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# A New Experiment on Rational Behavior

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# A NEW EXPERIMENT ON RATIONAL BEHAVIOR

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# Abstract

Behavioral economics is widely recognized as a rising field in economics, one whose discoveries and implications are not yet completed or understood. At the same time, economic theory plays an enormous role in our governmental and legal system. In particular, the Coase Theorem and its implications have affected nearly every area in the field of law and economics. This paper proposes a experimental test of Coasean bargaining in situations using two competitive players whose payoffs depend on minimizing their costs of mitigating the externality. A rational player's action can be predicted ahead of time, and the rationality of the game's outcome can be objectively measured. If behavioral effects found in consumer goods situations by other experimenters carry over to competitive business situations, then a substantial review of law regarding such situations is in order.

Keywords: Behavioral Economics, Coase Theorem, Externalities, Law

REFERENCE LIST

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# Abbreviations

| | |
|---|---|
| CT | Coase Theorem |
| EE | Endowment Effect |
| CU | Choice Uncertainty |
| TU | Trade Uncertainty |
| WTP | Willingness to Pay |
| WTA | Willingness to Accept Compensation |

# Introduction

Economic theory is not an obvious part of our everyday life. Very few people can easily name an economist, and even fewer can name anyone other than Milton Friedman and Paul Krugman. But classical economic theory has pervasively shaped every part of our government, economic, and law system. American society is built on trusting the invisible hand to guide our markets and efficiently allocate our scarce resources. Our government, particularly the bill of rights, was founded on the belief that restricting the power of the government to regulate our personal and economic behavior leads to better outcomes. And our legal system, while heavily based on tradition and precedent, is also predicated on promoting economic efficiency and competition.

Therefore, advances in economic theory have a enormous long term effect on our country; each small new discovery, each time a theory is significantly altered, starts a process that can completely redefine a law, an industry, or even the entire economy. While this process can decades, it is critical to keeping our economy efficient and creating the correct incentives for businesses and individuals. No single idea has had a greater impact on the economic analysis of law than the Coase Theorem ("CT"); its implications can be felt in every major area of law where the prerogative is balancing the incentives of parties to create economic efficiency, including but not limited to property

law[1], tort law[2], product liability[3], nuisance law[4], intellectual property[5], environmental law[6] divorce law[7].

However, CT rests on the assumption that both parties involved in bargaining are not systematically irrational. The explosion of the field of behavioral economics has created much support for the theory that not only do humans vary dramatically with respect to economic decisions, they are systematically irrational. The finding of many researchers, led by Kahneman and Tversky (1979), is that humans are systematically loss and risk averse, preference inconsistent, and highly attached to their initial state[8].

Out of these irrationalities grow a number of well-defined and documented biases. The endowment effect, in particular, has been considered a striking problem for the Coase theorem. The endowment effect ("EE"), which simply states that as soon as a party establishes ownership of a good, their valuation of it jumps by a significant amount, would hinder rational bargaining from taking place, as each party would overvalue their assets relative to the other person's assets. But until now, these experiments, especially the ones studying EE have focused on tangible consumer goods, not rights and products

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[1] Posner, Richard A., and Francesco Parisi. 2002. "The Economic Foundations of Private Law: An Introduction." In Economic foundations of private law, ix-xxix. Elgar Critical Writings Readers., 2002.
[2] Medema, Steven G. 1995. The legacy of Ronald Coase in economic analysis. 2 vols. Intellectual Legacies in Modern Economics series., 1995.
[3] Sykes, Alan O., ed. 2007. Economics of Tort Law. 2 vols. Economic Approaches to Law, vol. 11. An Elgar Reference Collection., 2007.
[4] Rosenthal, Leslie. 2007. "Economic Efficiency, Nuisance, and Sewage: New Lessons from Attorney-General v. Council of the Borough of Birmingham, 1858-95." Journal of Legal Studies 36, no. 1: 27-62.
[5] Besen, Stanley M., Willard G., Jr. Manning, and Bridger M. Mitchell. 2002. "Copyright Liability for Cable Television: Compulsory Licensing and the Coase Theorem." In The economics of intellectual property. Volume 1. Introduction and copyright, 495-523. International Library of Critical Writings in Economics, vol. 145., 2002.
[6] Bartsch, Elga. 1998. Liability for environmental damages: Incentives for precaution and risk allocation. Kieler Studien 292., 1998.
[7] Wickelgren, Abraham L. 2009. "Why Divorce Laws Matter: Incentives for Noncontractible Marital Investments under Unilateral and Consent Divorce." Journal of Law, Economics, and Organization 25, no. 1: 80-106.
[8] Kahneman, Daniel, and Amos Tversky. 1979. "Prospect Theory: An Analysis of Decision under Risk." Econometrica 47, no. 2: 263-291.

in a competitive business situation.

# Part I: The Importance of Coase

## The Coase Theorem

Published in 1960, Ronald Coase's paper, "The Problem of Social Cost", instantly became a magnet for criticism[9]. It simultaneously challenged the standard assumption in welfare economics that Pigouvian taxes were the most efficient solution for internalizing externalities, as well as redefining the problem in such a way that all analysis was forced to change. First and foremost, Coase was interested in economic efficiency; he did not dispute that in many cases Pigouvian taxes were efficiency maximizing, but merely demonstrated that there is a class of cases in which it is not. He also demonstrated some serious flaws in Pigouvian reasoning, first and foremost the assumption that the cost of an externality should always fall squarely on the producer.

Before Coase, externalities were viewed primarily as a cost that should be internalized by the producer in order to ensure the optimal amount of production would take place. Coase demonstrated that in fact the problem is reciprocal; the producer's externality clearly harms the second party, but without the second party, no harm occurs. Therefore the presence of the second party harms the producer. If the goal of the court is to promote social welfare, it must determine which side creates more social value through

[9] Coase, R. H. 2009. "The Problem of Social Cost." In Economics of Environmental Law. Volume 1. Theoretical Foundations, 3-46. An Elgar Reference Collection. Economic Approaches to Law, vol. 22. Cheltenham, U.K. and Northampton, Mass.: Elgar,

their activity, and force the other side to bear the cost. This, not the observation that in some cases regulation is not the best answer, is the true value of his paper.

In some cases, like pollution, the harm of the externality is unavoidable and spread over the population. But in some cases, especially in which the externality takes place only between two parties, internalizing the externality is not so simple. In Coase's first example, the very famous case of Sturges v. Bridgman (1879), we can see that the externality comes into existence as a result of both parties' actions. In this case, a confectionary had long been operating across a courtyard from a doctor's office[10]. The doctor, wishing to service more patients, added a shed adjoining the wall to be used as an examining room. The shed became unusable because the noise and rumbling from the confectionary was too great. Coase argues that the court's ruling, rather than being based on the fact that the confectionary was causing the externality, should have been whether the value of the additional doctoring warranted the cost of the confectionary mitigating the noise and rumbling, through moving operations or other means.

Common to most criticisms of the Coase theorem is that some part of the theorem does not actually represent the situation it purports to study; in many cases these are situations Coase himself addressed, and these will not be treated as real objections to the theory. For example, transaction costs are clearly part of the real world, but in different situations these transaction costs can range from prohibitive to almost unnoticeable. Therefore claiming the Coase theorem is invalid on the grounds it doesn't account for transaction costs is not a true objection to the theory. However, there do exist numerous objections to the Coase theorem, both to its internal logic and its practicality in the real

[10] The Story of Sturges v. Bridgman: The Resolution of Land Use Disputes Between Neighbors' in G Korngold and AP Morriss, *Property Stories* (2nd edn Foundation Press, New York 2009)

world. However, for such an objection to be truly useful, it must not also apply in equal measure to any other alternative. For example, a problem that invalidates both the Coase theorem and Pigouvian taxes does not inform us about which is the optimal solution when choosing between the two, it only proves that neither solution is perfect.

Andrew Halpin (2007) attempts to disprove the fundamental assumption of the Coase theorem by arguing that in three situations, the Coase theorem does not hold true even under the assumption of perfect information and no transaction costs[11]. His objection centers on the fact that Coase did not address the presence of economic rents in his theory. He poses three situations in which this poses trouble for the Coase theorem; first, if the side that must compensate currently derives no economic rent, then compensating is economically worse than abandoning their current activity and pursuing the second best alternative. Second, in situations where the rent is exactly equal for both sides and are less than the damage caused by the externality, then legal rules, by default, determine the person who continues their activities. And finally, if the loss of rents force one side to halt activity, then the externality will still potentially be imposed on the next user of the land.

First, in a perfect competition situation in which neither party is receiving an economic rent from their activity, the necessity of buying the externality right or compensating the economic party will push the margin of that party below the point at which switching to another activity is more profitable. This first situation fails for a litany of reasons, most importantly of which is the assumption that the parties have no idea, a priori, what the cost of the externality would be. In a world in which information is

[11] Halpin, Andrew. 2007. "Disproving the Coase Theorem?." Economics and Philosophy 23, no. 3: 321-341.

perfect, as assumed by the Coase theorem, each party would know the legal rule regarding their case, and would take into account the cost their liability might impose. Second, in this situation, pigouvian taxes or an established legal rule create the exact same problem; therefore this objection fails to provide a better framework for determining a solution.

Both his second and third objections fail this problem as well; while we might prefer a legal or government intervention to determine which activity is the most socially valuable, our courts and government tend to take the view that the producer of the externality should bear its costs, ignoring the reciprocal problem that Coase explained in his work. While a government intervention may eventually become necessary if dealing with the cost of the externality would force either to become unprofitable, this situation seems likely in only a small number of cases.

## Law and Coase

Product liability law is an excellent example of how changes in business practices and consumer demographics require a commensurate shift in law for the industry to remain efficient. “Caveat Emptor”, colloquially known as “buyer beware”, was at one time an economically efficient legal setting for product liability. Before the industrial revolution, almost all goods were handmade and sold person-to-person, while written contracts were only the norm for high-end goods, and goods were technologically simple enough that a learned intermediary was unnecessary. Because of this, the law dictated that all liability for malfunction lay on the part of the consumer; they were expected to have sufficient knowledge of the product to spot defects. As mass production become

more commonplace and goods became too complicated for a layman to sufficiently inspect, contracts became the standard business practice. The doctrine of privity, in which suit could occur only over breach of contract, became the law.

The case McPherson v. Buick Motor Co. (1916) was the first to mark a dramatic shift to emphasizing consumer protection[12]. The plaintiff, McPherson, had bought a Buick car from a dealer, with whom he had a contract. The Buick, which had been defectively made, underwent a wheel collapse, injuring the plaintiff. He brought suit against the Buick Motor Co. even though he did not have a contract with them, claiming that they were the least cost avoider of the accident and had made a defective product, and should therefore be liable for the accident. The court upheld that a reasonable inspection by Buick Motor Co. could have avoided the accident, and thus there were guilty of negligence. This began the shift from doctrine of privity to one of producer negligence. The courts decided that the producer was the lowest cost avoider, not the buyer or the intermediary.

Escola v. Coca-Cola Bottling Co. (1944) marked the final major evolution in liability law[13]. Escola, a waitress, was putting away bottles of Coca-Cola when one of the bottles spontaneously exploded in her hands. Although the lower courts found for the plaintiff on the grounds that the company had been negligible in not testing the bottles properly, Justice Traynor of the California Supreme Court wrote a concurrent opinion claiming that in almost all cases, the manufacturer was better equipped to deal with the externalities of its product and was the least cost avoider of injurer. Furthermore, because any increase in testing/design costs could be distributed to the public through price

[12] 161 A.D. 906 145 N.Y.S. 1132 1914 N.Y. App. Div.
[13] 150 P.2d 436 (Cal. 1944).

increases, imposing strict liability would far more often lead to the socially optimal level of output in an industry. This would be accepted by the California Supreme court in Greenman v. Yuba Power Products Inc. (1963) and would standard law in the United States and internationally[14].

Underlying all these shifts is the topic of this paper- externalities. Product liability was designed, and changed, to attempt to internalize the cost of malfunction most efficiently. When goods were simple and contracts were uncommon, consumers were the least cost avoider. When contracts become common and technology became moderately complex, producers were held liable for breach of contract, and we saw a Coasean bargaining situation in which individually determined contracts were the standard. When learned intermediaries and distributors became necessary and technology reached a level beyond the understanding of most consumers creating information asymmetry, it was decided that producers were most often the least cost avoider for harm, and that consumers were not informed enough to make optimal decision. Therefore a law of producer negligence became standard. Finally, once technology had reached a level beyond almost all consumers, and companies were often quite distant from their consumers because of intermediaries, strict liability became the most economically efficient way to internalize the cost of malfunction.

There are two main drivers of change in law: recognizing that the industry and its interaction with consumers has changed and the application of new research to reevaluate existing rules. Product Liability is a clear example of the former; as the market changed, the rules changed to maintain efficiency. Reevaluation is usually a slow process; in many cases, the existing rules are not inefficient enough to draw significant attention to their

[14] 59 Cal. 2d 57, 377 P.2d 897,27 Cal. Rptr. 697, 1963 Cal.

problems, and may take decades to change. In other cases, when a particularly egregious case or enormous inefficiency has occurred, change can occur almost instantaneously. On the other hand, new research often causes significant reevaluation of past analysis, but such reevaluation can take considerable time, and the change can only affect future decisions. Sometimes, however, a particular field or finding takes the world by storm, drawing significant attention and potentially creating enormous change.

Behavioral economics represents the latter, and for the purposes of creating change in our legal and governmental system, this may actually be a handicap. As a field, behavioral economics is in its infancy; most research has been in consumer purchasing decisions or how altruism and notions of justice affect decision-making and potential applications based on experimental evidence is limited. But the mainstream success and popularity of books like "Freakanomics"[15] and "Predictably Irrational"[16] has created the perception that the field is far more developed than it actually is. Overzealous interpretations and extrapolations of theories with little or no experimental evidence can cause rejection of the field in its entirety and hinder true developments.

The true flaw behind the Coase theorem is not the presence of transaction costs; Coase was well aware of this issue and addressed it thoroughly. Rather, we must focus on the actual parties in negotiation. If the sides, even under perfect conditions, are unable to adequately reason and bargain, then courts must intervene for the sake of economic efficiency. In particular, the initial owner of a legal right must not overvalue its utility, and neither side can overvalue their production because of EE.

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[15] Levitt, Steven D., and Stephen J. Dubner. 2005. *Freakonomics: a rogue economist explores the hidden side of everything*. New York: William Morrow.
[16] Ariely, Dan. 2008. *Predictably irrational: the hidden forces that shape our decisions*. New York, NY: Harper.

# Part II: Behavioral Economics

## Behavioral Economics

Behavioral economics is the "newest" and most innovative field in economics, although it really represents a return to studying the "animal instincts" Keynes so famously referred to[17]. The underlying assumption behind most behavioral economics research is that the classical rational expectations model does not accurately describe behavior at the individual level or the aggregate level. While this may be thought of as attacking a straw man, most macroeconomic theory is built on the belief that at the aggregate level, people act rationally.

This distinction is very important; very few people would claim that a rational utility maximizing model could describe every individual. But it could accurately describe a population, if non-rational behaviors were randomly distributed around a rational mean. For example, consider a population in which 100 people are risk neutral, 50 are risk takers, and 50 are risk avoiders; this means, on average, the entire population is risk neutral, the "rational" view. The same could occur for a large number of other characteristics considered irrational. And if true, it would mean that we could indeed be safe in assuming people are rational at the macroeconomic level.

But, as numerous researchers have found, people are not only irrational

[17] Keynes, John Maynard. 2008. "The General Theory of Interest, Employment and Money." In Financialization at Work: Key Texts and Commentary, 75-81. London and New York: Taylor and Francis, Routledge,.

individually but are systematically irrational at the population level. Humans, on average, are risk averse, loss averse, attached to initial wealth levels, susceptible to framing effects, and future discounting. Not only that, they consistently display inconsistent time preferences; that is, their preferences change over time, even in remarkably short periods of time. The general evidence for deviation from the rational expectations model of decision-making is nearly overwhelming and, in time, these findings will have an enormous effect on public policy.

But not yet; most experimental evidence in behavioral economics is focused in a distinct area; purchasing decisions and valuations for consumer goods. Furthermore, the situations simulated in these experiments are usually low pressure and involve only goods of low value; while the experiments are insightful and have laid the foundation for further research, their narrow focus means we cannot truly apply these insights to a broader spectrum of problems. New experiments need to be more complex to test real world situations, and they need to expand beyond consumer product purchasing to have a lasting impact on our legal and economic foundations. While archival studies like those does in *Freakanomics*[18] are valuable and point out policy problems, they often are not experimental tests and are limited in the conclusions one can draw. Of all the studies done so far, the most important and applicable are those studying the effect of status quo on decision-making, but these only inform us about a small range of human behavior. But to understand and reevaluate the rules and laws regarding property, externalities, and contracts, a great deal of research and experimentation remains to be done.

[18] Levitt, Steven D., and Stephen J. Dubner. 2005. *Freakonomics: a rogue economist explores the hidden side of everything*. New York: William Morrow.

## Prospect Theory

Prospect theory and other models of decision making that conflict with rational decision theory have undoubtedly improved our understanding of decisions at the individual and group level. Insights like the status quo bias[19], loss aversion[20], and risk aversion[21] have made formerly puzzling phenomenon easy to explain and manipulate. More importantly, these insights have led to changes in the real world. Some, like making contribution the default option for workers' 401K[22], have undoubtedly been good for individuals and society. Some, like overzealous rejection of the Coase theorem on "irrationality" grounds, have been over extensions of theories without experimental evidence.

There are three qualities that distinguish the experimental literature. First, participants in prospect theory literature are usually in non-competitive situations. Second, the experimental literature primarily deals with consumer goods, not with investments, capital goods, or legal rights. Finally, the experimental literature focuses on maximization of individual utility, not corporate decision-making. But these three characteristics, while shedding a great deal of light on consumer buying habits, disqualify most research from being applicable in law and economics or in corporate settings.

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[19] Kahneman, Daniel, Jack L. Knetsch, and Richard H. Thaler. 1999. "Anomalies: The Endowment Effect, Loss Aversion, and Status Quo Bias." In Environmental valuation. Volume 1.Methods and anomalies, 381-394. Elgar Reference Collection. Environmental Analysis and Economic Policy, vol. 3., 1999.

[20] Kahneman, D., Knetsch, J., & Thaler, R. (1990). Experimental Test of the endowment effect and the CoKahneman, Daniel, Jack L. Knetsch, and Richard H. Thaler. 1990. "Experimental Tests of the Endowment Effect and the Coase Theorem." Journal of Political Economy 98, no. 6: 1325-1348.

[21] Arrow, K.J. 1965, "The theory of risk aversion," in Aspects of the Theory of Risk Bearing, by Yrjo Jahnssonin Saatio, Helsinki. Reprinted in: Essays in the Theory of Risk Bearing, Markham Publ. Co., Chicago, 1971, 90-109.

[22] Choi, James J.; Laibson, David; and Madrian, Brigitte. 2004. "Plan Design and 401(k) Savings Outcomes," National Tax Journal 52(2) 275-298.

Kahneman and Tversky (1974)[23] and (1978)[24] were the seminal papers of prospect theory; through a series of simple experiments on students in their classes, which were later run on students at Harvard Business School, they found consistent, statistically significant deviations from the rational choice model of decision-making. They pinpointed the four areas in which irrationality seems prevalent and consistent: loss aversion, risk aversion for gains but risk seeking for losses, framing effects, and fixation on their initial endowment, not total wealth levels. Finally, they found that, from their initial endowment, people feel diminishing marginal utility from gains and losses.

First and foremost, they found that people are systematically loss averse. In a series of studies, they found that each dollar of loss, psychologically, is felt as powerfully as one and a half to two dollars of gain. This has major implications for legal policy, because it means that, on average, people are loss averse when it comes to trade or investments (when it is their own money). For the Coase theorem specifically, this factor becomes more and more powerful as the participants have less information.

Second, they found that people are risk seeking for losses and risk averse for gains. When given a choice between a low probability of high losses or no change and a high probability of low losses or no change, even when the high-probability, low-loss, option has a slightly better expected value, people overwhelmingly choose to gamble for the chance to preserve their initial endowment. This can be explained by the finding that people have diminished sensitivity as they move further from their initial endowment and in the realm of losses, they try hardest to avoid any loss at all, but as losses mount, the

[23] Tversky, Amos, and Daniel Kahneman. 1993. "Judgment under Uncertainty: Heuristics and Biases." In Economics and psychology, 433-440. Elgar Reference Collection series. International Library of Critical Writings in Economics, vol. 26., 1993.
[24] Kahneman, Daniel, and Amos Tversky. 1979. "Prospect Theory: An Analysis of Decision under Risk." Econometrica 47, no. 2: 263-291.

pain lessens. Therefore they prefer to risk a small probability of a large loss than a high probability of a small one. However, when Kahneman and Tversky inverted this decision so that participants were facing with a high probability of a small gain and a low probability of a large gain, participants overwhelmingly chose the high probability small gain. Once again, because participants are fixated on their initial endowment and have diminished sensitivity as they move away from it, they preferred the high probability of a small gain over the small possibility of a large one.

Third, and perhaps most importantly, Kahneman and Tversky (1981)[25] found that the way information is framed can vastly change the decision made by participants. In their most famous example, they gave participants two alternative solutions for a disease affecting a hypothetical population of 600 people. Option A saves 200 people's lives, while option B has a 33% chance of saving everyone but a 66% chance of saving no one. In this format, 72% of participants chose the conservative option. But when they posed the exact same scenario, with the wording changed in option A to 400 people will die, and option B to a 33% chance no one will die and a 66% chance 600 people will die, 78% of people chose the risky option. By changing the frame from positive, "saving lives", to negative "will die", they had a complete reversal of preference. This has major implications in law and economics; if a company or court knows that it can induce a reversal of preference by restating the exact same condition as a loss rather than gain, and vice versa, then optimal decision making by participants becomes nearly impossible.

[25] Tversky, Amos, and Daniel Kahneman. 2003. "The Framing of Decisions and the Psychology of Choice." In Experiments in environmental economics. Volume 2, 173-178. International Library of Environmental Economics and Policy., 2003.

Joles (2000)[26] explores how behavioral economics could impact law. As she states, when Kahneman and Tversky performed their original experiments on the endowment effect using tokens with pure monetary values, they found that participants traded at exactly the rate and level predicted by the Coase theorem, "a striking vindication of the Coase theorem", but then goes on to posit that "The conventional normative analysis... cannot survive in the presence of [the endowment effect])." This, while being absolutely true, is not yet supported by experimental literature. The key characteristic in experiments vindicating the Coase theorem is that the experimenters specified the value of the goods being traded.

Externalities vary greatly in how easy it is to price them; the greatest problem the government grapples with in regulating externalities is placing an accurate price on them, and handling variations in that value as market conditions change. However, in a Coasean bargaining situation between two actors, information is assumed to be perfect, and even in a situation without perfect information, it is expected that both sides will have an accurate idea about the value of the externality to their production, and that through negotiation or forced reimbursement, the other side will make their valuation of the externality clear. Second, as discussed earlier, an externality right may be viewed in the same light as an investment or capital good; it is a tool to make more money- a means, not an end. Because defined prices, in general, improve rational decision making, goods in which private bargaining can discern the price easily will tend to also exhibit more rational behavior from the bargainers.

Experimenters also found that tangibility is a very important factor in the

[26] Jolls, Christine. 2000. "Behavioral Economic Analysis of Redistributive Legal Rules." In Behavioral law and economics, 288-301. Cambridge Series on Judgment and Decision Making., 2000.

activation of the endowment effect. According to Peck and Shu (2009)[27], "One feature of nearly all endowment effect experiments is that the buyers (nonowners) and the sellers (owners) have the opportunity to physically hold the object being traded." According to Wolf, Arkes, and Muhanna (2008)[28], increasing the duration of physical contact with an item raised the bids placed by subjects on that item. This effect has been replicated with many goods, including chocolate bars, lottery tickets, mugs, and pens. (Knetsch and Sinden 1984; Franciosi et. al 1996; Kahneman et. al 1990; Johnson et. al 1993). However, in a Coasean situation, the legal right is an intangible asset; it remains to be seen if such as asset is also subject to the same effect as a good like a mug would be.

Engelmann and Hollard (2009)[29] propose a different way to interpret the endowment effect. In functioning markets, they propose the endowment effect occurs because of two factors: choice uncertainty ("CU") and trade uncertainty ("TU"). CU occurs when participants are uncertain about the relative value of their choices, while TU occurs because of risk and uncertainty about transaction costs and the rules governing the market. In a Coasean bargaining situation, both participants are assumed to have perfect information about their production function, the other participant's production function, and the cost of the externality; therefore choice uncertainty is not a valid factor. As well, in a Coasean bargaining situation there are no transaction costs, and either the rules of the market are clearly defined by the courts or there is an absence of a rule, meaning participants must bargain or the externality will continue unabated. Therefore trade

[27] Peck, Joann, and Suzanne B. Shu. 2009. "The Effect of Mere Touch on Perceived Ownership." Journal of Consumer Research 36, no. 3: 434-447.
[28] Wolf, James R., Hal R. Arkes, and Waleed A. Muhanna. 2008. "The Power of Touch: An Examination of the Effect of Duration of Physical Contact on the Valuation of Objects." Judgment and Decision Making 3, no. 6: 476-482.
[29] Engelmann, Dirk, and Guillaume Hollard. 2009. "A Shock Therapy Against the 'Endowment Effect'." 22 pages.

uncertainty is also not a factor. However, in a Coasean situation where information is imperfect or distributed asymmetrically, it is possible that participants will act in ways to mitigate CU and TU. But if both sides must make their true valuations clear through negotiation or via court, then this effect would likely diminished. As long as both parties are forced to bargain openly and in good faith, these particular problems should not be a hindrance.

Plott and Zeiler (2004)[30] believe that the robustness of the endowment effect is not as settled by experimental literature assumes it to be, and believes that the gap found between willingness to pay ("WTP") and willingness to accept ("WTA") might be dependent on the specific conditions employed by the experimenter in question. Specifically, they believe the problem is due to misconceptions the subjects may have about the conditions of the experiment in which they take part; they believe that only by eliminating subject misconceptions can a definitive experiment take place. They first replicate an experiment from Kahneman, Knetsch and Thaler (1990)[31] on two sets of undergraduates and find essentially the same results as the original experiment.

They then ran their own experiments with three key differences: complete anonymity, paid practice, and a demand revealing elicitation device. After inserting these three controls to insure that the participants had no misconceptions about the experiment or the demand elicitation process, they found no significant difference between WTA and WTP. This experiment shows that what we think of as an endowment effect might merely reflect the two variables hypothesized in Engelmann and Hollard (2009), choice

[30] Plott, Charles R., and Kathryn Zeiler. 2002. "The Willingness to Pay/Willingness to Accept Gap, The 'Endowment Effect' and Experimental Procedures for Eliciting Valuations."
[31] 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, no. 6: 1325-1348.

uncertainty and trade uncertainty. I believe that these variables mirror those established by Plott and Zeiler; anonymity, practice, and a demand recealing solicitation device all reduce choice uncertainty. In our experiment, the rules under which the participants bargain are clearly explained, reducing trade uncertainty, and in real life the law would serve the same purpose.

# Part III: The Experiment

## Purpose

The concept behind the experiment is built off two examples used by Coase (1960), a rancher whose livestock impose an externality on an adjoining farmer, and a railroad company whose railroads occasionally cause sparks that damage a farmer's crop. Aspects from both of these experiment have been taken to fully explore the topic. The experiment is meant to mirror a perfect Coasean bargaining situation; both participants have complete information, are aware of what the legal rule is if they do not come to an agreement, and neither has any transaction costs short of the time spent within the experiment. The experiment will run for five rounds, with each player repeating their role in each round, but having to adapt to changing legal rules. Experience should ensure that by the fifth round, both participants have a fundamental grasp of their production function, the other participant's production function, and the cost of the externality. If inefficient bargaining outcomes, especially bargaining that seems to exhibit the endowment effect, is still found by the fifth round then this would indicate that behavioral effects, rather than any other factor, is the underlying cause of the deviation. The order of the rules is randomized, meaning that experience effects will occur equally for each condition.

## Design

The primary experiment is designed to see if participants' behavior deviates from the rational outcome that should be expect in a Coasean bargaining situation. Two participants take part in a game in which their final payoff is primarily determined by their choices with their resources and their bargaining with each other. One participant is a farmer, denoted as F, and one participant is a rancher, denoted as R. The game will take place anonymously on computers separated in different locations so that neither player ever know whom they are playing with. Their land and the other player's land will be visible on the computer screen to increase tangibility and understanding of the situation, and participants will use a chat box to negotiate before they make their production decisions. In the primary version, each will have full knowledge of their production function, the other player's production function, the legal right each has, and the full range of options available, mirroring a perfect Coase situation.

Each participant can utilize their land to produce a good; the farmer can choose between two crops, a high-yield wheat crop that is hurt by the rancher, or a low yield potato crop that is totally resistant, but he can only choose to plant one of the two. The rancher can rise up to five head of cattle on his land, with diminishing returns to scale so that the marginal cost of the fifth head is exactly equal to the marginal revenue he receives from it. Each head of cattle on the ranch increases the externality imposed on the farmer at an increasing rate, reflecting the increasing number of cattle that will seek to graze on the farmers land. Finally, both participants receive a small and equal payoff from "land appreciation" each turn.

In the absence of externalities, the rancher would choose to raise five head of

cattle and the farmer would choose to use his entire land to farm wheat, maximizing their individual payoffs. There are six possible solutions to remove the externality: either the farmer or the rancher can shut down, a fence can be erected at X cost, the farmer can plant potatoes instead of wheat, the farmer can pay the rancher to reduce the externality, or the rancher can reimburse the farmer for the damage his cattle does. In the conditions currently designed, shut down for either the farmer or rancher will never be efficient. In only one case will it be close to efficient for rancher-farmer reimbursement to occur, meaning that the bargainers realistically have three options to choose from in each case.

## Payoffs

In the first scenario, the farmer has the property right, meaning the rancher is enjoined from causing an externality, or the farmer can accept compensation. The farmer's payoff is P(f)=V(c)-X+V(r)+A(p), where V(c) is the final value of his crops, X is the externality imposed, and V(r) is the reimbursement the rancher may make, in whatever form, the rancher pays, and A(p) is the appreciation of his property. The rancher's payoff is P(r)=V(ca)-R(r)+A(p)-C(e), where V(ca) is the final value of his cattle, V(r) is the reimbursement he pays to the farmer, A(p) is the appreciation of his property, and C(e) is the cost of whatever solution he uses to mitigate the externality. The total social value is P(r)+P(f)+C(f), where C(f) is the cost of a fence if one is built.

In this scenario, if behavior is optimal, then the rancher will end up with a profit of $150. He has two ways to mitigate the externality; he can reduce his production down to 2 head of cattle and reimburse the farmer for $200 in damages from the externality, or he can raise 4 or 5 head of cattle and build a fence for $350, leaving him with a profit of

$500-$350=$150. A rational farmer will always grow wheat in this scenario. From the social point of view, it would preferable that a fence is built, bringing total social product to $3850, the production of the farmer, rancher, and the cost of the fence.

In the second scenario, the rancher has the property right, he can choose to ranch at whatever level he wishes, and the farmer can pay for a solution or take on the full externality cost. In such a scenario, the farmer's payoff is P=V(c)-[X or C(e)]-P(r)+A(p), where all variables are the same except C(e) is the cost of the solution the farmer takes. The rancher's payoff is P=V(ca)+A(p)+P(f), where all variables are the same except R(f) is the payment the farmer may make to him/her. The total social value is P(r)+P(f)+C(f), where C(f) is the cost of a fence if one is built.

In this scenario, if behavior is optimal, the farmer will make a profit of $150. He has three options; he can pay the rancher $150 to reduce his production to two steers, which would create an externality of $200, causing a total cost of $350, leaving him with a profit of $150. The rancher's profit will always be $500, either by reducing production to 2 steers and being compensated by the farmer, or by raising five steers if the farmer builds a fence. From the social point of view, it would preferable that a fence is built, bringing total social product to $3850, the production of the farmer, rancher, and the cost of the fence.

In the third scenario, the farmer has the liability right, meaning that the rancher is liable for any damage done to his land, but he cannot enjoin the rancher from continuing to impose the externality. Therefore, the farmer's payoff is P=V(c)-X+V(r)+A(p). The rancher's payoff is P=V(ca)-C(e)-V(r)+A(p). The total social value is P(r)+P(f)+C(f),

where C(f) is the cost of a fence if one is built.

This scenario creates the same condition as the first; if behavior is optimal, then the rancher will end up with a profit of 150. He has two ways to mitigate the externality; he can reduce his production down to 2 head of cattle and reimburse the farmer for $200 in damages from the externality, or he can raise 4 or 5 head of cattle and build a fence for $350, leaving him with a profit of $500-$350=$150. A rational farmer will always grow wheat in this scenario. From the social point of view, it would preferable that a fence is built, bringing total social product to $3850, the production of the farmer, rancher, and the cost of the fence.

In the fourth scenario, the rancher has the liability rule. In this case, the rancher can be enjoined to stop his externality by the farmer, but the farmer must pay restitution for the rancher's course of action. In such a case, the farmer's payoff is P=V(c)-V(r)+A(p), where V(r) is the payment made to the rancher as restitution. The rancher's payoff is nominally P=Ca(v)+A(p)+R(f)-C(e), but because C(e) and R(f) are equal in value, the payoff is actually P=Ca(v)+A(p). The total social value is P(r)+P(f)+C(f), where C(f) is the cost of a fence if one is built.

In this scenario if behavior is optimal, the rancher will spend $350 on a fence and be reimbursed by the farmer, leaving the farmer with $150 in profit and the rancher with $500. Alternatively, as outlined in scenario two, the farmer can force the rancher to reduce his production to 2 steers, but must reimburse him for the lost profit, a total of $150, which would create an externality of $200, creating a total cost of $350 and leaving his profit at $150. From the social point of view, it would preferable that a fence is built,

bringing total social product to $3850, the production of the farmer, rancher, and the cost of the fence.

In the fifth scenario, neither side has an externality right, introducing a condition of imperfect information. Rather, they only know that if they do not reach a compromise, there is a 50% chance the rancher will be forced to reimburse the farmer and a 50% chance the farmer will have to bear the cost of the externality. If the two do not reach a bargain, the payoff of the farmer is P(f)=V(c)-.5C(e)-C(p)-C(s)+A(p), where C(p) is the payment he makes to the rancher and C(s) is the cost of whatever solution might be taken. The rancher's payoff is P(r)=V(r)-.5C(e)-C(p)-C(s)+A(p). The total social value is P(r)+P(f)+C(f), where C(f) is the cost of a fence if one is built.

In this case, the optimal course of action is for the two players to pool their resources and collaboratively construct the fence; this would cost each $175 in profit, leaving them both with $325 in profit. In this case, the socially optimal outcome is the only optimal outcome; a total of $3850 will be produced.

## Experimental Conclusions

Under these conditions, a fence is always the preferable option from a social point of view, and in fact, the same outcome occurs in all scenarios, with wealth levels only changing depending on what legal right defines the transaction. However, if conditions were tweaked, for example if the fence cost $400 instead of $350, then every scenario except the fifth would change. Under the scenarios where the farmer has the right, the rancher would have to reduce his production levels to 2 head of cattle, creating a situation in which social wealth is decreased. Under the scenarios where the rancher has the right,

the farmer would switch to potatoes, also reducing social wealth. However, in the fifth condition, a fence would still be optimal choice for the participants creating the socially efficient outcome, and demonstrating that the absence of a property right can, in some scenarios, be better than an established legal right.

Each of these scenarios, as well as the production functions, is open to change, which can change the optimal outcomes. These production functions are meant to show that, in some cases, the optimal solution from the point of the farmer and rancher may not coincide with the optimal solution from society's point of view, and that the way property rights are assigned can affect this outcome.

## Materials

Table 3.1 Rancher Production Function

| # Of Cattle Raised | Total Revenue | Marginal Revenue | Total Cost | Marginal Cost | Externality Cost |
|---|---|---|---|---|---|
| 1 | 400 | 400 | 200 | 200 | 100 |
| 2 | 800 | 400 | 450 | 250 | 200 |
| 3 | 1200 | 400 | 750 | 300 | 300 |
| 4 | 1600 | 400 | 1100 | 350 | 500 |
| 5 | 2000 | 400 | 1500 | 400 | 750 |

Table 3.2 Rancher Profit Function

| # Of Cattle Raised | Profit | Profit w/ Externality | |
|---|---|---|---|
| 1 | 200 | 100 | |
| 2 | 350 | 150 | |
| 3 | 450 | 50 | |
| 4 | 500 | -100 | |
| 5 | 500 | -250 | |

Table 3.3 Farmer's Production Function

| Production Method | Revenue | Cost | Profit |
|---|---|---|---|
| Full field of Wheat | 1500 | 1100 | 400 |
| Full field of Potatoes | 750 | 600 | 150 |

Table 3.4 Methods of Mitigating the Externality

| Method | Cost |
|---|---|
| Shutdown by Farmer | C(v) |
| Shutdown by Rancher | Ca(v) |
| Fence | 200 |
| Farmer plants potatoes | 100 in profit, 400 in revenue |
| Farmer pays Rancher to reduce production | Variable |
| Rancher reimburses farmer | Variable |

# Instructions for Participants

(Farmer)

In this game we will be testing your ability to negotiate with an anonymous partner over an externality he creates. This game will last five rounds, and including instruction and review periods should last approximately one hour. Each round is eight minutes long; you can converse with your partner after the first two minutes of each round via a chat box located at the bottom of your screen. If you do not come to a deal or make a decision on how to mitigate the externality during these eight minutes, a rule that will be presented to you at the beginning of each round will take effect, and payoffs will be determined that way. You must make a decision about production every round. In some rounds these rules may force the rancher to reimburse you, in others you may be forced to bear the cost of the externality. Your payoff will derive from two assets; an appreciation of the value of your land and the profit that you make from each round. In order to maximize your payoff, it is imperative that you explore all options available to you.

You have been assigned the role of farmer. This role will not change over the course of the experiment. You have two options of what to grow on your land: a full field of wheat or a full field of potatoes. The exact values of these options will be presented to you during the experiment. You will have several options to mitigate the externality, and

you can pay the rancher to reduce the amount of his livestock, also mitigating the size of the externality. Because this game is meant to test you and your partner's ability to bargain, you will be given full access to your own production function, your partner's production function, and the cost of solutions to the externality.

## Instructions for Participants

(Rancher)

In this game we will be testing your ability to negotiate with an anonymous partner over an externality you create. This game will last five rounds, and including instruction and review periods should last approximately one hour. Each round is eight minutes long; you can converse with your partner after the first two minutes of each round via a chat box located at the bottom of your screen. If you do not come to a deal or make a decision on how to mitigate the externality during these eight minutes, a rule that will be presented to you at the beginning of each round will take effect, and payoffs will be determined that way. You must make a production decision each round. In some rounds the farmer may be forced to bear the externality, and in others you may be forced to reimburse him or her. Your payoff will derive from two assets; an appreciation of the value of your land and the profit that you make from each round.

You have been assigned the role of rancher. You can choose to raise up to five head of livestock on your property, but as you increase the amount, the externality increases in size. You can choose to decrease the size of your herd to reduce the externality, negotiate a deal with the farmer, or construct a fence. Because this game is meant to test you and your partner's ability to bargain, you will be given full access to

your own production function, your partner's production function, and the cost of solutions to the externality. Before you begin, it is imperative you realize that you are not at fault for the externality; you have been ranching for years, and the farmer recently expanded his land, creating the problem.

## Conclusions

CT plays a major role in economic analysis of law and has been the subject of debate for decades. However, most objections to the Coase theorem have been made on the basis that its internal logic is flawed, that it is not applicable to the real world, or that its assumptions are impractical. Few researchers have used empirical tests to study the psychology of participants in a Coasean bargaining situation, and none have completely adopted the framework of perfect CT situation, instead using consumer goods and non-competitive games. But if it could be demonstrated that people placed in a real CT situation are not capable of the mental task in front of the, or cannot bargain rationally even when perfect information is given, then the Coase theorem has been weakened significantly.

This experiment is expressly designed to test this possibility, as well as demonstrate the underlying premise of the Coase theorem that legal rules can sometimes promote inefficiency. Participants are given adequate explanation beforehand, perfect information about each other's production functions and the cost of the externality, and five rounds to gain experience. If, by the final round, participants are still unable to bargain or come to an efficient outcome, then we must question the validity of the Coase theorem.

Finally, this experiment is relatively simple to run, and allows for easily changeable conditions; imperfect information about the other participant's production function can be introduced, production values can be changed, and legal rules can shift. This creates the potential for further experimentation, as well as making the experiment more applicable to the real world.

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