AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

A note on the performance measure of conservation auctions

Uwe Latacz-Lohmann[a*] and Steven Schilizzi[b]

[a]Department of Agricultural Economics, Christian-Albrechts Universität zu Kiel, D-24098 Kiel, Germany
[b]School of Agricultural and Resource Economics, The University of Western Australia, Crawley, WA 6009, Australia

*E-mail address: ulatacz@agric-econ.uni-kiel.de

18 February 2011
Working Paper 1104
School of Agricultural and Resource Economics
http://www.are.uwa.edu.au

THE UNIVERSITY OF WESTERN AUSTRALIA
Achieve International Excellence

Citation: Latacz-Lohmann, U. and Schilizzi, S. (2011) *A note on the performance measure of conservation auctions*, Working Paper 1104, School of Agricultural and Resource Economics, University of Western Australia, Crawley, Australia.

© Copyright remains with the authors of this document.

Abstract

We argue that previous assessments of discriminatory-price conservation auctions may have systematically overestimated their performance relative to uniform-payment schemes due to an inappropriate counterfactual comparison. We demonstrate that the cost curve (and not the bid curve) is the relevant supply curve when a uniform payment is offered and provide a theoretically rigorous counterfactual based on that insight. We estimate that the performance of BushTender may have been overrated by more than 50%.

Key words: Auctions, procurement, tenders, conservation, economic experiments, model validation, plus: assessment method, agricultural policy, environmental policy, market-based instruments

JEL classification: C91, C92, D44, Q24, Q28

A number of studies have assessed the economic performance of conservation auctions (or tenders) in comparison to fixed-price schemes using data from field experiments. These studies have typically concluded that auctions yield large advantages in terms of budgetary cost-effectiveness. In this note, we argue that the size of the gains reported in the literature may be overstated due to an inappropriate counterfactual comparison.

Stoneham *et al*. (2003) analyze the bids of the first two bidding rounds of the BushTender pilot auction and compare these to a hypothetical fixed-price scheme. They conclude that the amount of biodiversity benefits acquired through the first round of BushTender auctions would have cost the government agency about seven times as much if a fixed-price scheme had been used instead. For the second-round (Gippsland) trial, the estimated gain in cost-effectiveness is 260%. Connor *et al*. (2008) compare the cost-effectiveness of the Catchment Care auction in South Australia to that of a hypothetical uniform-payment scheme. They find that the estimated average environmental benefit of the uniform-payment policy was only 56% of the benefits attained through the auction with the same level of overall expenditure. White and Burton (2005) use data from the Auction for Landscape

Recovery pilot in Western Australia to benchmark the budgetary cost-effectiveness of the auction to that of a set of alternative fixed-price schemes. They show that the cost-effectiveness of the auction compared to that of a uniform-price scheme varies between 207% and 315% in round 1 and 165% and 186% in round 2, depending on the counterfactual fixed-price scheme selected.

Although these conclusions may in some cases be qualitatively correct, the magnitude of an auction's advantages derives from a mistaken method for measuring the performance of a discriminatory-price (pay-as-you-bid) auction. With the exception of White and Burton (2005), the above studies typically use the bid curve as the benchmark for constructing an equivalent fixed-price scheme (FPS). This equivalence is defined differently depending on whether a budget-constrained (BC) or a target-constrained (TC) auction is considered.[1] In the BC auction, the equivalent FPS is the minimum uniform payment rate that would have resulted in the same total expenditure as the auction. In Figure 1a this corresponds to calibrating the fixed price P_F such that area OP_FCX_F is equal to $OABX_D$. In the TC case, the equivalent FPS is defined as the minimum uniform payment that would have been needed to achieve the same conservation target as the auction. In Figure 1b this corresponds to calibrating the fixed price P_F such that $X_F = X_D$ (same target). In this case, the auction achieves the same environmental target at a lower cost (area $OABX_D$) than the uniform-payment scheme (OP_FBX_F).

Figures 1a and 1b about here

We argue that this approach is conceptually flawed because auction theory has established that discriminatory-price auctions generate bid shading; that is, bidders put in bids that are in excess of their costs which are unknown to the regulator. The existence of bid shading means that the underlying cost curve and not the observed bid curve is the correct benchmark for defining an equivalent FPS.

It is important to understand that the cost curve is the relevant supply curve *when a fixed payment is offered*. Then all landholders with costs below the fixed payment stand to gain from participation.

[1] In the BC auction, the programme budget is given and known; the risk is whether the target will be achieved. In the TC auction, the environmental target to be achieved is given and known; the risk is with what it might end up costing.

The marginal participant is the one whose cost is equal to the fixed payment rate offered – and not to the highest successful bid as assumed in the above studies.

Therefore, in a FPS, the auction's bid curve is not the relevant benchmark for defining the equivalent payment rate; rather, the unknown underlying cost curve is. Without knowledge of the underlying opportunity cost curve it is not possible to identify an appropriate counterfactual fixed price. Put differently, there are two different supply curves, one for the auction and one for the FPS. While the former includes bid shading, the latter is represented by the true underlying cost curve. In both the auction and the FPS mechanisms, landholders are able to secure themselves rents, but the rents differ in the two cases.

This is illustrated for both the auction and the FPS in Figures 2a and 2b in which the cost curve underlying the bids has been added in. In the auction, the rents accruing to successful bidders are defined by the vertical distance between the bid and cost curves (bid shading), whereas the rents under the FPS are defined by the vertical distance between the fixed payment (P_F) and the cost curve.

Figures 2a and 2b about here

In addition, the FPS is now constructed with reference to the cost curve which represents the appropriate supply curve. In the BC auction (Figure 2a), the fixed price P_F is calibrated such that the total expenditure is the same as in the auction; that is, such that area $OP_FCX_F = OABX_D$. In the TC auction (Figure 2b) the fixed price P_F is set such that it intersects the cost curve at the level of the target ($X_F = X_D$).

The difference between the approaches shown in Figures 1 and 2 is that, in the first approach, the advantage of the auction over its equivalent FPS will be overestimated. One can get an idea of the magnitude of this overestimation by considering one of the cases where the wrong approach has been used.

Stoneham *et al.* (2003) use the bid curve obtained from the BushTender conservation pilots to construct a FPS in the same manner as in Figure 1b. As explained above, they conclude that a FPS would require a budget of almost seven times of the actual budget spent under the auction. What

would their conclusion have been if they had applied the correct approach as per Figure 2b? To answer this question, one needs to estimate the degree of bid shading in order to obtain an estimate of the underlying cost curve. As part of another research program, we carried out controlled laboratory experiments with auctions of the same format, that is, with a fixed target and a sealed-bid discriminatory price payment rule, from which an estimate of bid shading can be made (XYZ, 200x)[2]. The results first remind us that bid shading depends, as predicted by theory, on the level of bidder's costs: the higher the costs, the lower the bid shading.

To be comparable to the BushTender results of Stoneham *et al.* (2003), we needed to compute the degree of bid shading for a supply of environmental services equal to the specific value of 1165 thousand BQ (biodiversity quantity) units, as per Figure 4 of their paper. This curve is reproduced in Figure 3 where the bid curve is exactly the same as that of their paper. In our experiments, the cost curve underlying the bids is of course known, and one can use this information to obtain some idea of the degree of bid shading. This was found to be quite robust across our experiments. Results suggest that, for the level of environmental service supplied (1165 thousand BQ units), bid shading lies close to the 50% mark. Rather than a fixed price of $2.30, the correct value is $1.55 (see Figure 3). With this information, applying the correct approach as per Figure 2b yields, for a target of 1165 thousand BQ units, an equivalent fixed-price budget of $1.8 million instead of $2.7 million. That is, the auction is 4.5 times, rather than 7 times, as efficient as the fixed-price payment.

Figure 3 about here

The fundamental result still holds: with the given data, the auction is (far) more efficient than the fixed-price program; but the result is, nevertheless, off the mark by more than 50%. In different contexts, this difference might be large enough so that policy implications are reversed.

Whether the experimental results extend to the real setting of Stoneham *et al.* (2003) depends of course on the external validity of those experiments. We have no way of controlling for this external

[2] XYZ are used to preserve anonymity in the reviewing process: they will be replaced by the authors' names in the final version of this paper.

validity, but previous work by Brookshire *et al.* (1987), List and Shogren (1998) and Lusk and Shogren (2007: chapter 9) suggests that experimental auctions have so far been found to have reasonable external validity. We can therefore take the above results of bid shading to be at least suggestive of plausible orders of magnitude.

References

Brookshire, D.S., Coursey, D.L. and Schulze, W.D. (1987). The external validity of experimental economic techniques: analysis of demand behaviour. *Economic Inquiry* 25: 239-250.

Connor, J.D., Ward, J.R. and Bryan, B. (2008). Exploring the cost-effectiveness of land conservation auctions and payment policies. *Australian Journal of Agricultural and Resource Economics* 51 (3): 303-319.

List, J. and Shogren, J.F. (1998). Calibration of the differences between actual and hypothetical valuations in a field experiment. *Journal of Economic Behavior and Organization* 37: 193-205.

Lusk, J.L. and Shogren, J.F. (2007). *Experimental Auctions: Methods and Applications in Economic and Marketing Research*. Cambridge University Press.

Stoneham, G., Chaudri, V., Ha, A. and Strappazon, L. (2003). Auctions for conservation contracts: an empirical examination of Victoria's BushTender trial. *Australian Journal of Agricultural and Resource Economics* 47 (4): 477–500.

White, B. and Burton, M. (2005). Measuring the efficiency of conservation auctions. Contributed paper at the 49th Annual Conference of the Australian Agricultural Economics Society Conference, Coffs Harbour, NSW, Australia.

XYZ, 200x. [The complete reference will be added in after the peer review process]

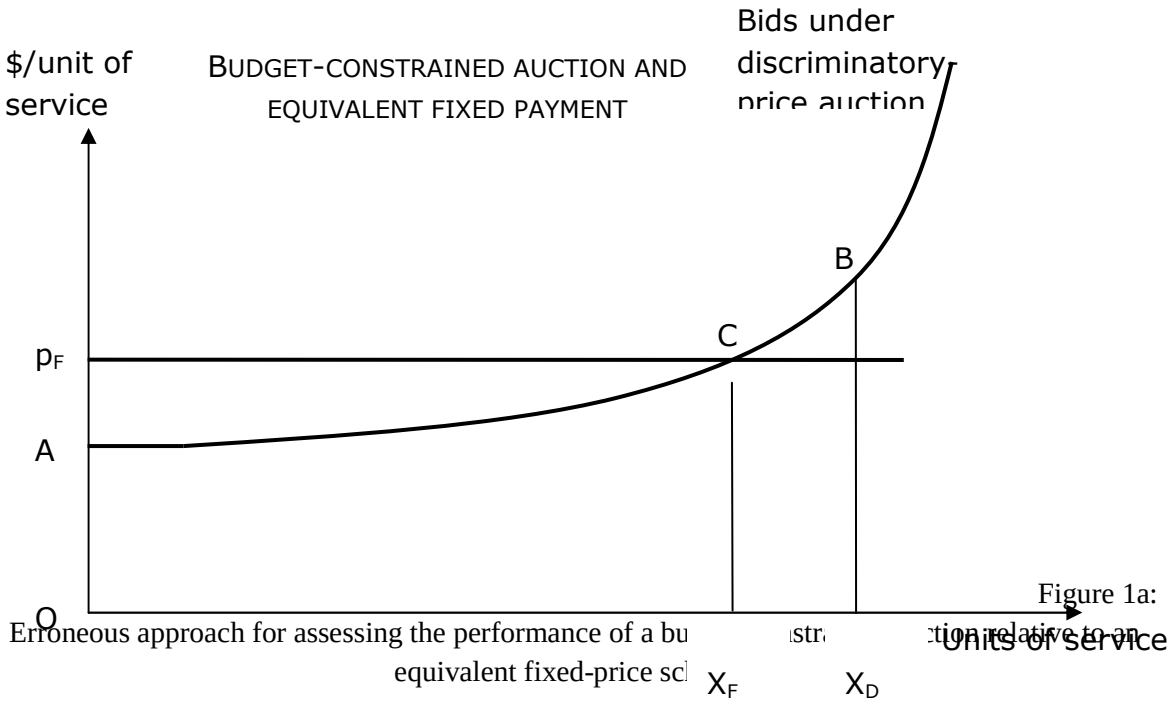

Figure 1a: Erroneous approach for assessing the performance of a bu str ction relative to an equivalent fixed-price sc

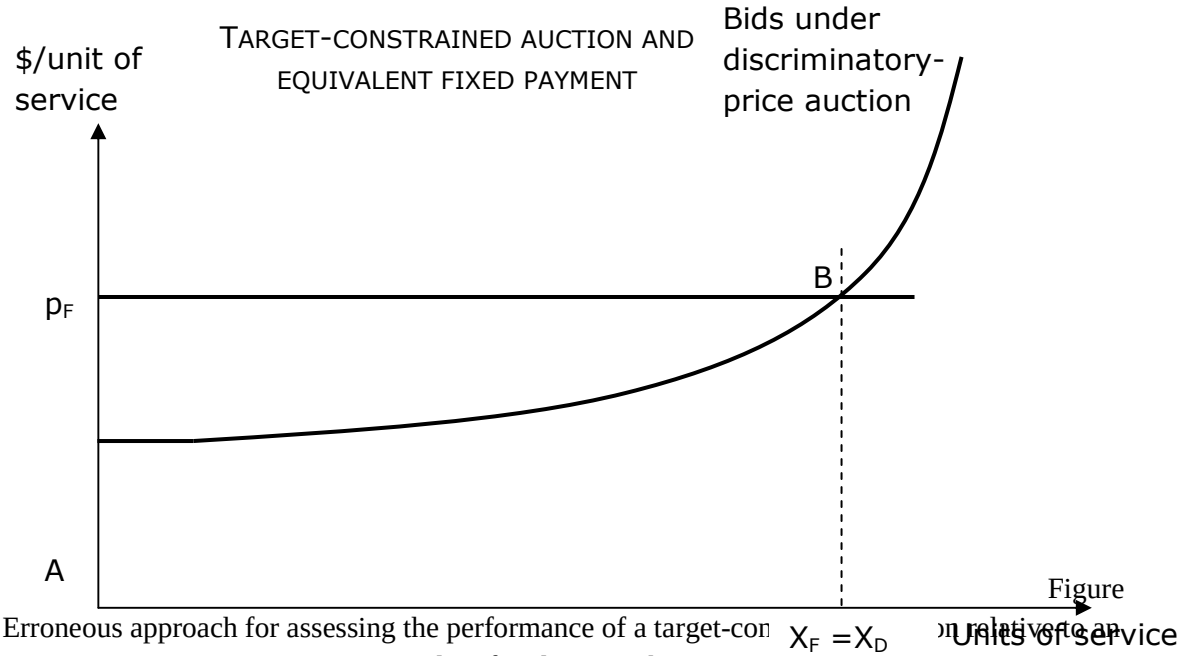

Figure 1b: Erroneous approach for assessing the performance of a target-con n relative to an equivalent fixed-price scheme.

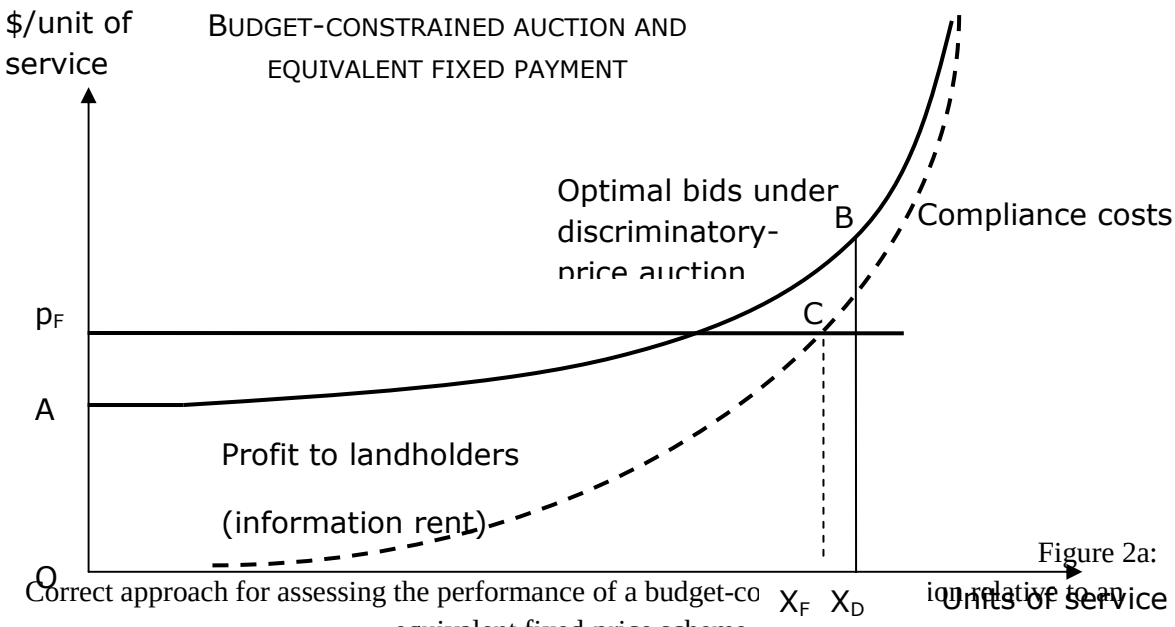

Figure 2a: Correct approach for assessing the performance of a budget-co ion relative to an equivalent fixed-price scheme.

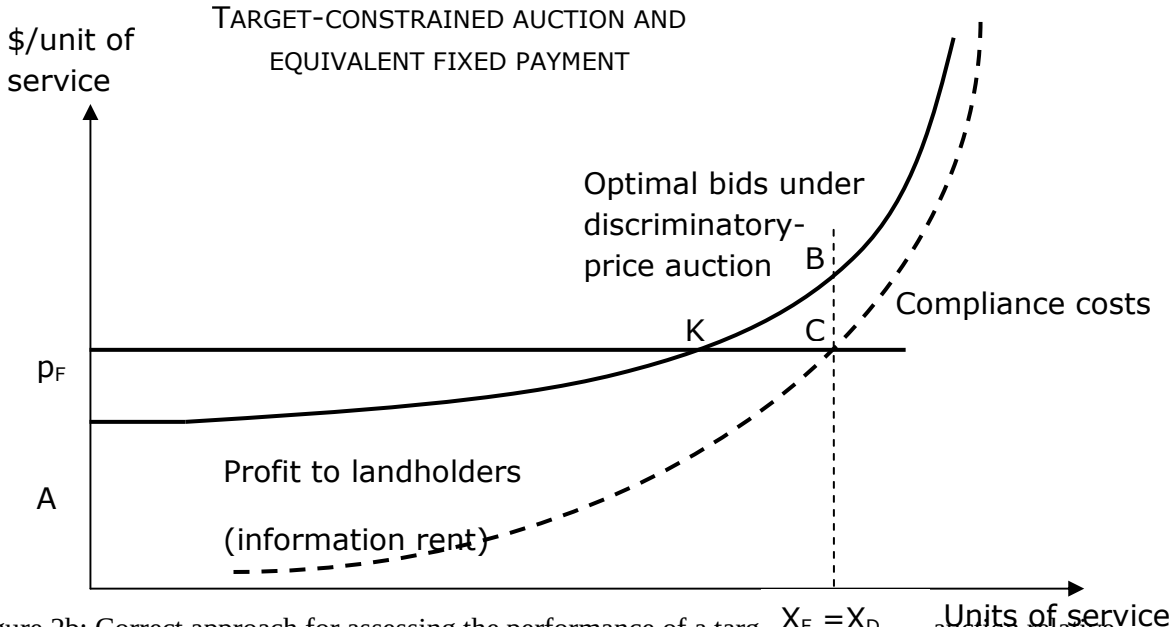

Figure 2b: Correct approach for assessing the performance of a targ auction relative to an equivalent fixed-price scheme.

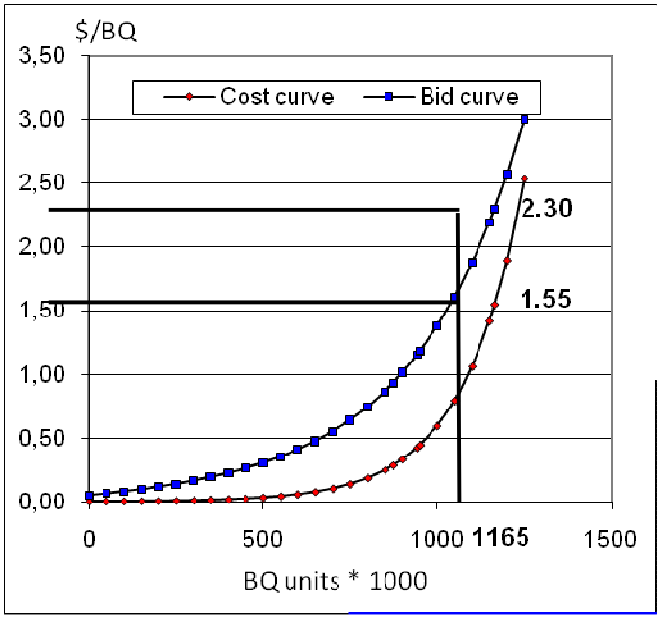

Figure 3

Figure 3: Reproduction of Figure 4 from Stoneham *et al.* (2003) with an experimentally derived underlying cost curve (below the bid curve)