

## Transparency in Procurement: The design and use of information in trading mechanisms

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An ESRC funded project



This research is motivated by the need to reduce the public deficit. One way to do this is by achieving efficiency savings in procurement for large public institutions such as the National Health Service (NHS), city councils, or the Ministry of Defence. We intend to contribute towards this goal by attempting to better align the stylised theoretical analysis of the reverse auction – a form of trading mechanism where the potential suppliers submit tenders – with the facts on the ground. While the project's immediate objective is to increase the stock of theoretical knowledge about procurement mechanisms in general, we are keen to be able to produce insights that could be directly applicable in real procurement processes. Our partnership with NHS Scotland provides the necessary close link with a user that could facilitate such a breakthrough:

“As the Scottish Government's centre of expertise, NSS National Procurement is the largest public sector procurement organisation in Scotland. They deliver a portfolio of national contracts for health in excess of £1.3 billion and cover around 60% of NHS Scotland's procurement spend – and this is continuing to grow. NSS National Procurement's excellence in its field has been recognised through many industry awards over its 10 year tenure and is acknowledged by their health board colleagues as delivering real tangible savings – over £225 million in the past five years.”

“This is potentially a very important application applying high level theory on mechanism design and auctions to the practical problem of NHS procurement.”

ESRC Assessor

The specific focus of our study is the provision and use of information in the tendering process, building on two recent methodological developments: “Information Design” and “Simple Auctions”. The literature on procurement auctions has focussed on finding the trading mechanism that maximizes the expected benefits of the buyer. The “maximisation” usually assumes that the trading mechanism can be arbitrarily complex, and has no effect on the information available to bidders in determining the size of their bids. However, these assumptions are often too strong: on the one hand, the buyer may have significant leeway in choosing what information to gather and disclose; on the other hand, “optimal” mechanisms often are too complicated, and consequently hard to implement in practice.

Our research is to push out the research frontier by analysing what information, and in which form, is presented to the potential traders and also how information revealed by them is used by the designer to determine prices and trades.



## Mini-conference

The first public event of the project was a one-day conference organised in Edinburgh (September 2016) with the participation of international speakers from Barcelona (UPF), Mannheim (ZEW), UCL and Bristol (Law) in addition to local experts and practitioners.

To achieve the first of these we build on the novel idea of information design: the optimal provision of information to a group of interacting agents by a designer with a certain objective. By strategically choosing its method for scoring the bids and by seeking out and revealing additional facts that might affect the cost of suppliers, the designer can create interdependence between the agents' information; this can then be exploited through the competitive bidding process, ultimately benefiting the designer's objective.

The second prong of our research strategy is based on the observation that due to the complex objective of the buyer (quality, timing, transparency,



"We source, procure, manage, transact and deliver over 47 million domestic and medical product items for NHS Scotland each year. Our logistics infrastructure enables us to supply goods to most hospital wards, departments and community health centres."  
(NSS National Procurement)



sustainability, etc. in addition to price) most actual tenders are multi-dimensional: the bids submitted include several different factors besides price. While a pre-announced scoring rule can transform these bids into readily comparable unidimensional scores, it does not eliminate the complexity of bids and of the bidders' beliefs about the bids of others. For practical reasons, the designer needs to compensate for this innate complication by simplifying the mechanism, resulting in additional restrictions on the set of mechanisms she can choose from. These restrictions imply that families of mechanisms previously discarded as sub-optimal, now become relevant. To capture this scenario, we analyse decentralised mechanisms, where trading prices are independent of the bids of competitors. In the context of scoring auctions, this would correspond to a discriminatory "first-score" auction. According to the existing literature, when the quantity traded is not set beforehand, these auctions are not optimal.

Together, these two approaches make it possible to advance our understanding of issues like simultaneous bidding and realistic mechanisms that deal with interdependent valuations. In this process we also pay particular attention not to be hemmed in by the artificial boundary between micro- and macro-economic

analyses, so that our insights can be exported to system-wide markets, such as the labour and credit markets.

## Preliminary findings

Following up on our initial meetings with the NHS procurement team, we have started a specific investigation into the relationship between the possibility of renegotiation of an awarded contract, subject to the constraint that the new contract does not reduce the score associated with the winning bid (otherwise, the unsuccessful bidders would have a reason to complain). For the (limited number of) situations analysed, it seems that the optimal scoring rule in such a situation is non-quasi-linear. Insisting on a "simple", quasi-linear scoring rule is therefore costly for the buyer.

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