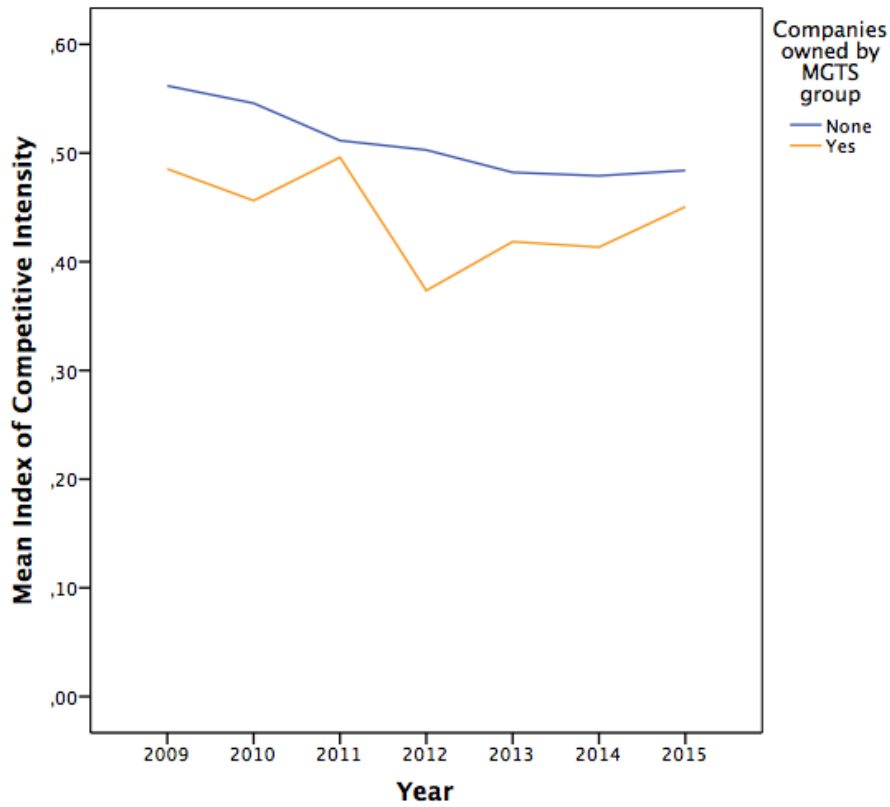
Notes: data are weighted by goodw15

S: companies: companies owned by Lajos Simicska

MGT: companies: companies owned by Lőrinc Mészáros, István Garancsi, or István Tiborcz

Source: CRCB

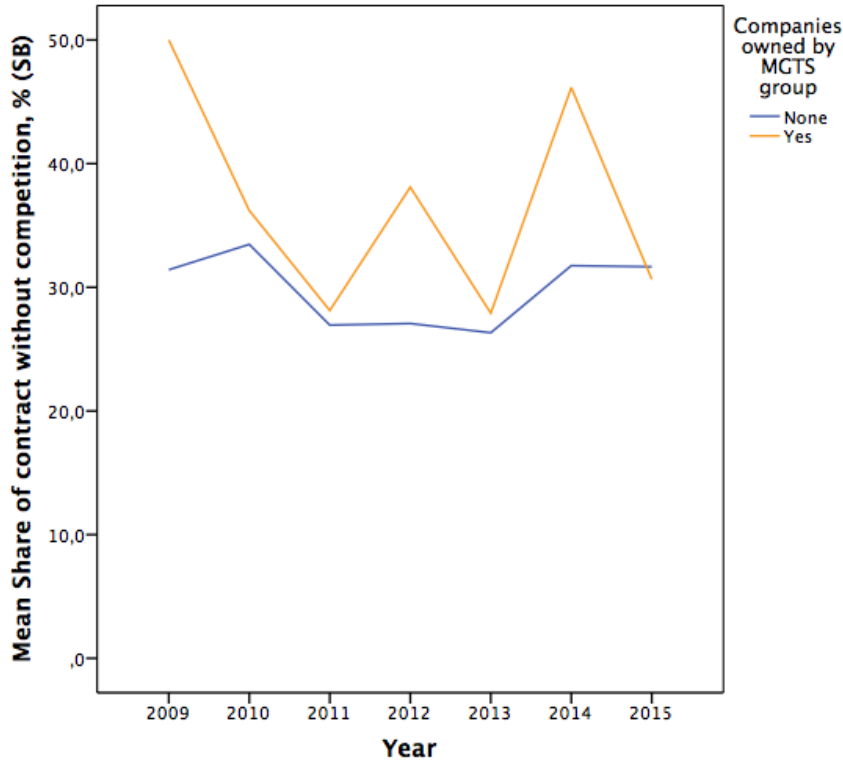
Figure 2.7.3.: The Index of Competitive Intensity (ICI) in Hungarian public procurement by CRONY_MGTS, 2009-2015, yearly data, N = 93,265



Note: data are filtered by goodw15; MGTS = Yes, the winners of procurement were companies belonging to Orban's friends and family; MGTS = None, other companies

Source: CRCB

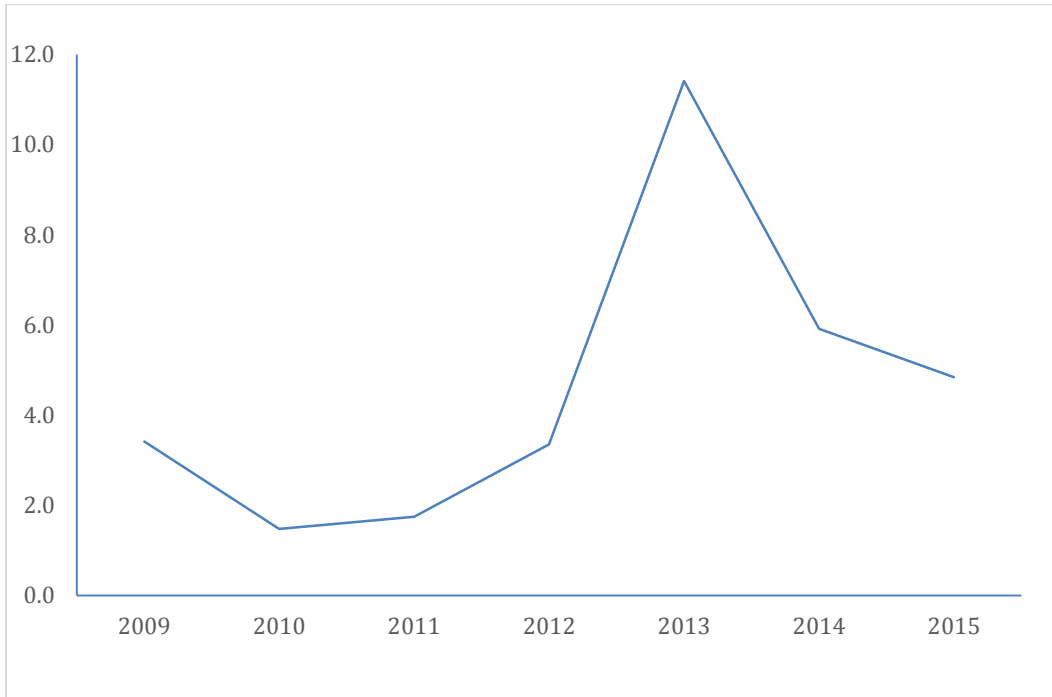
Figure 2.7.4.: Share of public procurement tenders with Single Bidder (SB) by CRONY_MGTS, 2009-2015, yearly data, N = 131,499



Note: data are filtered by goodw15; CRONY_MGTS = Yes, the winners of procurement were companies belonging to Orban Victor's friends and family; CRONY_MGTS = None, other companies

Source: CRCB

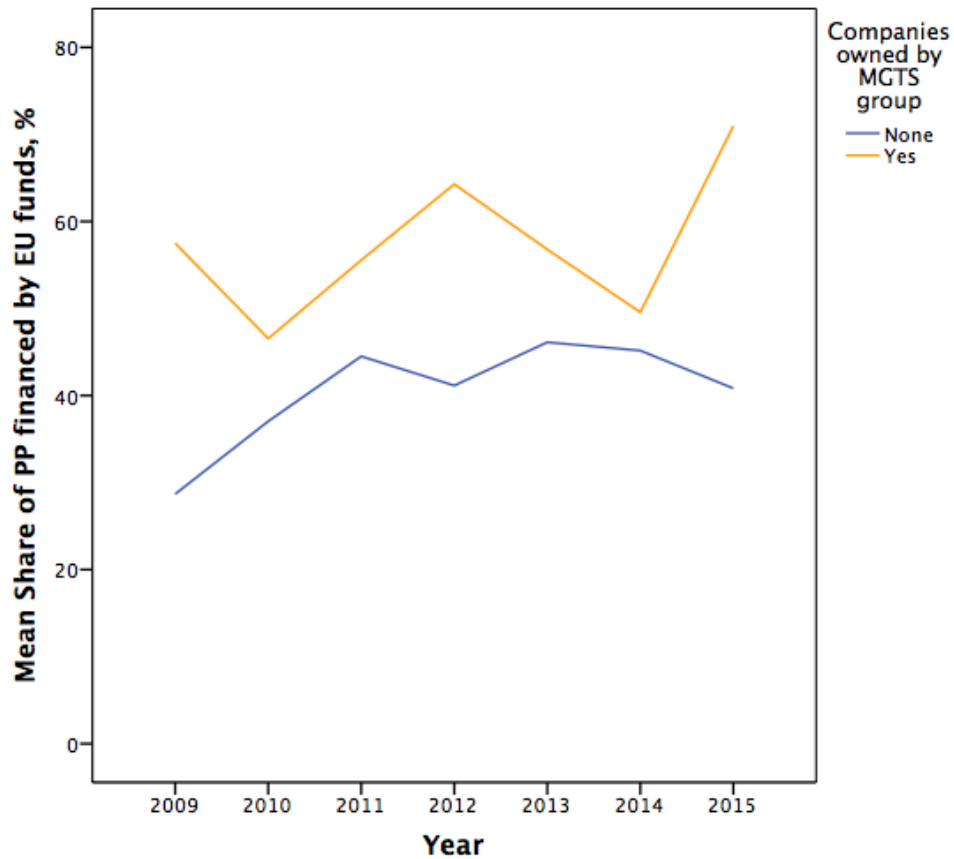
Figure 2.7.5.: The share of contract value of tenders won by CRONY_MGTS' companies in total contract value of Hungarian public procurement by year, 2009-2015, %, N = 130,609



Note: Data are filtered by goodw15

Source: CRCB

Figure 2.7.6.: The share of EU financed tenders in the tenders won by the companies related to CRONY_MGTS group and in other tenders, 2019-2015, %, N = 132,968

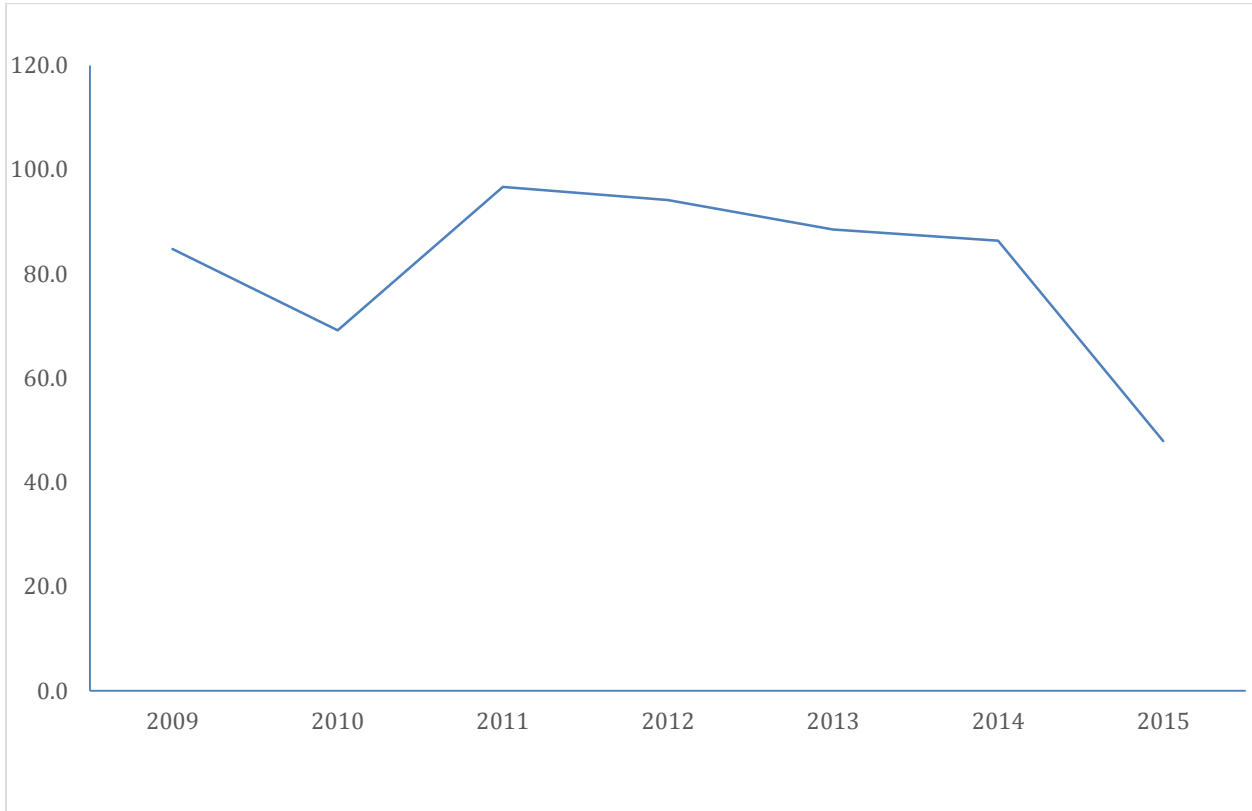


Note: Data are filtered by goodw15

CRONY_MGTS = Yes: there are winner companies owned by Lőrinc Mészáros, István Garancsi, István Tiborcz and Lajos Simicska; CRONY_MGTS = None, other winner companies.

Source: CRCB

Figure 2.7.7.: The share of contact value of EU financed tenders in the contact value of all tenders won by CRONY_MGTS' companies by year, %, 2009-2015, N = 440



Note: Data are filtered by goodw15

Source: CRCB

Annex

A1. Definition of variables used

	Variable names	Definition
1	GOODC15	Filter variable [0,1]; It filters the dataset to contract level data
2	GOODW15	Filter variable [0,1]; It filters the dataset to winner level data (one contract but more winners, because a consortium has won the tender)
	FILTER_S2	Filter variable [0,1]; It filters the dataset and creates a subsample of 7% at contract level.
3	DATE_	Date variable for monthly data;
4	DATEY	Date variable for yearly data;
5	EUFUND	Tender is funded by the EU [0,1]; The value of 1 means that the tender is funded by the EU, 0 otherwise.
6	XEUFUND	Tender is funded by the EU [0,100]; The value of 100 means that the tender is funded by the EU, 0 otherwise.
8	NCVALUE	Net contract price (in HUF)
9	XNCVALUE	Net contract price (in billion EURO)
	LNNCVALUE	Natural logarithm of net contract price (in HUF)
	NLNNCVAL	Quartiles of the natural logarithm of net contract price [1,..,4]
10	ICI	Index of Competitive Intensity [$0.3 \leq ICI \leq 1$]; It measures the competitive intensity: low value means low intensity, high value means high intensity. X: the number of bidders in a tender. $ICI = \ln X / \ln 10$ in case where $2 \leq X \leq 10$, and $ICI = 1$ if $X > 10$. $ICI = 99$ if $X = 1$; $ICI = 99$ if X value is missing; If $ICI = 99$, this is a missing value.
11	SECTOR6	Product market [1,2,3,4,5,6] of tenders; the information came from cpv codes published in tender documentation; The values are: 1 "Industrial goods" 2 "Construction works and services" 3 "IT works and services", 4 "Real estate and business services", and 5 "Engineering, R&D and financial services", 6 "Other services".
12	S1	Product market dummy variable [0,1]; the value of 1 means "Industrial goods", 0 otherwise.
13	S2	Product market dummy variable [0,1] the value of 1 means "Construction works and services", 0 otherwise.
	S3	Product market dummy variable [0,1] the value of 1 means "IT works and services", 0 otherwise.
	S4	Product market dummy variable [0,1] the value of 1 means

		"Real estate and business services", 0 otherwise.
	S5	Product market dummy variable [0,1] the value of 1 means 5 "Engineering, R&D and financial services", 0 otherwise.
	CRONY_MGTS	Company is owned by Lőrincz Mészáros, István Garancsi, István Tiborcz, or Lajos Simicska, the cronies / family members of Viktor Orban Prime Minister [0,1]; the value of 1 means that winner company owned by Mészáros, or Garancsi, or Tiborcz, or Simicska; 0 otherwise.
	TI	Transparency Index [0,1]; the value of 0 means the tender was issued without announcement; the value of 1 means the tender was issued with announcement.
	SB	Single bidder [0,1]; the value of 0 means there were more than one bidder; the value of 1 means there was only one bidder.
	XSB	Single bidder [0,100]; the value of 0 means there were more than one bidder; the value of 100 means there was only one bidder.
	S	Company is owned by Lajos Simicska, one of the cronies of Viktor Orban Prime Minister [0,1]; the value of 1 means that the winner company is owned by Simicska, 0 otherwise.
	MGT	Company is owned by Lőrincz Mészáros, István Garancsi, and István Tiborcz, the cronies / family members of Viktor Orban Prime Minister [0,1]; the value of 1 means that the winner company is owned by Mészáros, or Garancsi or Tiborcz; 0 otherwise.
	CR2	Corruption Risk Indicator [0, 0.5, 1]; The value of 0 means low corruption risk (more than one bidder and tender with announcement), the value of 1 means high corruption risk (only one bidder and tender without announcement).
	BENFORD	The first digit of contract prices [1,...,9];

A2. Some specific problems and errors of the official data management of the Hungarian public procurement

Our data collection procedure revealed several problems regarding the official data management of the public procurement in Hungary. These problems basically derive from the lack of validation of the fields on the data sheets. Several fields can be filled in as free text even if the requested information can be categorized.

The most problematic parts of the data sheet are about the contract value. The usage of thousand separators is not consistent, as both spaces¹⁸ and dots¹⁹ are used if there are separators at all²⁰. We could detect five cases between 2012 and 2013 when the contract value was entered repeatedly²¹ by inspecting the top ten raw contract values. In some cases we suspect that this fault occurred because the submitter of the data was not sure about the required form and entered the value several times but in different ways²². Also the use of the `.-` suffix that is for monetary sums in Hungary is inconsistent; in some cases the contract value ends with `.-`²³ but in other cases not²⁴.

The decision whether the contract value is defined as a unit price or not is quite uncertain as unit prices can only be indicated indirectly by the specification of the unit after contract value²⁵. However, in several cases there is no unit described, but the amount of the contract value suggests that it is calculated as a unit price²⁶. The indication of the VAT rate also demonstrated in an inconsistent way. The 27% Hungarian standard VAT rate is indicated in four ways:

- 0,27²⁷;
- 27,²⁸;
- 27,0²⁹;
- 1,27³⁰.

¹⁸ http://www.kozbeszerzes.hu/adatbazis/mutat/hirdetmeny/portal_7483_2012/

¹⁹ http://www.kozbeszerzes.hu/adatbazis/mutat/hirdetmeny/portal_1235_2012/

²⁰ http://www.kozbeszerzes.hu/adatbazis/mutat/hirdetmeny/portal_7483_2013/

²¹ http://www.kozbeszerzes.hu/adatbazis/mutat/hirdetmeny/portal_1793_2012/

²² http://www.kozbeszerzes.hu/adatbazis/mutat/hirdetmeny/portal_5747_2012/

²³ http://www.kozbeszerzes.hu/adatbazis/mutat/hirdetmeny/portal_19240_2012/

²⁴ http://www.kozbeszerzes.hu/adatbazis/mutat/hirdetmeny/portal_1120_2012/

²⁵ http://www.kozbeszerzes.hu/adatbazis/mutat/hirdetmeny/portal_11150_2012/

²⁶ http://www.kozbeszerzes.hu/adatbazis/mutat/hirdetmeny/portal_10751_2013/

²⁷ http://www.kozbeszerzes.hu/adatbazis/mutat/hirdetmeny/portal_16473_2014/

²⁸ http://www.kozbeszerzes.hu/adatbazis/mutat/hirdetmeny/portal_20362_2014/

²⁹ http://www.kozbeszerzes.hu/adatbazis/mutat/hirdetmeny/portal_10142_2012/

³⁰ http://www.kozbeszerzes.hu/adatbazis/mutat/hirdetmeny/portal_12141_2014/

The indication method of the main activity of the contracting body gives the opportunity for the submitter to mark several activities³¹ from a list with twenty predefined items; or by choosing the “Other” option, the submitter can describe the activity of the contracting body by his or her own words³².

³¹ http://kozbeszerzes.hu/adatbazis/mutat/hirdetmeny/portal_10031_2013/

³² http://kozbeszerzes.hu/adatbazis/mutat/hirdetmeny/portal_10127_2013/

A3. Definition of CRONY_MGTS group

Table A3.1.: Companies owned by the CRONY_MGTS group

Name of owner	Name of Company
Garancsi, István (G)	Bee Outdoor Kft. Futball Invest Zrt. Futball-F 2007 Kft. Garangold Investment GARHARTT Invest L11 Kft. Market Építő Zrt. Mobil Adat Kft. SHOAL Zrt. Sinus Investment Zrt. TrustAir Aviation Kft. VÁLL-BER Zrt. Visual Europe Zrt.
Mészáros, Lőrinc (M)	Aranykorona Zártkörűen Működő Mezőgazdasági Részvénytársaság Atlasz Geodézia Szolgáltató Kft. Bakony Hús Kft. BAU-PRODUKT 2002 Ingatlanforgalmazó és Szolgáltató Kft. Búzakalász 66 Felcsút Mezőgazdasági Kft. Korona-Alba Kereskedelmi Kft. Mészáros Autó Javító Kft. Mészáros és Mészáros Ipari, Kereskedelmi és Szolgáltató Kft. R - KORD Építőipari Kft.
Simicska, Lajos (S)	A Plakat Kft. B Reklám Kft. Breda-2000 Zrt. Budamédia Kft. Budamédia Rózsadomb Reklámszervező Kft. Dunántúli Távközlési és Biztosítóberendezési Építő Kft. E-OS Energiakereskedő Zrt. E-OS Gáz Kft. Euro Publicity Kereskedelmi és Szolgáltató Kft. Hárskúti Mezőgazdasági Zrt. Heti Válasz Kiadó Kft.

	<p>HUNG-ISTER Filmprodukción Zrt. Közgép Építő- és Fémszerkezetgyártó Zrt. Közgép-Energia Kft. Közgép-Ingatlanfejlesztő Kft. Mahir Cityposter Kft. Mahir Keszthely Kft. MAHIR Kiállítás és Rendezvény Szervező Kft. Mahir Többllet Ajándéktárgy Kft. Mahir Zrt. Manufaktúra-Befektető Kft. Nemzet Kft. NEO-MET Ingatlanforgalmazó és Vagyonkezelő Kft. Overdose Vagyonkezelő Kft. PATIENT MEDIA Kiadó- és Szolgáltató Kft. Pro A Kft. Pro B Kft. Pro-Aurum Vagyonkezelő Zrt. Publimont Kft. Rác-Ing Kft. Solum-Invest Ingatlanfejlesztő és Üzemeltető Kft. Transdanuvius 2000 Kft.</p>
Tiborc, István (T)	<p>BP Retail Ingatlanfejlesztő Kft. Elios Innovatív Zrt. ES Hungary G2G Zrt. Green Gener Kft. Green Investments & Solutions Kft. HCS Experts Kft IBC-Projekt Gazdasági Tanácsadó Kft. Nyugati-medence Kikötőfejlesztő Kft. PBE Energiamedenedsment Kft TSDM Holding Kft. Újszilvási Naperőműpark Kft.</p>

Table A3.2.: Summary statistics of CRONY_MGTS companies amongst the tender winners: number of the tenders won by the CRONY_MGTS' companies, 2009-2016, N = 135,300

Name of the owner	2009	2010	2011	2012	2013	2014	2015	Total
Garancsi, István (G)	0	2	2	1	3	12	10	30
Mészáros, Lőrinc (M)	0	1	1	8	5	12	16	43
Simicska, Lajos (S)	40	53	22	32	73	65	8	293
Tiborcz, István (T)	0	2	11	1	5	28	28	75
Total	40	58	36	42	86	117	62	441

Note: data are weighted by goodw15

Source: CRCB