E C O N O M I C S B U L L E T I N

Evaluating coasean bargaining experiments with meta-analysis

Tyler Prante
PhD. Candidate, Dept. of Economics, University of New Mexico

Jennifer A. Thacher
Assistant Professor, Dept. of Economics, University of New Mexico

Robert P. Berrens
Professor, Dept. of Economics, University of New Mexico

Abstract

While the Coase Theorem has been a touchstone for understanding bargaining behavior, it has also been criticized for relying on unrealistic assumptions. In response, a line of experimental research analyzes bargaining behavior in laboratory settings. This paper uses meta-analysis to evaluate the Coasean bargaining literature by modeling the probability of an efficient bargain as a function of: (1) measures of transaction costs and related variables, and (2) measures of the social dimensions of a bargain. Results suggest that efficient solutions are more likely when explicit transaction costs do not exist, in the absence of a binding time limit, and when participants have perfect information on payoff schedules. Social dimension variables are found to have the potential to affect bargaining outcomes and are an important avenue for further research.

Citation: Prante, Tyler, Jennifer A. Thacher, and Robert P. Berrens, (2007) "Evaluating coasean bargaining experiments with meta-analysis." *Economics Bulletin*, Vol. 3, No. 68 pp. 1-7
Submitted: October 4, 2007. **Accepted:** December 18, 2007.
URL: http://economicsbulletin.vanderbilt.edu/2007/volume3/EB-07C90007A.pdf

1. Introduction

When the assumptions of the Coase Theorem are relaxed to more accurately reflect real world transaction costs, the robustness of the predicted behavior from the Coase Theorem is unclear. Addressing this issue, a line of research has developed that analyzes the predictions of the Coase Theorem in experimental settings. This paper uses statistical meta-analysis to investigate the Coasean bargaining literature to identify patterns and open research questions. Using 2,052 observations from 16 experimental studies, we identify characteristics of study design that have a statistically significant impact on the probability that the predicted behavior of the Coase Theorem is supported by laboratory evidence. Two broad classifications of regressors are used: measures related to transaction costs and measures of the social dimensions of a bargain.

Econometric results from the meta-analysis indicate that the literature has made clear progress in evaluating the impact of transaction costs on efficiency (e.g., presence of penalties invoked with each offer or binding time limits). Variables that describe the social dimensions of a bargain (e.g., channels of communication, property right allocation process, and whether bargainers repeat rounds with the same partner) are also found to have the potential to significantly impact the likelihood that the predicted behavior of the Coase Theorem is supported by laboratory behavior. This finding is important in two ways.

First, across disciplines, the importance of social context and social capital (relationships and norms characterizing a community) are increasingly recognized (Pretty and Ward 2001) and tied to a variety of policy proposals (e.g., environmental applications in water and forest management, fisheries, habitat preservation, etc). The evidence here is supportive of a role for policy in actively attempting to develop social connections among bargainers.

Second, this result illuminates the need for a shift in relative focus in future Coasean bargaining research. Whereas the impact of transaction costs has been a common focal point in the literature, the impact of social dimensions has received considerably less attention. However, despite this relative emphasis, this meta-analysis shows that social dimensions also have the potential to influence bargaining behavior. Thus, our analysis suggests that study of *how* social dimensions impact Coasean bargaining behavior warrants attention and is an important avenue for future research.

2. Motivation

The Coase Theorem predicts that given clearly defined and transferable property rights, agents facing an externality will negotiate to an efficient solution, provided a number of assumptions are met (Coase 1960). Further, the Coase Theorem argues that the same Pareto efficient solution will occur irrespective of the initial property right allocation (Coase 1960). The Coase Theorem relies on the logic that in the absence of transaction costs, mutually beneficial trades will ensure that property rights are allocated to their highest value. The idea is powerful, and regulatory policy across a range of applications (e.g., tradable pollution permits, transferable rights to water usage) makes use of this logic.

The Coase Theorem is vulnerable to the critique that it depends upon restrictive, unrealistic assumptions. It is recognized widely, notably by Coase himself, that such assumptions are often inconsistent with real world externalities (Coase 1991; Usher

1998). Therefore, determining whether the predictions of the Coase Theorem can be extended to situations where transaction costs exist has been the central motivation of this line of experimental research as well as a focus here.

Providing additional motivation though is the trend in experimental economics of context affecting behavior in laboratory settings (Leavitt and List 2007; Messer et al. 2007). Choices in laboratory settings are increasingly thought to be influenced not only by pecuniary implications, but also by the social dimensions characterizing the setting. However, the Coasean bargaining literature has been characterized by a relative paucity of analyses specifically focused on social dimensions (Shogren 1989 is a notable exception). It is therefore an important and unanswered question as to whether the Coasean bargaining literature is consistent with the broader finding of social dimensions influencing behavior.

3. Coasean Bargaining Experiments

The majority of a growing number of Coasean bargaining studies follow something similar to the experimental design first used by Hoffman and Spitzer (1982). This design is described as follows.

Participants are segmented into bargaining dyads and provided a payoff schedule describing approximately five payoff options. Each payoff option describes the monetary payoff that both participants will receive. An example payoff schedule is presented in Table 1. A property right regime is implemented, where most often one of the players is assigned the right of Controller. The Controller may unilaterally decide which payoff option will be selected and in doing so selects the payoff both players receive. The player that does not have the property right, the Non-Controller, may attempt to convince the Controller to select a more favorable payoff option by offering a side payment. One of the payoff options, option 4 in Table 1, represents the payoff option where the participants receive the maximum possible joint profit. This payoff option is the potential Pareto efficient outcome.[1] Inference is drawn from whether bargaining pairs successfully negotiate to the efficient outcome and in doing so maximize their joint payoff. Coasean bargaining games are thus connected to the Coase Theorem in that the dominant payoff option for the Controller is often not the potential Pareto efficient solution and the efficient solution will only be reached if a side payment is negotiated.

Though the basic framework and design used is similar, the type and implementation of transaction costs in various experimental designs distinguish Coasean experiments from one another. Coasean bargaining experiments have analyzed the effect of a broad range of possible hindrances to efficiency. Examples include: having more than two parties associated with a bargain (Hoffman and Spitzer 1986), introducing explicit transaction costs that reduce a participant's payoffs as time or offers increase (Shogren 1998), not enforcing agreements with certainty (Cherry and Shogren 2005), and limiting the channels of communication (Prudencio 1982).

Consensus on the impact of transaction costs in bargaining behavior remains somewhat elusive. While the literature provides ample evidence that the predicted behavior of the Coase Theorem holds up in the presence of transaction costs (e.g.,

[1]Hereafter, "efficiency", "efficient solution", or "efficient outcome" refer to the payoff option where the sum of both participants payoffs is maximized.

Hoffman and Spitzer 1986; Shogren et al. 2003), some studies reach the opposite conclusion, (e.g., Rhoads and Shogren 2003), or find mixed evidence (Shogren 1998; Rhoads and Shogren 1999).

4. Modeling Strategy

Meta-analysis has emerged as a helpful tool for making inferences from a collection of empirical work (Stanley 2001). Similar in spirit to a literature review, meta-analysis uses statistical modeling to summarize the results from a line of research. In conventional meta-analysis, a summary statistic is drawn from each included study and regressed on moderator variables characterizing each study.

Though the objective is to remove some of the subjectivity inherent to narrative literature review, meta-analysis cannot sidestep all author bias. For example, because many bilateral bargaining experiments exist that make use of an experimental design similar to that described above, deciding what studies to include is a particularly important choice here. We use three criteria in deciding which studies to include. First, a study must show a clear focus on analyzing the Coase Theorem. Second, a study must meet our data requirement by providing the information to construct our summary statistic: whether or not a dyad negotiates to an efficient outcome. Finally, studies were gathered from economics databases (e.g., EconLit, JSTOR) and Google Scholar and are therefore limited to published works.

The variable EFFICIENT is a constructed dummy variable, coded as 1 if a dyad negotiates to the efficient outcome and 0 otherwise. A limitation of our summary variable EFFICIENT is that it is a binary measure and as a result, does not provide the richness of continuous measures of bargaining success. In later Coasean bargaining experiments, a continuous variable, often called reward efficiency, provides a more detailed description of bargaining success by measuring the joint payoff bargainers receive divided by the maximum possible joint payoff (e.g., Rhoads and Shogren 1999; Shogren et al. 2002; Rhoads and Shogren 2003). However, a majority of the extant Coasean bargaining studies do not report reward efficiency and we therefore must rely on the binary measure EFFICIENT as our dependent variable (only 39% of observations and seven studies used here report reward efficiency).

The probability of a negotiation resulting in efficiency is modeled using the probit probability model. From the experimental literature, we extract eight moderator variables that capture differences in experimental design. The data set consists of 2,052 bargains that take place across the 16 studies (Our data is available by request or at http://www.unm.edu/~jthacher/). The eight moderator variables are best considered as belonging to one of two categories: a set of variables measuring the transaction costs associated with an experimental design, and a group of variables measuring some aspect of the social dimensions of a design.

Because multiple observations are drawn from each individual paper, a primary concern in modeling is that the error terms from observations from the same study are not independent. In response, one commonly used econometric practice is to “correct” the error terms and allow for clustering. In a first set of models, we follow this convention by estimating with robust standard errors, clustered by the paper an observation is drawn from. Doing so removes the assumption of independence of observations that are from the same paper, grouping and summing error terms, by paper in this case, to calculate the

sample variance (Rogers 1993). The variance estimator for this set of models is (Scribney 2007):

$$V_{cluster} = (X'X)^{-1} * \sum_{j=1}^{n_c} u_j' * u_j * (X'X)^{-1} \quad (1)$$

where

$$u_j = \sum_{j_{cluster}} e_i * x_i \quad (2)$$

and n_c is the number of clusters and e_i is the residual from the *i*th observation.

Alternatively, panel modeling is another commonly used approach in meta-analysis. The advantage of this approach over the robust standard errors model is that both the parameter estimates and the standard errors reflect the underlying clustering. For this reason, we place greater emphasis on the results from the panel models than from the robust standard error models. We begin the panel modeling process by stratifying the data by the paper an observation is drawn from. The decision of whether to use models with paper-specific constants (i.e. fixed effects models) or paper specific-error terms (i.e. random effects models) is swayed by several characteristics of the data. On several counts, fixed effects modeling would be problematic. For one, our independent variables in some cases are characterized by little intra-panel variation, implying that including panel-specific constants dilutes the explanatory power of these variables. Secondly, adding paper-specific constants is costly in terms of degrees of freedom. Finally, fixed effects probit estimators are subject to the incidental parameters problem and therefore yield potentially inconsistent estimates. Therefore, modeling with paper-specific error terms and not paper-specific constants is a preferable option. Thus, we also present a second set of random effects probit models.

5. Data

Table 2 provides variable definitions and summary statistics. Across the entire data set (2052 observations), 69 percent of the experiments resulted in an efficient outcome. Beginning with the group of variables including transaction costs and related measures, the literature shows considerable variation in implementation. In some instances, transaction costs have been incorporated explicitly into the structure of a bargaining game (Shogren 1998). For example, the payoff that participants can potentially earn may decrease as the number of offers exchanged between a dyad increases (Cherry and Shogren 2005). Explicit transaction costs have also reduced the payoff amount that a dyad can potentially earn as time elapses (Shogren 1998). The effect of these types of transaction costs is measured with the dummy variable PENALTIES (coded as 1 for transaction costs that explicitly reduce potential payoffs, and 0 otherwise).[2]

[2] Some bargains that included PENALTIES are also coded as EFFICIENT. In these studies, bargainers negotiate over lottery tickets. Transaction costs here reduce the payoff to the winner of the lottery but do not affect the number of lottery tickets the dyad can potentially obtain. Dyads that obtain the maximum possible amount of lottery tickets are deemed EFFICIENT, irrespective of incurred penalties.

Though not as overt as the above mentioned transaction costs (PENALTIES), a series of other design elements nonetheless also represent potential barriers to efficiency. For example, a commonly used design element is to set a time limit for the bargaining period. We create the variable TIME, coded as 1 where a bargain is subject to a time limit and 0 otherwise. Paralleling the real world costs that are associated with legal systems in which bargains are not upheld with certainty, a group of our observations are taken from studies where negotiated side payments are not always enforced (Rhoads and Shogren 2003). The variable UNCERTAINTY is coded as 1 where bargains are not upheld with certainty and 0 otherwise. Finally, a subset of Coasean bargaining experiments do not assign a unilateral property right to an individual but rather require consensus among players (Hoffman and Spitzer 1986).[3] The variable SINGLE is a dummy coded as 1 when a single player has a unilateral property right and 0 otherwise. The variables in this first group are linked in that each is intended to capture the effect of a transaction cost associated with alternative institutional frameworks.

In contrast, the second group of variables measure social elements that can potentially influence the success of a bargain. The constructed social dimension variables are usually not the focus of the experiment (e.g., for hypothesis testing) but instead are simply characteristics of experimental design that vary across author and analytical approach as methodological contributions from related literatures have been incorporated. One design element with substantial variation is the channel of communication through which negotiating takes place. Examples from the literature include: face-to-face bargaining (e.g., Hoffman and Spitzer 1982), written negotiations passed through an intermediary (Prudencio 1982), and negotiating via networked PCs (King 1994). A dummy variable is created, FACE-TO-FACE, coded as 1 where negotiations take place face to face, and 0 otherwise.

In addition, by placing the payoff a participant receives in context with the payoff of their bargaining partner, the information participants receive describing the payoff schedule can also be thought of as one element of the social dimension of a negotiation (e.g., Hoffman and Spitzer 1986). We use the distinction between treatments in which bargainers are fully aware of their opponent's payoff schedule and experiments where bargainers know only their own payoff information to create the variable FULL-INFO. This is a dummy variable coded as 1 where bargainers are aware of their opponent's payoff schedule in addition to their own and 0 otherwise.

It has long been thought that the mechanism used to allocate the property right can impact bargaining behavior (Hoffman and Spitzer 1986). Participants have been observed in some instances negotiating with less emphasis on self interest and more emphasis on achieving a "fair" outcome when the property right is assigned randomly (Hoffman and Spitzer 1986; Shogren 1989). In response, some experiments have had participants play a game to determine the property right, hypothesizing that when the property right is "earned", participants are more likely to display self-interested behavior. The dummy variable, GAME, is constructed to describe the process by which the

[3]Hoffman and Spitzer (1986) describe this property right regime as having joint controllers where participants do not negotiate singularly but rather are separated into two teams. Unanimity among all team members is required. Each team member can veto the decision to accept a side payment in exchange for accepting a specific payoff option.

property right is allocated (coded 1 if the property right is decided by game play and 0 otherwise). The final design aspect we consider is whether participants engage in repeated bargains with the same partner. Potential reputation effects exist when bargaining dyads repeatedly negotiate with the same partner and are thought to have the potential to influence bargaining behavior. Thus, the variable REPEAT-BARGAIN is coded as 1 where participants bargain with the same partner over consecutive bargains and 0 otherwise.

6. Results

Econometric results are presented in Table 3. Three different model specifications are presented (Models 1, 2 and 3), each using both random effects and robust standard errors approaches. Wald χ^2 statistics are significant for each model, meaning that the presented models fit the data significantly better than a model which only includes an intercept term.

Results are unambiguous with respect to the effect of measures relating to transaction costs. Across all specifications and both modeling approaches, the estimated coefficients for the variables PENALTIES and TIME are statistically significant and negative. Therefore, the results suggest that the probability of a bargain resulting in efficiency is diminished when explicit transaction costs are invoked or a bargain is subject to a time constraint. Presented in Table 3, the marginal effects for these variables (and the subsequently discussed variables) show the change in probability of a negotiation resulting in efficiency as the regressor of interest changes from 0 to 1. While the reported marginal effects vary slightly by specification and modeling approach, the impact of these variables on the probability that a negotiation results in efficiency is considerable. The marginal effects for the random effects probit in Model 3 for PENALTIES and TIME are -17% and -26%, respectively. In other words, for the average experiment, imposing a time limit has the largest impact on efficiency, decreasing the likelihood of an efficient outcome by 26%.

Indicated by estimated coefficients that are never statistically different from zero, the two other variables in this category, UNCERTAINTY and SINGLE, do not appear to influence the probability of a bargain reaching efficiency. Thus, the type and manner of implementation of transaction costs appears important. The results from this set of variables are insensitive to both modeling approach and specification. Viewed as a whole, the evidence with respect to the group of variables measuring transaction costs tells a clear and not surprising story: increases in measures related to transaction costs can reduce the probability of efficiency.

The social dimensions of a bargain also have an important impact on whether the end outcome of a negotiation is efficient. The overall results from the social capital variables are generally consistent with the models presented in Table 3: In all cases, the estimated coefficient on FULL-INFO is statistically significant and positive, the estimated coefficients for FACE-TO-FACE and REPEAT-BARGAIN are generally positive and significant, and negative and significant, respectively, and the estimated coefficient for GAME is not statistically different than zero. However, though consistent in sign, the statistical significance of the coefficients for these variables is sensitive to model specification. Variables are less likely to be significant in the robust standard error models. In the random effects specifications, REPEAT-BARGAIN becomes insignificant

when FACE-TO-FACE is included, suggesting some underlying correlation between the social dimension variables. Similar to the set of transaction cost variables, the estimated marginal effects for these variables are potentially large. For example, the random effects specification for Model 3 shows that face-to-face negotiation and providing full information in the average experiment increases the probability of an efficient outcome by 22% and 21%, respectively. Therefore, while the impact of transaction costs has received far more attention in the literature, the meta-analysis suggests social dimension variables can have just as large an impact on bargaining behavior.

As noted earlier, sufficient data to use reward efficiency as our summary statistic does not exist. Nonetheless, it is possible that our results are affected by decision to use the binary variable EFFICIENT. As a test, alternative specifications were evaluated that include a dummy variable that categorized studies on the basis of whether they presented "reward efficiency." Though significant and negative, this variable is highly correlated with several other variables included in the model (0.61 and -0.56 with PENALTIES and REPEAT-BARGAIN, respectively) and concern over multicollinearity therefore prevents inclusion as a primary model. With respect to coefficient signs and significance, these models yielded results generally consistent with the models presented in Table 3.

7. Discussion and Conclusion

The task undertaken in this paper is to examine the literature of Coasean bargaining experiments. Using meta-analysis, we statistically model the probability of a bargain resulting in efficiency as a function of contrasting experimental design elements. The body of Coasean bargaining experiments shows clear evidence of variables characterizing transaction costs reducing the likelihood of efficient bargains. More striking though is the finding that in some cases, variables characterizing social dimensions have a just as significant impact on bargaining behavior.

This result is important in two ways. For one, this finding provides empirical support for arguments for developing social capital as a tool in settings like environmental management applications of Coasean bargaining. Across a range of such applications, policy is beginning to implement tools that aim to develop social capital (e.g., Pretty and Ward 2001), which may facilitate bargaining or collaborative behavior.

More broadly though, the findings here also represent a weather vane for future Coasean bargaining experiments. Despite receiving relatively little specific focus in the literature, variables characterizing social dimensions have efficiency impacts that are of a similar magnitude to measures of transaction costs. Thus, the meta-analysis suggests a transition in the literature is warranted. Alongside the traditional focus on transaction costs, an increased focus on the impact of social dimensions emerges as an important avenue for future research.

This finding is consistent with a broader trend in experimental economics recognizing the importance of context in experimental studies (Harrison and List 2004; Leavitt and List 2007). So while the meta-analysis clearly suggests social dimensions impact bargaining behavior, the specific manner of *how* emerges as an important avenue for future research. Combined with the unambiguous results from the transaction cost variables, this indicates an evolution of focus in the Coasean bargaining literature is appropriate.

References

Cherry, Todd L., and Jason F. Shogren. (2005) "Costly Coasean Bargaining and Property Right Security." *Environmental and Resource Economics* 31 (3), 349-367.

Coase, Ronald H. (1960) "The Problem of Social Cost." *Journal of Law and Economics* 3, 1-44.

Coase, Ronald H. (1991) "The Institutional Structure of Production." 1991 Alfred Nobel Memorial Prize Lecture in Economic Sciences.

Coursey, Don L., Elizabeth Hoffman, and Matthew L. Spitzer. (1987) "Fear and Loathing in the Coase Theorem: Experimental Tests Involving Physical Discomfort." *Journal of Legal Studies* 16, 217-248.

Harrison, Glenn W., and Michael McKee. (1985) "Experimental Evaluation of the Coase Theorem." *Journal of Law and Economics* 28, 653-670.

Harrison, Glenn W., and John A. List. (2004) "Field Experiments." *Journal of Economic Literature* 42 (4), 1009-1055.

Hoffman, Elizabeth, and Matthew L. Spitzer. (1982) "The Coase Theorem: Some Experimental Tests." *Journal of Law and Economics* 25 (1), 73-98.

Hoffman, Elizabeth, and Matthew L. Spitzer. (1986) "Experimental Tests of the Coase Theorem with Large Bargaining Groups." *Journal of Legal Studies* 15 (1), 149-171.

Kahneman, Daniel, Jack L. Knetsch, and Richard H. Thaler. (1990) "Experimental Tests of the Endowment Effect and the Coase Theorem." *Journal of Political Economy* 98 (6), 1325-1348.

King, Ronald R. (1994) "An Experimental Investigation of Transaction Costs." *Journal of Economic Behavior and Organization* 25, 391-409.

Leavitt, Steven D., and John A. List. (2007) "What do Laboratory Experiments Tell Us About the Real World." *Journal of Economic Perspectives* 21 (2), 153-174.

Messer, Kent D., Homa Zarghamee, Harry M. Kaiser, and William D. Schulze. (2007) "New Hope for the Voluntary Contribution Mechanism: The Effects of Context." Forthcoming in *Journal of Public Economics.*

Pretty, Jules, and Hugh Ward. (2001) "Social Capital and the Environment." *World Development* 29 (2), 209-227.

Prudencio, Yves Coffi. (1982) "The Voluntary Approach to Externality Problems: An Experimental Test." *Journal of Environmental Economics and Management* 9, 213-228.

Rhoads, Thomas A., and Jason F. Shogren. (2001) "Coasean Bargaining in Collaborative Environmental Policy." in *The Law and Economics of the Environment*, Edward Elgar Publishing, 18-44.

Rhoads, Thomas A., and Jason F. Shogren. (1999) "On Coasean Bargaining with Transaction Costs." *Applied Economics Letters* 6, 779-783.

Rhoads, Thomas A., and Jason F. Shogren. (2003) "Regulation Through Collaboration: Final Authority and Information Symmetry in Environmental Coasean Bargaining." *Journal of Regulatory Economics* 24 (1), 63-89.

Rogers, William. H. (1993). "Regression Standard Errors in Clustered Samples." *Stata Technical Bulletin* 13, 19-23.

Rosenberger, Randall S., and John B. Loomis. (2000) "Panel Stratification in Meta-Analysis of Economic Studies: An Investigation of Its Effects in the Recreation Valuation Literature." *Journal of Agricultural and Applied Economics* 32 (3), 459-470.

Shogren, Jason F. (1989) "Fairness in Bargaining Requires a Context An Experimental Examination of Loyalty." *Economics Letters* 31, 319-323.

Shogren, Jason F. (1992) "An Experiment on Coasian Bagaining Over Ex Ante Lotteries and Ex Post Rewards." *Journal of Economic Behavior and Organization* 17, 153-169.

Shogren, Jason F. (1998) "Coasean Bargaining With Symmetric Delay Costs." *Resource and Energy Economics* 20, 309-326.

Shogren, Jason F., Randy Moffett, and Michael Margolis. (2002) "Coasean Bargaining with Nonconvexities." *Applied Economics Letters* 9, 971-977.

Schwab, Stewart. (1988) "A Coasean Experiment on Contract Presumptions." *Journal of Legal Studies* 17 (2), 237-268.

Sribney, William. (2007) "Comparison of Standard Errors for Robust, Cluster, and Standard Estimators." STATA Data Analysis and Statistical Software, Support, FAQs. Available at http://www.stata.com/support/faqs/stat/cluster.html , last accessed August 21, 2007.

Stanley, T. D. (2001) "Wheat From Chaff: Meta-Analysis as Quantitative Literature Review." *Journal of Economic Perspectives* 15 (3) 131-150.

Usher, Dan. (1998) "The Coase Theorem is Tautological, Incoherent, or Wrong." *Economics Letters* 61, 3-11.

Table 1. Example Coasean Bargaining Payoff Schedule

Payoff Option	Payoff to Player A	Payoff to Player B
1	10	50
2	20	40
3	30	30
4	45	20
5	50	10

Table 2. Variable Descriptions and Summary Statistics (n=2052)

Variable	Description	Mean (sd)
EFFICIENT	Dummy variable; coded as 1 if participants negotiate to the potential Pareto efficient solution, 0 otherwise.	0.69 (0.46)
Transaction Cost Variables:		
PENALTIES	Dummy variable, coded as 1 if bargainers face explicit transaction costs that reduce their potential payoff, 0 otherwise.	0.28 (0.45)
TIME	Dummy variable; coded as 1 where bargainers face a time limit, 0 otherwise.	0.73 (0.45)
UNCERTAINTY	Dummy variable; coded as 1 where bargains are not upheld with certainty, 0 otherwise.	0.08 (0.27)
SINGLE	Dummy variable; coded as 1 when a single player has a unilateral right property right, and 0 otherwise.	0.71 (0.45)
Social Dimension Variables:		
FULL-INFO	Dummy variable; coded as 1 where bargainers are aware of their opponent's payoff schedule in addition to their own, 0 otherwise.	0.75 (0.43)
GAME	Dummy variable; coded as 1 when the property right is decided by game play, 0 otherwise.	0.37 (0.48)
REPEAT-BARGAIN	Dummy variable; coded as 1 if participants repeatedly bargain with the same partner, 0 otherwise.	0.40 (0.49)
FACE-TO-FACE	Dummy variable; coded as 1 where negotiating takes place face to face, 0 otherwise.	0.82 (0.38)

Table 3. Probit Regression Results (Dependent Variable = EFFICIENT)

	Model 1		Model 2		Model 3	
	Random Effects	Robust Standard Errors	Random Effects	Robust Standard Errors	Random Effects	Robust Standard Errors
Transaction Cost Variables:						
PENALTIES	-0.30 [-0.11] (-2.35)**	-0.63 [-0.22] (-2.50)**	-0.20 [-0.07] (-1.59)	-0.70 [-0.24] (-2.81)***	-0.46 [-0.17] (-4.27)***	-0.71 [-0.25] (-2.91)***
TIME	-1.14 [-0.33] (-8.04)***	-1.37 [-0.35] (-6.74)***	-1.37 [-0.39] (-9.24)***	-1.61 [-0.39] (-8.33)***	-0.85 [-0.26] (-4.26)***	-1.47 [-0.36] (-5.96)***
UNCERTAINTY	-0.06 [-0.02] (-0.47)	0.06 [0.02] (0.13)	-0.08 [-0.03] (-0.54)	-0.5 [-0.02] (-0.10)	-0.19 [-0.07] (-1.30)	-0.06 [-0.02] (-0.12)
SINGLE	0.16 [0.06] (1.60)	0.24 [0.08] (1.45)	0.15 [0.05] (1.53)	0.24 [0.08] (1.50)	0.14 [0.05] (1.36)	0.21 [0.07] (1.29)
Social Dimension Variables:						
FULL-INFO	0.56 [0.21] (4.53)***	1.05 [0.38] (4.54)***	0.49 [0.18] (3.94)***	1.05 [0.37] (4.41)***	0.56 [0.21] (4.63)***	1.06 [0.38] (4.52)***
FACE-TO-FACE	0.41 [0.15] (3.10)***	0.50 [0.18] (2.87)***	---	---	0.58 [0.22] (3.61)***	0.24 [0.08] (1.31)
GAME	---	---	0.02 [0.01] (0.13)	0.19 [0.06] (1.08)	0.11 [0.04] (1.09)	0.20 [0.06] (1.14)
REPEAT-BARGAIN	---	---	-0.28 [-0.10] (-2.68)***	-0.42 [-0.14] (-1.88)*	-0.08 [-0.03] (-0.62)	-0.26 [-0.09] (-1.01)
CONSTANT	0.56 (3.23)***	0.43 (1.92)*	1.17 (7.44)***	1.15 (5.43)***	0.30 (1.05)	0.79 (2.45)**
N	2052	2052	2052	2052	2052	2052
Wald χ^2	135.14***	277.08***	103.83***	812.76***	130.09***	483.80***
Log-Likelihood	-1027.69	-1051.78	-1028.49	-1046.47	-1026.96	-1044.75

Notes: ***, **, and * indicate statistical significance at the 0.01, 0.05, and 0.10 levels, respectively (two-tailed t-tests). Marginal effects are presented in brackets, t-statistics in parentheses. Log-Likelihood scores presented for models estimated with robust standard errors are Pseudo Log-Likelihood scores.