

## Electronic Auctions: Role of Visibility Settings in Transparency Analysis

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### ABSTRACT

**Purpose:** Main objective of the paper is to assess whether the auctions issuers have changed their preferences regarding the auction transparency described through the visibility settings, and to assess which and to what extent had the other auction parameters impact on the auction transparency and also to assess the effect of the transparency onto the achieved auction savings.

**Methodology/Approach:** The paper analyses sample records of 5,000 electronic auctions of SR and CR auction issuers on the time frame of 2009-2016, using methods of higher statistics. A composite index for transparency analysis has been developed and assessed. Two standalone regression models were applied to analyse the papers hypotheses regarding the transparency and auctions' savings.

**Findings:** The size of the auction described does not have a significant effect on the transparency settings, but the auction complexity does. The most saving generating visibility settings is the visible order of the participants and the visibility of the other measurements settings for the auctions. Increasing the auction complexity can decrease the generated saving by an average 9.3%.

**Research Limitation/implication:** Research was based on real secondary data from one electronic auction provider. The results are limited to the features enabled on this electronic platform. Results show that the application of visibility setting in auctions can generate additional benefits like savings, but also has to be applied carefully when assessing the transparency.

**Originality/Value of paper:** The analysis and results based on real secondary data are scarce in the current research area, therefore is this article a valued contribution.

**Category:** Research paper

**Keywords:** electronic reverse auctions; transparency; auction benefits

## 1 INTRODUCTION

The history of electronic reverse auctions presented in this article can go back to 1990 when they were claimed as a standart sourcing tool for organisations (Beall, 2003). Although they had many “defenders” they have received also several criticism. Despite their masive implementation (Giampietro and Emiliani, 2007), if uncontrolled or unstandarded without any regulation, electronic auctions can significantly damage the relationships between its participants (Caniëls and van Raaij, 2009; Emiliani, 2005; Hartley, Lane and Hong, 2004; Tassabehji, et al., 2006). Those with a positive relation to electronic auctions claimed its most benefits in obtaining low prices for buyers, inreasing the sourcing time, access to many suppliers at the same time, creating a more competitive environment, standardisation or repeatability of the sourcing process (Bartezzaghi and Ronchi, 2003). Suppliers can benefit from lower selling and customer generation costs as well as opening to new markets, customers, standardisation or increased transparency in biding (Smart and Harrison, 2003).

Ususally the research dealing with the auctions analysis is focused on the buyers’ perspective and fewer are concentrated on the suppliers or sellers’ opinion on the auctions. To attract more suppliers and to introduce elecronic auction to a wider subject have the auction systems and providers of the auction systems improved the visibility settings to adjust the auction environment to the needs of the auctioned good or service.

This article’s main objective is to assess the role of transparency defined through various visibility setting of the auction. The analisys should also identify differences in the “standardised” transparency settings between various auction types, or categories of the auctioned items.

To execute the analysis, we have been provided secondary source data from an auction platform provider.

## 2 METHODOLOGY

We analyse secondary data provided by an electronic auction platform provider. Altogether a random sample records of 5,000 electronic auctions have been processed for the analysis. All the auction issuers were from Slovakia or Czech Republic although the participants could be international. The analysed time frame ranges from 2009 until mid 2016, due to the internal rules of the platform provider. Database includes Sealed bid auctions, English reverse auctions, Nippon and Holland type auctions and RFq’s. The database was anonymised with the respect of unqiue records identification. After the screening and data pre-processing we were left with 4,255 auction records. Each record captured severall information about the auction: Issuer ID, Auction ID, date, Auction duration, Auction assessment type, visibility settings (what type of information is available to participants during the auction rounds), Estimated price, first offer price, Winners price, Saving achieved, Number of participants, Numer of new

participants, Name of the winner, Auction type, Buy or Sell type auction, Category of the auctioned item, Number of rounds, Type of these rounds, Number of changes, The absolutely best offer.

To assess the role of the transparency we have created a transparency index that captures the visibility setting of the auction.

The index is constructed so that it can capture each unique visibility settings. The visibility settings are described in the next table with the frequency of their application in our dataset. Also an option of no settings used was considered in the analysis.

*Table 1 – Frequency of Visibility Setting in the Dataset (Authors)*

<b>Winning / Loosing information</b>	<b>Order of first 3 visible</b>	<b>Order of all visible</b>	<b>Ordering per item visible</b>	<b>Ordering of additional conditions</b>
15	72	1961	473	236

### **Index composition**

To establish the index, we have ordered the visibility setting from those that contribute to the transparency the least to those that contribute the most. This ordering was carried out based on authors experiences with electronic auctions and based on the consultation with an expert referee from the data provider company.

*Table 2 – Transparency Index Composition (Authors)*

<b>Order</b>	<b>Visibility setting</b>	<b>Assigned value in index</b>
1	No settings active	0
2	Winning / Loosing information	1
3	Order of first 3 visible	2
4	Order of all visible	4
5	Ordering per item visible	8
6	Ordering of additional conditions	16

To each of the visibility setting a unique value was assigned so that the final sum of all the setting will add up a number that if decomposed can be exactly identified which of the visibility settings were turned on in the specific auction record. All these visibility settings are set to assess the role of transparency on the perceived savings a linear regression model and probit model that were applied using SPSS statistics program.

## **Paper Objectives**

Main objective of the paper is to assess whether the auctions issuers have changed their preferences regarding the auction transparency described through the visibility settings, and to assess which and to what extent had the other auction parameters impact on the auction transparency and also to assess the effect of the transparency onto the achieved auction savings.

To help fulfill the main objective we have created a set of research questions and hypothesis that were assessed during the analysis.

## **Research questions**

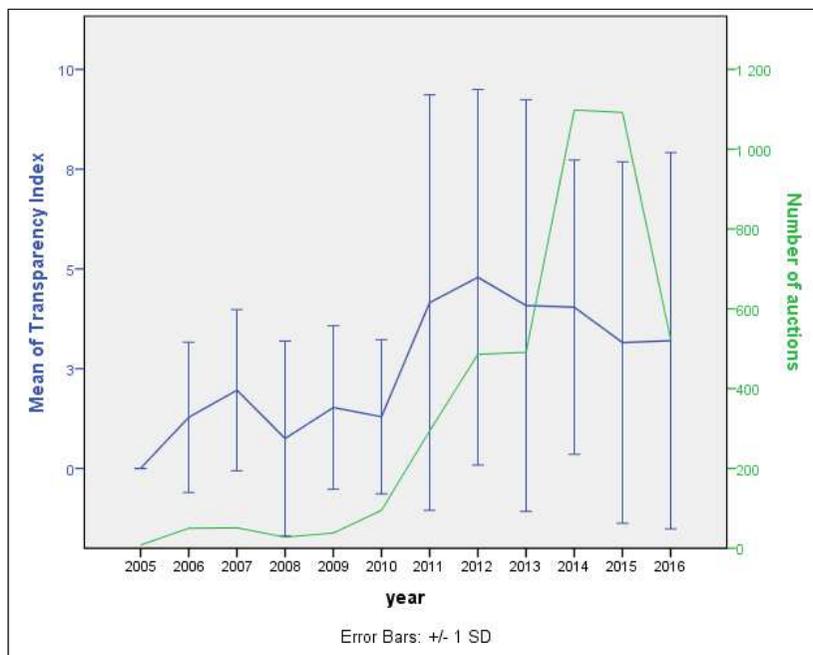
1. Intensification of electronic auction application should increase the general knowledge of the auctions issuers' about their full potential so an increase in the application and variability of visibility settings and so in transparency should be visible.
2. Although the increase if the auction application there should be no significant change towards transparency increase in the sealed bid auctions where the auction issuer is a public body.
3. We expect a positive increase in transparency in auctions by public bodies, due to changes in the public procurement laws form 2014.

## **Hypotheses being tested using the regression models**

- a) We expect the greater the auctioned value the greater the effort of the auction issuer for greater competition, so an increase in the auction transparency should be significant.
- b) The more the auction participants the "tighter" the auction settings increasing transparency.
- c) The more complex the auction is the higher the transparency settings.
- d) Increase in transparency should increase the achieved auction savings.
- e) The more complex the auction, the less effective they are, and less savings are achieved.

## **3 TRANSPARENCY ANALYSIS**

The values of transparency index indicate how the issuers set up the environment during the auctions. The development of this index value should reveal if there is any shift in the behaviour of auction issuers regarding these settings.



*Figure 1 – Development of the Transparency Index with Respect Number of Auctions (Authors Computations in SPSS)*

As can be seen in the Fig. 1 the average transparency index has an increasing trend during the analysed period with increasing variance in the standard deviation. This development suggest that auctions issuers have found useful to adjust the visibility settings of their auctions to achieve better control of the auction process and generate more benefits through transparency increase. The average value of the index starts at 2 what means that the issuers usually turn on the visibility of the participants' order on the first 3 places. When looking on the standard deviation almost 68% of all auctions never went with the settings above 4 until the 2011. After that year the variability for the visibility settings and so the transparency index has significantly increased and so did the number of auctions. After the 2013 the average index value has started to decrease even the increasing number of auctions. The decrease can be the result of several factors, where one of it could be the change in the law regarding the public procurement rules. To assess whether this assumption can be correct a simple Fig. 2 was created where the different auction types regarding the issuer type can be seen. The GOV labeled auctions correspond to those where a public body represented the electronic auction issuer. To go beyond that, we have separated auctions where the public issuer set up a sealed bid type of auction or a one closed round only auction (GOV Sea).

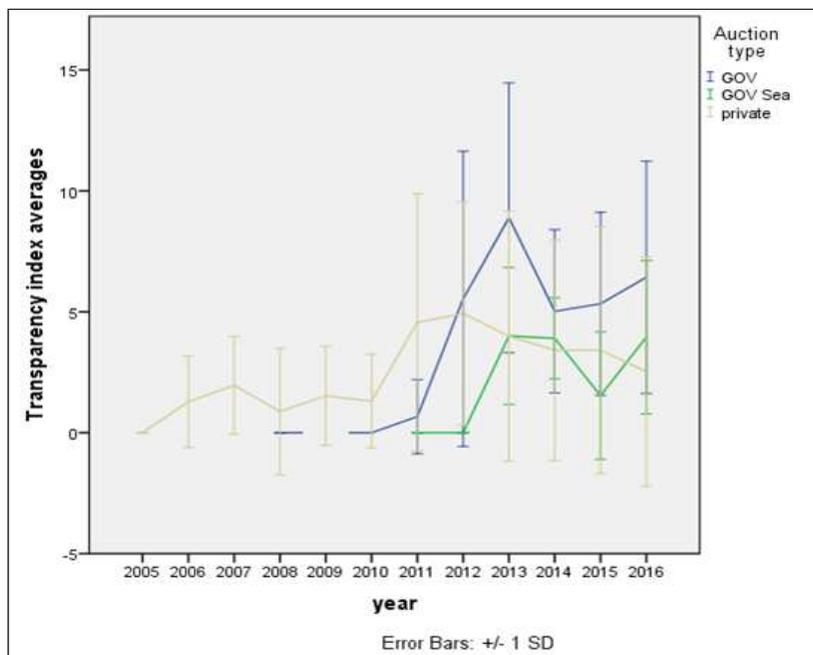
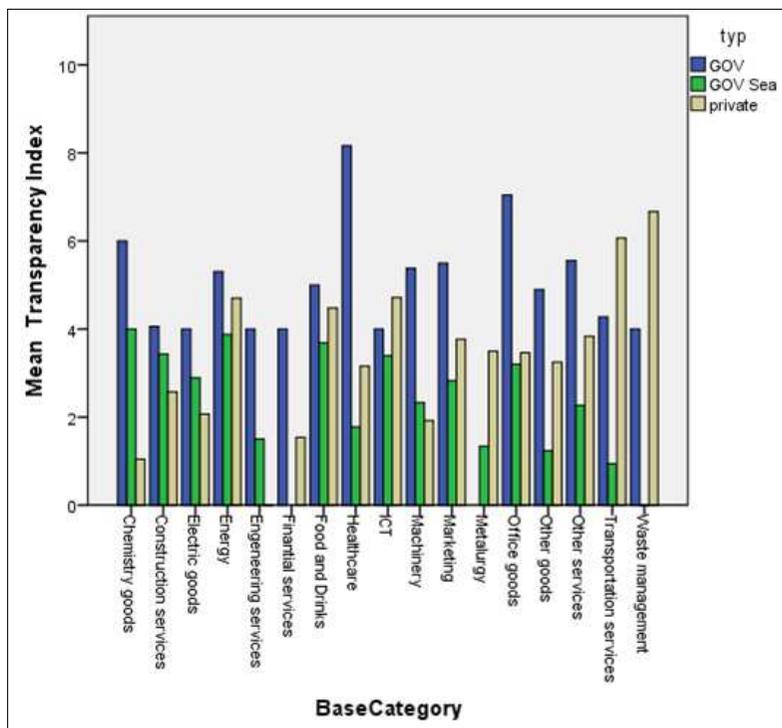


Figure 2 – Average Transparency Index per Auction Type  
(Authors Computations in SPSS)

Fig. 2 shows an overall increase in the transparency settings as defined through the transparency index. After the initial rapid increase in transparency from 2011 to 2013 due to changes in the law regarding the public procurement regulations a slight decrease in 2014-2015 has followed. The decline in the index during 2013-2015 is present most in the case where the issuer is from public sector. The decline in case of private sector subjects is a bit slower. Although the number of auctions carried out through the platform has in the years 2014 and 2015 reached its peak the transparency index has decreased to an average of 4 meaning that mostly the visibility of the full ordering to all participants was set. Also a low average transparency value is suggesting that less auctions have used the multiple auction criteria except the price. So in general can be concluded that in the recent years took the lead auctions focused only on the price as the only criterion for auction evaluation in the case of private auctions. During the last analysed year, the situation is changing towards more complex and transparent settings due to increasing transparency index at least in the case where the procurer is a public body.

When looking on the Fig. 3 the average transparency index per auction type and auctioned item category can be identified.



*Figure 3 – Transparency Index According to Base Category of the Auctioned Item an Auction Type (Authors Computations in SPSS)*

To assess the which factors, have an influence on the transparency settings we have conducted a simple econometric regression analysis to reveal wether some of the variables in our databes have a direct influence on the visibility settings defined through the transparency index. A logistic multinomial regression model was applied. Before the model application the statistic assumption on residual normality tests, autocorrelation and multicollinearity were tested. Through no significant disturbances in the data were observed a backward step wise regression model was performed. All the measures were carried out using the SPSS platform. As the transparency index is an ordinal variable, we have chosen a probed model that suits best for the ordinal dependent variables. The estimates and results are captured in the Tab. 3.

The results show that despite our assumption that the greater the auction size the more effort the issuer will put into the transparency assurance and so adjust the visibility setting to generate most benefits from the transparency settings, the volume had in the end no effect on the. The estimate for the auction volume is zero that is suggesting that the size of the auction has no efect on the transparency settings transparency so the first hypothesis a) could not be supported by the model. Another variable reflecting the size of the auction is the number of participants which has a significant but rather neutral to little positive

effect on the transparency increase. This results can be questioned to have the declared effect, because the number of participants is known and fixed after the auction announcement and can be slightly changed after the start but the transparency settings are set long before even the invitations are set or the auction is made public. In general our model suggest to confirm the hypothesis b) regarding the number of participants and their impact on the transparency.

*Table 3 – Regression Model for the Transparency Index (Authors Computations in SPSS)*

<i>Parameter Estimates</i>							
	<b>Parameter</b>	<b>Estimate</b>	<b>Std. Error</b>	<b>Z</b>	<b>Sig.</b>	<b>95% Confidence Interval</b>	
						<i>Lower Bound</i>	<i>Upper Bound</i>
PROBITa	Number of participants	.000	.000	-1.476	.140	.000	.000
	Number of new participants	.037	.000	128.411	.000	.036	.037
	Number of items	-.001	.000	-37.976	.000	-.001	-.001
	Number of rounds	-.100	.001	-83.804	.000	-.103	-.098
	Auction volume	.000	.000	-79.962	.000	.000	.000
	Number of prolongation	.001	.000	64.198	.000	.001	.001
	Number of price changes	-.001	.000	-153.21	.000	-.001	-.001
	Rounds before_auction_round	.065	.001	60.691	.000	.063	.067
	Rounds after_auction_round	.119	.002	61.258	.000	.115	.122
	Intercept	-.986	.002	-408.09	.000	-.988	-.983

*PROBIT model:  $PROBIT(p) = Intercept + BX$ , Dependent Variable: Transparency index*

The auction complexity is represented through the number of items auctioned, through the number of rounds and especially through the indicators number of rounds before and after the auction round. The model results show some contraindication in these variables. Where in more complex auctions (more rounds in general, more items in general) show a negative implication for the transparency so an increase in these values is decreasing the transparency, the variables round before and after the auction round show an opposite impact. Both of the last mentioned were identified as significant and have a positive effect on transparency. So in the end we can conclude the hypothesis c) as approved.

To assess the last two hypotheses, we have changed the econometric model due to the nature of the dependent variable that is no more an ordinal but a scale variable representing the percentual savings achieved from an auction.

Next table is summing up the results from the regression model build for the savings variable as the dependent one.

*Table 4 – Regression Model for the Auction Savings (Authors Computations in SPSS)*

<i>Coefficients<sup>a</sup></i>					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	5.679	1.098		5.172	.000
Transparency index	-.728	.093	-.222	-7.793	.000
S: Participant order	5.784	.614	.192	9.413	.000
S: Other conditions order	9.301	1.733	.152	5.368	.000
Invitations send (days before)	.140	.049	.048	2.882	.004
Number of new participants	.458	.113	.067	4.070	.000
Numer of participants	-.135	.060	-.039	-2.256	.024
Number of items	-.010	.007	-.023	-1.350	.177
Number of rounds	.508	.500	.023	1.015	.310
Numer of price changes	.013	.002	.188	8.055	.000
Number of auction prolongations	.019	.006	.065	2.927	.003
Rounds_before_auction_round	-1.158	.431	-.055	-2.686	.007
Rounds_after_auction_round	-2.158	1.116	-.036	-1.935	.053
<i>Dependent Variable: Savings</i>					

As can be seen from the significancy values and from the estimates values the transparency index defined through the visibility setting has been identified as significant but with a general negative value suggesting that by a unit increase in transparency setting the savings should decrease by 0.73%. So in general the hypothesis d) can not be confirmed and a more detailed analysis should be performed on this issue. On the other hadn also two componental dummy variables were left as significant in the model: S: Participant order and S: Other conditions order, which are representing if these visibility settings were turned on or off. Both of the last mentioned variables resulted with a high positive estimate suggesting that triggering these setting on has a positive impact on the savings (5.8 and 9.3%).

## 4 CONCLUSION

Despite the long proclaimed benefits of electronic auctions in the procurement processes there are many of those, who lack the trust, criticise or even openly disagree with their application. In our article we have been trying to investigate whether the transparency generated by these electronic tools have become a common feature in the current auctions and if the transparency is somehow dependent on the auction type or its parameters. At the end we have explored using an econometric approach whether the transparency and auction visibility settings do have a direct impact on the achieved auction savings. The results instead of answering these questions have opened new ones that have to be analysed in more detail.

Among the most interesting findings can be concluded: The size of the auction described through the auctioned value had not a significant impact on the transparency settings what was contrary to our assumptions. When assessing the auctions' complexity the results have showed some contradiction, where the number of auctioned items and number of auction round have showed a negative effect the number of round before and after the auction round have shown a positive effect. Therefore, here we would like to continue our research and analyse this issue in more detail.

Regarding the saving analysis two interesting results were identified. Visibility setting of the auction participants order and the visibility of other measuring means order of the auction parameter had a significant very positive effect on the savings (5.8 and 9.3%). Not less interesting is the impact of the auctions' complexity described by the number of round before and after the auction round, where the increase in the numbers of these round have a negative effect on the achieved savings, so they are suggesting less efficient auction processes. This issue should be also analysed in more detail. All in all, the analysis and results based on real secondary data are scarce in the current research area, therefore is this article a valued contribution.

## ACKNOWLEDGEMENTS

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