Review for "The Option Value of Contract Duration: Evidence from the U.S. Timber Market"

This paper examines how contract duration affects bidders' willingness to pay in timber auctions by embedding a real option over the timing of harvest. Using data from U.S. Bureau of Land Management timber auctions, the authors document delayed harvesting behavior and estimate a structural model that links post-auction cutting decisions to bidding behavior. Counterfactual simulations suggest that extending contract duration can increase seller revenue, with heterogeneous effects across buyer types and tract sizes.

The paper is carefully done, based on a rich administrative dataset that combines auction outcomes with detailed post-award behavior. The institutional setting is clearly described, and the descriptive evidence on delayed cutting and price responsiveness is convincing. The estimation appears competently implemented, and the authors conduct several within-model robustness checks. That said, I have substantive concerns about the paper's academic contribution, key modeling assumptions, and the interpretation of the counterfactual results. I present my comments below:

1. Contribution and positioning

At its core, the paper shows that contract duration is not a neutral design parameter: by expanding the option to delay harvesting, longer durations differentially benefit buyers with greater intertemporal flexibility, thereby reshaping the distribution of valuations across buyer types. This, in turn, affects which buyers are pivotal in determining auction prices and seller revenue.

This in my opinion is the strongest contribution of the paper. However, even in this form, the insight remains narrow. The idea that longer horizons increase option value is well established in the real-options literature, and the heterogeneity result follows naturally once buyer types differ in their ability to exercise that option. The paper does not introduce a new economic force or elevate this mechanism to a more general principle that travels beyond the timber setting. As a result, the contribution end up being a careful structural quantification of an existing intuition rather than a finding that materially changes how we think about contract or auction design.

2. Modeling assumptions and interpretation

Several maintained assumptions play a key role in generating the paper's results, as is the nature in most structural models, but their implications for interpretation are not fully addressed. I list them below.

i. Conceptual coherence of continuation values, ξ_m, and the private-values assumption

The paper adopts an independent private-values framework for the auction stage while linking bids to post-award continuation values from a dynamic cutting problem. While the use of private values for tractability is understandable, the way continuation values are modeled and conditioned on auction outcomes raises a conceptual tension. Continuation values differ only through buyer type and an idiosyncratic multiplicative component (ξ_m); conditional on type, the observed state, and winning the auction, they are otherwise largely aligned. Under a private-values interpretation, bidders' private information should persist after winning, implying richer heterogeneity in continuation values conditional on the auction outcome. Instead, the model compresses heterogeneity into a low-dimensional residual, a structure that is more consistent with a common-values environment in which prices are informational, and continuation values converge. As a result, (ξ_m) absorbs multiple unmodeled forces, including private information, belief heterogeneity, persistent operational constraints, and mis-specified expectations, making heterogeneity and competitive effects largely imposed by assumption rather than revealed by the data. The paper would benefit from a clearer acknowledgment of this limitation and a more cautious interpretation of how contract duration reshapes competition.

ii. Homogeneous beliefs and bidding-stage heterogeneity

The model assumes homogeneous beliefs across buyer types regarding future prices and states. Differences in bidding behavior across loggers and sawmills arise primarily through type-specific continuation values from the cutting problem and multiplicative idiosyncratic valuation terms in the bidding stage. This collapses potentially rich heterogeneity such as differences in information, expectations, risk attitudes, or forecasting ability, into residual valuation components.

As a result, the claim that contract duration "reshapes the competitive landscape" is mechanically driven by the scaling of continuation values rather than by endogenous strategic or informational responses. Competition is reordered ex ante through assumed valuation differences, not reshaped through belief heterogeneity or strategic interaction.

iii. Conditional independence in the dynamic cutting model

The dynamic cutting stage relies on the conditional independence assumption that is standard in Rust (1987), namely that unobserved shocks to cutting decisions are i.i.d. over time and independent of future states conditional on the observed state. In this setting, the plausibility of this assumption is unclear. Timber harvesting decisions are likely influenced by persistent, unobserved factors, such as weather, operational constraints, equipment availability, or liquidity, that may not be fully captured by the state variables included in the model. Additionally, the period of data context under study (CoVid and other time periods) may have this structurally persistent shocks.

If such shocks are serially correlated, delayed harvesting may reflect persistent frictions rather than forward-looking option exercise. Because the continuation value from this model feeds directly into bidding and counterfactual revenue effects, this assumption requires both more discussion and/or sensitivity analysis.

iv. Markov price process and expectations

The model further assumes that lumber prices follow a common Markov process and that all bidders share identical expectations about future price evolution. Given the pronounced volatility and regime shifts in lumber markets, and the different positions of sawmills and loggers along the supply chain, it is not obvious that forward-looking behavior should be governed by a restrictive expectation formation process. If buyer types form systematically different beliefs about future prices, some of the observed heterogeneity in cutting behavior may reflect belief differences rather than intertemporal flexibility.

3. Methodological contribution

Although the paper combines dynamic programming, auction models, and mixture approaches in a careful way, it is not clear that it offers a distinct methodological contribution. I appreciate the clean and elegant approach to modelling. That said, the tools employed are well known, and the paper does not articulate a generalizable estimation or identification insight that would be reusable by other researchers in different settings.

As a result, the structural model reads primarily as an application vehicle rather than as a contribution in its own right. This is not inherently problematic, but it places greater weight on the need for a strong and broadly relevant substantive insight, which, as noted above, remains somewhat limited.

4. Implications for the estimation of price sensitivity

These assumptions have direct consequences for the interpretation of the estimated price sensitivity parameters (γ_m). Under homogeneous beliefs, a common Markov price process, and conditional independence, any systematic differences in forward-looking behavior across buyer types must be absorbed by (γ_m) and cost parameters.

As a result, the estimated differences in (γ_m) across sawmills and loggers may conflate true price responsiveness with mis-specified beliefs or omitted persistent constraints. Because these parameters govern continuation values and underpin the counterfactual effects of contract duration, this raises concerns about the economic interpretation and robustness of the main results.

As an aside, I found the modeling of composition of entry as a weighting over buyer types to be a clever and transparent way to isolate inframarginal effects.

5. Estimation and robustness

The structural model appears competently implemented, and the reported robustness checks suggest that the estimates are numerically stable within the maintained framework. However, the robustness exercises largely operate within the same set of assumptions and therefore do not address the more substantive concern that key parameters, particularly those governing option value, are identified only under strong behavioral and informational assumptions that are not directly tested.

6. Counterfactual analysis

The counterfactual analysis of contract duration is carefully executed but largely delivers expected results: longer durations increase continuation values and seller revenue, with diminishing returns. On their own, these findings confirm existing real-options intuition rather than provide new insight.

The more interesting aspect of the counterfactuals I believe lies in the composition effects. The paper shows that revenue gains from extending duration are driven disproportionately by buyer types with greater option-exercise capacity, and that tract size and buyer composition matter. This is an interesting insight and could lead to better auction design outcomes. That said, the implications of this result are limited by the paper's own finding that entry is largely orthogonal to duration. Because duration does not affect who enters the auction, composition effects operate only among inframarginal bidders. As a result, contract duration reshapes outcomes through valuation reweighting rather than through strategic entry or screening, constraining its usefulness as a design lever.

6. Scope and generalizability

Finally, the paper's discussion extends its implications to a broad set of business-to-consumer contexts (e.g., loyalty programs, ticketing, reward expiration). These analogies are not well supported by the model or data and risk overstating the generality of the findings. The paper would be stronger if it focused more narrowly on procurement and resource-allocation contexts where irreversible investment and timing flexibility are central.

Minor points

- A lot of the assumptions made in the paper are standard but applied from other auction settings like oil and natural gas, etc. The paper would benefit from sensitivity analysis or at least a justification on why these assumptions would carry over in the current context.

Overall assessment

This is a careful and technically solid paper with high-quality data and a well-executed structural analysis. However, the academic contribution is narrow, the interpretation of the results is tightly bound to strong and under-discussed assumptions, and the counterfactual implications are limited in scope.

I would encourage the authors to reconsider the framing and scope of the paper, clarify what is learned beyond established real-options intuition, and adopt a more cautious interpretation of the counterfactual results given the maintained assumptions.