

PROCUREMENT PROCEDURES AS PREDICTORS FOR COST AND TIME OVERRUNS IN CONSTRUCTION

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ABSTRACT. The choice of procedure during public procurement is assumed to affect the overall result of the project. When studying the construction industry; delivery methods, payment systems and project specific variables may affect the end result. The question here is if project success is predicted by choice of procurement procedures. A survey was done on 222 road and railroad construction projects in Sweden between 2007 and 2010, collecting expected and actual empirical data on cost and time overruns and number of non-conformances from each project. The conclusion is that procurement procedures do not predict cost and time overrun nor do they predict number of non-conformances during inspection.

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BACKGROUND

The effectiveness of public procurement regulation has been discussed extensively during the years. This discussion has included, for example, the effect of regulation (Laffont & Tirole, 1993) and the nature of regulation in different international contexts (Arrowsmith & Wallace, 2000). In the debate leading up to the current reform proposals for the European public procurement directives a common trend for discussion was reform (Kotsonis, 2011), and increased availability, of different procedures within the directives. This discussion became especially clear during the public consultations for the green paper on the modernisation of EU public procurement policy (European Commission, 2011a; Williams, 2011). One central argument is that increased availability of the negotiated procedure would allow for increased efforts by procuring authorities to ensure value for money (VfM) during procurement processes. During the consultations most stakeholders did in fact concur with this argument (European Commission, 2011b).

Regulation of public procurement within the European Union is based on fundamental principles in the primary law, e.g. the principles of equal treatment, transparency and non-discrimination, while detailed procedural regulations of conducting public procurement is found in secondary law in procedural directives ("Utilities directive, 2004/17/EC," ; "Public Sector Directive 2004/18/EC,")("Utilities directive, 2004/17/EC," ; "Public Sector Directive 2004/18/EC,"). A key element of the public procurement regulations is the procedures for conducting public procurement. The public sector directives, art. 28, states that the normal procedures should be the open and restricted procedures. Those procedures are similar to a first-price sealed-bid auction, where specifications and scope of contract are determined by the procuring authority ex ante. During special circumstances a procuring authority may use two other procedures, competitive dialogue and the negotiated procedure. Competitive dialogue allow for a structured negotiation process ex ante, while the negotiated procedure provides for a possibility to

negotiate terms ex post (Arrowsmith, 2005). The competitive dialogue is only available for particularly complex projects, as set out in art. 29, while the availability of the negotiated procedures are limited even more so, following the wording of art. 30. The utilities directives leave the choice between open, restricted and negotiated procedures to the procuring authority's discretion in art 40 in the utilities directive. Competitive dialogue is not available under the utilities directive. The fundamental principles governing public procurement regulation has primarily been challenged as over-restrictive in disallowing state-aid like procurement to support regions, e.g. (Hansson & Holmgren, 2011), and the procedures for public procurement is challenged per se on a regular basis (European Commission, 2011a, 2011b). One contention is that the limited access to the negotiated procedures, obstruct the procuring authority to make a good bargain when purchasing goods and services. Those assertions has been applied to both competitive dialogue (Telles, 2010) and the negotiated procedure (Boyle, 2011; Tvarnø, 2012). Further, there have been theoretical and empirical contributions in the same line, showing the effect on costs for compiling specifications ex ante (Bajari, Houghton, & Tadelis, 2011; Bajari & Tadelis, 2006; Tadelis, In press)⁴. On the other hand a study of the impact of the South African regulations on public procurement shows no improvement nor decline while studying project performance in the construction industry (Manana, van Waveren, & Chan, 2012).

The international debate regarding procedures in public procurement has taken the same form in the Swedish national setting. A Public inquiry (SOU 2011:73 2011) on the reformation of the national public procurement legislation has concluded, through public consultations, that there is a desire from procuring authorities to have a free choice of procedures, including the negotiated procedures (SOU 2011:73). The Swedish national legislation has implemented the procurement directives in 'Lagen om offentlig upphandling' [The Public Procurement Act], the regulation closely follows the directives for above thresholds contracts, but do also impose directive-like procedures on procurement below the EU thresholds. Although there are some differences primarily in advertisement rules, the procedures are conducted the same way as for above threshold procurements. However, the negotiated

procedure is not available under the thresholds except under very specific circumstances. Time limits, advertising and invitation rules are more relaxed as they do not contain fixed regulations regarding those issues, but the limitations are based on a more subjective wording to ensure compliance with the fundamental principles in primary law.

THEORETICAL FRAMEWORK

In order to evaluate if procurement procedures affect project outcome it is of particular importance to consider how a procuring authority defines a satisfactory project outcome. All-in-all the assumption would be that a satisfactory outcome is when a project delivers VfM. VfM is an inherently ambiguous concept, especially in the context of public procurement. Whilst the values of a commercial undertaking might be concentrated to economical values (Coase, 1960) the values of a procuring authority varies between economic and social goods based on the purpose of the procuring authority but also with the purpose of specific projects undertaken by the authority. This paper will limit itself to impose an assumption that all procuring authorities see project success as a factor which increases VfM. This assumption is not uncontested, one view might be that the VfM concept is quite simply a measure of efficiency (e.g. Heald, 2003).

Even though project success is narrower in character than VfM, it is still not without facets. There might be a difference between what procurement officers perceive as project success and how successful a project is determining it from key indicators for the project. This distinction is important to make, as hard indicators can be observed objectively by measurements, the soft indicators are the product of individuals mental models, and as such affected by the individual past experiences (Kelly, 1963). A person's view of the world, or an event, is built upon experiences of previous events. Those experiences are then used to formulate expectations on future events. And it is those experiences which lay as a comparison when a person determines actual results. Furthermore, involved actors may

be affected by cognitive dissonance (Festinger, 1957) causing psychological reactions like buyer's remorse, but also forced compliance. If a procurement operative is forced to apply a process, which is not along the person's view of suitable processes, based on his or her expectations of future outcome, then this may result in a dissonance. Dissonance may in turn express itself differently (Festinger, Riecken, & Schachter, 1956), but one usual reaction would be a negative view of the system forcing compliance. Further, a survey on Dutch procurement operatives found that perceived inefficacy did not predict compliance with the directives (Gelderman, Paul, & Brugman, 2006). A finding which is in line with the theory that more detailed laws, with prescribed behaviour tend to increase compliance with those laws (Castro, 2012; Di Lorenzo, 2007). This might suggest that the case of regulation on procedures provoking reactions on forced compliance rather than a non-compliant behaviour. The effect of those psychological reactions may be a negative perception of project outcome and the regulation in general, even though there are no visible hard indicators suggesting deficient project performance.

Not only choice of procurement procedure might affect project performance, there are reasons to believe that contract design may also affect project performance for different reasons (Bolton & Dewatripont, 2005; Hart, 2003; Hart & Moore, 1988). This poses a challenge for an empirical investigation into project performance, due to the number of different contracts designs possibly used by procuring authorities. Fortunately, there are industry sectors available which more or less use standardised agreements when conducting business, thus allowing for a reduction of number of contract designs in investigated procurement processes. The Swedish construction industry is one example of this, where two dominant standard agreements is used throughout most of the sector; AB 04 for design-bid-build deliveries, and ABT 06 for design-build deliveries (AB 04, 2005; ABT 06, 2007). By limiting the study even further, by including only civil engineering works some other advantages are gained with respect to which procurement is applicable. As mentioned above, the utilities directives, and the Swedish legislation, allow for free choice of procedure. This increase the number of observed projects which has employed the negotiated procedure during procurement.

Studying both procurements covered by the directives and procurements below the thresholds add yet another dimension. Building on some theoretical work (Bajari & Tadelis, 2006) we can assume that contract completeness may be a factor predicting project success. The nature of civil engineering work is peculiar. Road and railroad projects depend on many different factors, such as geological conditions through the project stretch. A conclusive geological investigation is often not possible due to the cost and time constraints. Nonetheless, the nature of small projects would suggest a higher degree of completeness, since the cost for a specific level of completeness ought to be lower than for a larger project (Winch, 2010). This can be described with a model describing task and information uncertainty (Galbraith, 1977). A civil engineering contractor holds *ex ante* a certain amount of information. This information is created by the shared knowledge within the organisation, and knowledge gained from the tender notice documentation. However, the contractor needs to collect more information in order to successfully fulfil the contract. Work schedules, geological conditions, weather reports etc. This kind of information would not normally be available to a contractor *ex ante*. Thus, the complexity of a contract can be described with the amount of information which needed to be collected in order to fulfil the contract (Galbraith, 1977). This quantity of information ought to be larger in sizeable projects than in small projects, hence reflecting contract completeness, even though there may be exceptions. While the open procedure do not leave much room for adjustment of scope, details or specifications, the negotiated procedure would allow for some negotiation and exchange of information leading to increased completeness in the project. Those differences in completeness may predict project success on hard indicators. Furthermore, since the below threshold rules in Sweden are less strict in its prescription of conduct during procurement, and if the above reasoning on forced compliance is correct, the level of completeness could also manifest itself on a soft criterion by equate possibility to obtain, under the circumstances, highest possible completeness.

Operationalisation of Value-for-Money

Empirical studies regarding if choice of procedures affect procurement outcome is scarce, though some efforts to measure procurement performance has been made (eg. Essig, Amann, & Boerner, 2010). This state might be caused by a lack of available statistics, or it could be related to ambiguous definition of VfM. Describing what value for money is, in a generalised definition allowing for quantitative examination of the question is a daunting task. Nevertheless it may be possible to break down the VfM concept into measurable indicators, allowing for some empirical investigations into the topic. Project success is one dimension which may be contained within the definition. The logic would be that for a public authority to get VfM, the project being procured should be a success. There are of course exceptions, the Sydney opera house can be argued to have delivered a fair amount of VfM to the city of Sydney, nevertheless, the project in itself was a disaster, overshooting the budget with 1400 % and ten years behind schedule (Hall, 1982). Nevertheless, if the project had been concluded on budget, on time, the VfM could probably be calculated as higher than is the case today, *ceteris paribus*. Thus, VfM is not synonymous with project success, but project success is probably an intrinsic factor in the definition.

In order to operationalise project success 'hard' indicators and 'soft' indicators (see Manana et al., 2012 for a similar approach) will be studied. The hard indicators of project success are indicators which are not based on project participants' attitudes but rather information which can be read in the project documentation. There are of course some aspects of subjectivity in those indicators as well, but they ought to be fairly reliable nevertheless.

Two of the hard indicators used in this study are cost and time overrun. The question of if a project is delivered on time and on budget is related to project success, in this paper we disregard potential causes to why there is a cost or time overrun, but nevertheless it ought to be appropriate indicators. Another operationalisation of project success was the number of non-conformances during final inspection. This indicator is a little bit more ambiguous because it measures the number of non-conformances

found, and thus corrected by the contractor. It can be argued that, since the errors are corrected they are actually not affecting project success or VfM. The final hard indicator used is a notion of earned value. While cost overrun measures the differences in costs anticipated at project start and actual costs incurred at the end of the project, earned value provides a slightly other take on the same question. The thought is that change orders actually add value to the project, extend the scope or the quality of the project, thus, it can be argued that change orders actually increases the value for the customer, and it does not affect project success. An example is that a client using design-bid-build, accepts uncertainties in the design phase, fully aware that it would need to adjust for those uncertainties using change orders during the construction phase. Thus, only cost increases not related to change orders should be taken into account when measuring project success.

Furthermore, in this study soft project success is operationalised as a measurement of client satisfaction with the project overall, thus assuming there is a connection with project success and client satisfaction. From this we state the hypothesis that project success is higher when using negotiated procedures than by using open procedures. Further we state that project success should be higher when procuring below thresholds than when using the negotiated procedure.

METHODS

Table 1 Descriptive statistics

		<i>Median</i>	<i>Missing</i>	<i>Percentile 25</i>	<i>Percentile 75</i>
Open Procedures	Soft success	7,59	28	6,86	8,43
	Cost in contract (SEK)	49 493 000	3	17 650 000	95 256 000
	Actual invoiced costs (SEK)	71 009 500	36	19 599 184	201 143 000
	Non-conformances	17	34	2	45
	Project Time Delay (days)	10	37	-1	42
Negotiated Procedure	Soft success	8,33	14	7,43	9,00
	Cost in contract (SEK)	60 918 500	1	34 335 000	122 918 000
	Actual invoiced costs (SEK)	59 494 000	20	36 644 385	106 079 342
	Non-conformances	32	21	6	60
	Project Time Delay (days)	8	19	0	47
Below thresholds	Soft success	8,33	19	7,86	9,00
	Cost in contract (SEK)	20 570 000	0	14 300 000	32 795 000
	Actual invoiced costs (SEK)	21 857 000	23	14 982 000	34 500 000
	Non-conformances	6	24	2	18
	Project Time Delay (days)	7	29	-1	42

The study was done surveying road and railroad infrastructure investment projects between 2007 and 2010. The purpose of the study was primarily to investigate change of efficacy in public engineering projects, thus the questionnaire were designed

differently than maybe would be the case with the research question in this paper. The Swedish Transportation Agency collected 222 questionnaires from responsible project managers, however, the quality of responses proved to be uneven, creating large numbers of missing-data. No pattern emerged during analysis of missing data. Thus during the statistical analysis, a test-by-test case wise exclusion was done, actual N used in analysis are reported in table 2.

Further, three outliers were removed from the analysis because reported cost overrun values were greater than expected project total cost values, is it assumed those outliers is caused by miss typing. The collected responses did not fit on a normal distribution, and transformation attempts failed. Consequently, Kruskal-Wallis (Kruskal & Wallis, 1952) test were used to compare groups within the study. The Kruskal-Wallis uses mean ranks, with the assumption that the distributions of the groups are the same, whichever it may be. This enables a comparison between central tendencies between the groups, i.e. a non-parametric one-way ANOVA. While Wilcoxon rank-sum test (Wilcoxon, 1945) has the assumption of equal sample sizes in the groups (table 1), the more generalised, but similar, Mann-Whitney U test (Mann & Whitney, 1947) is used for post-hoc tests, as it uses rank-sums to compare differences between groups. Nevertheless, the variable 'non-conformances' did exhibit large deviance in variance towards other measures variables, see table 1. Previous studies on the same type of data has not been identified, and it does not seem self-evident that the distribution on some of the variables would eventually fit on a given probability function. Regardless, the given the large differences in group size shown in table 2, with some groups containing as little as 18 responses, leads to difficulties determining if the assumptions underlying the asymptotic significance tests are met. The most powerful remedy for this would be to execute an exact test, which generate the exact distribution of the data set, rather than relying on assumptions of distributions as in the asymptotic tests. The drawback is that an exact test is very compute intensive. Consequently, a Monte Carlo approach was taken instead. Simplified, this can be described as; instead of calculating every possible sample from the table, the method uses a random number of samples (in this paper 10.000 random samples) in order to estimate the distribution (Agresti, Wackerly, & Boyett,

1979), thus providing an estimation of the exact probability value. Although non-parametric tests are used, which is prone to type II errors, there still is no prior information on the probability for our hypothesis. This fact leads to the conclusion that a significance level of 0.05 was suitable. Since multiple tests on the same variables increases the cumulative probability of type I errors, an adjustment of probability levels are used by using the Bonferroni-Holm method (Holm, 1979).

While the questionnaire contained 56 different questions, only a few variables are used for the purpose of this study. Examples of variables excluded from this study are: Open-text project description and name, cost related to price indexing, number of person-days in the project, open-text reason for time overrun, use of partnering contracts, if an alternative solution were accepted, number of accidents and sick days, environmental consequences, payment system in contract. Further there were additional questions not included in the scientific part of the questionnaire which related to the public authorities key indicators. The descriptive of the used variables is shown in table 1. The 'soft criteria' for project success were measured as the mean of seven variables measuring client overall satisfaction with project outcome (*Cronbach's $\alpha = 0.847$*). 'Time overruns' and 'cost overruns' are measured as a percentage of overruns of expected time and cost at time of contract signing. This is done in order to offset some covariance in overruns when comparing projects of different sizes and costs. 'Earned value' are a measure of the sum of bid cost and approved costs for change orders divided by total invoiced costs. Thus the measurement can be said to measure whether costs are incurred which does not add value to the project. The last investigated variable is 'non-conformances' during inspection. Those are errors the client has found during inspection. Under the assumption that errors are not stochastic in nature, it would not be correlated to project size, thus there is no need to check for covariance with project total cost, or time span.

RESULTS

Kruskal-Wallis tests were used to analyse differences in procedure choice with regard to measures variables, the mean ranks are displayed in table 2. The variable 'soft criteria' show a significant difference ($\chi^2 = 11.834, p = 0.002$) indicating actors perceiving projects less successful when using open procedures than negotiated procedures. Nevertheless, using a Mann-Whitney U test as post-hoc analysis, shows the difference between open procedures and negotiated procedures to be non-significant ($U = 414, p_{adj} = 0.106$), leaving only the difference between open procedures and below threshold procedures significant ($U = 952, p_{adj} < 0.001$).). 'Time overrun' does not have any significant differences between the three compared groups ($\chi^2 = 0.223, p = 0.891$), suggesting 'time overruns' not having any relationship with choice of procedure. 'Cost overrun' does not show any significant differences either, however, the power is substantially higher than for time overrun ($\chi^2 = 4.704, p = 0.092$). Nonetheless, the differences seem to be heavily weighted towards contracts below the thresholds. Running a separate analysis comparing only open and negotiated procedures shows no significant

Table 2 Mean ranks of procedures

	Procedures	N	Mean Rank
Soft criteria	Open Procedures	46	53.20
	Negotiated Procedure	25	73.64
	Below thresholds	67	79.15
	Total	138	
Time overrun	Open Procedures	37	59.59
	Negotiated Procedure	20	56.80
	Below thresholds	57	56.39
	Total	114	
Cost overrun	Open Procedures	37	66.05
	Negotiated Procedure	17	60.59
	Below thresholds	60	51.35
	Total	114	
Earned value	Open Procedures	33	47.12
	Negotiated Procedure	16	53.06
	Below thresholds	56	56.45
	Total	105	
Non-conformances	Open Procedures	40	65.94
	Negotiated Procedure	18	78.03
	Below thresholds	62	51.90
	Total	126	

differences between the two groups ($U = 296$, $p_{adj} = 1$).

The difference between open procedure and below threshold procedures does not show any significance either ($U = 812$, $p_{adj} = 0.084$). 'Earned value' does not either show any significant differences between the examined groups ($\chi^2 = 1.949$, $p = 0.368$). Last, the number of reported 'non-conformances' during inspection, seem to exhibit significant differences between the investigated groups ($\chi^2 = 9.370$, $p = 0.008$). As the case with 'cost overrun' the primer seems to be the group containing below threshold contracts. However, the difference between open and negotiated procedure is directed in a counter-direction compared to the hypothesis, and not significant ($U = 228.5$, $p_{adj} = 0.229$), while the difference between open and below threshold procedures are not significant ($U = 951$, $p_{adj} = 0.096$), the difference between negotiated and below thresholds procedures were ($U = 314$, $p_{adj} = 0.012$).

Unfortunately only 14 cases were identified of using a design-build delivery, as opposed to 127 cases using a design-bid-build delivery system. This large difference in group sizes makes a statistical analysis blunt and prone to both Type I and II errors. Nevertheless, a test was carried out to give an indication, but did not result in any significant differences. The most significant difference was between the two delivery systems when compared on project delays ($U = 475$, $p = 0.362$). Thus, no conclusion whether delivery systems predict project performance can be made.

DISCUSSION

The discussion on the availability of procedures in the European public procurement directives has been comprehensive. The dominant argument has been that the open and restricted procedures limit the procuring authorities' ability to procure goods and services while getting value for money. While these arguments have been raised by academics as well as operatives, empirical studies have not before been conducted to investigate this issue from a project success perspective. During our analysis we could not prove

any difference between open and negotiated procedures with regard to project performance measured as a perception of project outcome but neither measured through observed 'hard' indicators connected to actual project success. This result is surprising given the prejudice against current legislation voiced by procuring authorities. It would seem procurement procedure cannot be seen as a predictor for time and cost overruns, nor earned value. This conclusion suggests that the prejudice against procurement procedures ought to arise from other factors. Further, the results would suggest that current procurement procedures actually do not prevent procuring authorities from achieving project success. There are some indications of a relationship between open and negotiated procedures and perception of project success. While this study has not been able to conclude whether this difference is real or created by random factors in this particular study, it nevertheless suggests a need for further investigation. If there is a real difference between perceived project success when using different procurement methods, and no difference in actual project success, the difference could be depending on two factors. First, it could be a psychological reaction on forced compliance. By enforcing a certain practice, good or bad, upon a procurement operative, this practice might create a dissonance towards the operative's subjective belief on how to conduct a procurement practice. This proposal does however contrast to the results in this study. If, the restriction of procedure choice caused negative reactions on the regulations, open and below threshold procedures should have been expected to be more similar. Instead, the difference is the only identified difference between the procedures in the dataset. Nevertheless a suggested approach to investigate this factor is to study differences in perception of projects success grouped by procurement officers experience, where procurement officers with private procurement experiences are put in one group, and procurement officers with only public procurement experience is put in a another group. The inherent belief on procurement processes ought to differ between the groups. A second factor may be that transaction costs, which are not measured in this study, may influence perception of project success, where higher transaction costs may cause lower satisfaction with project results. It may be that successful project outcome is possible to achieve with

any procedure, but that one procedure is more costly to use given a specific project outcome. While there is theoretical evidence for this conjecture (Bajari & Tadelis, 2006) and some empirical work (Bajari et al., 2011), the literature review for this paper has not been able to find any conclusive empirical results on this theory. Studying this research question would be a fastidious task, not only would one need to compare the actual cost for a procurement process, but one would need to include re-contracting costs (i.e. change orders) during project execution in order to obtain viable data.

The only procedure which was significantly different from other procedures was the procedures below the thresholds. Project success is perceived as more common in below threshold procurements than the case for open and negotiated procedures. As mentioned above, the negotiated procedure is not available at all for procurement under the thresholds when using the public sector directives. The difference between below threshold procurements ought not to be caused by any tension between an open procedure and a negotiated procedure. This conclusion is in line with the second statement in the hypothesis. Since the project scope in projects governed by the below threshold rules inherently are limited, there are a more clear understanding of expectations and it is easier to have a complete description of the project. This might lead to more 'realistic' completeness in the project. In addition, fewer non-conformances during inspections may be explained also by a more complete view of the project. Design work may be more detailed, and cover a larger percentage of the entire work than is the case with above threshold procurements. However, if this reasoning is correct, the conclusion would be that the negotiated procedure would not help creating completeness in a project. This may in turn be the result of the ex post nature of the negotiated procedure which, provides for ex post negotiations of terms, but not the actual scope of the project. A similar survey including competitive dialogue, which to some extent, enables ex ante negotiations, would bring clarity to this finding. It should also be noted that procurement of below thresholds procedures only showed significant differences with regard to two factors, soft criteria and non-conformances, although there is a substantial power with regard to cost overruns too. Two of the measured indicators of project success do not seem to be indicated at all by procurement procedure.

Further, there is no evidence of the step like relationship stated in the hypothesis where open procedure < negotiated procedure < below thresholds. Except for non-conformances there were no significant differences between below thresholds and negotiated procedures. This result may be caused by a small group size of negotiated procedures, something future investigation would need to clarify.

A note on the nature of civil engineering work may be warranted. Even though those works may be surrounded with uncertainty due to exogenous conditions, one may contend that it still is work which has been done many times before; maybe with the exclusion of large bridges and tunnel projects. This could lead to less uncertainty than perceived by an outside observer *prima facie*, and even further complexity maybe needed before seeing the effects used in theoretical work on the issue.

In conclusion we have not found any evidence suggesting that choice of public procurement directives procedures, or lack of choice, cannot be used as a predictor for cost overruns in construction project, nor can they be used as a predictor for time overruns. Further, there is no proof suggesting that one procedure would result in more non-conformances before another procedure, nor do the procedures predict perceived project success. From those results we can suggest that the prejudice against the directives procedures seem to arise from factors outside project performance.

The results in this study should not be exaggerated, and it is obvious that the results have to be confirmed, preferably with larger sample size, and more stringent data collection procedures. Then, hopefully, the researchers would be able to use more powerful, parametric, statistical tools in order to confirm these results. Nevertheless, the results do provide indications which stand in contrast to established positions in the discussions of public procurement regulations. Furthermore, investigating factors involving human behaviour is inherently difficult, and it can even be argued that such researcher need to be more narrowly driven by using experimental research designs rather than a survey research design. Experimental design would, for example, make it easier to establish and explain the relationships by hard versus soft success factors. Furthermore, a note on specification bias is warranted. VfM as well as project success is

two concepts without strict definitions. Many factors do affect project outcome, and in this paper only a few has been considered. The variables used are observable, and the values ought to be reliable due to their nature, but their inter-dependencies have not been thoroughly examined in this paper or in the literature. Time and cost overruns may be occurred due to random factors (e.g. weather) or covariates (e.g. design phase quality). Further, VfM as such probably has as many variables affecting VfM as there are projects executed. One response to this is to do macro-statistics (e.g. Bajari et al., 2011) in an effort to gain scale and thus being able to map out variables and sort out regularities between them. However, it is worth to stress, VfM is different between projects, and between procuring authorities. Thus, in order to develop a deep understanding on the relationship between VfM and public procurement procedures there is a need to dwell deep into procuring authorities and projects in order to understand the relationships. This allow for uncovering regularities in relationships during VfM shifts.

NOTES

4 It should be noted that the negotiated procedures within the directives are limited in comparison with a free commercial negotiation as assumed by the authors.

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