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DO E-AUCTIONS REALY IMPROVE THE EFFICIENCY OF PUBLIC PROCUREMENT? THE CASE OF THE SLOVAK MUNICIPALITIES

Jan Pavel, Emilia Sičáková-Beblavá*

Abstract:

The article deals with the factors which influence efficiency of public procurement in the competitive contracting conducted through e-auctions in 15 Slovak cities. Data cover building and IT contracts awarded in the years 2007-2009. Together 186 observations were used for the analysis. The article starts with a theoretical discussion on the factors influencing efficiency of the procurement including potential impacts of the e-procurement and the e-auction. Than five hypotheses are formulated and the set of data is described. The next part introduces results of the regression analyses. It shows indirect proportion of the relation between the number of the submitted bids and the winning price. Each additional bid brings decrease of the price by approximately 3.4% of the expected price. The use of the e-auctions is connected with an increase of the number of the submitted bids by 0.7, which mean an average decrease of the winning price by approximately 2.4% of the expected price. The article concludes that the application of the e-auctions brings an indirect impact on the winning price. The reason is that it is more transparent than "standard" tenders. It probably affects the trust of bidders and increases of their number.

Keywords: public procurement, efficiency, electronic auctions, municipalities

JEL Classification: H57, G14

Introduction

Considerable amounts of public funds are paid in developed countries within the framework of the institute of public procurement. OECD estimations (2007) made on the basis of an analysis of national accounts talk about 15-20% of GDP, which simultaneously constitutes a big proportion of public expenses. Possible increase of efficiency in the process of the competitive contracting, which would lead to reduction of winning prices of individual contracts, while maintaining defined quality level of the required purchases, could thus bring considerable cost saving and decrease pressure on

* Jan Pavel, University of Economics, Prague, W. Churchill Sq. 4, 130 67 Prague 3, Czech Republic (pavelj@vse.cz); Emilia Sičáková-Beblavá, Comenius University, Bratislava, Odbojárov 10/A, P.O. Box 129, 820 05 Bratislava 25, Slovak Republic (ema@transparency.sk).

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deficit budgets. One of the ways, which has been discussed in recent years especially in the European Union, and which is expected to be highly efficient, is the use of information and communication technologies (e-procurement, electronic auctions, *etc*.). Expected impacts on the winning prices are often rather high (20%), however, they are not based on empirical analyses.

The aim of this article is to analyze, based on an analysis of the data gathered in Slovak cities, the factors that influence efficiency of the competitive contracting and then test a hypothesis on the positive impact of using the electronic auction for achieved prices of the public contracts. The article is divided into five parts. The first one includes a theoretical discussion on the factors, which influence efficiency of the institute of public contracts including potential positive impacts of implementation of the electronic contracting and the electronic auction. The second part formulates hypotheses, which constitute the subject of the testing based on theoretical discussion. The third part describes a data file, which was acquired for testing the hypotheses by a direct data collection. The next part introduces results of the executed regression analyses. The last chapter concludes the results and formulates several economic and political recommendations whose respecting could lead to an increase of efficiency of the institute of the public contracts.

1. Factors Affecting Efficiency of the Competitive Contracting and Possible Benefits of the Electronic Auction

Several researches carried out in the given area (*e.g*. Gómez-Lobo, Szymanski, 2001 or Nemec, Vítek, Meričková, 2005) demonstrate that the use of competitive, open procedures that support transparency has brought reduction of prices of the purchased goods and thus an increase of efficiency of the public funds within the public procurement. This is also pointed out by the Office of Government Commerce of the Great Britain (2008), which states that the procurement aims can be achieved above all "by a fair and open procurement process". According to Soudry (2004) electronic reverse auctions can decrease contracting costs, increase transparency and achieve better economic outcomes as a result of increased competition. It follows that the electronic tendering procedure should be preferred to the traditional tendering procedure due to its clear advantages with respect to transparency. This stems from the fact that under the electronic auction procedure, the danger of having the procuring entity favouring a particular firm by providing it information on other tenders is limited. Under the electronic auction procedure, information on other bids is available to all tenderers in an open and equal manner. Moreover, all bidders are allowed to amend their tender at any time within the limits of the time period. Thus, the electronic auction increases transparency in two levels: (1) information available on other tenders; and (2) the availability of the procedure phases and its outcome to all interested tenderers (Soudry, 2004).

The European Commission makes similar conclusions (2004), when it claims that procurement processes in the EU should be not only transparent but also foreseeable.

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Such rules result in an improvement of the efficiency because there is a competition among suppliers who have more confidence in fairness of the selection procedures and are subsequently willing to invest funds in preparation of their bids. According to the EC (2004) competitive environment not only reduces prices in most cases, but also increases quality of the purchased goods and supports introducing of innovations. On the other hand, the procurement system built without clear rules leads to an oligopoly, in which recipients will not feel the positive effect resulting from the competition among providers.

It thus results from the above, among other things, that the main factor influencing efficiency of the public contracts from the viewpoint of achieving the best possible price for a public contracting authority is the number of suppliers. This aspect is confirmed by many empirical studies, *e.g*. Kuhlman, Johnson (1983) or Iimi (2006). However, Li and Zheng (2006) warn that impacts of this competition effect are not unlimited and they are gradually being overdrawn alongside with the growing number of the submitted bids, or the so-called competition effect is overwhelmed by the entry effect. Empirical studies like *e.g.* Brannman, Klein & Weiss (1987) or MacDonald, Handy & Plato (2002) identify that the competition effect is overdrawn somewhere around 6 submitted bids, while there are certain differences among individual industries.[1]

Another factor that influences the efficiency of the competitive contracting is professional competence of the contracting authorities. Due to incorrect setup of individual tendering procedures there can occur a significant increase of the winning prices. It must be emphasized that in this case, it is not an intentional defect, which we could expect in the case of a corruption conduct, but a mere consequence of the bureaucratic inefficiency. An interesting analysis in this respect is offered by Bandiera *et al*. (2008), who divide over-pricing of the public contracts into an active part (due to corruption) and passive part (due to the badly set tendering procedures). Results of an analysis carried out in Italy bring an interesting piece of information that the share of the passive waste on the overall over-pricing of the public contracts is as much as 83%.

One of the possible ways how to increase the efficiency of the competitive contracting is the use of the information and communication technologies, even in the case of the contracts, whose legislative regulation is not required by the respective European regulations.[2] There exist several approaches in this area, *e.g*. the system of the electronic markets (place, where requirements of the contracting authority and suppliers meet) and the electronic auction. The auction markets are considered to be a natural competitive

1 It must be stated in the context of this article that an average number of the submitted bids in the tendering procedures for public contracts is considerably lower in the post-communist countries than in the old Member States. According to the EC (2008), *e.g.* in Slovakia, it was approximately 2 in the years 2004-2005. The problem of the entry effect is thus rather theoretical.

2 The legislation of the European Communities must be implemented in the national laws only with respect to the contracts, whose expected prices exceed the so-called limits (thresholds). Individual Member States may regulate lower value contracts differently. Therefore, in a majority of the national laws we can also find contracts of a very low value, with respect to which the legislation does not stipulate any concrete contracting procedures in order to save administrative costs.

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environment, while electronic auctions are in general considered as an effective procurement mechanism (see *e.g.* Lengwiler and Wolfstetter, 2000).

Directive of the European Union No. 2008/18/ES, which regulates the public procurement issue in Member States offers a definition of the electronic auction. According to this Directive the electronic auction is "a repetitive process involving an electronic device for the presentation of new prices, revised downwards, and/or new values concerning certain elements of tenders, which occurs after an initial full evaluation of the tenders, enabling them to be ranked using automatic evaluation methods."[3]

There are several ways how to carry out the electronic auctions. From the viewpoint of the number of criteria these are multi-criteria and single-criterion e-auctions. One of the criteria of the e-auction can also be the price. In the course of the e-auction, prices are constantly changing, which is mostly demonstrated by their reduction. In the given case, one of the advantages of the e-auction is achieving the lowest price possible.

However, alongside with the electronic auction, which constitutes an extension to a standard (hard copy) competitive contracting, we can also think about better involvement of the information and communication technologies while these tools are also used for bidding by individual suppliers. In this case, Bertók (2005) talks about the e-procurement concept.

Various researchers focus on examination of a potential of the electronic procurement including the electronic auctions. Agenthin (2001) points out that the availability and generally low costs of gathering information and technology create pre-conditions for new approaches to purchasing, which are typical for the following:

- low barriers when entering the market
- price transparency
- avoiding contracting of preferred supply networks
- better balance of power between the seller and the purchaser

In the current professional literature, we can find many arguments supporting the use of the electronic tools in the public procurement and also an estimation of potential benefits. Bertók (2005) confirms the positive effects of the use of the IT technology in the public procurement and states that by means of the e-procurement, there is available more information and costs are reduced. Therefore the e-procurement should be considered as a main tool for limiting corruption and increasing transparency and thus also the efficiency of using the public funds. "Well-designed and implemented systems can minimise unnecessary face-to-face contract and reduce opportunities for the improper exercise of discretion". The author states that the e-procurement also improves the public control because it enables various participants to monitor the level of transparency.

The above new approach to the procurement leads to an increase of the competition, while it results in a situation, when goods and services are purchased at lower prices.

3 Directive 2004/18/ES, Art.1 (7).

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As demonstrated by Holt (1980), companies – agents in the auction markets can have different preferences, costs and information sources. Individual economic agents take strategic decisions concerning the bidding without disposing of complete information on the factors affecting possible gain of their competitors. A reduced price is thus achieved by a better management of information. According to Croom and Brandon-Jonson (2005), the better management of information is considered as an important catalyst, which enables price reduction through better transparency of the market prices and thus leads to a better decision-making.

Apart from the above theoretical arguments in favour of the electronic competitive contracting we can also find in literature estimations, which attempt to quantify impacts of this institute on the winning prices. For example a survey carried out in Scotland in 1998 has demonstrated that the amount of the achieved savings was 5-20% (E-commerce..., 1999). Croom and Brandon-Jones (2005) point out savings in the amount of 16% in the case of purchases like groceries or construction materials. Case studies processed in Brazil, Romania and Mexico presented in Auriol (2006) talk about savings in the amount of 20 and more percent. These numbers seem to be very effective and also influence estimations and expectations of some international institutions. For example the EC (2004) expects that application of the electronic competitive contracting will bring savings in the amount of 5% in the public costs and 50-80% in the transaction costs.

However, the main problem of the above studies and estimated savings is their methodology. They are all based on various questionnaire surveys, where results are negatively affected by the structure of obtained answers. It is so because all questionnaires are filled in only by entities, which deal with the given problem and consider the electronic competitive contracting to be useful. The use of more advanced quantitative methods is very limited in these studies.

There is considerably less studies, which analyse impacts of the electronic competitive contracting or the use of the electronic auctions on a bigger data sample. Here we can mention the study of Singer *et al*. (2009), in which the estimation of benefits (in terms of reduction of the winning prices) of the e-procurement implemented in Chile is slightly below 3%. This number is very similar to results of the study of Metty *et al*. (2005), which has been carried out with data of the Motorola company and reached 3.75%.

However, apart form the positive impacts on the winning price of goods, introduction of the e-procurement concept also affects the value of the transaction costs, above all the administrative costs, *i.e*. the costs related to organization of the tendering procedure by the public sector. Croom – Brandon-Jones (2005) speak in this context about an external (price/purchase) efficiency on one hand and an internal (administrative) efficiency[4] on the other hand. The empirical studies demonstrate that application of

4 The term internal efficiency is understood as the expensiveness of the procurement process usually measured by the value of administrative costs.

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the e-procurement really brings significant savings of administrative costs. The above survey carried out in Scotland demonstrates savings of the administrative costs related to the processing of the purchase requirement as high as 70% (E-commerce..., 1999). Winter *et al*. (2009) estimated savings of the administrative costs in Chile at the level of 0.38% of the value of the performed contracts. Results presented by Hofmanová (2009), which have been obtained within the framework of an analysis of a contract for purchase of the information technology in the Czech Republic show lower reduction of transaction costs, "only" 20%.

2. Formulation of Hypotheses

Within the framework of this research we deal with an analysis of impacts of using the electronic auctions, while we focus on the external efficiency. The reason for absence of an analysis of the internal efficiency is that application of the electronic auction means involvement of the information technologies only in the final part of the contracting process. Unlike in the case of the e-procurement concept, where the entire contracting process is electronic, including submittal of individual bids, here the contracting procedure is standard with the use of hardcopies until the moment, when bids of individual bidders are open. The values included in them are subsequently transferred to an electronic environment, in which bidders are allowed to adjust their bids for a certain time in reaction to the bids of other bidders. For this reason we cannot expect any significant impacts on administrative costs and thus also the internal efficiency[5].

Based on the above theoretical discussion and an analysis of the available literature we can formulate the following hypotheses:

H1: The winning price decreases alongside with an increase of the number of the submitted bids.

H2: The use of the electronic auction increases the competitive pressure among bidders and thus leads to lower winning prices than in the case of not using the auction.

H3: The use of the electronic auction leads to an increase of the number of the submitted bids.

H4: Organization of the tendering procedure by an external company leads to reduction of the winning price.

H5: Any limitation of the tendering procedure leads to an increase of the winning price.

The first hypothesis is a verification of a relation, whose existence has been repeatedly proved by an empirical analysis (see above). According to this hypothesis we can

5 Another problem is the fact that contracting authorities usually do not keep independent records of the administrative costs related to the competitive contracting.

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expect lower prices in the case of the tendering procedures with a higher number of the submitted bids.

Verification of applicability of the second and third hypotheses constitutes the core of this article. Positive effects of the electronic auction can be demonstrated through two channels. The first one is the possibility of bidders to react to the bids of others, which can lead to a bigger competition and reduction of the price. The second positive effect of the electronic auction can be an increased transparency of the tendering procedure, which will lead to an increase of the number of the submitted bids. The reason is an assumption that companies will react positively to the increased transparency since they will not be afraid so much of possible manipulability of the tendering procedure and they will be willing to invest funds in preparation of bids.

Formulation of the fourth hypothesis is based on an assumption that a waste in the case of the competitive contracting occurs alongside with corruption (active waste) also due to incompetence of internal employees (passive waste). Therefore we expect here that by outsourcing organization of the tendering procedure to a specialized external company we can achieve better technical preparation of the tendering procedure and thus better results.

Finally, the last hypothesis concerns the issue of limiting the competition and decreasing transparency. If using methods that are not freely open to all bidders and in the case of which the contracting authority does not have to meet such strict requirements for publicizing, we can expect negative impacts on the winning prices.

3. Data

Verification of applicability of the above hypotheses is tested on a file of the data collected from a sample of municipalities, which have previously used the electronic auction in Slovakia at least for several times when assessing their public contracts. Identification of these entities was carried out based on a study of documents, secondary data in the form of media outputs, which deal with the given issue, as well as relevant documents of the Public Procurement Office. There were simultaneously conducted interviews with representatives of the Public Procurement Office, who identified the contracting authorities working with the electronic auctions and the private companies supplying software for proper execution of the electronic auctions. In total, it is 15 municipalities in Slovakia with population of 10 - 115 thousand people. Apart from that, data were also requested from another 15 municipalities of a similar size, which carry out the competitive contracting by a standard method, *i.e.* without using the electronic auctions. The purpose of including these municipalities in the selection file was creating of some kind of a control group and thus also a possibility to filter the impact of other factors than the electronic auction. We have tried to identify the factors, which can in general affect the decision of municipalities to use e-auction, but without statistically significant success. So we can conclude that the parameter associated with an adoption of e-auction captures differences in individual municipality characteristics.

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The above sample group was addressed with a request to provide data on the contracts awarded in the years 2007-2009, which were needed for subsequent analyses, while the following information was required: expected price, winning price, contract type (building works, information technology), number of the submitted bids, use of the electronic auction, tendering method, outsourcing organization of the tendering procedure to an external entity. There were obtained 196 complete observations in total, out of which 186 observations were used for the analysis after excluding outliers. Basic descriptive statistics of individual variables are stated in the Table 1.

Table 1
Summary Statistics

Variable	Mean	S. D.	Min	Max
Price	89.844	11.777	49.79	120.08
Bid	3.2312	1.8055	1.00	11.00
ElAu*	0.3602	0.4814	0.00	1.00
ExFi*	0.1452	0.3532	0.00	1.00
BuWo*	0.7527	0.4326	0.00	1.00
LC*	0.2319	0.4227	0.00	1.00
MC*	0.0215	0.1455	0.00	1.00

Note 1: Price – the winning price as a percentage of the expected price, Bid – number of bids, ElAu – electronic auction, ExFi – organization of the tendering procedure by an external firm, BuWo – building works, LC – low value contracts, MC – bellow threshold contracts
Note 2: * dummy variable
Source: own research.
Note: J = 186.

4. Discussion on Findings

Within the framework of verifying applicability of the above hypotheses, there are sought factors affecting the winning prices and the number of the submitted bids. An attention is paid above all to the use of the electronic auction. Certain impact of this factor on both stated variables is demonstrated by a simple analysis of conditional means, whose results are presented in the Table 2. This rough analysis really indicates a positive impact on the winning price and the number of the submitted bids. However, in the first case, the difference between the conditional means is very small (only 2.62 percentage points). The impact on the number of the submitted bids is much more significant, since their average number in the case of using the electronic auction is higher by one, which means an increase by 34%. The analysis of the conditional means thus indicates an indirect impact of the electronic auction on the final price through an increase of the number of the submitted bids, rather than a more intensive competition of bidders within the proper auction.

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Table 2
Analysis of Conditional Means

El auctions	Winning price (conditional mean)	Number of bids (conditional mean)	Number of contracts
Yeas	88.17	3.85	67
No	90.79	2.88	119

Source: own calculations

However, functioning of the institute of public contracts can also be influenced by other factors, which have been described above. In order to verify their statistical significance from the viewpoint of impacts on the winning price, we can formulate the following regression model.

$$price = \beta_0 + \beta_1 Bid + \beta_2 Bid^2 + \beta_3 ElAu + \beta_4 ExFi + \beta_5 BuWo + \beta_6 LoCo + \beta_7 MeCo + \varepsilon \quad (1)$$

Where Price is the winning price as a percentage of the expected price, Bid is the number of bids, ElAu is the use of the electronic auction, ExFi is organization of the tendering procedure by an external firm, BuWo is a contract for building works, LC is a contract awarded within a small size contract regime, MC is a contract awarded within a bellow threshold regime and ε is a difference between the actual and expected value.

In the case of the number of the submitted bids (Bid), we can expect a negative regression coefficient in accordance with the above-mentioned positive impact of a higher number of the submitted bids on the winning price. On the other hand, in the case of the variable of square of the number of the submitted bids we can expect a positive coefficient, which will mean in this model gradual decreasing of the effect of an additional bidder and thus coming of an entry effect. Other variables in the model have character of dummy variables. In the case of the electronic auction we expect a negative coefficient because its application should bring lower winning prices due to a more intensive competition. In the case of the variable external firm, we can again expect negative coefficient, because considering their specialization, external companies will be capable of organizing the tendering procedure more effectively than employees of the contracting authority. Direction of the coefficient in the case of the variable building works is not clear. Application of this variable should secure an identification of possible specific performance of contracts for building works. The variables of low value contract and below threshold contract should have positive value of regression coefficients because in the case of these contracts, there can be identified lower transparency and openness

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than in the case of standard tendering methods (open and restricted tendering procedure).[6]

The above model had to be estimated by means of the WLS method, which eliminates the problem of heteroscedasticity that was identified in the case of using the OLS method. Results of the estimation are stated in the Table 3. Regression coefficients seem to be statistically significant only in the case of the number of bids, organization of the tendering procedure by an external company and in the case of low value contracts. In the first case, the regression coefficient is negative, which is in compliance with the tested hypothesis, *i.e*. that an additional bidder brings along decrease of the winning price, concretely by 3.4% of the expected price. A negative coefficient is also identified in the case of the dummy variable external firm, which means that in the case of the tendering procedures organized by proper contracting authorities, prices are higher than in the case of outsourcing such organization to an external entity. This is also in compliance with the formulated hypothesis on lower competence of internal employees. Finally, the last statistically significant indicator is the dummy variable of a low value contract. These are contracts, in the case of which laws do not require competitive testing. These contracts are in average more expensive than higher value contracts awarded within the tendering procedures that are better regulated in laws and thus more transparent. The general declarative potential of the estimated model is approximately 20%.

If we make an estimation of a reduced model, in the case of which we eliminate variables that are statistically insignificant, the model's declarative potential will increase (adjusted R2 is equal to 0.26), while values of the regression coefficients will not change substantially. There was not identified the problem of multicollinearity. The estimated regression formula will have the following form:

$$Price = 100.19 \ -3.38Bid - 3.15ExFi + 4.05LoCo \qquad (2)$$

6 Low value contracts are contracts of up to EUR 30,000 in the case of supplies and services and EUR 120,000 EUR in the case of building works. The manner of their awarding is not regulated by the Public Procurement Act and they do not require any public notice. Bellow threshold contracts have a higher level of transparency and openness (up to EUR 60,000 in the case of supplies and services and up to EUR 360,000 in the case of building works). The scope of performance must be correctly formulated and the intent to announce it must be publicized. After publicizing a public notice, at least three bidders who showed their interest must be invited to submit their bids.

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Table 3
Factors Affecting the Winning Price

	Basic model	Reduced model
Conditional variable	**Winning price as a percentage of the expected price (Price)**	**Winning price as a percentage of the expected price (Price)**
Explanatory variables		
Constant	99.2804 (3.08711)***	100.186 (1.57228)***
Bid	-3.36673 (1.52385)**	-3.37795 (0.483103)***
Bid2	0.0214587 (0.164270)	
ElAu	1.25192 (1.57828)	
ExFi	-4.08437 (2.13221)*	-3.14680 (1.83434)*
BuWo	0.669687 (1.66676)	
LC	3.72166 (1.66125)**	4.05259 (1.77478)**
MC	3.05974 (3.76849)	
R2	0.224476	0.275309
Adjusted R2	0.193978	0.263364
F-test (p-value)	***	***

Note: Standard deviations are stated in parentheses under the respective coefficient. *** significant at 1% level, ** significant at 5% level, * significant at 10% level.
Source: own calculations

In order to test applicability of other hypotheses, we will use the following model, which analyses variables affecting the number of the submitted bids. Based on a theoretical analysis we can expect positive coefficients in the case of the variables electronic auction and external firm, which are factors that should increase transparency of the tendering procedure and thus also willingness of bidders to apply for tenders. On the contrary, negative coefficients can be expected in the case of the variables low value contract and bellow threshold contract, because here free bidding of bidders is not possible. Estimations of the overall model, as well as a reduced model are stated in the Table 4.

$$Bid = \beta_0 + \beta_1 ElAu + \beta_2 ExFi + \beta_3 BuWo + \beta_4 LoCo + \beta_5 MeCo + \varepsilon \qquad (3)$$

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Table 4
Factors Affecting the Number of Submitted Bids

	Basic model	Reduced model
Conditional variable	**Number of bids (Bid)**	**Number of bids (Bid)**
Explanatory variables		
Constant	2.66469 (0.273354)***	2.82013 (0.159004)***
ElAu	0.716820 (0.281350) **	0.714870 (0.277545)* *
ExFi	1.17093 (0.396721)***	1.05774 (0.378237)***
BuWo	0.0408098 (0.304759)	
LC	0.438016 (0.308979)	
MC	0.294503 (0.886138)	
R2	0.115150	0.104909
Adjusted R2	0.090571	0.095127
F-test (p-value)	***	***

Note: Standard deviations are stated in parentheses under the respective coefficient. *** significant at 1% level, ** significant at 5% level, * significant at 10% level.

Source: own calculations

The statistical analysis confirmed positive impacts on the number of bidders in the case of the electronic auction and organization of the tendering procedure by an external company. In the second case, the statistical significance of the coefficient, as well as its value is higher. The general declarative potential of the model is relatively low (adjusted R2 is equal to 0.095) and within the framework of the reduced model it does not change much. The estimated regression formula of the reduced model will have the following form:

$$Bid = 2.82 + 0.71ElAu + 1.06ExFi \quad (4)$$

Conclusion

Econometric testing of the above-defined hypotheses confirmed indirect proportion of the relation between the number of the submitted bids and the winning price. Each additional bidder brings decrease of the price by approximately 3.4% disregarding the fact whether the contract is for building works or information technology. This value is very close to the estimated impact of an additional bidder in the case of transportation infrastructure constructions in the Czech Republic (3.27%), see Pavel (2010).

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Impact of the electronic auction on the winning price seems to be very indirect. We can reject the hypothesis on the positive impact of a more intensive competition, which brings along the possibility of bidding in the course of the auction. However, the use of the electronic auctions is connected with an increase of the number of the submitted bids by 0.7, which would mean, if we calculate it roughly, an average decrease of the winning price by approximately 2.4% of the expected price. This estimation is very close to the savings identified in the studies based on an empirical analysis – see Metty *et al.* (2005), Singer *et al*. (2009). Hofmanová (2009) reaches a very similar number (2%) in the Czech Republic. Achieving savings in tens of percents, which is often proclaimed, is thus clearly unrealistic.

Finally, negative impacts of lower transparency of certain procurement proceedings, as well as positive impacts of the use of external companies for organization of procurement proceedings are in full compliance with assumptions. The second conclusion is in compliance with the results presented by Bandiera *et al*. (2008). Estimation of the amount of a passive waste is approximately 3.14% of the expected price. Moreover, it was demonstrated that bidders get involved more often to procurement proceedings organized by external companies which further increases the pressure on reduction of prices. However, it is necessary to note that the above presented numbers should be interpreted with caution because of relative low values of adjusted R2.

It can be concluded that a proper application of the electronic auction brings an impact on the winning price. From the viewpoint of efficiency an important factor is the increased number of bidders which can be explained, as shown by Soundry (2004), by clear advantage of electronic auctions with respect to transparency, which leads to an increased trust. For these reasons in order to increase the efficiency of the institute of public contracts it is necessary above all to increase qualification of internal employees who organize the tendering procedures and thus decrease the level of the passive waste. It is further necessary to increase transparency and credibility of the tendering procedures, which can be done not only by application of the electronic auctions but also *e.g.* by decreasing the volume of funds that are allocated by means of other than standard procurement proceedings. The above measures can thus bring significant savings in the public expenses. However, expecting savings in tens of percents is totally unrealistic.

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