EXPERIMENTAL ECONOMICS AND THE LAW[*]

Sean P. Sullivan[†]
Federal Trade Commission

Charles A. Holt[‡]
University of Virginia

June 8, 2014

This chapter surveys the past and future role of experimental economics in legal research and practice. Following a brief explanation of the theory and methodology of experimental economics, the chapter discusses topics in each of three broad application areas: (1) the use of experiments for studying legal institutions such as settlement bargaining and adjudicative functions, (2) the use of experiments to explore legal doctrines, and (3) the use of experiments in litigation and trial strategy. The general theme of this material is a broad and versatile relationship between law and experimental economics.

---

[*] Pre-print version of Sean P. Sullivan & Charles A. Holt, *Experimental Economics and the Law*, *in* 1 OXFORD HANDBOOK OF LAW AND ECONOMICS 78 (Francesco Parisi ed., Oxford University Press 2017).

[†] Federal Trade Commission. This chapter reflects the personal views of the author and does not necessarily represent the views of the United States Government or Federal Trade Commission, which have neither approved nor disapproved its content. Contact Sean Sullivan at s-sullivan@uiowa.edu.

[‡] A. Willis Robertson Professor of Political Economy, Department of Economics, University of Virginia. Contact Charles Holt at cah2k@virginia.edu.

Table of Contents

1 INTRODUCTION

This chapter concerns the increasingly frequent interaction between two literatures: *experimental economics* and *law and economics*. In many ways, these literatures developed as siblings during the heady period of economic research spanning the 1960s and early 1970s. At about the same time that Ronald Coase (1960), Guido Calabresi (1961), and Gary Becker (1968) were authoring seminal papers in the modern law-and-economics movement, acceleration of the experimental economics literature was underway with Vernon Smith's (1962) experimental challenge to the established notion that theories of efficient, perfect competition were only relevant in idealized setting with large numbers of well-informed traders.

Smith's approach to studying market equilibrium was to *create* a market for an artificial commodity. Buyers in Smith's market valued the commodity because the rules of the experiment allowed them to redeem each "unit" of the commodity they bought for cash, earning the difference between an assigned redemption value and the negotiated price of each purchase. Sellers similarly valued trade because they earned the difference between the negotiated sales price and a cost number assigned to each unit of the commodity. These induced values allowed Smith to compare observed transactions to the Walrasian price that actually equated supply and demand in his market. The experiment was notable for showing that markets with good information about bids, asks, and sales prices would converge to the equilibrium prediction, even with small numbers of traders and no public information about others' values and costs.

Adaptations of the experimental approach to other settings quickly followed, eventually bleeding into the also-expanding literature of law and economics. Since then, one of the few real points of frustration in combining these fields has been purely terminological. The conjunctive title *law and economics* poses some linguistic challenges for describing the application of experimental economics to legal research. While the fumbling *experimental economics and law and economics* has thankfully been eschewed by all, the increasingly popular *experi-*

mental law and economics is not much better. The adjective "experimental" is ambiguously referential in this construction. At best, it sounds like something *experimental* is happening to the law-and-economics literature; at worst, one fears that economic analysis is being applied to something called *experimental law*.

But beyond this syntactical ungainliness, *experimental law and economics* is objectionable for the more important reason of being descriptively under-inclusive. To the extent that it suggests the application of experimental economics to topics in the traditional domain of law-and-economics, it conveys only part of the potential scope of experimental economics in law. What it omits are the many possible contributions experimental economics stands to make beyond the traditional boundaries of law-and-economics, in topics within the domain of general legal scholarship and even actual legal practice.

Painting in broad strokes, experimental economics finds an analytical foothold in at least three archetypal areas of legal scholarship and practice. First, it can be used to explore the functioning of legal institutions, such as settlement bargaining, jury deliberation, and alternative dispute resolution. Second, it can be directed to the study of legal doctrines, such as those relating to property-rule liability, damages doctrines, and the negligence standard. Third, it can contribute to the practice of law, for example, by informing how the presentation of probabilities is handled at trial, or how damages claims or other complicated legal theories are demonstrated to the trier of fact.

The work of this chapter is to illustrate the current achievements and future role of experimental economics in shaping law and legal analysis in each of these three broad subject areas. Following a brief primer on the theory and methodology of experimental economics, the chapter summarizes and discusses some important topics within each broad area of application. Making the most of limited space, focus is directed to general findings, areas for development, and opportunities for innovation and growth. The unifying theme of this review is a versatile relationship between experimental economics and legal analysis broadly construed. The title of the chapter reflects this focus: *experimental economics and the law*.

2 THE METHODOLOGY OF EXPERIMENTAL ECONOMICS

2.1 *Controlled Experimental Design*

At least at a conceptual level, there is little need to motivate the idea of economic experimentation. This is because the design and implementation of controlled experiments is about as fundamental to scientific inquiry as anything could be. Suppose a physicist wishes to determine the electrical resistance of a wire over a range of possible operating temperatures. The most obvious path forward would be to design an experiment. By exercising control over pertinent environmental factors in a laboratory context, the physicist could measure the conductivity of the wire at different temperatures set by design, holding all other environmental variables fixed.

Another intuitive use of experiments is as part of a more open-ended search for practical solutions to a novel problem. This is often the case in experiments designed for engineering applications. In World War II, for example, the British military was trying to deal with German torpedo nets erected to protect major dams in the Ruhr valley. One scientist came up with the idea of a spinning bomb that would skip across the water, over the netting, with a reverse spin that would let it "swim" back up against the dam wall before exploding. Theory and intuition suggested that this plan could work, but the idea was novel enough to attract strong criticism. The British Chief of Bomber Command initially considered the idea to be "just about the maddest proposition as a weapon we have come across."[1]

Experiments were used to explore the plan. Initial small-scale experiments tested whether rounded objects could even be made to skip on water by catapulting marbles into a washbasin. When the concept proved sound, subsequent experiments were conducted to find the necessary angle of impact to cause a four-ton bomb to bounce on water like a skipping stone. Experimentation was especially critical in this

[1] For more historic details, see Hayley Dixon, "Sir Barnes Wallis and the Dambusters' Bouncing Bomb," *The Telegraph*, May 13, 2013.

application as German countermeasures would make a second attempt difficult if the initial raid failed. (It didn't.)

Economists use experiments in much the same ways as physicists or engineers. Economic theories are typically based on strong assumptions about rationality and foresight, and evaluated on the basis of elegance, sharpness of prediction, and consistency with basic intuition. Features of context, interpersonal frictions, and institutional detail are frequently omitted to achieve greater tractability and generality. The resulting theories cry out for experimental tests, where differences in individual personality traits and propensities, limitations in attention and foresight, and other details too intricate to measure or model formally can be accounted for using random assignment and other experimental controls. Experiments can thus be used to evaluate the empirical predictions of economic theory, often under less restrictive contexts and assumptions, and often in novel settings.

As an example and thought experiment, consider the question whether a cap on damages reduces the frequency of tort suits.[2] If society sufficiently valued the answer to this question, a large-scale experiment could be designed to provide an answer. Randomization or careful selection algorithms could be used to partition the members of society into two identical (or at least nearly identical) groups; one group would remain under the status quo liability rules, while the other would be subject to a cap on damages. With absolutely nothing else changed, the researcher could collect data for a few months, and then compare the rates of tort suits in the two groups to see what causal effect the cap on damages had on the outcome of interest.

Obviously an experiment on this grand scale is unlikely to be socially acceptable, but the thought experiment illustrates the basic structure of an economic experiment. The researcher exploits *control* over the experimental environment to apply some *treatment* to only one of two otherwise identical groups of subjects. Subjects in the experiment then interact according to their normal self interests, but those in the *treatment group* act under a slightly different set of rules

[2] For economic experiments on the effect of damages caps on the rate of settlement, see Babcock and Pogarsky (1999) and Pogarsky and Babcock (2001).

than those in the *control group*. The experimenter measures observed behavior in both the treatment and control groups, and any difference in behavior reflects the causal *treatment effect* of interest.

This is probably the most common experimental design used in experimental economics, but it is far from the only approach.[3] Like the spinning bomb example above, economic experiments are sometimes designed simply to measure and document how subjects behave in a given market structure or incentive environment without reference to any control group. Examples include experiments that test the efficiency of an auction structure, such as an innovative proposal to allow bidding for *combinations* of spectrum licenses in a way that protects firms from overpaying for pieces of a fragmented network.[4] Similarly, like the physics example with differing temperature conditions, economic experiments can also be structured to consider a range of treatment effects. An example is an experimental study of equilibrium price formation in a homogenous-good oligopoly as the number of producers drops from five, to four, to three, to two (e.g. Huck et al. 2004; Dufwenberg and Gneezy 2000). In every case, the conceptual framework of the economics experiment is the same as that of experiments in any other field of science.

2.2 *Induced-Value Theory*

Relative to experiments in the natural sciences, one unique difficulty facing experimental social scientists is achieving strong control over the experimental environment. Humans are not as easily manipulated as bombs or wire. Whereas the state of a physical object is determined by forces and conditions in the past, the temporal directions of causa-

[3] For broad surveys of various experimental designs in economics, see Davis and Holt (1993), Kagel and Roth (1995), and Holt (2007). For a practical approach to experimental design for economists, see Friedman and Sunder (1994).

[4] See Goeree and Holt (2010) for a set of experiments used by the U.S. Federal Communications Commission to design and implement a major auction for spectrum licenses for the provision of wireless communications services in a geographic network. Even this paper, however, had a control treatment without package bidding opportunities, which showed problems that could arise if bidders were not permitted to submit "all or nothing" bids for combinations of licenses.

tion go both directions with forward-looking human subjects. Moreover, society is rarely willing to give researchers the degree of control required to conduct experiments that mimic many aspects of daily life. Hence, most economic experiments are small-scale and short-term operations conducted with groups of willing subjects in laboratory or simplified field contexts (cf. Harrison and List 2004). Such experiments are necessarily only models or abstractions of the complicated phenomena being studied, so it falls on the researcher to insure that the experiment involves the critical motivations, constraints, and influences that shape the behavior of interest.

Experimental control over subjects' preferences is especially important in this abstract and small-scale context. Whether studying supply and demand, bargaining, or various game-theoretic behaviors, it is generally convenient and often necessary for the researcher to know something about subjects' preference primitives in order to understand the results of the experiment relative to theoretical predictions. Likewise, the actions of subjects in an experiment are often most useful when they represent the thoughtful decisions of outcome-motivated actors, as opposed to the hasty reactions of subjects to uncertain or hypothetical incentives.

The theory of induced valuation is the tool experimental economists use to gain control over subjects' preferences (see Smith 1976).[5] Put simplistically, the idea is that a human subject with non-satiable preferences for some valuable resource (usually money) can be induced to exhibit nearly any preference ordering in an experiment by varying the shape of an applicable payoff function. For example, to cause a subject to treat arbitrary "tokens" as a valuable commodity in an experimental market, the experimenter can allow the subject to exchange tokens for real-world currency at the end of the experiment. To induce diminishing utility in tokens, the experimenter can simply provide less money for each token exchanged by the subject.

Induced-value theory is a powerful tool for achieving low-level control over preferences, but experimental economists are not naïve

[5] For additional discussion of preference induction, see Friedman and Sunder (1994: § 2.3), Davis and Holt (1993: p. 24), and Holt (2007: pp. 10–11).

about the sometimes uncontrollable collateral preferences of subjects. Universal experiences such as boredom and effort avoidance, for example, apply in economics experiments the same as anywhere else. To some extent, these preferences may be controlled by increasing the payoffs associated with experimental choices. But preferences over social stigmatization or perceived degradation are more serious obstacles that may not be controllable in many experiments. How to account for such uncontrolled preferences is a complicated question best addressed on an application-by-application basis.

2.3 *Scaled Observation*

The capacity to study economic experiments at different *scales* of observation provides the researcher with a powerful analytical tool. One way to interpret the different scales of observation is to consider the different uses of experiments for thinking *inside* and *outside the box*.

A researcher uses economic experiments to look inside the box when value induction, control over institutional structure, and low-level measurement of behavior are used to study concepts not readily observable in the outside world. For example, despite being a highly desired characteristic of an economic institution, economic efficiency it often not observed in field settings where traders hide their values and costs in a strategic manner. In an economic experiment with explicitly induced values, it is possible to measure economic efficiency by comparing the new wealth created by observed trades or agreements with the maximum possible wealth that could have been created given the known valuations of all subjects.

Another way experiments are used to look inside the box is in the study of activities that are difficult to observe outside the laboratory. Examples include price collusion (because it is illegal) or strategic discussions of bidding strategies (because they are often based on proprietary ideas and information). Deeper yet, *neuroeconomic* experiments measure brain activity in precise spatial and temporal dimensions in order to explore low-level properties of the decision-making process. Cooperators, for example, tend to show greater activity in areas of the brain associated with social situations and visualization than is the

case for people who choose self-serving options in experimental trust games (McCabe et al. 2001). In bargaining experiments, areas of the brain associated with emotion are strongly activated when inequitable offers are received, and these areas again activate when such offers are rejected (Sanfey et al. 2003).[6]

At a more macro scale of observation, economic experiments can be used to think outside the box by considering rules and policies that have never yet been implemented. (The spinning bomb experiments are an example of this type of use outside of the economic realm.) This approach to experimentation has been particularly fruitful in guiding the design of new types of auctions for fishing rights, emissions permits, or combinations of frequency bands in spectrum auctions.[7] On the policy side, a relevant example is the use of experimental control to evaluate proposed (but not yet implemented) changes in litigation procedures designed to promote the early settlements of tort claims (Sullivan 2011).

2.4 *Repetition and Replication*

Finally, the hallmark of experimental study is causal inference. To afford adequate statistical power, most experiments collect a sample of observations rather than a single data point. But instead of conducting experiments with hundreds of subjects who interact with each other in one large group, most researchers break experiments into separate groups or "*sessions*" conducted with smaller subsets of the subject population. Within a session, decision-making and interaction oppor-

[6] See Chorvat et al. (2005) for a thoughtful discussion of the implications of neuroeconomics for traditional areas of law and economics scholarship.

[7] For example, see Holt et al. (2007) for a report in which laboratory experiments were used to design the Regional Greenhouse Gas Initiative auctions that have been run quarterly since 2008. Similarly, Cummings, Holt, and Laury (2004) used experiments in the lab and the field prior to implementing a special auction in which farmers would bid for payments to be received in exchanged for irrigation reduction in a draught year. More recently, a special issue of the *Agricultural and Resource Economics Review* (vol. 39, number 2, April 2010) contains articles that used laboratory experiments to study the allocation of fishery rights, water rights, emissions permits, and common pool resources.

tunities are often repeated over many *rounds*. Among other things, this repetition provides time for subjects to learn experientially about the decision environment, and for any interactive behavior to reach a steady-state in equilibrium analysis. Although market behavior often evolves through repeated interaction over time, many legal scenarios may be better viewed as single-round experiences without opportunities for repeated interaction between individuals.

Statistical inference on experimental data can be conducted at any of the above levels of aggregation. Observations at the individual-decision level (with no interaction among subjects) provide the largest sample size, but can be complicated to analyze due to potential serial and contemporaneous correlation. For example, behavior in later stages of a decision process may be affected by the outcomes of random events observed earlier. To a lesser extent, this same concern afflicts observations averaged at the round level, because multi-round experiments leave open the possibility that observed behavior will be affected by experience in prior rounds. A person who encounters cooperative partners in a series of prisoner's dilemma games, for example, would presumably be more likely to cooperate in later rounds of the same experiment; "defection" is likewise highly contagious in a series of prisoner's dilemma pairings.[8] In this sense, measurements in one round are not independent of measurements in another.

Out of an abundance of caution, many experimental economists opt to analyze collected data averaged at the session level if the experiment involves multi-round interactions. This affords a strong assumption of statistical independence across separate sessions, at the cost of relatively small sample sizes. Statistical inference on such sample sizes generally requires the use of exact tests.[9] It is no coincidence that experimental economists—who work with budget-constrained sample sizes—often prefer statistical tests for which rejection regions can be calculated exactly, instead of relying on large-sample properties of standard test statistics.

---

[8] For a survey of prisoner's dilemma experiments in which people can choose who to be paired with and who to avoid, see Holt, Johnson, and Schmitz (2014).

[9] For an introduction to exact statistical inference, see Miller (1997) and Gibbons and Chakraborti (2003).

3 EXPERIMENTS FOR STUDYING LEGAL INSTITUTIONS

With this context in place, the remainder of this chapter discusses the many potential contributions of experimental economics to law and legal analysis. To start, the importance of institutional details in economic theory is reflected in a large set of experimental studies targeted at better understanding the role and function of legal institutions. As a tool for framing discussion, it is helpful to draw a distinction between legal institutions inside and outside of the courtroom.

3.1 *Out-of-Court Institutions: Settlement Bargaining*

Of all the out-of-court institutions that might be studied using economics experiments, by far the best travelled is settlement bargaining, with the bulk of research to date focusing on a single, narrow question: why do legal disputes go to trial? The poignancy of this inquiry is that basic economic models of settlement bargaining fail to account for anything other than the private settlement of legal disputes. On the unremarkable assumptions that (1) trial is costly and (2) any trial verdict can more cheaply be reproduced through a feasible contractual agreement, the onus is to explain why disputants ever take the inefficient route of trial over efficient private settlement.

One popular hypothesis – explored by many scholars but most often attributed to Priest and Klein (1984) – is the idea that litigants may fail to settle their disputes when they form incompatible expectations about the prospects of a trial outcome.[10] Of present concern, an important series of experimental studies explore the idea that self-serving bias may cause litigants to develop incompatible beliefs about the strength of their respective sides of a legal dispute.[11] These studies

[10] This general model of settlement failure has been advocated by Gould (1973) and Shavell (1982) among many others. For an experimental study specific to Priest and Klein's selection hypothesis, see Stanley and Coursey (1990).

[11] For details and additional background, see Babcock and Loewenstein (1997). For alternative studies conducted with the same basic design, see Babcock et al. (1997), Babcock and Pogarsky (1999), and Pogarsky and Babcock (2001).

use experimental economics to profound effect in demonstrating the persuasiveness of this theory of settlement failure.

Every experiment in this line of studies explores a variation on the following experimental design (Lowenstein et al. 1993). Subjects were randomly paired and assigned roles as either plaintiff or defendant in a mock tort dispute. Each subject was then provided about 30 pages of case materials (testimony, reports, diagrams, etc) describing the events and transactions alleged to support a cause of action. Both sides were given the same information; told as much; and also told that the information had been shown to a judge who had rendered a secret verdict that would control end-of-experiment payouts in the event that a private settlement wasn't reached.[12] Subjects were given time to read and consider the facts at length before entering the bargaining phase of the experiment, where they had thirty minutes to negotiate face-to-face in attempting to reach a private settlement.

Of the many experiments conducted using this basic framework, two in particular demonstrate the explanatory power of self-serving bias in driving settlement impasse. In the first such experiment, subjects were assigned roles and given time to read the case materials as above; but before engaging in any actual negotiation, they were first asked to guess what the judge's secret damages award had been (Loewenstein et al. 1993). These predictions were provided in strict confidence to the experimenter and were incentivized by small monetary rewards for guesses sufficiently close to the actual award. The collected data reveal strong evidence of self-serving bias: estimates of the judge's award were systematically higher for plaintiffs and lower for defendants. Critically, the degree of a litigant's bias also correlated with subsequent failure to settle during negotiation.

In a second experiment, the authors confirmed the causality of self-serving bias in explaining the systematic divergence of expectations by modifying the experimental design so that subjects read the case materials and provided damages estimates *before* being assigned their roles as plaintiff or defendant (Babcock et al. 1995). In contrast to the

[12] The "judge" was actually a civil litigation specialist on the faculty of the University of Texas at Austin School of Law (Loewenstein et al. 1993: p. 145 n. 30).

previous results, predictions evinced no systematic bias by eventual role assignment in this experiment. Furthermore, after being assigned their litigation roles, the subjects that had interpreted the case information from an *ex ante* neutral posture achieved significantly higher rates of settlement than the subjects that had read the case information already aware of their litigation roles.

Another popular hypothesis for the failure of litigants to achieve efficient settlement posits that verdict-relevant information is asymmetrically distributed between the parties to a legal dispute. Settlement inefficiencies are then explained by the strategic attempts of litigants to signal or extract private information during the litigation process (e.g. Bebchuk 1984; Reinganum and Wilde 1986).[13] Economic models of settlement bargaining under asymmetric information predict both settlement failure (i.e. trials) *and* settlement delay (i.e. late settlement) under appropriate conditions (see e.g. Spier 1992; 1994).

A recent experiment on settlement bargaining clearly demonstrates both predictions of the asymmetric information hypothesis (Sullivan 2014). In contrast to the previous experiments on self-serving bias, this asymmetric-information experiment contextualized negotiation more abstractly. Bargaining was again framed as a tort dispute, but instead of packets of factual evidence, subjects were provided numerical details about their case: the plaintiff's probability of winning at trial, the probability distribution over damages, the fees incurred at different stages of litigation, etc. Subjects negotiated settlements anonymously using a computer program that tracked cumulative fees, current settlement offers, and other information throughout the bargaining process. Incurring legal fees with each passing second, subjects had two minutes per round to negotiate a settlement in real time, with a computerized "judge" resolving disputes that failed to settle.

To test the effect of asymmetric information on settlement outcomes, one treatment of the experiment provided subjects with symmetric information about the case, while a second treatment provided

[13] Kennan and Wilson (1993) provide a detailed treatment of the role of asymmetric information in general bargaining models. For a survey of economic experiments on bargaining under asymmetric information, see Roth (1995).

one litigant in each pair with superior information (the exact value of the computerized judge's damages award). Comparing data collected in both treatments provides strong support for the hypothesized effects. Subjects negotiating under symmetric information were found to be about 50% more likely to successfully settle a dispute.[14] Moreover, even among litigants who managed to settle their disputes, subjects negotiating under asymmetric information took nearly twice as long to do so – a very expensive delay in this environment.

3.2 *In-Court Institutions: Judges and Juries*

Though less well-traveled than out-of-court institutions, in-court legal institutions are another promising subject for experimental scrutiny. The interpretation of evidence and formulation of conclusions by judges and juries, for example, raise a number of deep questions going beyond the traditional boundaries of law and economics to implicate fundamental issues in equity and modern jurisprudence. Uncertainty about the preferences of these actors represents both a challenge for experimental study, and a potential opportunity for growth.

Under admittedly opaque motivations, judges are tasked with drawing legal conclusions and making certain findings of fact at trial. Setting aside the question of judicial preferences, these functions themselves implicate a wealth of research at the intersection of experimental economics and cognitive psychology. Because the myriad cognitive biases that affect human perception and reasoning (see e.g. Kahneman et al. 1982; Kahneman 2011) are also apparent in members of the judiciary (see Guthrie et al. 2001; Rachlinski et al. 2006), study of conclusions made in adjudicative postures may provide insight into the strengths and limitations of trial judges.

Experimental study of anchoring effects in adjudication provides an intuitive example. The basic question is whether judges may tend to anchor ultimate determinations of guilt and innocence on the implications of early evidence (Thompson and Schumann 1987). A recent ex-

[14] Other experiments discussing settlement bargaining failure and asymmetric information include Babcock and Landeo (2004) and Inglis et al. (2005).

periment by Sonnemans and van Dijk (2011) provides some evidence to this effect in the context of studying judicial effort – for example, the amount of time or energy a judge expends in weighing evidence at trial. Assuming judges care about both the accuracy of their findings and the amount of time or energy they devote to an inquiry, the experiment places subjects in the role of trial judges with payoffs increasing in "correct" rulings but decreasing in the amount of costly search undertaken in acquiring information. Collected data show experimental judges abandoning their search efforts inefficiently early, with subjects evidently overweighing the value of their initial assessments and thus inefficiently abbreviating evidentiary hearings.

The trial functions of juries implicate many of the same issues as judges, but subject to the additional complication that juries make decisions in a group context. The introduction of group dynamics may not seem like a big difference, but experimental economics is replete with examples of substantial differences in behavior when individuals and groups engage in otherwise identical decision-making tasks. For example, in a detailed survey of the literature comparing individual and group decision-making, Charness and Sutter (2012) observe that groups appear generally less exposed to cognitive biases than individuals, and also appear less susceptible to emotional influences when making decisions. This observation has obvious implications for understanding the relative strengths of juries compared to judges.

The rules of group interaction are also uniquely important when considering how juries perform adjudicative functions (cf. Bosman et al. 2006). Take, for example, the common intuition that "false convictions" will be less likely if a unanimous jury vote is required. In contrast, the game-theoretic prediction is that unanimity requirements may actually increase the probability of false convictions as a result of strategic juror voting (Feddersen and Pesendorfer 1998). To understand the possible effects of strategic voting under unanimity, note that a vote to acquit only matters if *everyone else* votes to convict, which might cause jurors to be reluctant to vote to aquit even if they personally believe the defendant is innocent. Guarnaschelli, McKelvey and Palfrey (2000) test this surprising prediction using a series of experiments in which subjects were incentivized to make careful voting deci-

sions in an environment analogous to jury deliberation in a criminal case. The authors find strong experimental evidence that some jurors *do* vote strategically under a unanimity rule, but that the effect of such strategic voting is not strong enough to cause the rate of false convictions under unanimity to be higher than under a simple majority requirement. Moreover, Goeree and Yariv (2011) find evidence that strategic voting in a similar experimental setting may be substantially mitigated by opportunities for jury deliberation.[15] The implication of experimental results to date is that it could be a serious mistake to base policy recommendations on sharp theoretical predictions that have not been evaluated in the laboratory, especially when these predictions run counter to basic intuition.

Returning, finally, to uncertainty over the adjudicative preferences of judges and juries, there may be untapped potential for experimental economics to provide new insights in this area. All the experiments described above approach their research problems from the conventional direction of inducing subjects' valuation over the outcomes of the particular game being studied. But experimental economics can also be used to elicit subjects' primitive preferences in some contexts. The growing experimental literature on eliciting risk preferences is an example.[16] Approaches to eliciting beliefs about uncertain and future events (e.g. Palfrey and Wang 2009; Holt and Smith 2014) are closely related to risk preference elicitation, with similar application to understanding judicial motivations.[17]

By way of illustration, the Holt and Smith (2014) belief elicitation procedure derives quantitative measures of subjective beliefs by asking subjects to choose between two random devices. The first device, the "event lottery," provides a fixed payment (e.g. $100) if an uncertain event of interest is observed (e.g. the defendant is found innocent). The second device, the "dice lottery," provides the same payment ($100) when a random draw from the standard uniform distribution

[15] Baddeley and Parkinson (2012) use experiments to explore some of the individual and group dynamics that may influence jury deliberation, and also provide a thorough review of the relevant literatures.
[16] For a recent survey of this literature, see Holt and Laury (2013).
[17] For a recent survey of this literature, see Schotter and Trevino (2014).

exceeds a specified probability threshold. Given an event of interest, subjects in the belief elicitation experiment must decide whether they would prefer the event lottery (which pays when the event occurs) or the dice lottery (which pays by pure chance) for each of a menu of dice lotteries with different probability thresholds. Subject to a single-crossing constraint, the cutoff point at which a subject no longer prefers the dice lottery over the event lottery reveals the subject's implicit assessment of the probability of the event. The experiment thus uses subjects' desire to win a valuable prize to elicit both the (conscious) effort of the subject to accurately guess the probability of the uncertain event and the (perhaps unconscious) revelation of this subjective probability assessment to the researcher.

Whether similar economic experiments can be designed to identify and compare different adjudicate preferences is an interesting question. Beyond the difficulty of developing appropriate revelation procedures, an obvious concern in relying on something like hypothetical trials to measure juror preferences is the potential difficulty of incentivizing experimental subjects to apply the same thought processes and effort as actual jurors rendering verdicts in naturally occurring judicial proceedings outside of the laboratory (Cahoy and Ding 2004). The absence of any clearly self-oriented incentives in many adjudicative postures begs the question whether subjects in such preference or belief elicitation experiments could be adequately incentivized by narrative interest alone.

There is reason for both optimism and doubt. It has long been suggested that subjects in experiments can, in some circumstances, be adequately and appropriately incentivized by personal preferences over abstract outcomes such as winning a game (Smith 1976: p. 277). The clear concern that many people express over the demise of characters in fictional stories and television shows – mapped to the outcomes of fictional litigants in mock disputes – may not be so different from the preferences actual jurors have over the "real," but in many ways no less hypothetical outcomes of the cases before them. Delicacy is required, however, as motivating subjects by way of context may simultaneously tend to bias subjects' beliefs or perceived values in ways that invalidate or at least obscure theoretical predictions. On the other hand, such

biases may be of limited concern if they are uncorrelated with treatment conditions of interest.

4 EXPERIMENTS FOR UNDERSTANDING LEGAL DOCTRINE

Experimental economics can also be applied to the study of legal doctrine. Indeed, the first explicit effort to merge the study of law and experimental economics appears to be the use of laboratory experiments as a means of studying the Coase Theorem (Hoffman and Spitzer 1982). Much of the subsequent research in this area has remained stuck within the strong gravitational pull of that early work, but alternative subject matters are open for exploration.

4.1 *The Coase Theorem*

In just one of its many modern forms, the Coase Theorem posits that, in the absence of transactions costs and various other impediments to private reallocation of legal entitlements, the ultimate conduct of individuals will be socially efficient irrespective of the initial allocation of rights and the nature of rights as affording liability or property rule protection (Coase 1960).[18] Today, the implications of this insight shape the jurisprudence of many areas of law, particularly in regard to the protection and allocation of property rights.[19]

The wide-spanning influence and celebrated status of the Coase Theorem have motivated many attempts test its properties and conclusions, often with the aid of economic experiments. The first and most influential work applying experimental methods in studying the Coase Theorem is that of Hoffman and Spitzer (1982). The methodology of this early study has become a jumping-off point for much of the subsequent literature.

---

[18] For a compilation of different versions of the Coase Theorem, see Medema and Zerbe (2000: pp. 837–38). For commentary on the original meaning and evolution of the Theorem, see Zerbe and Medema (1997) and McCloskey (1997).

[19] For example, the Coase theorem as portrayed in the "property rule" and "liability rule" analysis of Calabresi and Melamed (1972) informs modern understanding of contract law, tort law, property law, and the choice of remedies generally.

Hoffman and Spitzer's experimental design is most easily described in terms of its simplest treatment. After being randomly divided into pairs and assigned identities as *A* or *B*, one subject in each pair was randomly selected to be the "controller." This subject had unilateral authority to select the "number" that would determine experimental payments; a sample choice menu is reproduced as Table 1. Rather than select the number in isolation, however, each controller was permitted to confer face-to-face with their partner. In these conferences, subjects could complete binding agreements stipulating how final payments would be allocated after a number was selected.

Table 1: Sample Decision Structure

Controller Choice	Payoff Functions	
"number"	Payout to *A* ($)	Payout to *B* ($)
0	0.00	12.00
1	4.00	10.00
2	6.00	6.00
3	8.00	4.00
4	9.00	2.00
5	10.00	1.00
6	11.00	0.00

Source: Hoffman and Spitzer (1982: p. 86, Part A, Table 1).

In case it isn't obvious, this design is an abstract and context-neutral analog of the ideal Coasean bargaining environment with no impediments to bargaining. The socially optimal outcome is number 1, yielding a total payoff of $14.00. Under the circumstances, the Coase Theorem predicts that subjects should negotiate side payments to incentivize selection of number 1 irrespective of the property right, i.e. of whether *A* or *B* is selected to be the controller. Summarizing data collected in the above treatment as well as others involving three-party bargaining and alternative information structures, Hoffman and Spitzer (1982) find clear support for the Coase Theorem: the efficient outcome is by far the most frequent choice. Somewhat surprisingly,

subjects also frequently divide profits evenly, despite the controller's ostensibly strong bargaining advantage in this design.

Several subsequent experiments have demonstrated the causality and empirical robustness of the Coase Theorem's predictions. For example, support for the Coase Theorem does not diminish when group size becomes as large as 20 subjects (Hoffman and Spitzer 1986), when the controller is assigned by competition rather than random chance (Hoffman and Spitzer 1985), or when asymmetric payoffs or even physical discomfort are involved in negotiation (Coursey, Hoffman, and Spitzer 1987). Importantly, Coasean bargaining appears to drive these results, as socially efficient outcomes are not usually observed when the design is altered to eliminate the negotiation of side payments (Harrison and McKee 1985).

But just as important as verification of the Coase Theorem under low transaction costs is the task of charting transaction costs sufficient to defeat the efficient reallocation of rights through private bargaining (Coase 1992: p. 717). An early experiment by Schwab (1988) stakes a peg well into the field of transaction-costs through complexity. Framing bargaining in the rich context of a collective bargaining agreement, the experiment provided subjects with multiple dimensions of value to negotiate over (wages, vacation time, noise reduction, and a "relocation clause"), introduced incomplete information (subjects could state their preferences, but could not reveal their actual payoff schedules), and admitted multiple Pareto efficient outcomes. Few subjects, in this experiment, were able to negotiate their way to socially optimal outcomes.

Other experiments have plotted similar paths in attempting to determine what transaction costs are sufficient to defeat efficient allocation under the Coase Theorem. One consideration is the *endowment effect* – the tendency of property owners to value assets more than prospective buyers (Kahneman et al. 1991).[20] Merely changing the basic experiment so that bargaining concerns the controller's ownership of a tangible chocolate bar significantly reduces subjects' ability to negoti-

[20] Experimental evidence is not fully supportive of the endowment effect. For an extensive survey and critique, see Klass and Zeiler (2013).

ating an efficient reallocation of property rights (Kahneman et al. 1990). Experiments also show reduced allocative efficiency when the process of bargaining entails explicit negotiation costs (Rhoads and Shogren 1999) and when negotiators operate under asymmetric information (McKelvey and Page 2000). Interestingly, there is some evidence that uncertain property rights may actually *increase* efficiency by incentivizing negotiation as opposed to entrenchment (Cherry and Shogren 2005; see also Croson and Johnston 2000).

4.2 *Negligence and Tort Liability*

Switching subject matters, experimental economics can similarly be used to study basic doctrinal questions in tort law. Research topics in this area include empirical study of the popular law-and-economics interpretation of liability regimes as incentivizing careful conduct, as well as more fundamental questions such as what strength of relationship there is between liability and defendants' actual culpability for unintentional injuries under the negligence standard.

Economic experiments are particularly valuable as a means of providing empirical insight into the incentive effects of different liability regimes. An early study by Kornhauser and Schotter (1990) illustrates the typical design. Subjects in the experiment were tasked with making individual choices in an abstract decision environment analogous to the basic carefulness decision in a single-actor accident. Over multiple rounds of the experiment, subjects were exposed to the risk of a random event (accidental injury of a third party) which occurred with some probability that the subject could reduce by investing in a costly resource (carefulness of conduct). In any period in which the event occurred, the subject's earnings were reduced (tort liability for the injury) according to an abstract representation of a given liability regime (negligence, strict liability, etc).

Kornhauser and Schotter (1990) report that observed care levels rapidly converged to the theoretic prediction under a negligence standard in which subjects were liable for injuries only if less than a fixed degree of care was exercised. Efficient care can thus be incentivized by an appropriate choice of negligence standard. By contrast,

when operating under a strict liability standard, in which no degree of care suffices to escape liability for an injury, subjects never converged to the efficient level of care during the experiment. Wittman et al. (1997) extend the inquiry to subspecies of negligence liability in a related experiment on two-actor accidents. Convergence to equilibrium (and efficient) levels of care is observed more quickly under comparative negligence than contributory negligence,[21] perhaps reflecting the more intuitive apportionment rule of comparative negligence or the blurring of incentive effects under the comparative fault regime. In any event, a no-liability rule is observed to underperform both negligence standards.

These experiments are a good start, but there is still substantial work to be done in this area. For one thing, reliable replication of key findings is currently lacking. To the contrary, a recent experiment on single-actor accidents by Angelova et al. (2013) reports stable and equivalent levels of care under both negligence and strict liability – a conclusion inconsistent with that of Kornhauser and Schotter (1990). Another topic deserving of further attention is discussion of *learning* and *convergence to equilibrium* in this literature. If indeed efficient levels of care are something that must be learned experientially in practice, then the rare and idiosyncratic nature of many accidental injuries may imply that experiments would be better focused on the out-of-equilibrium behavior of inexperienced subjects when considering the relative efficiency of different liability standards.[22] Alternatively, if learning is thought to propagate through something like social norms and conventions, then future experiments may be designed to study group-learning of equilibrium behavior under various liability standards. Finally, experimental work is needed on the closely related question of how different damages rules incentivize behavior under a given liability standard (e.g. Engel and Eisenberg 2014).

At a more philosophical level, experimental economics can also provide a window for exploring issues such as how liability decisions are made under the negligence standard. In both Learned Hand's in-

[21] For background and commentary on this distinction, see Schwartz (1978).
[22] See Kornhauser and Schotter (1990: pp. 223–224) for additional discussion.

famous *benefit versus expected loss* formula as well as the more traditional *reasonably prudent person* definition, the negligence standard compels the fact-finder to consider the *ex ante* likelihood of accidental injury under the defendant's conduct.[23] Unfortunately, substantial experimental evidence indicates that people are not very good at this type of *ex post* assessment of *ex ante* probabilities. A particularly uncomfortable problem is *hindsight bias* – the tendency of people who observe the outcome of a random event to overstate the *ex ante* probability of that outcome's occurrence (Fischhoff 1975; Slovic and Fischhoff 1977). A closely related observation in economics experiments is the general inability of informed subjects to introspectively reproduce the judgments of relatively uninformed subjects, even when incentivized to do so – a phenomenon termed the *curse of knowledge* (Camerer et al. 1989).

One way to interpret these results is as a fundamental strike against the validity of culpability determinations under the negligence standard: even the most well-intentioned jurors will be structurally biased toward overstating the dangerousness of the defendant's conduct, all else equal. Alternatively, and more constructively, economic experiments could be seen as a tool for understanding and remedying judgment biases that undermine the standard. Camerer, Loewenstein, and Weber (1989), for example, find that participation in a market structure helps to partially reduce the curse of knowledge. Whether jury deliberation performs a similar function is an open empirical question. Similarly, a recent economic experiment by Wu et al. (2012) suggests that providing informed subjects with specific details about the evaluative process used by an uninformed subject may help to substantially reduce hindsight bias when the informed subject attempts to assess the judgment of the uninformed subject. At a minimum, the implications for advocacy are obvious.

This discussion warrants two passing comments. First, the influence of hindsight bias on fact-finding is not limited to actions in negligence. Mandel (2006) considers hindsight bias in patent applications,

[23] Zipursky (2007) provides both context and provocative commentary on these competing formulations of the standard of care in negligence.

for example, but the problem should be expected to arise generically whenever the fact-finder is required to consider the *ex ante* probability of an *ex post* known outcome. Second, hindsight bias is not the only judgment bias implicating probability determinations under the negligence standard (see e.g. Kahneman, Slovic and Tversky 1982). Experimental evidence of the difficulty of Bayesian updating (Grether 1992; see also Koehler and Kaye 1991) and possible workarounds (e.g. Gigerenzer and Hoffrage 1995) are particularly on-point.

5 EXPERIMENTS AT TRIAL AND IN LEGAL PRACTICE

Finally, the role of experimental economics in law is more than academic. This is partly evident in the outlines of advocacy strategies scattered throughout this chapter, but experimental economics also stands to play a direct role in the litigation process itself. Important illustrations include the use of experiments as trial evidence, and the use of experiments in the strategy of advocacy and litigation.

5.1 *Experiments as Evidence*

While the bulk of trial evidence is obviously observational, controlled experiments are admissible as evidence in most jurisdictions, provided that the experiment is sufficiently related to a material issue to be probative, and provided that the probative value of the experiment is not substantially outweighed by the usual risks of unfair prejudice, confusion of the issues, etc.[24] Occasional fixation on the "substantial similarity" of an experiment to the facts of a case can sometimes prove an obstacle, but particularly when an experiment is proffered only to demonstrate a general rule or scientific principle, as opposed to bearing on specific facts in dispute, the standard of admissibility may be relatively relaxed (see e.g. Broun et al. 2013: pp. 1138–1143). Against

[24] These are general conditions for the admissibility of all evidence. In the federal system, probative value is required by Federal Rules of Evidence 401 and 402; ad hoc balancing against various risks is required by Federal Rule of Evidence 403. For discussion specific to controlled experiments, see Broun et al. (2013: §§ 202–207).

this backdrop, the use of economic experiments as substantive evidence is a robust and underappreciated trial strategy.

Potential applications arise whenever economic concepts are needed to support a case or theory. In antitrust cases, for example, experimental economics represents an untapped resource for providing a more narrative, intuitive, and experiential means of communicating complicated economic propositions to the finder of fact.[25] Take game theoretic models of collusive price fixing in repeated oligopolistic interaction (e.g. Shapiro 1989: § 3.2.1; Green and Porter 1984). Which of the following modes of proof is likely to be more persuasive to a lay jury: (1) a black-box assertion of the esoteric predictions of game theory by an expert witness, or (2) description or *demonstration* of experiments involving actual humans observed to be engaging in express or tacit collusion in the lab (see e.g. Holt 1995: pp. 401–411)? The value of the experimental approach is not that it obviates or replaces conventional testimony, but that it provides a tool for communicating the economic concept in concrete and actor-centric terms, hopefully allowing the lay fact-finder to develop an intuitive model of the general economic concept that can be used in assessing the facts of the case.

Beyond the illustration of abstract economic principles, experimental economics could also be used to demonstrate specific factual propositions in appropriate cases. In certain products liability, fraud, and consumer protection matters, for example, controlled field experiments might be conducted to demonstrate how consumer expectations or behavior would differ under counterfactual warnings, terms, or product packaging (cf. Listokin 2010). Similarly, in many instances in which surveys of hypothetical behavior or preferences are currently used (see Broun et al. 2013: § 208), economic field experiments might be designed to answer the same evidentiary questions with greater narrative impact and possibly greater empirical rigor.

Rounding out these remarks, a collateral advantage to the use of experimental economics as evidence is that the scientific nature of experiments may ease the often strained fit of economic expert testimo-

[25] Additional arguments for the use of experimental economics in antitrust applications are provided by Landeo (2014).

ny in the evidentiary framework for expert witnesses (cf. Wrobel and Meriwether 2010; Lopatka and Page 2005: pp. 699–703).[26] As Solow and Fletcher (2006) note, the legal standard for expert witness testimony appears to contemplate a "traditional" concept of the scientific method involving "the generation of new hypotheses, the development of experiments that generate data with which to test them, and validation of the results through repetition" at odds with the more observational and axiomatic nature of much economic study (p. 494). Bridging the gap between mainstream economic research and the type of traditional scientific inquiry expected by the courts, experimental economics provides an intuitive tool for translating economic theory into a language more familiar as trial evidence.

5.2 *Experiments in Litigation Strategy*

Finally, experimental economics has an important place in legal practice itself. Recognizing the cognitive limitations of most decision makers (cf. Gigerenzer and Selten 2001), experiments can be – and already are – designed to improve the strategy and practice of litigation and advocacy. Experimental economics can be exploited by legal practitioners to better understand both their audiences and themselves.

To start, there is a sense in which the use of experimental economics in litigation strategy is not novel at all. The use of mock juries, mock trials, and shadow juries to study juror influences and the persuasiveness of different legal theories is well traveled in both academic research and legal practice (see Devine et al. 2000). These studies, which are often similar to economic experiments in many regards, approach the understanding of jury preferences, attention, and receptiveness to different arguments from an experimental perspective, replacing folk wisdom and anecdote with scientific inquiry (MacCoun 1989). Looking at this field of study prospectively, a closer integration

[26] In the federal system, the evidentiary framework for the admissibility of scientific expert testimony is largely circumscribed by Federal Rule of Evidence 702, the historic general acceptance standard of *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923), and the modern standard of *Daubert v. Merrell Dow Pharmaceuticals Inc.*, 509 U.S. 579 (1993).

of the methodology of jury simulation (see Bornstein 1999) and modern experimental economics may provide an interesting and novel approach to better understanding juror preferences.

A related application of experimental economics in legal practice involves the use of experiments to discover and implement *debiasing* techniques relevant to effective legal representation. Just as experiments can be used to discover cognitive biases that lead intuitive reasoning astray of objectively accurate conclusions (see e.g. Kahneman et al. 1982), experiments can also be used to explore techniques for debiasing intuitive reasoning. Some examples discussed earlier in this chapter, such as the approach of Wu et al. (2012) to reducing the effect of hindsight bias through illustration of the search-behavior of uninformed subjects, can be integrated directly into the presentation of evidence to jurors. Experiments by Gigerenzer and Hoffrage (1995) indicating improved Bayesian reasoning when probabilities are presented in frequency terms have similarly direct implications for the presentation of probabilities at trial.[27] Other uses of experimental economics in legal practice go to the more insidious problem of trying to debias lawyers themselves.

To illustrate, consider the following question: how well can experienced lawyers predict the outcome of a trial? As an empirical matter,

[27] As an example, consider the claim that the probability of a randomly selected person possessing a particular genetic marker is 0.001. It would be clearer for most people to express this rate in frequency terms as 1 person in each 1000 people in the population. Frequencies are also effective for conveying the implications of Bayes' rule, which tends to baffle non-statisticians. In the above example, suppose that a genetic test will always detect the trait if it is present, but will also yield a "false positive" (indicating that the trait is present when it is not) in 1 case out of 100. When considering a test with this degree of accuracy, most people would accept the argument that a person is much more likely to have the trait than not when the test indicates the trait is present. But this inference is not justified by the evidence. To see why, note that (on average) only 1 person out of 1000 people tested would actually have the trait and return a "true positive." By contrast, a one percent false positive rate would generate about 10 false positives for the 999 people without the trait. With 1 true positive and 10 false positives, the chance that the person with the positive test result actually *has* the genetic trait is only about 1 in 11, which is less than ten percent. This frequency-based approach to the Bayes' rule calculation can be made even more intuitive with color-coded graphics of rows of human figures.

the answer appears to be *not very well at all* (Goodman-Delahunty et al. 2010). The problem is the same overconfidence bias afflicting litigants in settlement bargaining (Loewenstein et al. 1993; Babcock et al. 1995). This is a potential concern from the perspective of representing a client's interests: an overconfident lawyer may fail to adequately inform a client of the weakness of a case, or may fail to see the weakness of a particular argument at trial through selective blindness to alternative interpretations of the facts. Again, however, experimental economics can be used to develop context-appropriate debiasing techniques. Among many parsimonious debiasing procedures that have been explored in the settlement bargaining context (see Babcock and Loewenstein 1997), enumeration of the weaknesses of one's own case appears to be the most effective in the lab (Babcock et al. 1997). Whether better debiasing techniques can be developed for this and related issues is an open question demanding future research.

6 CONCLUSION

As Stigler tells it, "When Aaron Director and Edward Levi launched the *Journal of Law and Economics* in 1958, Director suggested the title *Law or Economics*" (Stigler 1992: p. 455). It sometimes feels like Director may have had it right the first time. While no one can seriously dispute the influence that the law-and-economics movement has had on modern legal thinking, neither can one fail to see the dogmatic trenches that cordon off intellectual circles and domains of law in which economic analysis is and is not welcomed.

Beyond merely summarizing the use of experimental economics in law, this chapter puts forth the modest thesis that experimental economics may help to bridge the gap between law-and-economics researchers and the remainder of the wider legal audience. Two considerations guide this suggestion. First, the highly intuitive nature of economic experiments helps to make even complicated economic propositions clear to lay audiences without substantial economic training. Second, the subject matter reach of the many potential uses of economic experiments in legal research and practice is spread wide

enough to touch many subject matters and practice areas beyond the familiar touchstones of traditional law-and-economics scholarship.

As a device for framing discussion, this chapter has divided applications of experimental economics in law into three broad categories: (1) experiments for exploring the functioning of legal institutions, (2) experiments for studying and understanding the properties of legal doctrines, and (3) experiments contributing to the actual practice of law and advocacy. Obviously, the boundaries of these categories are blurry at best, and the few applications surveyed in this short chapter represent only a sampling of the many historic and potential uses of experimental economics in law.

7 REFERENENCES

Angelova, V., Armantier, O., Attanasi, G., & Hiriart, Y. (2013). Relative Performance of Liability Rules: Experimental Evidence. *Theory and Decision*, forthcoming.

Babcock, L., Camerer, C., Loewenstein, G., & Issacharoff, S. (1995). Biased Judgments of Fairness in Bargaining. *American Economic Review*, 85(5), 1337–1343.

Babcock, L., & Landeo, C. M. (2004). Settlement Escrows: an Experimental Study of a Bilateral Bargaining Game. *Journal of Economic Behavior & Organization*, 53(3), 401–417.

Babcock, L., & Loewenstein, G. (1997). Explaining Bargaining Impasse: the Role of Self-Serving Biases. *Journal of Economic Perspectives*, 11(1), 109–126.

Babcock, L., Loewenstein, G., & Issacharoff, S. (1997). Creating Convergence: Debiasing Biased Litigants. *Law & Social Inquiry*, 22(4), 913–925.

Babcock, L., & Pogarsky, G. (1999). Damage Caps and Settlement: a Behavioral Approach. *Journal of Legal Studies*, 28(2), 341–370.

Baddeley, M., & Parkinson, S. (2012). Group Decision-Making: An Economic Analysis of Social Influence and Individual Difference in Experimental Juries. *Journal of Socio-Economics*, 41(5), 558–573.

Bebchuk, L. A. (1984). Litigation and Settlement Under Imperfect Information. *RAND Journal of Economics*, 15(3), 404–415.

Becker, G. S. (1968). Crime and Punishment: An Economic Approach. *Journal of Political Economy*, 76(2), 169–217.

Bornstein, B. H. (1999). The Ecological Validity of Jury Simulations: Is the Jury Still Out? *Law and Human Behavior*, 23(1), 75–91.

Bosman, R., Hennig-Schmidt, H., & Winden, F. (2006). Exploring Group Decision Making in a Power-to-Take experiment. *Experimental Economics*, 9(1), 35–51.

Broun, K. S., Dix, G. E., Imwinkerried, E. J., Kaye, D. H., Mosteller, R. P., Roberts, E. F., & Swift, E. (2013). *McCormick on Evidence* (7th ed.). Thomson Reuters.

Cahoy, D. R., & Ding, M. (2004). Using Experimental Economics to Peek into the Black Box of Jury Behavior: a Proposal for Jury Research Reform. *Southern California Interdisciplinary Law Journal*, 14, 31–66.

Calabresi, G. (1961). Some Thoughts on Risk Distributions and the Law of Torts. *Yale Law Journal*, 70(4), 499–553.

Calabresi, G., & Melamed, A. D. (1972). Property Rules, Liability Rules, and Inalienability: One View of the Cathedral. *Harvard Law Review*, 85(6), 1089–1128.

Camerer, C., Loewenstein, G., & Weber, M. (1989). The curse of knowledge in economic settings: An experimental analysis. *Journal of Political Economy*, 97(5), 1232–1254.

Charness, G., & Sutter, M. (2012). Groups Make Better Self-Interested Decisions. *Journal of Economic Perspectives*, 26(3), 157–176.

Cherry, T. L., & Shogren, J. F. (2005). Costly Coasean Bargaining and Property Right Security. *Environmental & Resource Economics*, 31(3), 349–367.

Chorvat, T., McCabe, K., & Smith, V. (2005). Law and neuroeconomics. *Supreme Court Economic Review*, 13, 35–62.

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

Coase, R. H. (1992). The Institutional Structure of Production. *American Economic Review*, 82(4), 713–719.

Coursey, D. L., Hoffman, E., & Spitzer, M. L. (1987). Fear and Loathing in the Coase Theorem: Experimental Tests Involving Physical Discomfort. *The Journal of Legal Studies*, 16, 217–248.

Croson, R., & Johnston, J. S. (2000). Experimental Results on Bargaining Under Alternative Property Rights Regimes. *Journal of Law, Economics, and Organization*, 16(1), 50–73.

Cummings, R. G., Holt, C. A., & Laury, S. K. (2004). Using Laboratory Experiments for Policymaking: An Example from the Georgia Irrigation Reduction Auction. *Journal of Policy Analysis and Management*, 23(2), 341–363.

Davis, D. D., & Holt, C. A. (1993). *Experimental Economics*. Princeton, NJ: Princeton University Press.

Devine, D. J., Clayton, L. D., Dunford, B. B., Seying, R., & Pryce, J. (2000). Jury Decision Making: 45 Years of Empirical Research on Deliberating Groups. *Psychology, Public Policy, and Law*, 7(3), 622–727.

Dufwenberg, M., & Gneezy, U. (2000). Price Competition and Market Concentration: An Experimental Study. *International Journal of Industrial Organization*, 18, 7–22.

Engel, C., & Eisenberg, T. (2014). Assuring Civil Damages Adequately Deter: A Public Good Experiment. *Journal of Empirical Legal Studies*, Forthcoming.

Feddersen, T., & Pesendorfer, W. (1998). Convicting the innocent: The inferiority of unanimous jury verdicts under strategic voting. *American Political Science Review*, 92(1), 23–35.

Fischhoff, B. F. (1975). Hindsight ≠ Foresight: the Effect of Outcome Knowledge on Judgment under Uncertainty. *Journal of Experimental Psychology: Human Perception and Performance*, 1(3), 288–299.

Friedman, D., & Sunder, S. (1994). *Experimental Methods: A Primer for Economists*. New York, NY: Cambridge University Press.

Gibbons, J. D., & Chakraborti, S. (2003). *Nonparametric Statistical Inference* (4th ed.). New York: Marcel Dekker, Inc.

Gigerenzer, G., & Hoffrage, U. (1995). How to Improve Bayesian Reasoning Without Instruction: Frequency Formats. *Psychological Review*, 102(4), 684–704.

Gigerenzer, G., & Selten, R. (Eds.). (2001). *Bounded Rationality: The Adaptive Toolbox*. Cambridge, MA: The MIT Press.

Goeree, J. K., & Holt, C. A. (2010). Hierarchical Package Bidding: A Paper & Pencil Combinatorial Auction. *Games and Economic Behavior*, 70, 146–169.

Goeree, J. K., & Yariv, L. (2011). An Experimental Study of Collective Deliberation. *Econometrica*, 79(3), 893–921.

Goodman-Delahunty, J., Granhag, P. A., Hartwig, M., & Loftus, E. F. (2010). Insightful or Wishful: Lawyers' Ability to Predict Case Outcomes. *Psychology, Public Policy, and Law*, 16(2), 133–157.

Gould, J. P. (1973). The Economics of Legal Conflicts. *Journal of Legal Studies*, 2, 279–300.

Green, E. J., & Porter, R. H. (1984). Noncooperative Collusion under Imperfect Price Information. *Econometrica*, 52(1), 87–100.

Grether, D. M. (1992). Testing Bayes Rule and the Representativeness Heuristic: Some Experimental Evidence. *Journal of Economic Behavior & Organization*, 17(1), 31–57.

Guarnaschelli, S., McKelvey, R. D., & Palfrey, T. R. (2000). An experimental study of jury decision rules. *American Political Science Review*, 94(2), 407–423.

Guthrie, C., Rachlinski, J. J., & Wistrich, A. J. (2001). Inside the judicial mind. *Cornell Law Review*, 86, 777–830.

Harrison, G. W., & McKee, M. (1985). Experimental Evaluation of the Coase Theorem. *Journal of Law and Economics*, 28(3), 653–670.

Harrison, G. W., & List, J. A. (2004). Field experiments. *Journal of Economic Literature*, 42(4), 1009–1055.

Hoffman, E., & Spitzer, M. L. (1982). The Coase Theorem: Some Experimental Tests. *Journal of Law and Economics*, 25(1), 73–98.

Hoffman, E., & Spitzer, M. L. (1985). Entitlements, Rights, and Fairness: An Experimental Examination of Subjects' Concepts of Distributive Justice. *Journal of Legal Studies*, 14(2), 259–297.

Hoffman, E., & Spitzer, M. L. (1986). Experimental Tests of the Coase Theorem with Large Bargaining Groups. *Journal of Legal Studies*, 15(1), 149–171.

Holt, C. A. (2007). *Markets, Games, & Strategic Behavior*. Boston: Pearson Education, Inc.

Holt, C. A., Shobe, W., Burtraw, D., Palmer, K., & Goeree, J. K. (2007). *Auction Design for Selling CO2 Emission Allowances Under the Re-*

gional Greenhouse Gas Initiative (pp. 1–130). Retrieved from http://www.rggi.org/docs/rggi_auction_final.pdf.

Holt, C. A. (1995). Industrial Organization: A Survey of Laboratory Research. In J. H. Kagel & A. E. Roth (Eds.), *Handbook of Experimental Economics* (pp. 349–443). Princeton, NJ: Princeton University Press.

Holt, C. A., & Laury, S. K. (2013). Assessment and Estimation of Risk Preferences. In M. J. Machina & W. K. Viscusi (Eds.), *Handbook of the Economics of Risk and Uncertainty* (pp. 135–202). Amsterdam: Elsevier B.V.

Holt, C. A., & Smith, A. M. (2014). Belief Elicitation with a Synchronized Lottery Choice Menu that is Invariant to Risk Attitudes, Working Paper.

Holt, C. A., Johnson, C., & Schmitz, D. (2014). Prisoner's Dilemma Experiments. In M. Peterson (Ed.), *The Prisoner's Dilemma* (forthcoming). Cambridge, U.K.: Cambridge University Press.

Huck, S., Normann, H.-T., & Oechssler, J. (2004). Two Are Few and Four Are Many: Number Effects in Experimental Oligopolies. *Journal of Economic Behavior & Organization*, 53(4), 435–446.

Inglis, L., McCabe, K., Rassenti, S., Simmons, D., & Tallroth, E. (2005). Experiments on the Effects of Cost-Shifting, Court Costs, and Discovery on the Efficient Settlement of Tort Claims. *Florida State University Law Review*, 33, 89–117.

Kagel, J. H., & Roth, A. E. (Eds.). (1995). *Handbook of Experimental Economics*. Princeton, NJ: Princeton University Press.

Kahneman, D. (2011). *Thinking, Fast and Slow*. New York, NY: Farrar, Straus and Giroux.

Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1990). Experimental tests of the Endowment Effect and the Coase Theorem. *Journal of political Economy*, 98(6), 1325–1348.

Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1991). Anomalies: The Endowment Effect, Loss Aversion, and Status Quo Bias. *Journal of Economic Perspectives*, 5(1), 193–206.

Kahneman, D., Slovic, P., & Tversky, A. (1982). *Judgment under Uncertainty: Heuristics and Biases*. Cambridge: Cambridge University Press.

Kennan, J. & Wilson, R. (1993). Bargaining with Private Information, *Journal of Economic Literature*, 31(1): 45–104.

Klass, G., & Zeiler, K. (2013). Against Endowment Theory: Experimental Economics and Legal Scholarship. *UCLA Law Review*, 61, 2–64.

Koehler, J. J., & Kaye, D. H. (1991). Can Jurors Understand Probabilistic Evidence? *Journal of the Royal Statistical Society: Series A*, 154(1), 75–81.

Kornhauser, L., & Schotter, A. (1990). Experimental Study of Single-Actor Accidents. *Journal of Legal Studies*, 19(1), 203–233.

Landeo, C. M. (2014). Exclusionary Vertical Restraints and Antitrust: Experimental Law and Economics Contributions. In K. Zeiler & J. Teitelbaum (Eds.), *Handbook on Behavioral Law and Economics* (forthcoming). Edward Elgar.

Langton, L., & Cohen, T. H. (2008). *Bureau of Justice Statistics Special Report Civil Bench and Jury Trials in State Courts, 2005* (pp. 1–20). Washington, D.C.

Listokin, Y. (2010). The Meaning of Contractual Silence: A Field Experiment. *Journal of Legal Analysis*, 2(2), 397–416.

Loewenstein, G., Issacharoff, S., Camerer, C., & Babcock, L. (1993). Self-Serving Assessments of Fairness and Pretrial Bargaining. *Journal of Legal Studies*, 22(1), 135–159.

Lopatka, J. E., & Page, W. H. (2005). Economic Authority and the Limits of Expertise in Antitrust Cases. *Cornell Law Review*, 90, 617–704.

MacCoun, R. J. (1989). Jury Decision-Making. *Science*, 244(4908), 1046–1050.

Mandel, G. N. (2006). Patently Non-Obvious: Empirical Demonstration That the Hindsight Bias Renders Patent Decisions Irrational. *Ohio State Law Journal*, 67, 1391–1463.

McCabe, K., Houser, D., Ryan, L., Smith, V., & Trouard, T. (2001). A functional imaging study of cooperation in two-person reciprocal exchange. *Proceedings of the National Academy of Sciences of the United States of America*, 98(20), 11832–11835.

McCloskey, D. N. (1997). The Good Old Coase Theorem and the Good Old Chicago School: A Comment on Zerbe and Medema. In

S. G. Medema (Ed.), *Coasean Economics Law and Economics and the New Institutional Economics* (pp. 239–248). Boston: Springer.
McKelvey, R. D., & Page, T. (2000). An Experimental Study of the Effect of Private Information in the Coase Theorem. *Experimental Economics*, 3(3), 187–213.
Medema, S. G., & Zerbe, R. O. (2000). The Coase Theorem. In B. Bouckaert & G. De Geest (Eds.), *Encyclopedia of Law and Economics* (pp. 836–892).
Miller, R. G. (1997). *Beyond Anova: Basics of Applied Statistics*. Boca Raton: Chapman & Hall/CRC.
Palfrey, T. R., & Wang, S. W. (2009). On Eliciting Beliefs in Strategic Games. *Journal of Economic Behavior & Organization*, 71, 98–109.
Pogarsky, G., & Babcock, L. (2001). Damage Caps, Motivated Anchoring, and Bargaining Impasse. *Journal of Legal Studies*, 30(1), 143–159.
Priest, G. L., & Klein, B. (1984). The Selection of Disputes for Litigation. *Journal of Legal Studies*, 13(1), 1–55.
Rachlinski, J. J., Guthrie, C., & Wistrich, A. J. (2006). Inside the Bankruptcy Judge's Mind. *Boston University Law Review*, 86, 1227–1265.
Reinganum, J. F., & Wilde, L. L. (1986). Settlement, Litigation, and the Allocation of Litigation Costs. *RAND Journal of Economics*, 17(4), 557–566.
Rhoads, T. A., & Shogren, J. F. (1999). On Coasean Bargaining with Transaction Costs. *Applied Economics Letters*, 6, 779–783.
Roth, A. E. (1995). Bargaining Experiments. In J. H. Kagel & A. E. Roth (Eds.), *Handbook of Experimental Economics* (pp. 253–348). Princeton, NJ: Princeton University Press.
Sanfey, A. G., Rilling, J. K., Aronson, J. A., Nystrom, L. E., & Cohen, J. D. (2003). The Neural Basis of Economic Decision-Making in the Ultimatum Game. *Science*, 300(5626), 1755–1758.
Schotter, A., & Trevino, I. (2014). Belief Elicitation in the Lab. *Annual Review of Economics*, 6, forthcoming.
Schwab, S. (1988). A Coasean experiment on contract presumptions. *Journal of Legal Studies*, 17(2), 237–268.
Schwartz, G. T. (1978). Contributory and Comparative Negligence: A Reappraisal. *Yale Law Journal*, 87(4), 697–727.

Shapiro, C. (1989). Theories of Oligopoly Behavior. In R. Schmalensee & R. D. Willig (Eds.), *Handbook of Industrial Organization* (Vol. I, pp. 329–414). Amsterdam: Elsevier Science Publishers.

Shavell, S. (1982). Suit, Settlement, and Trial: A Theoretical Analysis under Alternative Methods for the Allocation of Legal Costs. *Journal of Legal Studies*, 11(1), 55–81.

Slovic, P., & Fischhoff, B. (1977). On the Psychology of Experimental Surprises. *Journal of Experimental Psychology: Human Perception and Performance*, 3(4), 544–551.

Smith, V. L. (1962). An Experimental Study of Competitive Market Behavior. *Journal of Political Economy*, 70(2), 111–137.

Smith, V. L. (1976). Experimental economics: Induced value theory. *American Economic Review*, 66(2), 274–279.

Solow, J., & Fletcher, D. (2006). Doing Good Economics in the Courtroom: Thoughts on Daubert and Expert Testimony in Antitrust. *Journal of Corporation Law*, 2006(Winter), 489–502.

Sonnemans, J., & van Dijk, F. (2011). Errors in Judicial Decisions: Experimental Results. *Journal of Law, Economics, and Organization*, 28(4), 687–716.

Spier, K. E. (1992). The Dynamics of Pretrial Negotiation. *Review of Economic Studies*, 59(1), 93–108.

Spier, K. E. (1994). Pretrial Bargaining and the Design of Fee-Shifting Rules. *RAND Journal of Economics*, 25(2), 197–214.

Stanley, L. R., & Coursey, D. L. (1990). Empirical Evidence on the Selection Hypothesis and the Decision to Litigate or Settle. *Journal of Legal Studies*, 19(1), 145–172.

Stigler, G. J. (1992). Law or economics? *Journal of Law and Economics*, 35(2), 455–468.

Sullivan, S. P. (2011). An Experimental Study of Settlement Delay in Pretrial Bargaining with Asymmetric Information. Dissertation: University of Virginia, UMI Pub. No. 3501713.

Sullivan, S. P. (2014). Why Wait to Settle? An Experimental Test of the Asymmetric Information Hypothesis (SSRN No. 2389642). Retrieved from http://ssrn.com/abstract=2389642

Thompson, W. C., & Schumann, E. L. (1987). Interpretation of Statistical Evidence in Criminal Trials: The Prosecutor's Fallacy and the

Defense Attorney's Fallacy. *Law and Human Behavior*, 11(3), 167–187.
Wittman, D., Friedman, D., Crevier, S., & Braskin, A. (1997). Learning Liability Rules. *Journal of Legal Studies*, 26, 145–162.
Wrobel, G. G., & Meriwether, E. (2010). Economic Experts: The Challenges of Gatekeepers and Complexity. *Antitrust*, 25(3), 8–12.
Wu, D.-A., Shimojo, S., Wang, S. W., & Camerer, C. F. (2012). Shared visual attention reduces hindsight bias. *Psychological Science*, 23(12), 1524–33.
Zerbe, R. O. J., & Medema, S. G. (1997). Ronald Coase, The British Tradition, and the Future of Economic Method. In S. G. Medema (Ed.), *Coasean Economics Law and Economics and the New Institutional Economics* (pp. 209–238). Boston: Springer.
Zipursky, B. C. (2007). Sleight of Hand. *William and Mary Law Review*, 48, 1999–2041.