Irreconcilable Differences: Judicial Resolution of Business Deadlock

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INTRODUCTION

In 1999, Ronald Mizrahi and Ezra Cohen, a dentist and an optometrist who were related by marriage, formed a limited liability company (LLC) to purchase and develop property in Brooklyn, New York.[1] The mixed-use structure housed four residential units and seven commercial units.[2] Mizrahi established his practice in a spacious unit on the second floor of the building while Cohen occupied a first-floor storefront unit.[3] Because the LLC operating agreement required unanimous approval for business decisions, seemingly minor obstacles escalated into major problems.[4] Conflicts arose over the monthly rents that Mizrahi and Cohen were paying to the LLC for use of their office space.[5] When Cohen fell behind in his financial contributions, Mizrahi advanced sums of money to the LLC to avoid defaulting on its loans.[6]

1   They were 50/50 managing members and each contributed an initial $100,000 to the venture. See *Mizrahi v Cohen*, 2012 WL 104775, *1 (NY Sup Ct). See also *Mizrahi v Cohen*, 2013 WL 238490, *2–3 (NY Sup Ct).

2   *Mizrahi*, 2012 WL 104775 at *2.

3   See id.

4   See id.

5   See id.

6   *Mizrahi*, 2012 WL 104775 at *2.

In 2006, Cohen withdrew $230,000 from the company coffers.[7] Mizrahi brought suit seeking judicial dissolution of the LLC, alleging that Cohen had breached his fiduciary duty and embezzled funds.[8] In addition to determining that the LLC should be dissolved, the court held that it was its duty "*to provide a mechanism* for the liquidation and distribution of [the] assets."[9] Commentators argue that the court's decision reflects the current trend of more active participation by judges in the design of resolution mechanisms for business divorce.[10]

Irreconcilable differences among joint owners are all too common in business entities, including closely held companies such as general partnerships and LLCs.[11] In practice, the resolution of business deadlock might involve the dissolution of the business entity or the dissociation of joint owners.[12] While many joint owners foresee possible deadlocks and include resolution mechanisms in their business agreements,[13] others fail to do so.[14] Judicial involvement arises in the absence of privately contracted divorce clauses. It may also occur when a deadlock clause was included in the business agreement but the grounds for dissociation or dissolution are not clear. In both situations, the court may be called upon to determine the appropriate remedy and to design an asset-valuation procedure.[15]

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[7]   Id at *3.

[8]   Id. The LLC operating agreement included a provision requiring arbitration in case of deadlock:

> When a vote is required on any matter under this Agreement, and insufficient votes to approve or disapprove of the matter are cast [100% required], then any member may, subject to ten(10) days notice to the other members, require that the matter be submitted to Rabbi Shlomo Churpa, or if Rabbi Michael Haber [i]s unavailable or unwilling to resolve the dispute to such person as shall be named [by?] The Safardic Rabbinical Counsel of Flatbush.

Id at *5 (alterations in original). It was not clear whether such a rabbinical counsel existed. See id.

[9]   *Mizrahi*, 2013 WL 238490 at *2 (emphasis added).

[10]   See Peter Mahler, *Court Decision Boosts Equitable Buy-Out Remedy in LLC Dissolution Case*, New York Business Divorce (Farrell Fritz Feb 19, 2013), online at http://www.nybusinessdivorce.com/2013/02/articles/llcs/mizrahi (visited Mar 2, 2014).

[11]   See Claudia M. Landeo and Kathryn E. Spier, *Shotguns and Deadlocks*, 31 Yale J Reg *4 (forthcoming 2014), online at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2258966 (visited Mar 2, 2014).

[12]   See id at *13.

[13]   See, for example, *Valinote v Ballis*, 2001 WL 1135871, *1–2 (ND Ill).

[14]   See, for example, *Vila v BVWebTies LLC*, 2010 WL 3866098, *8 (Del Chanc).

[15]   The Uniform Partnership Act (UPA) and the Revised Uniform Partnership Act (RUPA) include default statutory rules that govern the judicial resolution of deadlocks in case of general partnerships. See UPA § 32 (1914), 6 Pt II ULA 404 (West 2001); RUPA

Placing an accurate value on the business assets of a closely held company can be a difficult task. While publicly traded companies often have active markets for ownership, closely held companies may be very difficult for outside investors and/or appraisers to evaluate. By virtue of their experience with the business venture and their expertise, the joint owners may themselves be in the best position to accurately pinpoint the value of the assets. Thus, the court faces the challenge of designing a deadlock-resolution mechanism that induces the owners to accurately reveal the value of the business assets. To resolve the deadlock in *Mizrahi v Cohen*,[16] for example, the court appointed a trustee to oversee a private auction between the two co-owners for sole ownership of the LLC.[17]

In recent, previous work, we have argued that courts both can and should make greater use of so-called Shotgun mechanisms in business-divorce cases.[18] In these mechanisms, the court would require one owner to name a buy-sell price, and the other owner would be required to either buy or sell shares at the named price.[19] This proposal represents an application of the classic cake-cutting mechanism, in which one party cuts the cake (sets the buy-sell price) and the other party chooses a piece (by either buying or selling shares).[20] Under ideal conditions,

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§ 801(5)–(6) (1997), 6 Pt I ULA 189 (West 2001). The default rules for LLCs are encompassed in state statutes. See Landeo and Spier, *Shotguns and Deadlocks*, 31 Yale J Reg at *12 (cited in note 11).

[16]   2013 WL 238490 (NY Sup Ct).

[17]   Id at *4–5. The trial court in *Creel v Lilly*, on the other hand, accepted a party's external appraisal of the value of the company assets. *Creel v Lilly*, 729 A2d 385, 390 (Md 1999). See also *Horne v Aune*, 121 P3d 1227, 1234 (Wash App 2005). This resolution mechanism might be associated with cost inefficiencies, unnecessary delays, and inequitable outcomes. See Landeo and Spier, *Shotguns and Deadlocks*, 31 Yale J Reg at *30 (cited in note 11).

[18]   See generally Landeo and Spier, *Shotguns and Deadlocks*, 31 Yale J Reg (cited in note 11). This article provides legal and formal analyses of private and judicial resolutions of business deadlock. Specifically, it encompasses theoretical and experimental assessments of the Shotgun mechanism with informed and uninformed offerors using a binary setting (two values of the business assets). See id at *17–26.

[19]   Judges seldom use Shotgun mechanisms to resolve business deadlocks in the United States. But see *Fulk v Washington Service Associates, Inc*, 2002 WL 1402273, *5, 14 (Del Chanc). In contrast, judges in Canada commonly use Shotgun mechanisms to resolve business deadlocks. See *Kinzie v Dells Holdings Ltd*, 2010 BCSC 1360 at ¶¶ 25–27, 74 BLR (4th) 306; *Lee v Lee*, 2002 BCSC 1077 at ¶ 20, 3 BCLR (4th) 129, affd in part and revd in part, 2003 BCCA 330, 13 BCLR (4th) 270; *Whistler Service Park Ltd v Glacier Creek Development Corp*, 2005 BCSC 1942 at ¶ 40, affd, 2005 BCCA 472, 9 BLR (4th) 171; *Safarik v Ocean Fisheries Ltd*, (1996), 17 BCLR (3d) 354 at ¶ 28.

[20]   See Steven J. Brams and Alan D. Taylor, *Fair Division: From Cake-Cutting to Dispute Resolution* 8–12 (Cambridge 1996); Saul Levmore, *Self-Assessed Valuation*

Shotgun mechanisms have the desirable feature that the owner who makes the buy-sell offer has an incentive to name an accurate and fair price, since he or she may end up on either side of the transaction.[21]

Our previous research has also demonstrated that Shotgun mechanisms may lead to inequitable outcomes when owners have asymmetric information, asymmetric capabilities, and asymmetric financial resources.[22] Importantly, these risks are likely to be mitigated in judicial settings. Since courts have the ability to design valuation mechanisms ex post rather than ex ante, they may well have enough information to identify the presence of asymmetries and tailor the Shotgun mechanism appropriately.[23] For example, the court may assign the role of offeror to the better-informed party and may give the parties adequate time to arrange for external financing.

This Article extends our work on the judicial resolution of business deadlocks by theoretically and experimentally studying the ex post judicial design and properties of the Shotgun and Private Auction mechanisms.[24] We first construct a simple theoretical framework.[25] In this framework, a business venture with two joint owners is deadlocked, and the value of the business assets will be higher if ownership is consolidated in the hands of just one owner. The owners are equally capable at

Systems for Tort and Other Law, 68 Va L Rev 771, 838–39 (1982); Lee Anne Fennell, *Revealing Options*, 118 Harv L Rev 1399, 1420–24 (2005); Ian Ayres and Eric Talley, *Solomonic Bargaining: Dividing a Legal Entitlement to Facilitate Coasean Trade*, 104 Yale L J 1027, 1072–73 & n 133 (1995); Claudia M. Landeo and Kathryn E. Spier, *Shotgun Mechanisms for Common-Value Partnerships: The Unassigned-Offeror Problem*, 121 Econ Letters 390, 390–91 (2013); Richard R.W. Brooks, Claudia M. Landeo, and Kathryn E. Spier, *Trigger Happy or Gun Shy? Dissolving Common-Value Partnerships with Texas Shootouts*, 41 RAND J Econ 649, 652 (2010).

[21] In his opinion in *Valinote v Ballis*, 295 F3d 666 (7th Cir 2002), Judge Frank Easterbrook states that "[t]he possibility that the person naming the price can be forced either to buy or to sell keeps the first mover honest." Id at 667.

[22] See Landeo and Spier, *Shotguns and Deadlocks*, 31 Yale J Reg at *23–26 (cited in note 11).

[23] In contrast, when parties include Shotgun provisions in their ex ante business agreements, unforeseen events may arise. The asymmetries generated by these contingencies may lead to serious shortcomings of the privately contracted Shotgun mechanism.

[24] See Landeo and Spier, *Shotguns and Deadlocks*, 31 Yale J Reg at *31–42 (cited in note 11). The Private Auction mechanism refers to a first-price, sealed-bid auction between the owners. We will use the terms "auction," "Private Auction," and "first-price, sealed-bid auction" interchangeably.

[25] The Shotgun-mechanism environments are simplified versions of the more general settings discussed in Brooks, Landeo, and Spier, 41 RAND J Econ at 653–58 (cited in note 20).

managing the firm, and both owners have adequate liquidity to purchase the stake of the other.[26] The two owners differ, however, in how much information they possess about the future cash flows from the business assets. Owner 1 is assumed to be well informed about the future value of the cash flows, while Owner 2 is uninformed and also realizes that he is at an informational disadvantage. This theoretical setting involves common values, since the information that is in the hands of Owner 1 is directly relevant for the future payoff of Owner 2 if Owner 2 were to maintain an ownership stake in the company. We assume that the value of the business assets is randomly drawn from a range of equally likely values (so the density of asset values is uniform).

We derive several important theoretical predictions. First, an equitable outcome is obtained by the judicially mandated Shotgun mechanism when the better-informed party, Owner 1, is forced to make the buy-sell offer. Since Owner 1 may be on either the buying end or the selling end of the deal, Owner 1 has an incentive to fully reveal the value of the assets and split the surplus evenly with Owner 2. Second, an equitable division of surplus is clearly not obtained when Owner 2 is put in the position of making the buy-sell offer. Since Owner 2 lacks accurate information, the best he can do is make an offer that reflects the average value of the assets. Owner 1, being rational and self-interested, will sell his stake to Owner 2 when the asset value is low and buy Owner 2's stake when the asset value is high. So, when forced to make the buy-sell offer, Owner 2 is guaranteed to receive the proverbial "short end of the stick." Third, we show that the Private Auction does not lead to an equitable outcome either, as Owner 1 shades his bid below the equitable value, thereby profiting from his informational advantage.[27]

We then conduct a series of controlled laboratory experiments with human subjects to assess whether the judicially mandated Shotgun and Auction mechanisms will have the predicted effects. Our experimental environment simulates a deadlocked business venture in which two owners need to divide the

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[26]   Our previous work also discusses asymmetries in managerial capabilities and financial differences between the two owners. See Landeo and Spier, *Shotguns and Deadlocks*, 31 Yale J Reg at *23–25 (cited in note 11).

[27]   A second-price, sealed-bid auction would not yield an equal division of the surplus in this common-value setting either. See Paul Klemperer, *Auction Theory: A Guide to the Literature*, 13 J Econ Surveys 227, 232 (1999).

business assets, and only one of the two owners knows the true value of the business assets. Two Shotgun treatments are included in our experimental design. In the first Shotgun treatment, the better-informed owner is compelled to make the buy-sell offer; in the second treatment, the less informed owner is compelled to make the offer. Our design also encompasses a Private Auction treatment in which both owners propose bids to purchase the stake of the other. Our subject pool, undergraduate and graduate students from the University of Alberta, was paid according to performance.

Our experimental findings support the theory: The Shotgun mechanism with an informed offeror leads to a more equitable division of the assets than the other Shotgun mechanism and the Private Auction. The Shotgun mechanism induces the informed offeror to truthfully reveal his private information and, as a result, an equitable outcome is more likely to be achieved. Moreover, the uninformed owner is better off on average and the informed owner is worse off on average in this treatment.

The results in this Article, taken together with the legal and formal analysis presented in our earlier work, suggest that Shotgun mechanisms can and should play a larger role in the judicial resolution of business deadlocks.[28] Importantly, our proposal, which involves the active participation of judges in the evaluation of the environments surrounding the legal cases and the choice and design of the most appropriate resolution mechanism, is aligned with current judicial practices regarding the management of business divorce in the United States.[29]

The Article is divided into three Parts. Part I explores the judicial design of the Shotgun and Private Auction mechanisms in a simple analytical framework. Part II presents experimental evidence on the properties of these deadlock-resolution mechanisms and establishes that the Shotgun mechanism with an informed offeror leads to a more equitable outcome than the Private Auction mechanism. Part III discusses the empirical feasibility of the judicial design and implementation of the Shotgun mechanism and presents concluding remarks.

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[28]   See Landeo and Spier, *Shotguns and Deadlocks*, 31 Yale J Reg at *42–43 (cited in note 11).

[29]   See, for example, *Mizrahi*, 2012 WL 104775 at *7; *Mizrahi*, 2013 WL 238490 at *3.

I. THEORETICAL FRAMEWORK

Suppose that two co-venturers, Owner 1 and Owner 2, own equal stakes in a firm with uncertain value x, which is drawn from a uniform distribution on the interval [$400, $1,000].[30] Then, every value of the business assets in this interval is equally likely. The average asset value in this interval is $\bar{x} = (\$400 + \$1,000)/2 = \$700$. We assume that Owner 1 is the informed owner (that is, she knows the true value of x) and Owner 2 is the uninformed owner (that is, he does not observe the value of the business assets but does know that any value in the interval is equally likely). Thus, this game has one-sided asymmetric information with common values. We also assume that there is a business deadlock; the assets will be more valuable if ownership is consolidated. Resolving the deadlock will create an additional $200 of value, so after the consolidation of ownership the assets are worth (x + $200), with values on the interval [$600, $1,200].

We study the ex post judicial design of two deadlock-resolution mechanisms: the Shotgun mechanism and the Private Auction. Under the former, one owner names a single buy-sell price and the other owner is compelled to either buy or sell shares at that named price. Under the latter, both owners propose a price and the higher bidder buys the assets of the other owner. We let p represent the buy-sell prices for the Shotgun mechanisms and the prices (bids) in the Auction mechanism.[31] If Owner 1 purchases Owner 2's stake for price p, the payoff for Owner 1 is x + $200 – p and the payoff for Owner 2 is p.[32]

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[30]   The Shotgun-mechanism environments studied here are simplified versions of the more general environments presented in Brooks, Landeo, and Spier, 41 RAND J Econ at 653–58 (cited in note 20). General versions of the propositions and formal proofs are included in this Article. A formal proof of the Private Auction environment is available upon request.

[31]   The equilibrium concepts used are perfect-Bayesian and Nash-Bayesian equilibrium concepts for the case of the Shotgun mechanism and the Private Auction, respectively. For more general statements and proofs, see Claudia M. Landeo and Kathryn E. Spier, *Irreconcilable Differences: Judicial Resolution of Business Deadlock* at Appendix, online at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2282162 (visited Mar 2, 2014).

[32]   If the business would remain deadlocked, each owner would receive x/2. This outcome does not occur in any of the three mechanisms considered in the current Article. It may arise endogenously in non-mandatory environments, however. See Brooks, Landeo, and Spier, 41 RAND J Econ at 662–63 (cited in note 20).

A.   Shotgun Mechanism

Suppose that, in the final step of resolving the business deadlock, the court orders the parties to participate in a Shotgun mechanism. Two judicially mandated Shotgun environments are analyzed: a Shotgun mechanism with an informed offeror and a Shotgun mechanism with an uninformed offeror. We will demonstrate that only the court-mandated Shotgun mechanism with an informed offeror generates equitable outcomes.

1.   Shotgun mechanism with an informed offeror.

Suppose that the court assigns the role of the offeror to the better-informed party, Owner 1. Proposition 1 characterizes the outcome in this environment.[33]

PROPOSITION 1: *Suppose Owner 1 (the informed party) makes the buy-sell offer. In equilibrium, Owner 1 offers $p_1(x) = (x + \$200)/2$ and Owner 2 randomizes between buying and selling with equal probability. The mean payoff of each owner is $450.*

Figure 1 illustrates these findings. Intuitively, when the informed owner is the offeror, there is full revelation of private information. To see how this *revelation mechanism* would work, suppose that Owner 2 believes that Owner 1 always makes offers aligned with the true asset values. In other words, imagine that Owner 2 believes that Owner 1 is always *telling the truth*.

In this scenario, when he receives an offer of $450, for example, Owner 2 believes that the assets have a value equal to $450, and given this belief Owner 2 is indifferent between selling and buying. It is a toss-up from Owner 2's perspective, and Owner 2 may rationally either buy or sell shares. The possibility that the better-informed Owner 1 could end up on either end of the deal is what keeps him honest and creates no incentive to misrepresent the value of the company.

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[33]   This proposition refers to the fully separating equilibrium. Note that there are also pooling equilibria. See id at 654 n 21.

FIGURE 1. SHOTGUN MECHANISM WITH AN INFORMED
OFFEROR
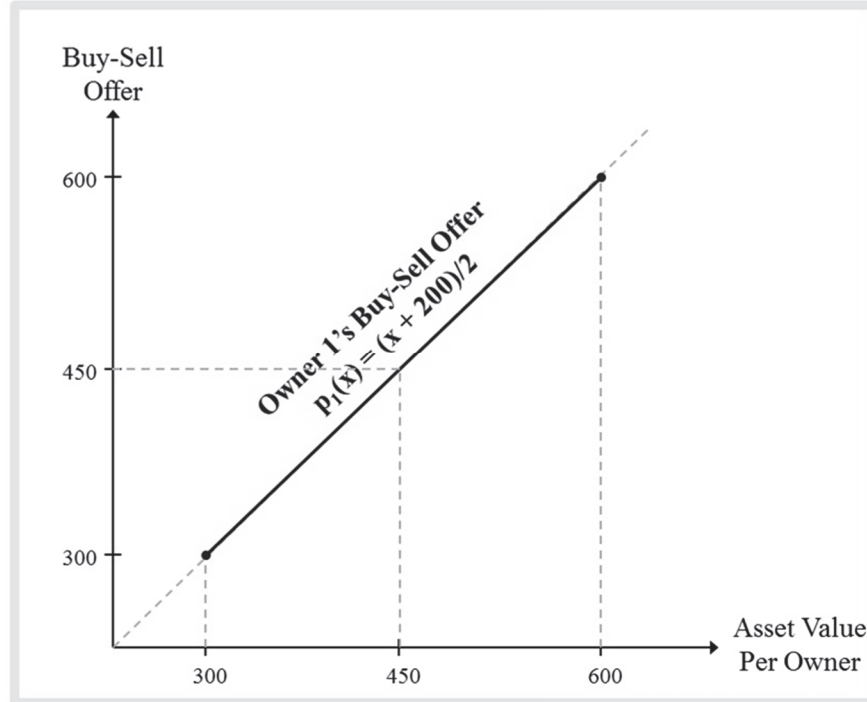

2.   Shotgun mechanism with an uninformed offeror.

Suppose now that the court assigns the role of the offeror to the less informed party, Owner 2. Owner 2 is at a significant disadvantage when making a buy-sell offer. Suppose that Owner 2 makes an offer equal to the average value of the business assets per owner after consolidation ($700 + $200)/2 = $450. In the best-case scenario, in which the assets per owner are worth ($700 + $200)/2 = $450, Owner 1, the fully informed offeree, would be indifferent between buying and selling, and both owners would ultimately walk away with payoffs of ($700 + $200)/2 = $450. This is an equitable outcome.

In an alternative scenario, in which the assets per owner are really worth less than ($700 + $200)/2 = $450, say $400, then Owner 1 (the offeree) would surely decide to sell his stake to Owner 2. Owner 1 would receive the $450 selling price, and Owner 2 would net $350 because he will become the sole owner of a business with value equal to $800 by transferring $450 to Owner 1 (for assets with value $400). In sum, Owner 2 will get a payoff of $350, while Owner 1 will get a payoff of $450, an inequitable outcome. Proposition 2 characterizes the outcomes in this environment.

PROPOSITION 2: *Suppose Owner 2 (the uninformed party) makes the buy-sell offer. In equilibrium, Owner 2 offers the average value of the business assets per owner, $p_2 = (\bar{x} + \$200)/2 = \$450$. Owner 1 sells his stake to Owner 2 when the actual asset value is below the average value, $(x + 200)/2 < \$450$, and buys Owner 2's stake when the actual asset value is above the average value, $(x + 200)/2 \geq \$450$. The mean payoffs of Owner 1 and Owner 2 are $525 and $375, respectively.*

Figure 2 illustrates these findings. Intuitively, by offering a price equal to the average value of the business assets ($450), Owner 2 will maximize his average payoff given his information disadvantage. However, this strategy does not preclude inequitable outcomes. As we demonstrated in the previous Section, Owner 2 would do much better if the better-informed Owner 1 made the buy-sell offer instead.

FIGURE 2. SHOTGUN MECHANISM WITH AN UNINFORMED OFFEROR
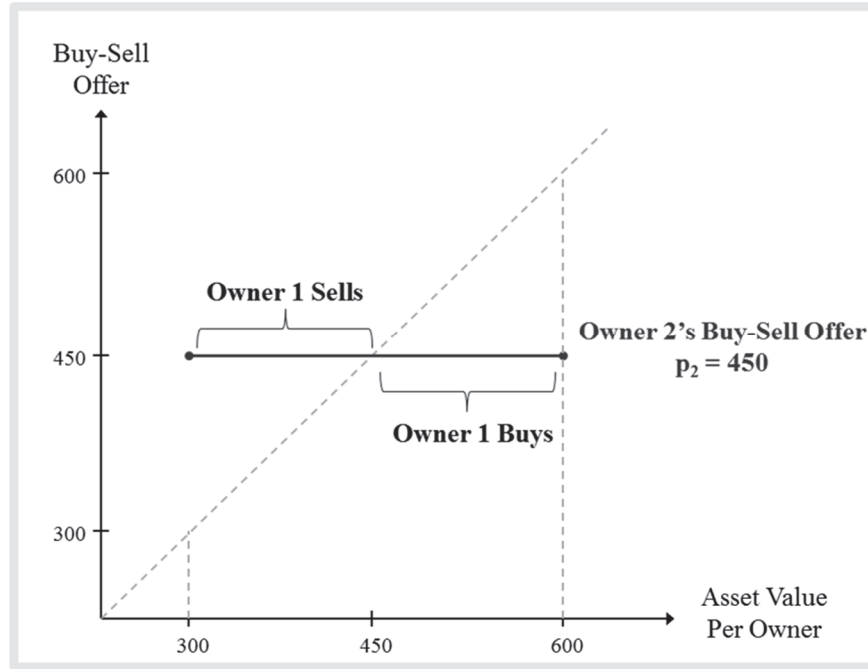
B. Private Auction Mechanism

Suppose now that, in the final step of resolving the business deadlock, the court mandates the parties to participate in a first-price, sealed-bid auction. In this Private Auction (that is, an auction with just the two owners bidding), the party who submits the highest bid purchases the asset from the other party and pays a price equal to his own bid. The "winner" of the auction is the buyer and the "loser" of the auction is the seller. Proposition 3 summarizes the outcomes of this environment, and Figure 3 illustrates these findings.[34]

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[34] For exposition, rounded values (integers) are presented.

FIGURE 3. PRIVATE AUCTION
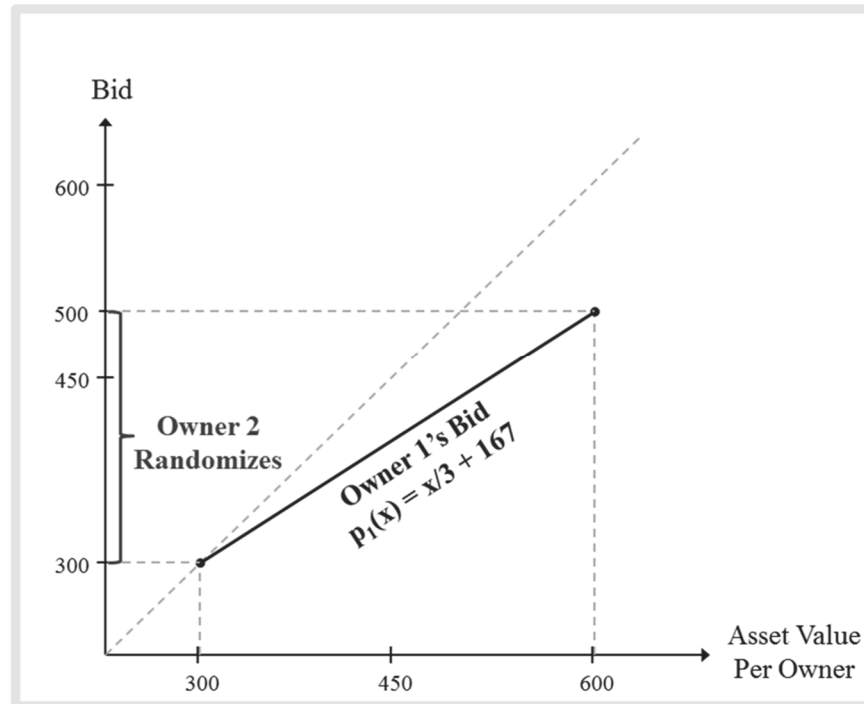
PROPOSITION 3: *Suppose Owner 1 and Owner 2 partici-pate in a Private Auction in which the party making the higher bid purchases the stake of the other bidder. There is an equilibri-um in which the informed Owner 1 bids $p_1(x) = x/3 + \$167$. The uninformed Owner 2's bid, p_2, is drawn from the interval [\$300, \$500] with uniform density (equally likely values). The ex-pected payoffs of Owner 1 and Owner 2 are \$500 and \$400, re-spectively.*

Intuitively, the bidding strategies in this common-value auction involve a degree of randomization in the sense that the less informed party randomizes over a range of prices. The bet-ter-informed owner's bid is equal to $x/3 + \$167$. Importantly, this bid is lower than or equal to $(x + \$200)/2$, the price offered by the better-informed party in the Shotgun mechanism with an in-formed offeror (for all the relevant values of the business assets

per owner under consolidation).[35] The better-informed party is at a strategic advantage in the Private Auction mechanism. On average, the party with the better information will receive a higher payoff than the less informed party ($500 versus $400).[36]

C.   Qualitative Hypotheses

The qualitative hypotheses are as follows.

HYPOTHESIS 1: *The Shotgun environment with an informed offeror increases the likelihood of equitable outcomes (relative to the other Shotgun and Auction environments).*

HYPOTHESIS 2: *The Shotgun environment with an informed offeror increases the expected payoff of the uninformed owner (relative to the other Shotgun and Auction environments).*

Our theory indicates that equitable outcomes will be achieved in only the Shotgun mechanism with an informed offeror environment. Similarly, our theoretical predictions suggest that the uninformed owner gets the highest possible payoff in this environment.

II. EXPERIMENTAL EVIDENCE

This Part reports the results from a series of experiments with human subjects paid according to their performance.

A.   Games and Sessions

We investigate whether the behavior of the subjects supports our theoretical predictions.[37]

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[35]   The relevant values of the business assets are represented by the values of $(x + \$200)/2$ on the interval [$300, $600].

[36]   A second-price, sealed-bid auction does not produce equitable outcomes either. A sequential-auction mechanism in which the informed player places the first bid and the uninformed player places the second bid would generate the same outcome as the Shotgun mechanism with an informed offeror.

[37]   The experimental setting satisfies the assumptions of the theory. Following experimental-economics methods, the setting was described to the subjects in a parsimonious way. We made minimal use of labels. A concern with our study—a concern that is common to all experimental research—is its external validity. Although our experiment cannot predict the effects of resolution mechanisms in richer environments, the experiment provides evidence regarding whether the Shotgun mechanism and the Private Auction in an environment such as the one we have structured here will have the predicted effects. Importantly, if the theoretical predictions do not hold in these simple experimental

We consider three different conditions: Shotgun mechanism with the informed owner making a buy-sell offer (Informed Offeror environment or IO), Shotgun mechanism with the uninformed owner making a buy-sell offer (Uninformed Offeror environment or UO), and Private Auction (First-Price, Sealed-Bid Auction environment or A).[38]

Procedural regularity was accomplished by developing a software program that permits subjects to play the game by using networked personal computers.[39] In the Shotgun mechanism conditions, the subjects played a two-stage game. In the first stage, the offeror made a buy-sell offer to the other subject, the offeree. The offeror's chosen price $p \geq 0$ was then revealed to the offeree. In the second stage, the offeree was required to respond to the offer by either buying or selling at the named price. In the Private Auction condition, the subjects played a simultaneous-move game. Player 1 and Player 2 each made offers to buy the other owner's assets, and the higher bidder became the buyer.[40]

We ran three ninety-minute sessions of eighteen subjects each (one session per condition; fifty-four subjects in total) at the University of Alberta School of Business computer laboratories. The subject pool was recruited from undergraduate and graduate classes at the University of Alberta by posting advertisements on electronic bulletin boards. We used a laboratory currency called the token (427 tokens = 1 Canadian dollar (CAD)).

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settings, there is little hope that the theory will work in more complex environments. Hence, our experimental findings will provide useful feedback to theorists.

[38] The Shotgun mechanism and the non-mandatory Shotgun mechanism (a setting in which the offeror can choose simple offers to buy or to sell instead) with informed and uninformed owners have been experimentally studied in common-value binary environments with one-sided asymmetric information. See Landeo and Spier, *Shotguns and Deadlocks*, 31 Yale J Reg at *44 (cited in note 11); Brooks, Landeo, and Spier, 41 RAND J Econ at 650–51 (cited in note 20). Common-value auctions with asymmetric information have been experimentally studied in settings involving an informed bidder and multiple uninformed bidders. See generally John H. Kagel and Dan Levin, *Common Value Auctions with Insider Information*, 67 Econometrica 1219 (1999). They have been also studied using field experiments. See generally Glenn W. Harrison and John A. List, *Naturally Occurring Markets and Exogenous Laboratory Experiments: A Case Study of the Winner's Curse*, 118 Econ J 822 (2008). See also John H. Kagel and Dan Levin, *Auctions: A Survey of Experimental Research, 1995–2010*, in John H. Kagel and Alvin E. Roth, eds, 2 *The Handbook of Experimental Economics* *32–36 (forthcoming), online at http://www.econ.ohio-state.edu/kagel/Auction_survey_1_11_all.pdf (visited Mar 2, 2014).

[39] Software screenshots and instructions are available upon request.

[40] In case of equal bids, the computer randomly allocated the role of the buyer (with equal likelihood).

The experimental sessions encompassed eight practice rounds[41] and sixteen actual rounds.[42] Before the beginning of the first actual round, the computer randomly assigned a role to each of the subjects: Player 1 or Player 2. Player 1, the informed player, was the offeror in the Informed Offeror condition and the offeree in the Uninformed Offeror condition; and Players 1 and 2 were bidders in the auction condition. Before the beginning of each actual round, the computer also randomly formed pairs. Subjects were not paired with the same partner in any two immediately consecutive rounds. Then, the computer randomly chose the value of the business assets.[43] This value was revealed only to Player 1.[44]

Communication between players was done through a computer terminal and, therefore, players were completely anonymous to one another. Hence, this experimental environment precluded the formation of reputation.[45] The average payoff was $27 CAD.[46] At the end of each session, subjects received their monetary payoffs in cash.

B. Results

The main findings will be presented in a series of results.

1. Data summary.

Table 1 presents the descriptive statistics for all experimental treatments,[47] including information about the mean prices and payoffs for informed and uninformed owners. The equitable-outcome rate is defined as the percentage of total pairs in which the uninformed owner's payoff was between 49 percent

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[41] The outcomes for the eight practice rounds were not considered in the computation of the payoffs. Hence, during the practice rounds, subjects had an incentive to experiment with the different options and become familiar with the experimental environment. During the practice rounds, the subjects experienced each role four times.

[42] The information per condition (number of subjects, number of pairs for the sixteen actual rounds) is (18, 144).

[43] The computer obtained the realization of the initial value of the business assets from the interval [400, 1,000]. To allow for equitable divisions of the business assets, only even integers were considered.

[44] Both players knew that Player 1 received this information.

[45] Given the randomization process used to form pairs, and the diversity of asset values and prices that subjects confronted, the sixteen actual rounds do not represent identical repetitions of the game. Consequently, we can treat each round as a one-shot experience.

[46] The participation fee was $10 CAD.

[47] For exposition, rounded values (integers) are presented.

TABLE 1. DESCRIPTIVE STATISTICS FOR ALL TREATMENTS

	Shotgun Mechanisms		Auction
	IO	UO	A
Informed Owner's Price [a]	463	–	378
	(113)	–	(99)
Uninformed Owner's Price [a]	–	449	363
	–	(73)	(80)
Informed Owner's Payoff	410	541	492
	(138)	(113)	(118)
Uninformed Owner's Payoff	453	358	401
	(132)	(110)	(113)
Equitable-Outcome Rate	43	6	8
Asset Value [b]	431	441	446
	(89)	(86)	(90)
Observations [c]	144	144	144

Note: (a) Mean prices are presented; (b) mean asset values per owner under ownership consolidation are presented; (c) sample sizes correspond to the number of pairs for the 16 rounds; standard deviations are presented in parentheses.

and 51 percent of the sum of payoffs.[48] Mean asset values per owner under ownership consolidation are presented.[49]

The data indicate that the Shotgun mechanism with an informed offeror positively affected the uninformed owner's mean payoff (relative to the other treatments), reduced the informed owner's mean payoff (relative to the other treatments), and increased the equitable-outcome rate (relative to the other treatments).

Regarding the offerees' buying decisions in the informed-offeror (IO) environment, in theory, uninformed offerees should randomize 50–50 between buying and selling. Our data suggest that, on average, the uninformed owner bought his partner's assets

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[48] Equitable-outcome rates under the less empirically relevant definition involving an exact 50–50 allocation are 28 percent, 0 percent, and 1 percent, for the IO, UO, and A conditions, respectively.

[49] The asset-value differences across conditions were not statistically significant.

TABLE 2. AVERAGE PRICE OFFERED PER ASSET-VALUE GROUP[a]

Condition	300–400	401–500	501–600	Total Offers
IO	400	480	546	144
	(79)	(103)	(107)	
UO	459	435	454	144
	(69)	(56)	(92)	
A				
-Inf. Bidder	283	392	466	144
	(75)	(52)	(47)	
-Uninf. Bidder	378	349	359	144
	(91)	(77)	(68)	

Note: (a) Asset value refers to the value of assets per owner under ownership consolidation $(x + 200)/2$; standard deviations are presented in parentheses.

in 44 percent of the total cases. Interestingly, when the value of the business assets was lower than 450, uninformed offerees bought in 60 percent of the total cases; and when the value of the business assets was higher than or equal to 450, uninformed offerees sold in 79 percent of the total cases. In the case of the uninformed-offeror (UO) condition, our theory indicates that the informed offeree should buy if the value of the business assets per owner under ownership consolidation is $(x + 200)/2 \geq 450$. Our data suggest the following informed offerees' responses: when the value of the business assets per owner under ownership consolidation was greater than or equal to 450, the informed owner bought her partner's assets in 88 percent of the total cases; when the business assets were lower than 450, the informed owner sold her business assets to her partner in 83 percent of the cases.

Table 2 describes the mean offers made by the owners per asset-value group. Asset value refers to the value of the business

assets per owner under consolidated ownership, $(x + 200)/2$.[50] For example, in the UO condition, the uninformed owner's mean offer was equal to 454 when the value of the business assets per owner under ownership consolidation lay in the interval [501, 600].

Our theoretical framework indicates that the prices proposed by Owner 1, the informed owner, should be increasing with the value of the business assets in both the Shotgun mechanism with an informed offeror (IO) and the Private Auction (A) environments. Our data indicate a positive relationship between mean prices and the value of the business assets per owner under ownership consolidation in these settings. Our theory also suggests that a price equal to 450 should be proposed by the uninformed owner in the Shotgun mechanism with an uninformed offeror (UO) environment. In our data, the mode price offer in this setting was equal to 450.

More detailed information about the patterns of offers in the Shotgun mechanism with informed and uninformed offerors and in the Private Auction environment (informed and uninformed bidders) is provided in Figures 4–7.[51] In addition to the information about observed offers, these figures include information about offers that produce equitable outcomes (Equitable Buy-Sell Offer and Equitable Bid, for the cases of the Shotgun and Auction mechanisms, respectively); and, information about the outcome predicted by the theory (Predicted Buy-Sell Offer and Predicted Bid, for the cases of the Shotgun and Auction mechanisms, respectively). These figures suggest that the data is aligned with our theoretical predictions.

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[50] We classified the data into three different groups, according to the value of the business assets per owner under ownership consolidation, $(x + 200)/2$: the first group corresponds to $(x + 200)/2 \in [300, 400]$, the second group corresponds to $(x + 200)/2 \in [401, 500]$, and the third group corresponds to $(x + 200)/2 \in [501, 600]$.

[51] For more detailed graphical representations, see Claudia M. Landeo and Kathryn E. Spier, *Irreconcilable Differences: Judicial Resolution of Business Deadlock*, online at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2282162 (visited Mar 2, 2014).
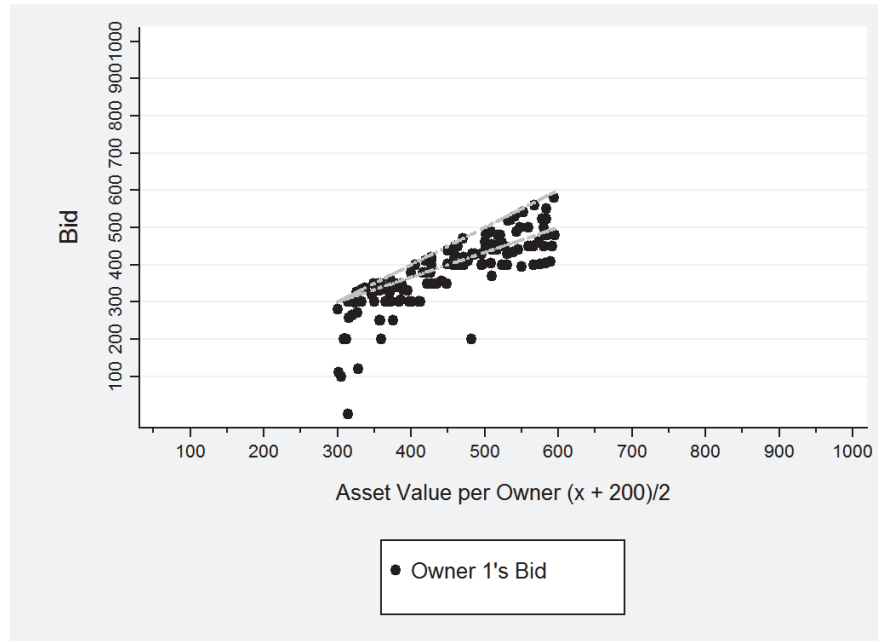
FIGURE 4. SHOTGUN MECHANISM WITH AN INFORMED OFFEROR
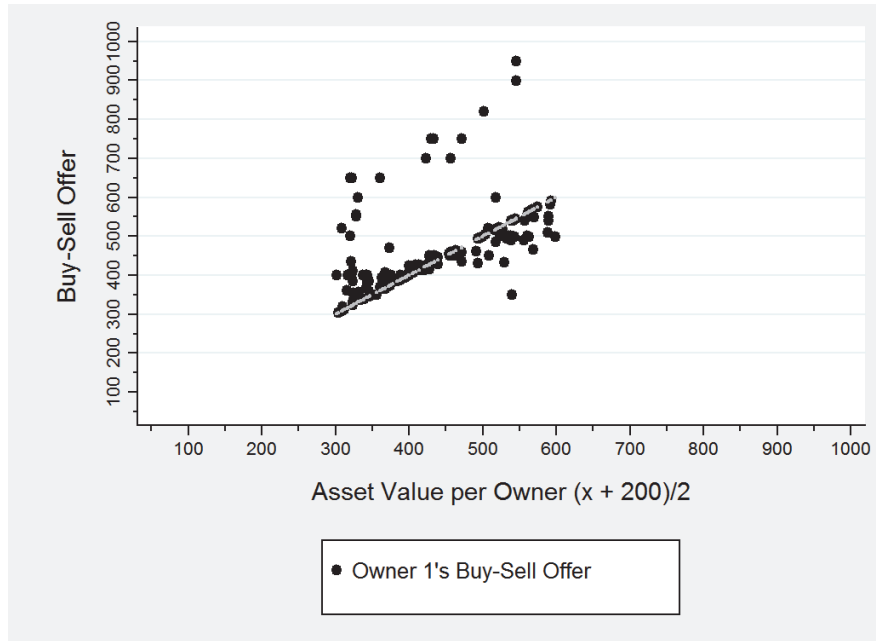
Specifically, Figures 4 and 5 illustrate the offer behavior of the informed owners in Shotgun and Auction environments, respectively. The data suggest that the offers increase with the value of the business assets. In the case of the Shotgun mechanism with an informed offeror (Figure 4), the upward-sloping line reflects the equitable buy-sell offers, which also correspond to the predicted values. The patterns of the data indicate that the offerors generally made offers higher than the equitable prices for low levels of the business assets, and offers lower than the equitable offers for high levels of the business assets.[52] In the case of Auction mechanism (Figure 5), the upper and lower upward-sloping lines reflect the equitable and predicted bids, respectively. The patterns of the data suggest that the informed bidders generally offered prices that were lower than the equitable bids. Interestingly, the data also indicate that the bids tended to be lower on average than those predicted by theory.

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[52]   Remember that the uninformed offerees generally bought for low realized values of the business assets and sold for high realized values of the business assets.

FIGURE 5. AUCTION MECHANISM—INFORMED BIDDER

Figures 6 and 7 illustrate the offer behavior of uninformed owners in Shotgun and Auction environments, respectively. Not surprisingly, the data suggest that the offers did not systematically increase with the value of the business assets. In the case of the Shotgun mechanism with an uninformed offeror (Figure 6), the upward-sloping and totally horizontal lines indicate the equitable and predicted buy-sell offers, respectively. The mode offer (equal to 450) was aligned with the theoretical prediction. In case of the Auction mechanism (Figure 7), the upward-sloping line reflects the equitable bids. The upper and lower totally horizontal lines indicate the maximum and minimum bids predicted by the theory. The patterns of the data suggest that the uninformed bidder made offers within the predicted 300-to-500 interval. The data also indicate a concentration of the bids in the lower part of the theoretical interval.[53]

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[53] The sample mean bid was equal to 363, lower than the predicted mean bid of 400.

FIGURE 6. SHOTGUN MECHANISM WITH AN UNINFORMED
OFFEROR
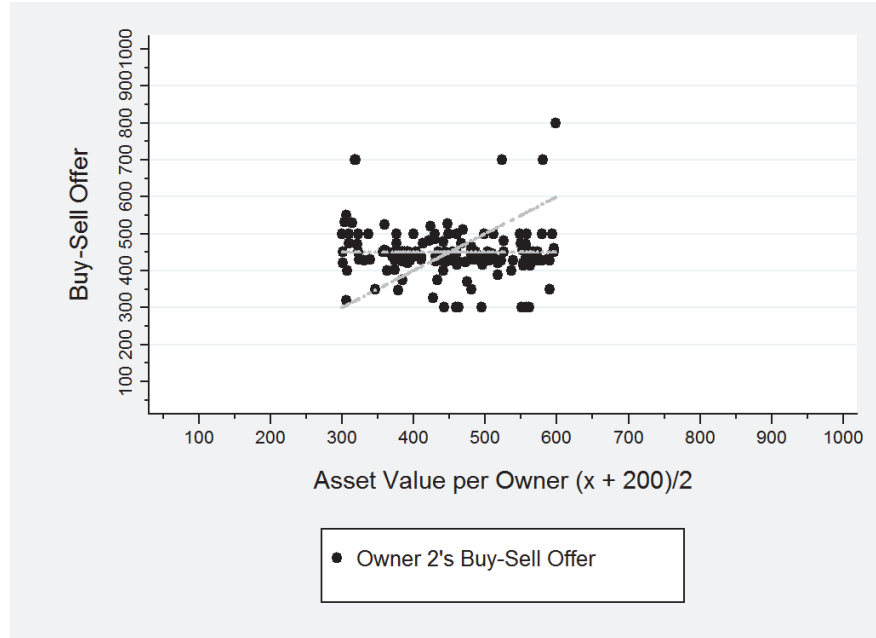
2. Analysis.

Table 3 presents the effects of the Shotgun mechanism with an informed offeror (with respect to the other Shotgun mechanism and the Private Auction) on the equitable-outcome rate (second column) and on the uninformed owner's mean payoff (third column). We take pairs of conditions and estimate probit and OLS regression models, respectively. Each probit or OLS regression model includes a treatment dummy variable and the round as its regressors. The treatment dummy variable is constructed as follows.[54] The standard errors computed are robust to general forms of heteroskedasticity and hence, they account for the possible dependence across rounds.[55]

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[54] For example, for the case of the probit model that assesses the effects of the Shotgun mechanism with informed offeror (versus the Shotgun mechanism with uninformed offeror), the dummy variable will take a value equal to one if the observation pertains to the condition IO, and a value equal to zero if the observation pertains to the condition UO. The data for conditions IO and UO are pooled to estimate this probit model. Given that probit magnitudes are difficult to interpret, we report the marginal effects.

[55] Note that each person plays sixteen rounds and interacts with other players during the session. Regression estimations for all treatments and data corresponding to the last eight rounds of play are available upon request. Note that all qualitative results still

FIGURE 7. AUCTION MECHANISM—UNINFORMED BIDDER

a) Equitable-outcome rates.   The effects of the Shotgun mechanism with an informed offeror on the probability of equitable outcomes are reported in the second column of Table 3. The Shotgun mechanism with an informed offeror significantly increases the likelihood of equitable outcomes. In fact, as a result of this mechanism, higher equitable-outcome rates are observed: 6 percent versus 43 percent for the UO and IO conditions, respectively; and 8 percent versus 43 percent for the A and IO conditions, respectively.[56] Thus, there is clear support for Hypothesis 1.[57]

RESULT 1: *The Shotgun mechanism with an informed offeror significantly increases the equitable-outcome rate (relative to the other Shotgun and Auction mechanisms).*

hold when only the last eight rounds of play are considered. The variable round was not statistically significant.

[56]   See Table 1. Given that the equitable-outcomes rate under the 50–50-allocation definition was equal to 0 percent for the UO condition, a probit model comparing IO and UO could not be estimated; the qualitative results of the probit model comparing IO and A are robust to this alternative definition of equitable outcomes (*p*-value < 0.001).

[57]   In previous work, we studied the IO and UO environments in a binary setting (that is, only two values of the business assets). The IO versus UO findings are aligned with our previous results. See Landeo and Spier, *Shotguns and Deadlocks*, 31 Yale J Reg at *39–41 (cited in note 11).

TABLE 3. EFFECTS OF THE SHOTGUN MECHANISM WITH AN
INFORMED OFFEROR ON THE PROBABILITY OF EQUITABLE
OUTCOME AND THE UNINFORMED OWNER'S MEAN PAYOFF

(Tests of Differences between Conditions)

Conditions	Prob. Equitable Outcome (Marginal Effects)	Uninf. Owner's Mean Payoff (Coefficients)
UO versus IO	0.375***	94.882***
	(0.046)	(14.360)
Observations	288	288
A versus IO	0.355***	52.056***
	(0.047)	(14.491)
Observations	288	288

Note: The columns report the change in the probability of equitable outcome and difference between the means (uninformed owner's payoff) due to the Shotgun mechanism with informed offeror (IO); marginal effects reported in case of the probit models; robust standard errors are in parentheses; *** denotes significance at the 1% level; observations correspond to number of pairs.

b) Uninformed owner's mean payoff.   The effects of the Shotgun mechanism with an informed offeror on the uninformed owner's mean payoff are reported in the third column of Table 3. The Shotgun mechanism with an informed offeror significantly increases the uninformed owner's mean payoff. As a result of this mechanism, higher mean payoffs for the uninformed owners are observed: 358 versus 453 for the UO and IO conditions, respectively, and 401 versus 453 for the A and IO conditions, respectively. These findings support Hypothesis 2.

RESULT 2: *The Shotgun mechanism with an informed offeror significantly increases the uninformed owner's mean payoff (relative to the other Shotgun and Auction mechanisms).*

Our theoretical insights regarding the equity superiority of the Shotgun mechanism with an informed offeror are largely confirmed by our laboratory experiments.

III. Discussion and Conclusion

In recent, previous work, we asserted that Shotgun mechanisms can and should play a larger role in the judicial management of business divorce.[58] This Article extends our previous work by experimentally investigating the judicial design and properties of the Shotgun and Private Auction mechanisms in an environment in which one business owner has better information about the value of the business assets. Our experimental findings support our theory: The frequency of equitable outcomes was higher when the better-informed owner made the Shotgun offer. Interestingly, when obligated to make a buy-sell offer, the better-informed owner frequently revealed his private information to the less informed owner. Specifically, we demonstrate that the Shotgun mechanism with an informed offeror outperforms the other Shotgun mechanisms and the Private Auction in terms of an equity criterion.[59]

Kinzie v Dells Holdings Ltd,[60] a Canadian case, demonstrates the empirical feasibility of our proposal and provides an interesting example of a careful judicial implementation of the Shotgun mechanism:

> In a "shot gun" sale, the court must determine the party who will make the first offer. Normally, the party who is in the best position to assess the value of the business and determine the fair market value is ordered to make the initial offer . . . . If either party is unable to obtain financing to complete the purchase of the shares within the 90-day time limit, having made reasonable efforts to do so, the [assets] shall be listed for sale on the open market with the parties having joint conduct of sale.[61]

The *Kinzie* court clearly addressed the issue of offeror assignment. In addition, the court mitigated the adverse effects associated with financial constraints by providing the winning party a sufficiently long period of time to raise the necessary capital.

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[58] See id at *43.

[59] See Table 3.

[60] 2010 BCSC 1360, 74 BLR (4th) 306 (BC Sup Ct).

[61] Id at ¶¶ 31, 34.

Our proposal involves the active participation of the court in the evaluation of the environment surrounding the legal case, and the choice and design of the most appropriate resolution mechanism. This proposal is aligned with current judicial practices regarding management of business-divorce cases in the United States. Brooklyn Commercial Division Supreme Court Justice Carolyn E. Demarest's insightful design of the deadlock-resolution mechanism in *Mizrahi v Cohen* reflects this trend.[62] As commentators argue, Justice Demarest employed the court's equitable powers "to avoid the glaring injustice that would have resulted in *Mizrahi* had the court stayed within the strict confines of the LLC agreement."[63] In fact, the mechanism selected by the court derives not from the LLC agreement but from the court's discretion to exercise the principle of equity.

The analysis presented in this Article provides an equity rationale for the judicial design and implementation of the Shotgun mechanism in business-divorce cases under the appropriate conditions and demonstrates the empirical feasibility of our proposal.

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[62] See *Mizrahi*, 2013 WL 238490 at *4–5. Justice Demarest's ruling includes a careful description of the implementation of a Private Auction mechanism. See id. Note that both owners were managing members of the LLC. See *Mizrahi v Cohen*, 2012 WL 104775, *1 (NY Sup Ct). Therefore, it is likely that they were symmetrically informed about the value of the business assets. Under symmetric information, the Private Auction mechanism also produces equitable outcomes. Hence, the court's resolution mechanism choice seems to be appropriate. See Landeo and Spier, *Shotguns and Deadlocks*, 31 Yale J Reg at *27, 30 (cited in note 11).

[63] Mahler, *Court Decision Boosts Equitable Buy-Out Remedy* (cited in note 10). See also Doug Batey, *New York Court Orders Dissolution of LLC - Recharacterizes Capital Contributions as Loans to Reach Equitable Result*, LLC Law Monitor (Stoel Rives Jan 27, 2012), online at http://www.llclawmonitor.com/2012/01/articles/dissolution-1/new-york-court-orders-dissolution-of-llc-recharacterizes-capital-contributions-as-loans-to-reach-equitable-result (visited Mar 2, 2014).