Partnership Dissolution Mechanisms in the Laboratory

Thomas Kittsteiner\textsuperscript{a,b,*}, Axel Ockenfels\textsuperscript{c} and Nadja Trhal\textsuperscript{c,d}

\textsuperscript{a} RWTH Aachen University, Lehrstuhl für Mikroökonomie, Templergraben 64, D-52062 Aachen
\textsuperscript{b} London School of Economics, Managerial Economics and Strategy Group, Houghton Street, WC2A 2AE London, UK
\textsuperscript{c} University of Cologne, Department of Economics, Albertus Magnus Platz, D-50923 Cologne
\textsuperscript{d} Frontier Economics Ltd, Kranhaus Mitte, Im Zollhafen 18, D-50678 Cologne

Abstract

We experimentally compare two partnership dissolution mechanisms, the widely-used buy-sell clause and the winner’s bid auction. Contrary to theoretical predictions, the buy-sell clause (weakly) outperforms the auction with respect to efficiency. We argue that the data is better organized by a model where players exhibit different degrees of risk-aversion.

Keywords: Partnership dissolution, buy-sell clause, shotgun clause, laboratory experiment

\textit{JEL:} C91, D44, D61
1. Introduction

In legal practice, partnership dissolution is often governed by a mechanism known as buy-sell clause, sometimes also referred to as shotgun clause. Yet, in a standard symmetric independent private values (IPV) model, the buy-sell clause does not always (i.e. for any realization of valuations for the partnership) allocate ownership to the partner with the highest valuation (McAfee 1992), while other mechanisms, and in particular the winner’s bid auction, do (Cramton et al. 1987, McAfee 1992).

To address the question of why in practice the buy-sell clause predominates, we provide laboratory evidence that it (slightly) more frequently assigns property rights to the partner with the higher valuation than a winner’s bid auction in an IPV context. By doing so we provide the first empirical study of the performance of the buy-sell clause, together with a comparison to the performance of the winner’s bid auction.¹ We also find that individual behavior in the lab is more heterogeneous than captured by the IPV model. Both findings can be organized by adding heterogeneity with respect to risk-aversion to the standard model.

2. A Framework with homogeneous partners

We assume that each of two partners holds a 50% stake in a partnership. Partner i’s \((i = 1, 2)\) valuation for the whole partnership, \(v_i\), is privately known to \(i\). The other partner knows that \(v_i\) is the realization of a uniformly distributed random variable on \([0,100]\), and that \(v_1\) and \(v_2\) are stochastically independent. This implies that the value of assets unrelated to specific human capital is common knowledge (e.g., because they can be valued at market prices).

In the buy-sell clause, one partner (the proposer) offers the amount \(P\) to her partner (the chooser), who can then decide to either buy the proposer’s share of the firm at a price of \(P = \frac{4}{5}\) or sell her own share at this price. The roles of proposer and chooser are exogenously determined (see Section 5 for a brief discussion of this assumption). In the auction, on the other hand, each partner submits a sealed bid \(b_i, i = 1, 2\). The partner who submits the higher bid \(b_w\) receives all shares in the firm and pays a price of \(p =

¹ In independent theoretical and experimental research, Brooks et al. (2009) show in a common value context that partners equipped with the possibility to choose between simple options to buy or sell and the buy-sell clause prefer the former. There is no empirical study on the buy-sell clause (or other dissolution mechanisms) that uses field data. Such data is difficult to obtain and to interpret. For an experimental investigation of the winner’s and the loser’s bid auction see Güth et al. (2002, 2003)
If both partners submit the same bid, each partner wins with probability $1/2$.

Bayesian Nash equilibria of dissolution mechanisms for our framework have been derived in Cramton et al. (1987) and McAfee (1992). Under the assumption that partners exhibit the same degree of constant absolute risk-aversion, partners in the auction bid according to the same strictly increasing bidding function, implying that the partnership is always allocated efficiently. This is not true for the buy-sell clause, as a proposer’s price is (almost always) different from her true valuation: a proposer whose valuation $v$ is below (above) 50 is more likely to sell (buy) at $P = v$ and thus proposes a price above (below) her valuation (similar to a monopolist pricing above constant marginal costs). Based on this framework we can formulate:\footnote{Our hypotheses are also directly implied by the theory provided in our supplementary material.}

**Hypothesis 1**: The auction is more likely to result in an efficient allocation than the buy-sell clause.

**Hypothesis 2**: A chooser in the buy-sell clause with valuation $v$ has a strictly higher expected (interim-) payoff than in the auction. The latter is strictly higher than her payoff as proposer.

Hypothesis 2 is derived by McAfee (1992). As an illustration, consider a partner with a valuation of 50. As proposer she optimally sets a price of 50 (see above). As chooser, she is offered prices different to her valuation and hence always makes a positive gain. If her valuation is different from 50, being chooser is even more advantageous. For a chooser the expected gap between price and valuation is larger for more extreme valuations whereas a proposer cannot profit much from setting a price too far from her valuation as it would result in unprofitable trade with high probability.

### 3. Experimental design and results

#### 3.1 Experimental design

Each subject participated in only one of the treatments, either buy-sell or auction. In the buy-sell treatment, subjects kept their role (proposer or chooser; randomly assigned) throughout the session. Each session consisted of 30 rounds, with independent draws from the valuation distribution in each round, and with strangers matching. Specifically, each session was run with 32 subjects, and subjects were divided into 8 matching groups of 4 subjects. Subjects were informed that in each round their game partner was chosen randomly, but did not know the size of the matching group.
The experiment was conducted at the Cologne Laboratory for Economic Research in June 2006, using the software modules z-Tree (Fischbacher, 2007) and ORSEE (Greiner 2004). Subjects were undergraduate students of economics and business administration from the University of Cologne. In total, we had 64 subjects participating in the buy-sell clause, and 32 subjects for the auctions. Sessions lasted about one hour, and average earnings including a show up fee of 2.50 € were 12.73 € for the buy-sell clause (with a minimum of 8.70 € and a maximum of 17.10 €), and 12.60 € for the auction (with a minimum of 8.90 € and a maximum of 15.10 €).3

3.2 Experimental results
Overall, the percentage of efficient allocations in auctions is 85.21%, which is weakly significantly below 89.69%, the corresponding value in the buy-sell clause; a Mann-Whitney-U-test based on independent matching group averages, 16 for the buy-sell clause and 8 for the auction, yields a two-sided \( p = 0.092 \).4 This indicates that, in the laboratory, the auction does not result in an efficient dissolution with higher probability as stated in Hypothesis 1; in fact, the evidence suggests the opposite, though the effect is not large and only weakly significant.

Regarding the payoff ranking, average round payoffs under both mechanisms are almost the same (33.91 Eurocent for the buy-sell clause and 33.48 Eurocent for the auction). However, proposers in the buy-sell receive a significantly lower payoff (26.42 Eurocent) and choosers significantly more (41.40 Eurocent) than participants in the auction (\( p < 0.001 \) for both cases). This lends strong support to Hypothesis 2.

Figure 1 shows scatter plots of the valuations and the corresponding proposals (bids) for the buy-sell (auction) treatment. The black line displays the equilibrium strategy if partners are risk-neutral.5

3 The written instructions for participants can be found as supplementary material.
4 The efficiency rate, measured as the ratio of the buying partner’s valuation and the higher valuation of both partners, also yields a slightly (yet insignificantly) higher percentage in the buy-sell clause than in the auction (97.29% versus 96.43%).
5 In the buy-sell clause a risk-neutral proposer with valuation \( v \) proposes a price \( P(v) = 25 + 1/2 \, v \); in the auction she bids \( b(v) = 2/3 \, v \).
Three outliers in the buy-sell clause and one in the auction (proposals/bids of more than 120) are excluded in the figure.

Both graphs indicate a lot of heterogeneity in bidding/proposing behavior.\(^6\) In particular, the left panel seems to suggest that many proposals actually match the corresponding valuations, whereas in the auction heterogeneity appears to be more symmetric around the risk-neutral equilibrium. A straightforward linear OLS regression with robust standard errors yields for the buy-sell clause a constant of 14.839 and a coefficient of 0.661 (both highly significant at \(p < 0.001\)), suggesting that proposals are closer to the valuation than predicted by equilibrium for risk-neutral partners. For the auction, on the other hand, the regression yields a constant of 1.241, which does not differ significantly from 0, and a highly significant coefficient of 0.651, which is close to the equilibrium.\(^7\)

4. A framework with heterogeneous partners

We check whether the experimental findings are more aligned with equilibrium behavior in an IPV model that allows for idiosyncratic risk attitudes. With probability \(\alpha\) a partner is risk-neutral and with probability \((1 - \alpha)\) she is infinitely risk-averse in the sense that she values a lottery as equivalent to the worst possible outcome of the lottery with certainty (extreme type).\(^8\) Such a partner will propose her own valuation in the buy-sell clause and bid her own valuation in the auction. Thus, a proposer of extreme type enhances efficiency of the buy-sell clause as compared to a risk-neutral

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\(^{6}\) For a chooser it is a dominant strategy to buy (sell) if her valuation is larger (smaller) than the proposal. In only 14 cases (1.46\% of dissolutions) choosers' behavior deviated from the dominant strategy.

\(^{7}\) The hypothesis that the coefficient in the auction equals 2/3 cannot be rejected by a postestimation Wald test \((p = 0.3578)\). However, in the buy-sell clause the hypothesis that the coefficient equals 0.5 must be rejected \((p < 0.001)\).

\(^{8}\) In order to be able to analytically solve this multi-dimensional screening problem, we restrict one component of the type (the degree of risk aversion) to take only one of two different values.
5. Conclusion

In a laboratory experiment we compare the performance of the buy-sell clause, the predominant termination rule for partnerships in practice, with that of an auction. The (weakly) better performance of the buy-sell clause as well as the payoff ranking observed in the laboratory are consistent with equilibrium behavior in a framework where partners have idiosyncratic attitudes towards risk. The framework captures the benefits of at least some of the heterogeneity in the buy-sell clause, and the detrimental effects of heterogeneity in the auction. On the aggregate level its predictions are aligned with the experimental findings – while it is sufficiently simple to be tractable.9

Our experiment also provides evidence that the buy-sell clause leads to very unequal payoffs: a proposer expects a significantly lower payoff as compared to a chooser, whereas average payoffs are close to what one can expect in the auction. Therefore the determination of the proposer is an important part of the mechanism. De Frutos and Kittsteiner (2008) show that with endogenous proposer selection, the buy-sell performs as good as the auction, so that one might expect our results to become even more favorable for the buy-sell clause if subjects can select the proposer endogenously. We leave this to future research.

9 We caution, however, that on a more detailed level this framework cannot organize that partners propose/bid their valuation in the buy-sell more often (30%) than in the auction (11%), if we assume that the preferences are equally distributed across treatments.
Acknowledgements
We thank Felix Lamouroux for excellent research assistance. Ockenfels thanks the Deutsche Forschungsgemeinschaft for financial support.

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