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zIndex – Benchmarking Municipalities in Public Procurement

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zIndex – Benchmarking Municipalities in Public Procurement

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Abstract:

This paper presents a methodology and first results of the zIndex – a public procurement benchmarking tool for contracting authorities that measures a deviation from best practice recommendations. zIndex is a composite index mapping many issues in the areas of openness, competition and transparency. Indirectly it measures efficiency and corruption potential in public procurement. The pilot application of our methodology on a sample of 194 Czech municipalities and their procurement in the period 2011-2013 worth 3 billion EUR showed several remarkable results such as very low share (30%) of public procurement on actual purchases volume or large portion (50%) of contracts that were cancelled or modified. Finally we find correlation of zIndex with procurement law violations and detected price savings. This implies, that proposed measure of best practice relates both to efficiency and legality, making it usable metric for various further research as well as practical monitoring of procuring agencies.

Keywords: public procurement, Transparency Index, efficient public control, benchmarking municipalities

JEL: H57, C43

1 Introduction

zIndex is a public procurement benchmarking tool for contracting authorities. It uses real data to measure each contracting authority's rate of transparency, efficiency and corruption potential in public procurement. In a nutshell, the zIndex measures the contracting authority's compliance with best practice recommendations defined by international organizations (OECD (2007, 2009) or EC (2008a, 2008b)), the Czech Ministry of Regional Development (MRD (2014)), and non-governmental organizations (TICZ (2007, 2008) or Oživení (2011)).

Defined best practice involves more than just proceeding in accordance with the law. Legal provisions inherently cover all sorts of marginal situations and exceptions, hence they establish rather broad rules of conduct. Best practice describes not only the behaviour legally required of contracting authorities, but the most desirable behaviour within those rules.

The purpose of zIndex is to highlight both controversial and exemplary contracting authorities. By evaluating different areas of contracting practice separately, it is able to identify areas for specific improvement. The authors' ambition is to further develop the zIndex methodology, publish evaluations of different authority subsets (municipalities, government departments, state-owned enterprises, etc.) on a regular basis, and in so doing, gradually increase the pressure on the authorities to improve their public procurement practice.

The tool was introduced in Chvalkovská & Skuhrovec (2010). The aim of this paper is to present an updated methodology of individual indicators that are closely related to the best practice guidelines, together with a more straightforward aggregation of individual indicators. Moreover, we would like to present the pilot application of the methodology on a sample of 194 Czech municipalities and their procurement in the period 2011-2013. The paper shows how zIndex methodology highlights the weak spots of municipalities' procurement processes.

Despite being a relatively robust statistical indicator, zIndex cannot reflect all aspects of the ideal procurement process, especially when it comes to qualitative aspects. The zIndex score benchmarks the contracting authorities only according to objective, well measurable criteria. Given that those account for most aspects of the procurement process, this is a fair way of assessing public procurement.

A low zIndex rating implies a deviation from best practice. Contracting authorities with low zIndex values (in comparison to similar institutions) are not necessarily more corrupt or less efficient; the low score simply indicates there is more room for corrupt or inefficient practices in their procedures - but whether that opportunity has been exploited or not cannot be proven from these statistics. Deviation from best practice is not always a bad thing, in some specific circumstances it might be beneficial for the procurer not to follow the best practice (for example it is reasonable to cancel procurement procedure if procurer realize that the contract documentation is incorrect). However such deviations from best practice could be hardly beneficial for the procurer (and for the public) when they become daily practice.

2 Literature review

The paper promotes relatively novel approach to the topic. Its foundations are thus only partially formed by academic resources, the other part follows from policy documents reflecting recent development in Czech Republic and EU. We first describe the policy part and then move on to the academic one.

The basic idea behind our approach is measuring of the best practice in public procurement, as defined in various policy guidelines. The key authority in this respect is the OECD who's project on Integrity in public procurement resulted in variety of studies describing the whole purchasing process from need identification, make or buy decision, vendor selection to post contract monitoring and supplier management (OECD (2007), OECD (2008), OECD (2009)). The publications also cover general rules of integrity in the procurement process as well as particular practical hints how to avoid most common mistake in the process. Similar guidelines are produced by the European Commission but those are usually focused on some particular topic: facilitating access by SME's in public procurement (EC (2008a)), identifying opportunities in technology procurement (EC (2008b)) or they are very closely linked with the mechanism of European structural funds (EC, COCOF (2007)). Very impressive and inspirational are the producing practical guidelines, manuals and toolkits produced by several governmental bodies in the United Kingdom such as "Local Government Transparency Code 2014" (Department for Communities and Local Government (2014)), "Good practice contract management framework" (National Audit Office (2008) or last but not least the collection of procurement policy notes (Cabinet Office (2015)).

In the Czech Republic, the Ministry of Regional Development as a procurement central authority issues the Public procurement formal guidelines - the supplement to the Procurement Act and its amendments (MRD (2014)). However such guidelines are very formal and they just interpret the law. Important guidelines in the Czech environment are produced by non-governmental sector: Czech affiliates of the Transparency International Propose an Integrity pacts in public procurement (TICZ (2007)) and anticorruption policies (TICZ (2008)). Oživení, o.s. discuss the loopholes in transparency of the procurement process (Oživení (2011)).

As stated before, our paper is a methodology extension and real-time data application of the index calculation proposed in Chvalková & Skuhrovec (2010). Beside this key source of inspiration, there is a rapidly increasing number of papers that uses real-time data in order to benchmark institutions that operate with public money. Easterly and Pfutze (2008) benchmark development aid providing institutions. Meinzer et al. (2013) use a broad variety of hard value data to compose a financial secrecy index which ranks jurisdictions according to their secrecy in the area of taxes and related finance.

There is however also handful of similar approaches near our own field. Coviello & Gagliarducci (2010) use numbers of bidders and savings to benchmark quality of governance by public officials. Likewise Goldman et al. (2013) measures the effect of bidder's political connections on procurement results. Since we tend to combine multiple metrics like that to produce more comprehensive index, perhaps the closest to our research

is the work of Fazekas et. al. (2013a, 2013b) who investigates publicly available procurement data to find red flag indicators for corruption in Hungarian procurement. They present a Corruption Risk Index, a composite index consisting of several red flag indicators such as single bidder contracts, call for tender modifications, exclusion of all but one bid or contract additions. In the contrast to our own study, Fazekas et. al. concentrate on the issue of corruption in public procurement, whereas we stress a bit broader issue of best practice.

3 Rating methodology¹

zIndex scores consist of eleven partial indicators, each of which describes a particular public procurement issue. Together, these indicators cover most aspects of the procurement process. The resulting evaluation provides information on three main issues:

- **Openness** - are the contracts accessible to bidders?
- **Competition** - do several bidders really compete for each contract?
- **Transparency** - are the details of the relevant cash flows publicly available?

3.1 Openness - are contracts accessible to bidders?

Openness is a substantial prerequisite for fair public procurement procedure. If potential bidders are not informed about a call for tender and thus have no chance of bidding for it, the existing bidders are not under any pressure to offer a better quality/price ratio (a lower price or higher quality product). Procedures in which contracts are awarded without open competition are far more liable to corruption, patronage, cartel agreements and other unfair practices. zIndex evaluates openness on the basis of three criteria:

z₁ - Public procurement share of total purchases: checks for evasion of procurement law

z₂ - Competitive contracting: checks the use of competitive procedure types

z₃ - Consistent conduct: checks for frequent tender cancellations, modifications

3.2 Competition - Do firms really compete for the contract?

Direct competition between potential suppliers is an essential part of public procurement, because it encourages lower prices and higher quality goods and services. A direct competition environment is also much less susceptible to corrupt practices or cartel arrangements. We evaluate the level of competition on the basis of the following sub-indicators:

¹ The methodology and calculation in full are described at wiki <http://wiki.zindex.cz/doku.php?id=en:start>

z₄ - Winner concentration: measures whether a significant portion of contracts is awarded to only one or a very limited number of bidders.

z₅ - Bidder participation: checks whether an appropriate level of competition is achieved

z₆ - Pro-competitive tools: promotes the use of e-auction, contract lots and extended deadlines

z₇ - Legal misconduct: penalizes misconduct found by court authorities, typically this includes discrimination or poor bids evaluation

3.3 Inspection - are the details of the relevant cash flows publicly available?

Last but not least, it is vital that public procurement contracts can be fully scrutinised, ideally both by government authorities and by the general public. We look at the opportunities for inspection and audit, based on the following four criteria:

z₈ - Journal data quality: checks the quality and consistency of data published in the national journal

z₉ - Buyer profile data quality: – checks the quality and consistency of data published on the contracting authority's website

z₁₀ - Supplier rating: checks for any "red flags" on the winning supplier, such as insolvency or donation to political parties.

z₁₁ - Information provision: rates the quality of responses to an FOI request concerning procurement information.

3.4 zIndex calculation

The eleven indicators are combined to produce a single zIndex value, using a weighted average:

Equation 1 zIndex aggregation of indicators

$$Z = \left(\sum_{i=1}^{10} z_i + 0.5z_{11} \right) / 10.5$$

Where Z is the final zIndex value and z_1 to z_{11} are the values of the individual indicators numbered according to the list above (the detailed computation of the indicators follows). Each of the indicators is scaled between 0 and 100, and they thus have equal weight (for single exception explanation see below). This simplistic approach was chosen as a compromise following extensive discussions with several experts in the field.

There is possibly no optimal way of combining the indicators, given the fact that what we are trying to measure - best practice - is relatively fluid term, furthermore constantly changing over time, as state-of-art evolves. Any calibration of weights would raise

additional suspicion about tampering with our results and introduce another dimension into the already complex debate on best practice. We thus chose the most straightforward approach, stating that details relevant to the authorities are present in individual indicators, rather than their combination.

Hence we only conducted calibration of all indicators (mostly using exponential forms), in order to give them similar variance and thus implicit weight in overall zIndex, leaving out indicator 11, where this could not have been done (due to its categorical nature) and the weight had to be set explicitly. We also deliberately introduce slightly smaller variance (and consequently weight) to indicator 10, which is the only indicator that authorities have limited means of affecting.

The methodology described here is suitable for benchmarking contracting authorities with similar structures and volumes of purchases. It is not suitable for comparing markedly different types of authorities, e.g. a municipality and a state owned enterprise. For institutions with unique spending patterns (such as the Road and Motorway Directorate, responsible for building highways), zIndex evaluation only has an indicative value.

z₁ - Public procurement share on total purchases

The indicator is calculated as the value of published procurement contracts in the reference period, measured against the total volume of controllable operating costs (as defined in the Czech Ministry of Finance's methodology(2014)) in the same reference period.

Equation 2 Public procurement share on total purchases

$$z_1 = \sqrt{\frac{\text{value of public procurement contract}}{\text{value of controllable operating costs}}}$$

Controllable operating costs are defined as the sum of selected cost items that are dependent on the contracting authority's management decisions (these include consumptions of energy and materials, repairs and maintenance, other services, etc.), which are obtained from the profit and loss account of the respective institution, together with expenditures on acquisition of capital assets from the cash flow statement. Both documents are available on the State Treasury web². The goal is to control for purchases outside public procurement – to see if various exceptions are not abused. Mainly the lower threshold below which procurement rules do not apply, and which motivates authorities to split their contracts.

z₂ - Competitive contracting

The competitive contracting indicator measures contracts awarded through Negotiated procedure without publication (NpWP), the least transparent procedure preventing external competition, which is generally recommended only for extreme cases. Indicator measures a proportion of the total volume of contracts awarded by the contracting authority in question. A rating of zero (the lowest rating) would be assigned to an authority that awarded all its contracts through NPWP.

² <http://monitor.statnipokladna.cz/en/>

Equation 3 Competitive contracting

$$z_2 = \left(1 - \frac{\text{value of contracts awarded through NPwP}}{\text{total value of contracts}}\right)^4$$

Negotiated procedures that followed a design contest, i.e. a transparent and open competition, are not considered to be NPwP for the purposes of this calculation, as there is no need to penalize this type of procedure. The design contest method is endorsed by the Czech Chamber of Architects (see Competition regulations (in Czech)) and is used for approximately 10-20 public procurement contracts per year. For the same reason (because they follow a preceding open contest with the same subject-matter) NPwP processed contracts that are part of framework agreements are also excluded from this calculation. For the purposes of this indicator, we also do not penalize purchases on a commodity exchange. Market pressures on the commodity exchange ensure appropriate levels competition and minimization of corruption and hence this means of procurement is viewed as transparent despite being administratively classed as NPwP.

z₃ - Consistent conduct

The consistent conduct indicator is calculated on the basis of all contract notices issued by the respective contracting authority. Its purpose is to monitor behaviour, that puts excess load on companies, applying for contracts that keep changing or have no winner in the end. Each published contract is evaluated as follows:

- a score of 1 is given to a properly awarded contract without any correction notices
- a score of 0.75 is given to contracts with one correction notice attached
- a score of 0.5 is given to contracts with two correction notices attached
- a score of 0.25 is given to contracts with three correction notices attached
- a score of 0 is given to contracts with four or more correction notices, to cancelled tender procedures, or if no contract was awarded (i.e. where neither a contract award notice nor a cancellation notice is present in the Journal).

The indicator value is computed as the contracting authority's average score for all its published contracts.

Equation 4 consistent conduct

$$z_3 = \frac{\sum \text{contract score}}{\text{number of contracts}}$$

z₄ - Winners concentration

Winner concentration is measured as the value of all contract(s) awarded to each individual bidder, divided by the total value of all contracts awarded by the respective contracting authority; this calculation is made for each successful bidder, and the results are summed. The purpose is to monitor clientelistic ties, leading to advantage of some firms within competition.

Equation 5 winners concentration

$$z_4 = \left(1 - \frac{\sum \frac{(\text{value of contracts awarded as a supplier})^2}{\text{total value of contracts}}}{\text{total value of contracts}}\right)^2$$

The calculation has form of the standard Herfindahl index for measuring supplier concentration, adapted for the purpose of public procurement contracts. The resulting index is then squared in order to emphasize the difference between highly rated and lowly rated contracting authorities.

z₅ – Bidders participation

The indicator benchmarks actual level of competition. It is calculated in a two-step process. First, the level of competition is evaluated for each contract, and these levels are then averaged across all contracts for a given contracting authority, to give a partial indicator "k".

Our calculation of k also reflects the fact that different markets are subject to different levels of competition. We compare the results for all contracts against the median number of tenders in contracts with the same or closely related CPV code. To maximise precision but avoid misleading statistics, this median value is calculated for the most detailed relevant level of CPV that has at least 20 contracts awarded. The sub-indicator k thus compares the number of tenders submitted for a particular call with the usual number of tenders for that contract subject. Finally, result is capped to stay within 0-1 interval.

Equation 6 bidders participation formula for one contract

$$k = 0.5 + \frac{\text{tenders submitted}_{\text{contract}} - \text{median}_{\text{CPV category}}(\text{tenders submitted})}{\text{median}_{\text{CPV category}}(\text{tenders submitted})}$$

The second step in our calculation is to compute the aggregate indicator as the weighted sum of k indicators across all contracts awarded by the respective contracting authority. The awarded price of every contract is used as its weight, in order to emphasize the indicator results for bigger contracts. The resulting weighted sum is then divided by the total value of the relevant authority's contracts. Contracts with an undefined number of tenders are excluded from the evaluation, as authorities are already penalized for these through the journal information quality indicator.

Equation 7 bidders participation calculation for a procurer

$$z_5 = \frac{\sum \text{contract value} \times k}{\text{total value of contracts}}$$

z₆ – Pro-competitive tools

The indicator shows how various special approaches, considered as good practice, are used. It consists of three components:

1. e-auctions as a share of the total number of contracts in the reference period
2. the share of contracts split into lots, out of the total number of contracts
3. contracts with a bid submission period at least a week longer than the legal minimum (22 days for below-the-threshold and 52 days for above-the-threshold contracts), expressed as a share of contracts in the reference period. Only open procedures and simplified below-the-threshold procedures are evaluated for this component.

It would make no sense to require the use of these instruments in every contract as a proof of best practice, as the tools are not appropriate in many cases.. Thus the maximum rating for this indicator is therefore assigned to any contracting authority that uses them in more than 25% of cases. Hence, in calculating the indicator value, each share is multiplied by four, but restricted to maximum value 1. This means that a contracting authority splitting all of its contracts into lots but never using either e-auctions or extended deadlines is assigned the indicator value of 1/3.

All contracts whose expected value was below 1 million CZK are omitted from the evaluation of this indicator, because they may include voluntarily published small-scale contracts, for which there is very little advantage from using the before mentioned tools.

Equation 8 pro-competitive tools calculation

$$z_6 = \sqrt{\left(\frac{4 \times (e\text{auctions} + \text{contractssplitintolots} + \text{contractswitextendeddeadlines})}{3 \times \text{numberofcontracts}} \right)}$$

The purpose of the square root in the formula is to diminish the differences between the authorities' scores and reduce variance, in order to facilitate comparability with other zIndex indicators.

z₇ - Legal misconduct

We manually sort through all OPC (Office for Protection of Competition, responsible for Czech procurement market oversight) rulings related to the contracting authorities whose practice we are evaluating, during the relevant reference period. We focus on proven cases of misconduct that can be considered to be serious (according to the methodology below).

Only final OPC rulings are considered - so if an original ruling of misconduct was overturned at appeal, only the latter decision is taken into account. In cases where OPC proceedings are pending, the last published ruling is taken into account. Likewise in cases where there has been a judicial review of the OPC ruling, only the latest court ruling is considered (and not any previous rulings by either the court or the OPC).

Defining pertinence to the reference period is sometimes difficult. In most cases, we use the contract notice publication date. Some cases are treated differently however, owing to their specific features (e.g. where one OPC proceeding regards several different contracts,

or where the misconduct arose only during the course of the award procedure itself etc.). The OPC reviews various degrees of misconduct - but for the purposes of calculating the legal misconduct sub-indicator we consider only cases which are judged to be serious according to the following criteria:

- A case is considered serious, if the OPC's ruling actually intervened in the ongoing tendering procedure (by cancelling the whole procedure, or certain steps: e.g. the decision to debar a bidder, the evaluation of a tender, or the final awarding of the contract).
- If the OPC reviewed a case where the tendering procedure resulted in the successful awarding of a contract, misconduct is regarded as serious only if it was directly related to the course of the tendering procedure or to the tender specifications. This typically involves discriminatory bidder requirements, overly vague qualification criteria or tender specification, or mutually incomparable tenders.
- Misconduct related to the way the contracting authority processed objections against its procedure is not considered to be serious, since it has little or no direct influence on the course and result of the tendering procedure; such misconduct is, however, still an administrative offence and can be penalized with a fine.
- In some cases, the OPC found misconduct had taken place, and the contracting authority subsequently filed an appeal against that decision, but before the appeal process was concluded, the contracting authority either cancelled the tendering procedure or remedied the previous deficiencies so as to comply with the law) and so the administrative procedure was terminated as being devoid of purpose. We consider these cases to constitute misconduct, because the contractual authority's actions suggest acknowledgement of their previous misconduct.

The legal misconduct indicator is assigned value 1 for a contract related to which the OPC found evidence of (serious) misconduct, and value 0 for contracts related to which no misconduct was found. The aggregate value for all the contracts awarded by a given contracting authority is then computed as follows:

Equation 9 Legal misconduct calculation

$$z_7 = 1 - \sqrt[4]{\frac{\text{Number of serious misconduct cases}}{\text{number of contracts}}}$$

The number of serious misconduct cases is the number of objections made to the OPC about the contracting authority's conduct, as a result of which the OPC's investigations found serious misconduct in the execution of tendering procedures that fall within our reference period. The number of contracts is the total number of contract award notices issued by the relevant contracting authority. Application of the overall fourth root enhances the effect of each proven instance of misconduct on the indicator value.

z₈ - Journal data quality

This indicator is calculated in a two-step process.

Each contract is assigned a full value of 100% if no shortcomings are detected. For each shortcoming identified, a penalty is given as follows (the minimum possible value a contract can be assigned overall is 0):

- -100% for non-disclosure of the contract notice
- -25% for inconsistent information (discrepancies between the contract notice and the contract award notice)
- -25% for non-disclosure of estimated or award price (or a misleading price declaration)
- -25% for stating an incorrect identification number for the contracting authority
- -25% for stating an incorrect identification number for the winning bidder
- -25% for stating an incorrect official name for the contracting authority
- -25% for non-disclosure of the procedure type (or for discrepancy between the type of procedure and its justification)
- -25% for non-disclosure of the total number of tenders received.

All contracts whose estimated value does not exceed 1 million CZK are excluded from this evaluation, since these may include small-scale contracts published on a voluntary basis, and it would not be fair to penalize these shortcomings when publication was voluntary. There is no doubt, however, that once a contracting authority does decide to publish even a small-scale contract in the Journal, it should do so transparently - using correct ID numbers and names, and properly linking the contract award notice to the contract notice.

All contract ratings are subsequently aggregated using a weighted average, with the weight being the value of each contract.

Equation 10 Journal data quality calculation

$$z_8 = \frac{\sum \text{contractvalue} \times \text{contractscore}}{\text{totalvalueofcontracts}}$$

z₉ - Profile data quality

We gather data from Profiles – websites of each contracting authority. The law dictates, these have to be machine readable, and contain specific very detailed information on contracts, such as identification of bidders or the amount already paid. We measure a number of various errors starting from the proper machine readability itself, and consequently examining data validity and completeness, by cross-referencing it internally and with our other dataset from central Journal.

Due to machine-readability not being obligatory before January 1st 2013, only information related to contracts published since then is evaluated. The information available must be consistent with the information advertised in the Journal, in terms of the number of tenders received, the identification of both the contracting authority and the winning bidder, and the status of the tendering procedure (contract awarded/cancelled etc.). The final price must be in the same order of magnitude. Data quality is also examined, using a set of simple requirements such as „every awarded contract must have a declared winner“.

If a contracting authority has (or at any time had) several buyer profiles in the reference period, this situation is evaluated in the most conservative manner. We do not require all unconcluded contracts to have been transferred to the newest profile (as required by the Ministry of Regional Development's methodology - see below), but consider it sufficient when at least one of valid profile is machine-readable. For the functionality and quality checks, only profiles that were valid at the date of the surveillance were considered. On the other hand, in terms of completeness, any available data from all past and present profiles was taken into account. The indicator value has a fixed minimum value of 0 (a negative value cannot be assigned, even where a large number of errors is identified).

Equation 11 Journal data quality calculation

$$z_9 = \text{machinereadability} \times \frac{\text{numberofprofile} \wedge \text{Journalcontracts}}{\text{numberofJournalprofilecontracts}} \times \left(1 - \frac{\text{numberoferrors}}{4 \times \text{numberofcontracts} \in \text{profile}}\right)$$

z₁₀ - Supplier rating

We evaluate the supplier (i.e. the winning bidder) of each contract using the following sub-indicators:

- **Public procurement as a share of total revenue** in the reference period (typically 3 years). For this sub-indicator we only count suppliers that existed and published financial statements for the whole of the three years reference period, as this is a long enough period for us to reliably assess them (suppliers who do not disclose their financial statements are penalized by another sub-indicator).
- **Subcontractors' share of the contract value.**
- **Period of time since the supplier's establishment.** Six months is the critical period for our calculation - suppliers established (i.e. entered in the Commercial Register) less than six months before winning a contract are penalized.
- **Regular disclosure of financial statements in the Commercial Register** is a legal obligation for most legal entities. We consider it problematic if at the date of being awarded a contract, the supplier had not yet disclosed their obligatory financial statements for the penultimate year (i.e. a supplier awarded a contract any time in 2013 should have disclosed its annual report for 2011, provided it existed at the time).
- **Company demise.** This sub-indicator is calculated as the number of months between the award of a contract and its supplier's termination. We penalize companies that closed down shortly after winning a public contract, the crucial limit being 18 months. Companies are only penalized if they closed in a non-standard manner; official closure as a result of mergers or divisions is not penalized.
- **Supplier insolvency.** We penalize suppliers who were insolvent at the time they were awarded a contract or within a period of one year before or after that time.

- **Supplier donations to political parties.** If a supplier makes donations to political parties, this brings a risk of conflict of interest (Skuhrovec, J., Titl, V. & Palanský, M. (2015)). We penalize suppliers that made donations to political parties in the year prior to the award of a contract as well as in the year following the contract's award (e.g. a contract awarded in 2012 is affected by donations made in 2011, 2012 or 2013).

Calculation

All our sub-indicators are binary - they assume value 0 for a negative effect (e.g. the supplier went into liquidation or failed to disclose an annual report in the Commercial Register) or 1 (if the negative effect in question was not found). Each supplier is then evaluated in the following manner:

- value 1 is awarded to suppliers with no negative effects
- value 0.75 is awarded to suppliers with only a single negative effect
- value 0.5 is awarded if two negative effects were found
- value 0.25 is awarded where three negative effects were found
- value 0 is awarded if four or more negative effects were found (out of the total seven observed).

Using these values, an average rating is calculated for all suppliers to a given contracting authority, in the form of a squared value of the weighted average, with the weights being the values of the contracts awarded to the individual suppliers. The purpose of the square in the formula is to emphasise the differences between high rated and the low rated contracting authorities.

Equation 12 Supplier rating calculation

$$z_{10} = \frac{\sum (\text{value of contracts awarded asupplier} * \text{supplierrating})^2}{\sum (\text{total value of contracts})^2}$$

z₁₁ - Information provision

A Freedom of Information request was sent to each contracting authority, requesting the following information:

1. The total volumes of small-scale contracts awarded in 2011, 2012 and 2013 (one total per year).
2. The total volume of purchases made using a dynamic purchasing system during the period 2011-2013, if any.
3. The total volume of purchases made using an electronic marketplace for public procurement during the period 2011-2013, if any.

Ideally, the contracting authority should provide this information:

1. within the legal limit of 15 working days;
2. complete (i.e. the information should cover the entire institution and all years requested);
3. free of charge (demonstrating that the information is already available in a clear, structured form and its retrieval does not result in additional costs).

Calculation

The e-mail responses received were evaluated based on the following classification. If the response did not arrive within 15 working days (whether or not legal reasons for time limit extension were cited), the contracting authority's score was lowered by 25 %. When more than one response was received from a single authority, only the best response was considered.

Response classification (with illustrative examples):

- **Full disclosure** - 100; complete information was provided, covering all requested years and the entire authority. We consider the response sufficient if it includes small-scale contract totals above 100 000 CZK.
 - The contracting authority supplied three aggregate figures, for total volumes of small-scale contracts in 2011, 2012 and 2013, together with information about the use of dynamic purchasing systems and electronic marketplaces.
- **Partial disclosure** - 75; the information provided did not cover all requested years or all parts of the contracting authority.
 - The contracting authority confirmed the use of an electronic marketplace, but did not provide the volume of purchases made through it.
 - Information for some years is missing.
 - The contracting authority explained that the information provided was incomplete, e.g. due to not including all parts of the authority.
- **Conditional disclosure** - 50; the contracting authority is willing to provide information, but has not sent any.
 - The contracting authority requires payment for information retrieval or delivery.
 - After requests for clarification were answered, the contracting authority still requires further information from us before it will provide any response.
- **Non-disclosure** - 25; the response received does not include any of the information requested.
 - The contracting authority refused to provide information.
 - The contracting authority promised to provide the information later, but none was received.
 - The information is not available and thus the authority can not provide it.
- **No response** - 0; no response or only an automatic e-mail response
 - We received no response.
 - We received only an automatic e-mail response.

3.5 Data sources

The data used for computation have been obtained mostly using own developed software, that extracted those from government servers:

- the Czech Public Procurement Journal (hereinafter referred to as the Journal)
- public company registers: Business register, ARES (company data including financial statements)
- donors to political parties from the Politickefinance.cz (following from political party annual reports)
- financial statements of contracting authorities from the State Treasury depository
- the Collection of decisions of the Office for the Protection of Competition
- further procurement data retrieved from buyer profiles
- information provided by the contracting authorities themselves in response to an enquiry under the Freedom of Information Act.

The IT-intensive methodology used for each source has been different and is beyond scope of this paper all the data went through thorough quality control and could be considered reliable (with exception of procurement data itself – see Journal and Profile data quality indicators).

The Journal, as a primary source, is the central place in which essential information about public contracts procured in compliance with the Public Procurement Act 137/2006 Coll. (i.e. above and below-the-threshold public contracts) is published. Obtained information was cleaned³ and paired with the other data⁴. Data processing was performed in cooperation with our affiliated company Datlab s.r.o.

Furhter preparation of some other datasets was also necessary – the most requiring was manual classification of Court decisions, preparation of specialised software for performing advanced checks of buyer profiles⁵ and email communication for using FOI requests.

Finally the data were combined into major database, linking together buyers, procurements, financial reports etc. to enable iterative development and testing of all indicators' computation.

³ Cleaning proces consists mostly of cross-checking prices to eliminate frequent scale errors – we generally detected cases when various estimated and final prices of same procurement varied beyond 90% threshold, calculated foreing currencies, VAT differences. Similarly we were checking for other inconsistencies within published data, included corrections of published forms etc.

⁴ To ensure proper identification of suppliers and buyers we cross-checked names, identification numbers and addresses. This was done on semi-manual basis – once pairing algorithm was not certain, human input was used.

⁵ The stand-alone results are currently published at profil.info

4 Pilot: zIndex Results for Municipalities 2011-2013

This chapter presents the pilot application of our methodology on a sample of 194 Czech municipalities and their procurement in the period 2011-2013. Municipalities are key local authorities, managing all kinds of public affairs, including the provision of primary health care, primary schools and kindergartens, local police forces, fire brigades, public utilities, territorial planning, local road maintenance, and garbage collection. Some of the larger municipalities are also responsible for services such as local transportation provision, water and waste management, forest management or environmental protection (Šťastná 2011).

All these responsibilities are associated with a budget. The municipalities' total expenditures in the examined period 2011-2013 were 744 billion CZK (app. €29 billion; statnipokladna.cz⁶). That represents about 6 % of the Czech GDP in the same period (own computation based on CZSO.cz⁷).

As all municipalities have very similar responsibilities and objectives, they also should have a similar procurement portfolio in terms of the types of goods and services purchased. For us this implies good degree of comparability in their procurement practice. For most indicators, we only consider the municipalities' contracts if they were published in the national Journal, to which Czech procurement law applies⁸ (smaller contracts are almost unregulated and impossible to track). Our dataset consists of 11 260 contracts procured by 2 350 different municipalities, with a total procurement volume of 141 billion CZK (€5.6 billion, or 20% of the municipalities' total budgets).

Even so, the evaluation presented in this study only covers municipalities that published at least ten *contract award notices* and at least two *contract notices* in the Journal in the given period. We have arbitrarily set these as the minimum inputs needed to give our aggregate indicators reasonable explanatory power. The result is a total dataset of 194 procurers. The timeframe from 2011 until 2013 fits the political situation well, because in 2010 there were elections to the municipalities' boards. Consequently it may be assumed that the first round of procurement actually managed by the municipalities' new management took place in 2011. We divide the procurers into three groups, in order to maintain good comparability within each:

- 60 large cities with more than 20 000 inhabitants.
- 121 smaller cities with fewer than 20 000 inhabitants.
- 14 Prague districts, which procure on their own⁹.

⁶ <http://monitor.statnipokladna.cz/analyza/#>

⁷ http://apl.czso.cz/pll/rocenka/rocenkavyber.makroek_vydaj_en

⁸ This covers all procurement above national thresholds, which varied over time. Between 1/2011 and 3/2012 the threshold was 2mil CZK (€80,000) for goods and services and 6mil CZK (€240,000) for construction works. From 4/2012 to 12/2013 it was 1mil CZK (€40,000) for goods and services and 3mil CZK (€120,000) for construction works.

⁹ Compared to districts in other large cities, which procure under the auspices and with the same ID as the city's central municipal office.

Our reduced sample covering these three groups consists of 6 433 contracts with a total procurement volume of 90 billion CZK (€3.6 billion).

Table 1: Data summary by category

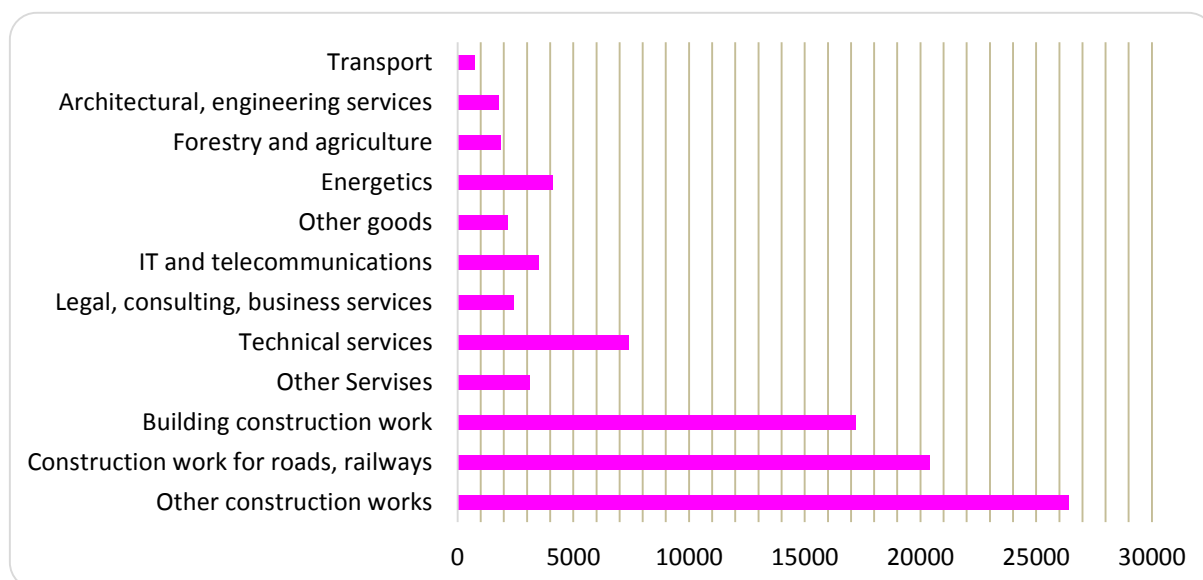
Municipality category	Number of procurers	Number of contracts	Sum (CV)	Avg* (CV)	Std. dev.* (CV)	Min* (CV)	Max* (CV)
Large cities	60	3 966	61 614	14	105	0.1	6 219
Prague districts	14	424	7 773	18	53	0.1	522
Small cities	120	2 043	20 739	9	32	0.1	690
<i>not in sample</i>	2153	4 827	50 707	11	39	0.1	950

*source: own computation based on the journal; CV = Contracted volume in millions of CZK, * indicates statistics per individual contracts*

The largest portion of contracts in the sample (2/3 of the sample's contracted volume) is procured by large cities. The number of contracts varies significantly and is driven mostly by the size of the city: the smaller procurers in our sample award 10-20 contracts over the period, whereas the biggest Czech cities such as Prague, Brno, and Ostrava awarded more than 300 contracts in the same period. Large number of procurers and contracts are "*not in the sample*" because they published only a few contracts in the given period: more than 2 000 procurers published at least one *contract notice*, but did not publish more than 10. These occasional procurers – typically very small municipalities together published 40 % of all municipal contracts in the reference period.

The most frequent type of contract issued by the municipalities is for construction works (these make up 77 % of the contracted volume). Other significant, but smaller types of contracts are those purchasing technical services (8% of the total volume), energy, and IT & telecommunications (4% each).

Figure 1: Contracted volume by subject, in millions of CZK



Source: own computation based on the Journal

4.1 Overview of Results

We applied our methodology to the described dataset of Czech municipalities, and our findings can be summarised as follows:

Firstly, public procurement expenditures usually form only one third of all purchases made by an average city. The residual costs are usually payments based on historical contracts with extra-large volume, small contracts (below the threshold at which a contract award notice is required) and various legal exceptions. This outcome indicates that even with perfect transparency measures in the area of public procurement, only minor part of public purchases of goods and services will be actually publicly auditable.

We also find that **Municipalities award 10 % of their public procurement using the least transparent negotiated procedure without publication**, where there is only one bidder and therefore competition is missed. That is more than three times above the EU average. Based on our results, we can say that Municipalities rarely use electronic auctions (this method is used to award just 7 % of contracts). Division into lots is more frequent (used to award 20% of contracts). But still the results mean authorities rarely spend extra effort to minimize costs/maximize potential value-for-money of the public contracts.

Data from the Journal indicates that **one half of all contract notices issued were either modified or cancelled**, potentially hampering competition and wasting sources of all stakeholder in the process. Moreover we find, that one third of all municipalities procured at least one contract in which the Czech supervisory authority found significant misconduct against fair competition. Additionally, In half of the contract award notices, vital information such as the final price, ID or name of the supplier is either incorrect or missing. The share of contracts for which incomplete information is provided on the contracting authority's own website is even higher.

At last, but not least, only 40 % of municipalities answered our FOI request about their procurement volumes in a timely manner. 35 % of the answers we received were either incomplete or late (after the 15 day legal deadline); most claimed they were unable to fully answer, while 25 % of municipalities did not answer at all. This suggests records of municipal purchases are kept in a very poor state.

The following table presents descriptive statistics for our indicators for the examined municipalities:

Table 2: Descriptive statistics of Indicators, Municipalities 2010-2013

z	Component	Count(*)	Avg (value)	Std. dev (value)	Min (value)	Max (value)
z₁	Public procurement share of total purchases	60	0.58	0.16	0.30	1.00
z₂	Competitive contracting	195	0.79	0.24	0.01	1.00
z₃	Consistent conduct	195	0.65	0.23	0.00	1.00
z₄	Winner concentration	195	0.59	0.20	0.08	0.94
z₅	Bidder participation	195	0.60	0.20	0.07	0.98
z₆	Pro-competitive tools	195	0.47	0.23	0.00	0.88
z₇	Legal misconduct	60	0.85	0.20	0.46	1.00
z₈	Journal data quality	195	0.51	0.24	0.00	0.96
z₉	Buyer profile data quality	195	0.29	0.24	0.00	0.95
z₁₀	Supplier rating	195	0.86	0.11	0.48	1.00
z₁₁	Information provision	74	0.62	0.41	0.00	1.00

For data availability as well as capacity reasons, indicators z_1 and z_7 are only calculated for the *Large cities* category, and Indicator z_{11} is calculated for *Large cities* and *Prague Districts*.

The calculation formulas were deliberately altered, so that the standard deviation for most of the indicators varies closely to 0.2, which is large enough for comparison and ranking in individual indicators. More importantly, this ensures that the aggregate zIndex indicator is not prone/skewed to the movement of one particular indicator. We only allowed for two exceptions from this approach. First, the only indicator with very high variance is z_{11} - Information provision, which is why we decided to reduce the weight of this indicator by half compared to the other indicators. Second, the indicator z_{10} (supplier rating) has significantly lower variance and consequently has a lower impact on the overall zIndex rating. Reason for that lies in different nature of the indicator, because the procurers have limited power to affect this it., The supplier is chosen strictly by procedure in compliance with the law. The supplier rating indicator merely indicates potential risk of conflict of interest and need not be linked with any deliberate action of contracting authority, thus we decided to make it less relevant than others.

4.2 Results of Selected Indicators

We now briefly discuss the results of specific indicators, to illustrate their practical use and relevance.

4.2.1 z_1 - Public procurement share on total purchases

This indicator measures the ratio between all purchases the contracting authority makes, and the purchases it makes through public procurement. It is used to identify deliberate splitting of contracts (in order to push contracts below the value at which certain

procedures have to be followed and the details of the contract published in the Journal) and excessive misuse of other legal exceptions.

The indicator compares the value of contracts published in the Journal with the total volume of controllable operating costs, which is calculated as the sum of selective investment and non-investment expenses according to the State Treasury. Because of the lack of detailed budget data for smaller cities and Prague districts, this indicator was computed only for 60 large cities.

The best cities such as Mladá Boleslav or Strakonice publish 70 % of all their procurable costs in the Journal. Those cities have minimum legal exceptions from procurement law and few payments based on historical contracts. This is very favourable for overall budget transparency, as the majority of the budget can be traced in the Journal and how open and competitive the supplier choosing process were may thus be verified.

On the other hand, more than a quarter of the cities we evaluated publish less than 20 % of their procurable costs in the Journal, which indicates either strong financial dependency on historical contracts or very creative procurement management with a propensity towards avoiding procurement law. The worst cases were Blansko and Jablonec nad Nisou, where the contract notices published in the Journal represent less than 10 % of those cities' total procurable costs.

It should be mentioned that this indicator only covers two years (2012 – 2013) due to changes in accounting procedures at municipalities. This decreases the explanatory power of the indicator, however even on a two year horizon we can see the towns' tendencies towards or away from the good practice of correct procurement for a maximum of the municipality expenditure. At the same time, there might be delays in payments associated to contracts, and so the 2-year period may be too short to observe true practice. However if a contracting authority annually procures a similar volume of contracts, then the volume of historic contracts carried over to the controllable operating costs from the previous year should be equalized by the volume of present contracts carried over to the following year. In this way a contracting authority may be discriminated only if it awarded an unusually large value of contracts (for over 50% of its controllable operating costs) prior to the reference period and the performance of those contracts is thus not counterbalanced in the manner described.

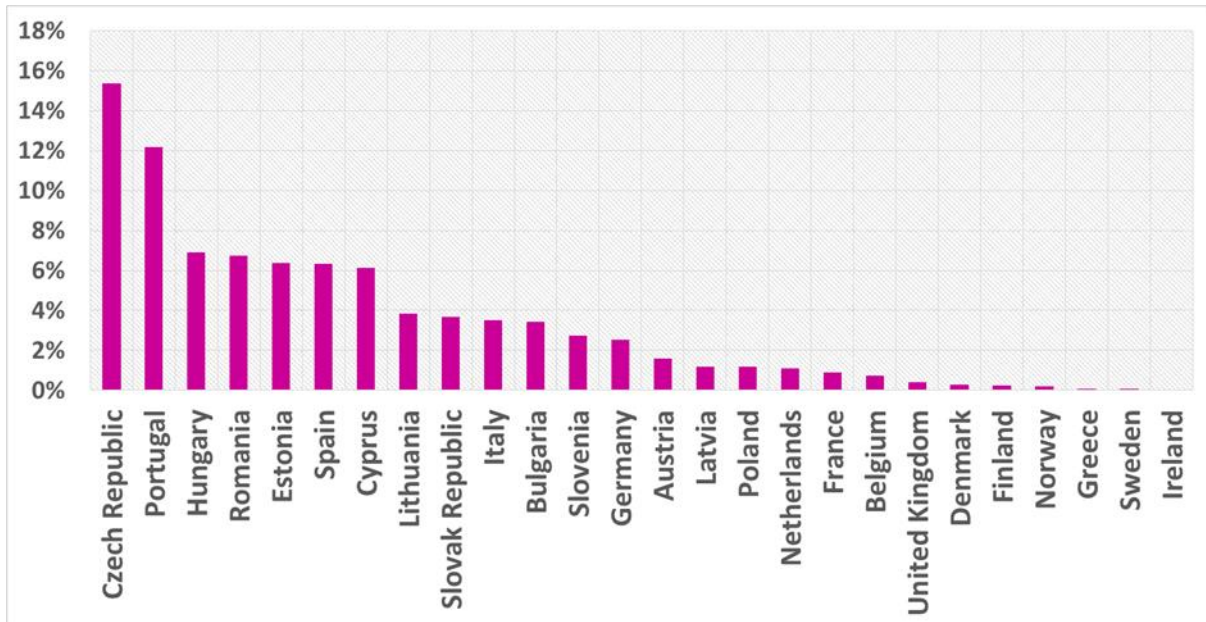
4.2.2 z_2 - Competitive contracting

This indicator measures the volume of contracts processed through certain competitive tendering procedures. Contracts tendered through a negotiated procedure without publication (NPwP), which is the least transparent and the most competition restrictive procedure, are penalized. This type of procedure is often used for contract additions and enhancements, where there is only one possible supplier, or in case of "extreme distress" (e.g.: accidents, natural disasters).

The methodology for the implementation of the Czech Public Procurement Act states that NPwP is an extreme type of procurement procedure and should be used only if objective circumstances do not allow otherwise (Ministry of Regional Development (2013)). Despite this, municipalities have continued to award 10 % of public procurement using a negotiated procedure without publication. Internationally, the Czech Republic ranks first in Europe in

using NPwP to award above-the-threshold contracts, scoring five times above the European average.

Figure 2: International comparison of NPwP share of above threshold contracts, 2013

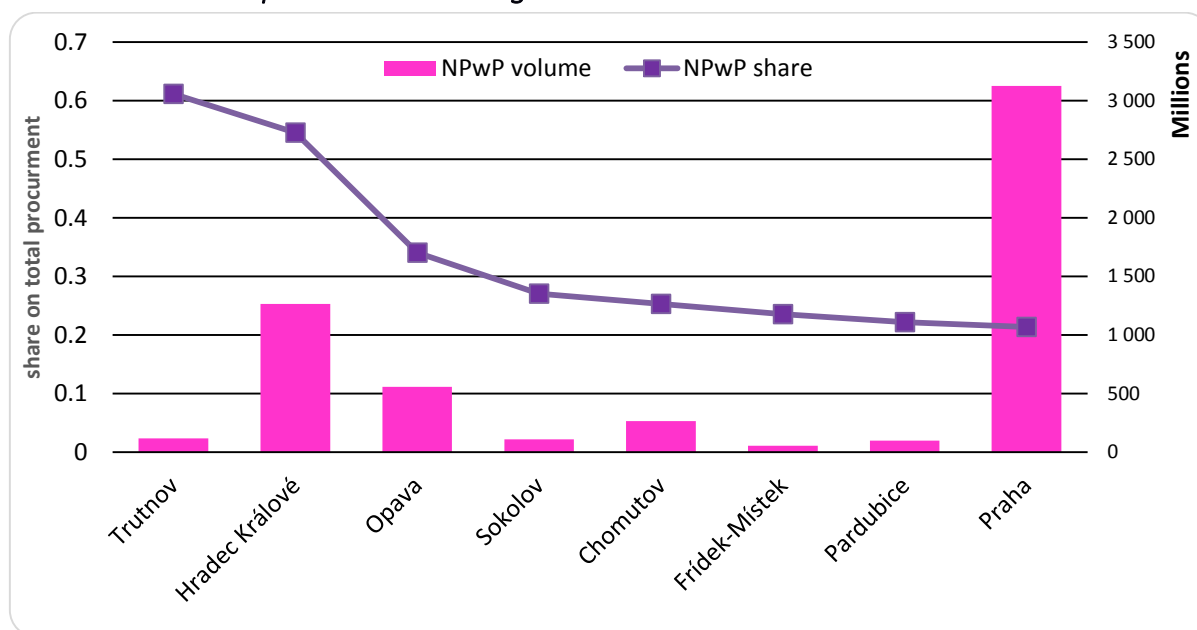


Source: own computation based on the Tender Electronic Daily, European procurement journal

It should, however, be mentioned that a certain proportion of this excessive usage of NPwP is the result of the publication methodology in use: according to Czech procurement law, all additions to contracts, up to 20% of the contract value, must be reported as NPwP – even tiny ones. This approach is not common across EU countries.

Only one third of the cities procured less than 3% of their procurement using NPwP – the EU average. Half of the large cities procure between 3 and 12 percent of their contracts using NPwP. There are eight cities in our sample (see graph below) that procure more than 20 % of their procurement via NPwP.

Figure 3: share of total procurement and absolute value of contracts awarded by NPwP, worst cities in competitive contracting indicator.



Source: own computation based on the Journal

The reasons for using NPwP are usually connected to previous contracts which were established with improper subject definition or inadequate analysis, ultimately leading to a need for additional work or to vendor lock-in. In such cases, NPwP must be used, because it appears that no other party could bid for the contract, or it seems that unexpected additions must be made to the existing contract. As an example – the town of Trutnov scores worst in this indicator, because in the period studied, it allocated more than 50 % of its total procurement expenditure to "extra work" and additions to existing contracts for sewerage constructions in Volanov¹⁰, seriously challenging the fairness of its previous open competition, which used the lowest price criterion. Thus consequent overpricing rendered the face value of the original winning bid irrelevant. We use this example to illustrate that the purpose of this indicator is to punish behaviour that leads to excessive use of NPwP, rather than to punish the use of NPwP itself.

¹⁰ Viz <http://bit.ly/1njaU2C> (Vsechnyzakazky.cz)

4.2.3 z_3 - Consistent conduct

The consistent conduct indicator penalizes contracting authorities for wasting money on tender preparation, which usually happens when the authority prepares contracts improperly or is inconsistent in its decision-making. In particular, money is wasted when:

- contracts are announced but not awarded (neither a contract award notice nor a contract cancellation notice is to be found in the Journal);
- contracts are cancelled; or
- several amendments are made to contracts that have already been announced.

Best practice guidelines emphasize the need for maximum investment plan transparency and predictability, in order to give all potential bidders enough time to prepare for the planned tendering procedures. When a procedure is cancelled, however, all the bidders' preparations are wasted, and the likelihood that the same bidder will participate in future tenders might be reduced.

We observe that 40 % of all municipalities' contract notices were either not followed up with the award of a contract, or were cancelled. Part of this may arguably be attributed to improper contract award publication, whose effect we are unable to determine. Given just the cancellations, which we are certain of, this indicates that in at least TODO XX % cases the bids were prepared and perhaps also placed in vain. Ultimately, these costs might translate into higher prices in other Contracts – either directly through firm's mark-up or indirectly through smaller competition.

Furthermore, 20 % of the municipalities' contract notices were amended with one or more correction notices (corrigendum in TED terminology). Such a significant volume of amendments to tender specifications is also in conflict with best practice recommendations. These amendments imply certain errors or shortcomings in the original specification, pointing out possible lack of market research or technical preparation, and prolonging the whole tendering procedure. Consequently they also create additional costs for the firms preparing bids in line with the original conditions.

4.2.4 z_4 - Winner concentration

This indicator measures the breadth and diversity of suppliers. It measures whether a single bidder, or a very limited group of bidders, is awarded a significant portion of the authority's contracts. Best practice guides note that *"avoiding the concentration of key areas in the hands of a single individual is fundamental in the prevention of corruption"* (OECD (2009), p. 35). A high winner concentration (which gives a low indicator rating) is usually caused by:

- One large contract being awarded in place of several smaller ones.
- Unfair tendering processes, which repetitively discriminate or disqualify some bidders in favour of others.
- Technological or legal restrictions preventing changes of supplier: vendor lock-in.

The Winner concentration indicator captures situations in which one firm consistently wins contracts in seemingly competitive procedures, due to vendor lock-in or procurer bias. The

relatively high average score for this indicator (0.6) is given by the variety of purchased goods – it is nearly impossible for a procurer to have a score of 0 for this indicator, since that would mean that only one vendor supplied its whole portfolio of procurement needs, including supplies, services and construction works.

Winner concentration is complementary to the Bidder participation indicator. While the number of tenders reflects the observed number of competitors, winner concentration monitors the occurrence of a single repeated winner (despite apparent competition).

4.2.5 z_5 - Bidder participation

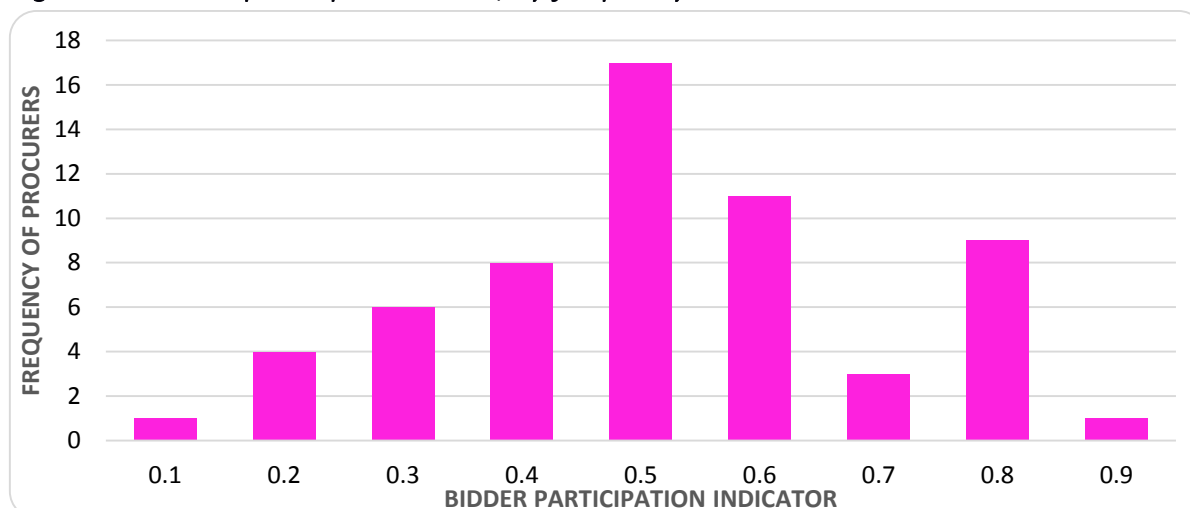
This indicator monitors the level of competition for each contract and penalizes procedures with an unusually low number of tenders. The calculation reflects different levels of competition across various markets. All contracts are compared against the median number of tenders in contracts with the same CPV code (in less frequent cases of markets with very small sample, similar CPV families are grouped together in order to obtain more robust figures).

Competition is a key instrument in public procurement, which prevents corruption and cartel arrangements, reduces contract prices, and helps the contracting authority to achieve maximum value for its money. A bidder who does not have to compete against other bidders has no motivation to offer their best possible quality/price ratio. The influence competition has on final contract price has been confirmed by a number of academic studies (for example Domberger et al. (1995), Onur et al. (2012) or Soudek & Skuhrovec(2013)). The European Commission also focuses on bidder participation in its internal market score-board of member states' public procurement performance.

The most common reasons for a call not to receive many bids include: poorly identified subject matter, inadequate qualification criteria, or insufficient publicity. Best practice requires contracting authorities to avoid these shortcomings and to procure contracts in a way that encourages maximum competition.

The following graph compares the Bidder participation indicator scores for the examined authorities. The distribution of these scores is almost normal: two thirds of evaluated cities are in the middle, experiencing average competition in their procurement. Moreover, there is a peak of 10 municipalities with very good score of 0.8, indicating that there are several municipalities who manage to sustain significantly higher than average levels of competition in their procurement procedures.

Figure 4: Bidders participation score, by frequency



Source: own computation based on the Journal

One would presume that the most successful municipalities will be the big ones, where there is more economic activity and therefore a broader range of potential suppliers. Surprisingly, we do not find this to be the case: the highest scores were acquired by various smaller cities (20-50 thousand inhabitants) spread across the country, while the capital city Prague scored second worst, despite being the economic centre of the country, where the most companies operate. The reason for these results may be in the fact that larger cities procure larger contracts, where competition may be limited due to capacity constraints. We test this hypothesis and find no significant difference in the number of bidders with respect to the contract size for contracts worth up to 0.5 billion CZK. For contracts worth more than 0.5 billion CZK, the number of bidders is lower by approximately one bidder, compared to the median number in the given CPV industry. However contracts this large are rare in the dataset (11 contracts worth 15 billion CZK). The results indicate that the procurer can affect the actual number of bidders who participate in the procurement procedure by creating (or removing) obstacles for participation, while adverse geographical location poses only a minor problem.

To give some examples of successful cases, we can mention:

- The most competitive procurement procedures are carried out in the city of Tábor, where bidder numbers in double figures are common (compared to the usual country-wide median of 3 to 5 bidders).
- The city of Jihlava was able to attract four bidders to the tender for an IT technology centre – a type of project where a single bidder is usual¹¹ and having two bidders is considered a rarity in Czech procurement.
- Fourteen bidders competed for a contract to provide cleaning services for the municipality office in the city of Kolín, despite the fact that the tender was processed through a negotiated procedure with publication – a procedure where usually only a few bidders are involved.

¹¹ <http://bit.ly/1w2IFVt> (Vsechnyzakazky.cz – IT technology centre; in Czech)

Such extraordinary competition should be beneficial for the procurers, as a number of academic studies (such as Domberger et. al (1995), Onur et. al. (2012) or Soudek & Skuhrovec (2013)) have confirmed the impact of the competition (measured by the amount of bidders) on the final contract price.

4.2.6 z₆ - Pro-competitive tools

The pro-competitive tools indicator evaluates the extent to which each contracting authority uses optional pro-competitive tools, namely:

- Electronic auctions that allow bidders to repeatedly adjust their bid, leading to real-time direct competition among bidders; the auction ends when no bidder is willing to offer a lower bid.
- Dividing contracts into lots, which allows procurers to attract maximum competition for each particular item in the contract, and facilitates access to contracts for SMEs.
- Extended deadlines for tender submissions, which allow potential bidders to prepare their bid more thoroughly and therefore results in more numerous bids and better offers.

Use of the optional tools listed above fosters fair competition (OECD (2008)). This indicator thus rewards a contracting authority for additional activity (where appropriate) which goes beyond its legal obligations and supports a competitive environment in public procurement.

Municipalities use electronic auctions to award 7 % of contracts, mostly when procuring energy (60 % of all e-auctions) and construction works (25 %). This tool is used by all categories of procurers (50 % of *small cities* and 70 % of *large cities* used e-auction at least once in the reference period).

The most popular of the three optional tools is division into lots: this technique was used in 15 % of contracts (for all types of procurers). The contracts most frequently divided into lots are those for construction works (65 % of all divisions), followed by IT & telecommunications (9 %) and energy (8 %).

4.2.7 z₇ - Legal misconduct

The legal misconduct indicator reflects the number of incidences of misconduct by each contracting authority detected by the Office for the Protection of Competition (OPC), which is the authorized body for reviewing the legality of public procurement practices. We only penalize incidences of serious misconduct.

Legality is a fundamental prerequisite for best practice in public procurement. Contracting authorities can never become efficient and effective while engaging in misconduct that can be challenged, potentially resulting in the cancellation of the tendering procedure. The OPC is responsible for reviewing the legality of tendering procedures, most commonly based on bidders' complaints. If serious misconduct is detected in the contracting authority's practices (in particular, defective tender specifications or an improper approach towards bidders), that contract does not comply with best practice principles. In 2013 the OPC reviewed 2873 contracts and initiated administrative proceedings based on 668 of them (OPC Annual Report 2013). The most frequent types of misconduct they identified were:

- establishing non-transparent and discriminatory tender criteria;
- ambiguous definition of the evaluation method to be used, and disproportionate qualification requirements;
- malpractice in the assessment and evaluation of bids (i.e. lack of transparency in the assessment and evaluation report, most often caused by insufficient description of the evaluation method and evaluation process, and incorrect procedure in the assessment of extremely low bids);
- unjustified exclusion of a bidder
- incorrect determination of the estimated value of the public contract and as a result, incorrect choice of procurement procedure type;
- use of the negotiated procedure without publication, in cases that do not meet the conditions for its use;
- cancellation of award procedures that do not fulfil the conditions under which the authority may cancel them.

Serious misconduct such as this clearly fails to comply both with the law and with best practice principles. The indicator covers only 60 *large cities*, and we found 40 relevant cases of misconduct where the OPC had identified serious anti-competitive behaviour in the procurement procedure. The most frequent anti-competitive behaviour was ambiguous definition of the evaluation method and the unjustified exclusion of a bidder. Out of the 40 cases identified, the OPC cancelled the contract fourteen times; in five cases the procurer had cancelled the procurement procedure on their own; in the rest of the cases a fine was imposed.

At the same time, we found a very low ratio of serious cases at the OPC: only 20 % of OPC reviews identified serious misconduct – the remainder of reviews usually only revealed formal deficiencies.

4.2.8 z₈ - Journal data quality

The journal data quality indicator evaluates the quality of information published via the Public Procurement Journal by each contracting authority. In particular, it assesses whether the authority published valid basic details, which are fundamental for transparency, accountability and fair competition. Where the following shortcomings related to a contract award notice are found, the evaluation penalizes the relevant authority:

- failure to publish a contract notice (in the case of open procedures, restricted or negotiated procedures with publication, or competitive dialogue procedures);
- inconsistent information in the contract notice and contract award notice (type of procedure, framework agreement, EU funding);
- failure to disclose estimated price or award price (or disclosure of ambiguous figures clearly not corresponding to the actual final price - e.g. hourly rates);
- incorrect identification number given for the contracting authority;
- incorrect identification number given for the winning bidder (for single winner contracts, where it is technically possible to publish this number);
- incorrect official name given for the contracting authority (minor typos and capitalization mistakes are ignored);
- failure to disclose the type of procedure;

- insufficient justification of the chosen procedure (when a negotiated procedure without publication is chosen, or another country-specific below-the-threshold procedure);
- failure to disclose the number of tenders submitted.

Each of the above listed shortcomings reduces the overall transparency level of the process. This reduces the scope for public inspection and indirectly contributes to corruption and inefficiency in public procurement (OECD (2005), EC (2013)). When auditing projects co-financed by the structural funds, the European Commission considers non-compliance with advertising procedures punishable by a financial correction (i.e. subsidy cut) of at least 25% and at most 100% of the value of the contract involved (COCOF (2007)).

Errors in the details published may be caused by negligence while completing Journal forms, or by deliberate obfuscation of sensitive information in order to reduce a contract's traceability. The primary purpose of this indicator is to punish the latter form of malpractice.

In a half of the contract award notices there is incorrect or missing information that is key for public scrutiny, such as the final price, both the procurer's and the supplier's ID number or name. For example, the city of Brno awarded 400 contracts in the reference period and yet in the Journal it filed just 61 different names (excluding typos and misspellings) and two different identification numbers. Similar inconsistencies can be seen in all large cities (Prague: 27 names & 4 ID numbers, Plzeň: 27 names & 2 ID numbers, Ostrava: 30 names). The "winner" in this competition would be the association of municipalities called "Vodovody a kanalizace Znojemska" (Water supply and Sewerage of the Znojmo region) who used eight different names to procure ten contracts in the reference period. This multi-name issue makes it impossible to track all the contracts the procurer purchased.

4.2.9 z₉ - Buyer profile data quality

The buyer profile data quality indicator evaluates whether and how contracting authorities publish contract information on their electronic buyer profiles, using a machine-readable interface that every purchaser is legally obliged to have. The following three aspects are evaluated:

- **Functionality** - is the profile machine-readable, as required by law?
- **Completeness** - does the profile contain information about all the contracts the authority has published in the Journal?
- **Quality** - does the profile contain any apparent errors, or information inconsistent with the Journal?

To compute this indicator we prepared our own special software, which downloaded and evaluated data from each buyer profile (these are machine readable), displaying lists of all errors found.

We found multiple severe flaws in the data on nearly all profiles, as buyers failed to report bidders or prices, or to publish information on the procurement at all. The reason behind the poor data quality may be that no NGOs and more importantly no public authorities have ever before attempted to explore this data in such detail. In other words, before our

project there was no real scrutiny of these profiles, which possibly led to them being seen as unimportant. In the coming years, we would like to use this rich buyer profile data as a basis for a more extensive rating; however, before this can happen, we need to put pressure on the buyers to get the data into better shape. That is what we hope this indicator will stimulate.

4.2.10 z_{10} - Supplier Rating

The supplier rating indicator identifies the following supplier characteristics that may imply reduced efficiency or greater risk of corruption:

- public procurement exceeds 75% of the supplier's total revenue;
- the supplier subcontracts more than 50% of the contract value;
- the supplier fails to disclose its financial statements in the Commercial Register;
- the supplier ceased operations in a non-standard manner;
- the supplier is insolvent;
- the supplier was founded less than six months prior to the contract notice;
- the supplier has made donations to political parties;

A necessary prerequisite for the optimal supply of public investment is the effective management and monitoring of the supply chain (OECD, 2009). According to anti-corruption organizations (TICZ (2005) or Oživení (2011)) the Czech contracting authorities have a wide margin particularly in the supervision of the selected contractor's performance and delivery. Our chosen set of sub-indicators identifies supplier risk characteristics, which may be warning signs of potential corrupt conduct, or may cause difficulties with the delivery of contracted work or enforcement of guarantees.

For example, as reported in a recent study for the Center of Applied Economics (Skuhrovec, Titl & Palanský (2015)), 29.6% of all Czech procurement winners directly donate money to political parties. The study's results also suggest that making a donation to a political party significantly increases the expected value of the public procurement contracts awarded to the donor, and reduces the competition in the procedures that lead to such an award ((Skuhrovec, Titl & Palanský (2014)).

4.3 Interrelation between municipalities' results

The chapter discusses the interrelation between the various indicators, in order to crosscheck the robustness and validity of our results. We use standard statistical methods that enable us to identify the scope and magnitude of the relationships between indicators and consequently the underlying characteristics of Czech municipal procurement.

4.3.1 Correlation Matrix

We begin our analysis with a standard correlation matrix, as can be seen in Table 3. The individual zIndex indicators were designed to complement and offset each other.

Table 3: Correlation matrix for all indicators

		z ₁	z ₂	z ₃	z ₄	z ₅	z ₆	z ₇	z ₈	z ₉	z ₁₀	z ₁₁
z ₁	PP share on total purchases	1										
z ₂	Competitive contracting	-0.15	1									
z ₃	Consistent conduct	0.20	0.00	1								
z ₄	Winner concentration	-0.30	0.18	-0.07	1							
z ₅	Bidder participation	-0.27	0.44	-0.18	0.28	1						
z ₆	Pro-competitive tools	-0.13	-0.19	0.11	0.29	0.21	1					
z ₇	Legal misconduct	-0.06	-0.20	0.09	-0.03	0.14	0.13	1				
z ₈	Journal data quality	0.19	0.24	0.57	-0.18	0.09	0.06	0.21	1			
z ₉	Buyer profile data quality	0.02	-0.12	-0.05	-0.14	-0.09	0.18	0.35	0.00	1		
z ₁₀	Supplier rating	-0.16	-0.14	-0.02	0.09	-0.20	0.08	-0.24	-0.27	0.02	1	
z ₁₁	Information provision	-0.19	-0.10	-0.25	0.06	0.10	-0.14	0.30	-0.03	0.20	-0.12	1
	City population	-0.14	-0.24	0.04	0.02	-0.24	-0.05	-0.22	0.02	-0.22	0.16	0.03

Some interesting relationships are observed:

- 1) There is a strong positive correlation between indicators z₂ - competitive contracting and z₅ - bidder participation, which supports the hypothesis that more competitive contracting (in terms of avoiding NPwP) leads to higher competition in the procurement procedure (in terms of the number of bidders).
- 2) There is a positive correlation between z₄ - winner concentration, z₅ - bidder participation and z₆ - pro-competitive tools, which confirms the hypothesis that pro-competitive tools actually do support competition and diversity across suppliers. In other words: e-auctions, division into lots and extra time for bid preparation actually lead to higher bidder participation in the procurement, and in a broader sense correlates with an effort to attract more bidders.
- 3) There is a strong negative correlation between the z₁ - share of total purchases and z₄ - winner concentration, which is caused by the eventual effect of one big investment project – in cases where a municipality procured an extraordinarily huge contract in the reference period, its procurement as a share of spending looks high, but it takes a very large part of its purchases from one vendor.
- 4) The rather negative correlation between size of city and most of the other indicators might suggest that zIndex favours smaller cities, or that procurement practice in major cities is worse. Let us briefly discuss these hypotheses for two of the most negatively correlated indicators:
 - z₂ - competitive contracting is predominantly determined by the amount of additional construction work the given authority needed in the reference period. Since these are mandatorily published regardless of their value, they should not be correlated with size of contract, nor with the particular authority. It might be the case that larger projects do require a progressively higher amount of additional work – yet we do not have any evidence of that. Secondly, there are a large number of current IT vendor lock-ins in the Czech Republic, most

notoriously in its capital city of Prague. Contracts for further services associated with these deals might cause bias, since only contracts above 2 mil. CZK have to be published as negotiated procedure without publication and thus be included in the rating. Thus we might see major cities suffering a slight disadvantage from this indicator. On the other hand, z_5 - bidder participation should arguably be more favourable to major cities, where there are with more local suppliers available to compete for contracts.

- z_7 - legal misconduct refers to the quality of data publication, which is entirely in the hands of the relevant contracting authority. The conditions might be slightly better for larger cities, who publish data more regularly and whose employees should be more skilled in this task. Similarly, z_9 should be directly linked to the professionalism of procurement staff, who should be able to abide by the law. Major cities should be in a better position to employ more skilled professionals, at least because of their considerable economies of scale. In spite of this fact, they are more often found to violate the law. The only plausible explanation for this (besides assuming major cities' practices are worse) is that objections are made more frequently against their practice - evidence for which, however, we did not find.

We can thus conclude that major cities might have an actual disadvantage in some indicators, but there is no strong reason to suppose a systemic bias in this direction in the zIndex calculation. The correlations with size that we have observed might therefore be only a random occurrence on this sample.

4.3.2 Principal component analysis

We use principal component analysis to describe the dimensionality of the data and to reveal its internal structure. The analysis is conducted on the full range of indicators, for the 60 *Large cities* only. Five components meet the criteria of eigenvalue above one, explaining 72 % of the variance in the data. The number of components and relatively low eigenvalues indicate the multidimensionality and robustness of our indicators, as it is not possible to replace them with one or more explanatory variables. The non-orthogonal Promax rotation was applied in order to explain the resulting components more straightforwardly.

Table 4: Principal component analysis for Large cities, all indicators

z	Component	Comp1	Comp2	Comp3	Comp4	Comp5	Unexplained
	Eigenvalue	2.00	1.91	1.68	1.54	1.51	
	Proportion	0.17	0.16	0.14	0.13	0.13	
	Cumulative	0.17	0.33	0.47	0.59	0.72	
z₁	PP share on total purchases					-0.32	0.40
z₂	Competitive contracting	0.63					0.26
z₃	Consistent conduct		0.66				0.23
z₄	Winner concentration	0.30			0.41		0.41
z₅	Bidder participation	0.58					0.28
z₆	Pro-competitive tools				0.73		0.24
z₇	Legal misconduct			0.52			0.31
z₈	Journal data quality		0.69				0.18
z₉	Buyer profile data quality					-0.35	0.42
z₁₀	Supplier rating				0.31		0.49
z₁₁	Information provision			0.67			0.27
	City population					0.81	0.20

Essentially, these results show that our mutually independent indicators cross-confirm each other in quite an intuitive manner. Component 1 can be seen as representing competition: it is highly correlated with the indicators describing a competitive environment: z_2 - competitive contracting, z_4 - winner concentration and z_5 - bidder participation. Component 2 relates to the quality of the authority's tender preparation practice: indicator z_8 - journal data quality directly measures the quality of Journal announcement data, while indicator z_3 - consistent conduct measures the frequency with which such announcements are modified or cancelled, which again reflects the quality of the initial call. Component 3 ties together the two indicators most directly linked to abiding by law, whereas component 4 links pro-competitive behaviour with larger supplier heterogeneity and the less frequent involvement of risky suppliers. Finally, component 5 captures the effect of the municipality's size and shows the fact that larger cities have a larger proportion of below-the-threshold procurements and publish their data in worse quality.

As a robustness check, we also conduct this principal component analysis on the full dataset of evaluated municipalities, but only for the available components based on the data from the Journal notices. The very similar results in terms of the number of components, level of explanatory power and correlation patterns indicate that there is no structural change

in the data with respect to different municipality categories and confirms our previous findings.

Table 5: Principal component analysis for all municipalities, components based on the Journal

z	Component	Comp1	Comp2	Comp3	Comp4	Comp5	Unexplained
	Eigenvalue	1.56	1.43	1.29	1.21	1.15	
	Proportion	0.17	0.16	0.14	0.13	0.13	
	Cumulative	0.17	0.33	0.48	0.61	0.74	
z₂	Competitive contracting		0.39			-0.38	0.33
z₃	Consistent conduct	0.62					0.34
z₄	Winner concentration		0.49		0.43		0.26
z₅	Bidder participation		0.72				0.25
z₆	Pro-competitive tools			0.63			0.35
z₈	Journal data quality	0.72					0.20
z₉	Buyer profile data quality			0.76			0.28
z₁₀	Supplier rating					0.87	0.19
	City population				0.82		0.26

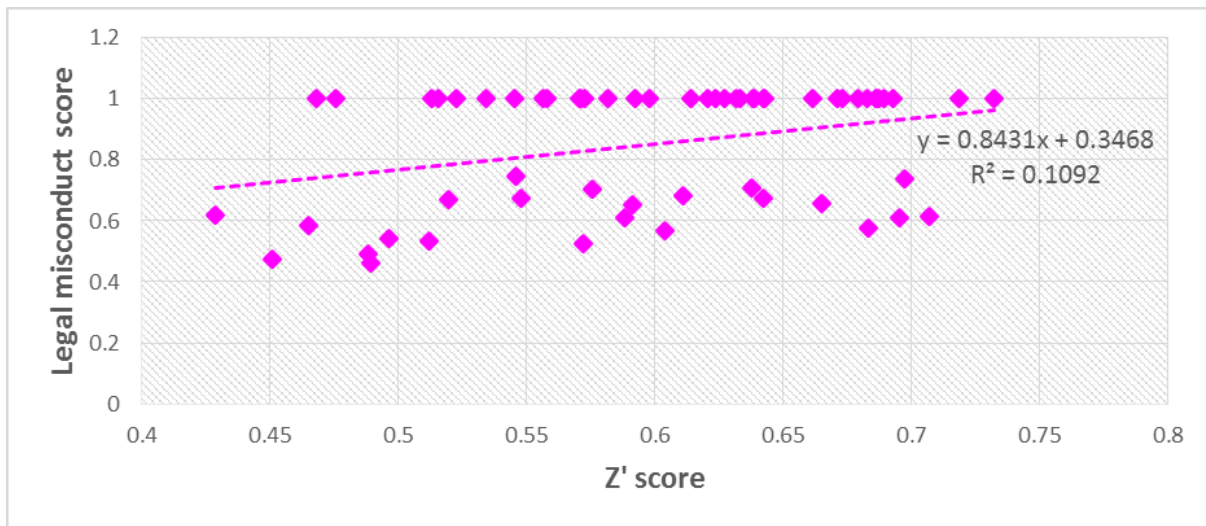
4.3.3 Good practice and Legal misconduct relation

All but one of our indicators in fact have a very limited direct impact on incentive schemes in municipality management. It may be, that the management's only objective in the procurement process is to deliver the public good that is purchased without hitting legal boundaries. The public body has soft budget constraints and therefore making savings through the implementation more effective procedures is not seen to be necessary. Other desirable characteristics such as transparency and controllability are beneficial for the municipality's management only in case of public or voter demand. These are to large extent unobservable by voters. Thus we propose, that the only indicator that has a straightforward impact on management incentives (in terms of the city or themselves being in trouble if the indicator is low) is z_7 – legal misconduct, which measures the incidence of anti-competitive and illegal conduct in the municipal procurement, as identified by OPC. If the OPC finds serious misconduct in the municipality's procedures, it may incur penalties, delays in procedure, cancellation of its contracts, or further investigation by other supervisory bodies and potentially criminal investigations.

We therefore decided to test whether there is a relationship between z_7 – legal misconduct – and the other indicators. This tests not only whether our soft best practice indicators do give some information on risks of legal misconduct, but also whether prosecution-averse

policy makers might see benefit in improving their zIndex values. We conducted an alternative aggregate zIndex, where z_7 is excluded: $Z' = (\sum z_i + 0.5z_{11})/9.5; i \in \{1, \dots, 10\}; i \neq 7$. We use this alternative zIndex as an explanatory variable in OLS estimation for z_7 - occurrence of serious misconduct in procurement law – and find (at the 99 % confidence level) that procurers with lower Z' scores by 10 percentage points also have lower scores in z_7 – legal misconduct – by 8.4 percentage points on average (t-test $(1,58) = 7.11$; Prob > t = 0.0099).

Figure 5: Legal misconduct and zIndex relation



Source: own computation using OLS based on the Journal and OPC

Alternative model testing gives us similar results: since the dependent variable is constrained on interval

(0,1), we use tobit regression and get very similar results with only a minor loss of confidence ($\beta=1.9$; F-test $(1,59) = 5.59$; Prob > F = 0.0214).

This relationship proves that procurers who avoid best practice as measured by zIndex tend to have more difficulties meeting the legal requirements, and are thus more often subject to disciplinary measures following OPC investigations.

4.3.4 Good practice and relative price relation

The most common metric in procurement literature (e.g. Kuhlman & Johnson (1983), Iimi (2006), Pavel & Sičáková-Blebavá (2012) or Onur et. al. (2012)) that measures procurement effectiveness is the relative price ratio (winning bid/ex ante estimated price). We therefore decided to test the relationship of the zIndex as a good practice indicator and relative price ratio. Generally, procurement procedures following good practice create a more competitive environment in the procurement, which pushes bidders to put their price bids down from the initially estimated price by the procurer and that results in lower relative price ratio.

We test this relationship on the sample of 3 100 construction work contracts in order to avoid massive heterogeneity in the subject purchased. The choice of market was motivated both by its large scale and by fact that methodology for producing price estimates is more rigorous and reliable than in other markets. We find (at the 99 % confidence level) that procurers with higher zIndex scores by 10 percentage points have (in average) lower relative price by 1.4 percentage points (t-test (1, 3 100) = 9:66; Prob > t = 0.0019). This implies, that in there is about 5 % difference in savings across the best and the worst rated municipalities. Such number can be considered an estimate of average cost for conducting procurement without focus on best practice.

5 Conclusion

zIndex is the first composite index developed to measure good practice among contracting authorities. It empowers researchers, journalists and the general public to benchmark and further explore how public bodies deal with public money. More importantly, through its individual indicators, zIndex enables the contracting authorities themselves to monitor and address possible weaknesses in their own purchasing behaviour.

We ranked 194 Czech municipalities according to their procurement practice in 2011-2013. The plan is to issue a similar ranking periodically for a wider range of contracting authorities, including bodies such as hospitals and state-owned enterprises. The methodology is quite flexible in this respect, with the only issue being comparability in terms of the contracting authorities' portfolio of purchased goods and services.

Empirical results show, that individual indicators cross-confirm each other. More importantly, measured good practice has significant correlation with both observed legal misconduct and savings, where best performing cities save in average 5 % of relative price and face 30 % lower chance of legal misconduct than the worst ones.

The index works with a broad range of high-quality data combining multiple sources. This is especially difficult in the field of public procurement, where data are usually unreliable or unavailable, both to researchers and to the general public. By publishing detailed statistics for individual municipalities, we hope to foster discussions about good practice in public procurement.

Our proposed methodology has been found to measure various dimensions of good practice in public procurement successfully. We have discussed this methodology and the results extensively with several expert Czech lawyers and procurement practitioners, and have submitted the results to the rated authorities themselves for two rounds of comments; all valid comments received have been addressed. To our knowledge, the zIndex methodology is reasonably fair and informative, given the extremely complex issue of good practice in public procurement, which it aims to measure.

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