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# AN EXPERIMENT ON THE ROLE OF PENALTY CLAUSES AND THE LEVEL OF LEGAL REMEDIES FOR BREACH OF CONTRACT ON THE PREVENTION OF THE HOLD-UP PROBLEM IN COLOMBIAN CONTRACT LAW

*Juan Antonio Gaviria*<sup>1</sup>

*This article analyzes the results of an experiment with Colombian students testing the theories that penalty clauses and a high level of legal remedies for breach of contract prevent the hold-up problem. While the results of this experiment failed to statistically confirm the predictions of the theory, they did not reject them. Furthermore, the results show that held-up parties were better off after the parties renegotiated the contract when either a penalty clause was provided or the law increased the level of legal remedies in comparison with a benchmark scenario. On the other hand, the results are a contribution to the field of empirical contract law and economics since the analysis presented here might be replicated in similar experiments and, ultimately, lead to proposals to efficiently address the hold-up problem.*

## INTRODUCTION

Hypothetically, the Chief Executive Officer (“CEO”) of a company (“Buyco”) calls his colleague at another company (“Selco”) and says: “Hi Jon, it’s Fred, how are you doing? Jon, our contract is not performing as well as we expected on our side, so we need to renegotiate it. I hope you will understand this friendly request. By the way, Jon, I am sorry to say that if your company does not accept our offer, we will be forced to stop buying your steel.”

Perhaps this story is not terribly surprising. It occurs every day in the business world, and nobody refers to it as blackmail, extortion, or foul play. Indeed, business people accept and encourage this kind of behavior. There are cases, however, where this behavior is impermissible, such as when the original contract required Selco to make a nine-figure dollar investment to manufacture and customize the steel—a process that made this investment worthless for any company other than Buyco. It might be surprising that Buyco’s CEO coinciden-

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tally demands a modification just after Selco's investment sunk and not before that, or at the negotiation of the original contract. It might be even more surprising why Buyco is subtly threatening to breach the contract if Selco does not accept the price change. Many people reading these facts might logically conclude that Buyco's behavior is outrageous. Indeed, it is. Sadly, Buyco's behavior is also rational: Fred, its CEO, is taking advantage of Selco's sunk investment to increase its contractual surplus.

Selco's CEO (Jon) might consider telling Fred to stop buying its steel as he threatened. Jon would consider that if Buyco follows through on this threat, his company might find itself on the brink of bankruptcy. Not only does the contract account for a great percentage of its bottom line, but also, the ensuing litigation would be lengthy, expensive, and uncertain. Thus, chances are that Jon, while outraged, would accept the modification only to avoid a bigger evil: breach. In such a case, Selco is held-up by Buyco.

This hypothetical scenario does not stop there. Jon tells some of his friends, top executives at other companies, about the "extortion" he suffered at the hands of Buyco. His colleagues' reactions are natural: after listening to Selco's predicament, they refrain from entering into contracts requiring idiosyncratic investments in order to avoid being in a vulnerable position during the performance of these contracts. They prefer, and no shareholder may criticize them for such decisions, to make general and low-risk investments. They are also held-up, and their refusal to make some investments is not good for companies or the economy as a whole.

A hold-up, the situation arising in the example above, is a problem for many reasons. Most noticeably, hold-ups lead to inefficient investments, which in turn harm the macroeconomic fundamentals of a country. Thus, if the hold-up problem is not well understood, or worse, if the law does not adequately address it, many huge and strategic investments for the economic development of Colombia, or of any other country, will never be made.

At least two other harmful effects of the hold-up problem deserve some explanation. First, because the parties deciding to make idiosyncratic investments do so only after taking some precautions, such as protective contract provisions, to avoid being extorted during the performance stage of the contract, the hold-up problem leads to an increase in transaction costs. Of course, these precautions are expensive; hence, their technical name is transaction costs.<sup>2</sup> Even worse,

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<sup>2</sup> See OLIVER E. WILLIAMSON, *THE MECHANISMS OF GOVERNANCE* 373 (1996) (discussing how transaction costs are the expenses of negotiating, drafting, and monitoring the allocation of rights and duties resulting from any possible contingency might be unaffordable).

protective contract provisions are not always effective to address the hold-up problem. Otherwise, these provisions would be used sparingly to prevent the problem. For example, a penalty clause may prevent the hold-up problem. However, a penalty clause has a cost—an increased or reduced price for the potentially held-up party. Furthermore, if this party is actually held-up, enforcing the penalty clause is not an easy task.

Second, the hold-up problem reduces the reliability of contracts: that is, the confidence that parties and the market as a whole should have that contracts will usually be performed in accordance with the provisions that were voluntarily agreed upon. Reliability in contracts is reduced because the hold-up problem forces a one-sided modification that one of the parties would not have accepted, but for fear of losing an investment that is only valuable for the other party, but not for any third-party. Needless to say, if contracts are not reliable, the efficiency of markets is impaired and their failures are worsened.<sup>3</sup>

This description is not intended to be a comprehensive examination of the hold-up problem. Such a goal is beyond the scope of this article. Rather, it is just an introduction to this article's topic: an analysis of the role of both penalty clauses and a higher level of remedies for breach of contract (in comparison with the current level) on the prevention of the hold-up problem in contracts between private merchants to manufacture and sell or supply goods.<sup>4</sup> This analysis provides at least two benefits. On the one hand, this article contributes to the empirical contract law and economics literature,<sup>5</sup> especially in Colombia where studies about empirical legal studies are almost inexistent. On the other hand, this experiment not only intends to test some theories, but also to encourage further experiments with similar purposes.<sup>6</sup>

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<sup>3</sup> See MANCUR OLSON, *POWER AND PROSPERITY: OUTGROWING COMMUNIST AND CAPITALIST DICTATORSHIPS* 185 (2000) (providing the causality link between reliability in contracts and well-performing markets).

<sup>4</sup> Legal remedies, incidentally, mean those remedies that the law supplies in the absence of valid contractually stated remedies (i.e., penalty clauses).

<sup>5</sup> See Colin Camerer & Eric Talley, *Experimental Study of Law*, in 2 *HANDBOOK OF LAW AND ECONOMICS* 1621, 1621 (A. Mitchel Polinsky & Steven Shavell eds., 2007) (describing the emergence of empirical approaches in the field of law and economics).

<sup>6</sup> See Richard K. Neumann, Jr. & Stefan H. Krieger, *Empirical Inquiry Twenty-Five Years After the Lawyering Process*, 10 *CLINICAL L. REV.* 349, 359 (2003) (stating that the value of an empirical analysis depends on the ability of other investigators to replicate the research); see also Rachel Croson, *Why and How to Experiment: Methodologies from Experimental Economics*, 2002 *U. ILL. L. REV.* 921, 922 (2002).

For instance, the theory stating that penalty clauses prevent the hold-up problem, might be tested in the United States (“U.S.”), where these kind of clauses are unenforceable. If the U.S. experiments confirm the theory, the proposals contending that penalty clauses should be enforceable might have empirical support, at least in relation to the hold-up problem. The theory that a high level of legal remedy mitigates the hold-up problem might also be tested in the U.S., or in any other country.

This article is structured as follows: Section I summarizes the economic theory underlying the hold-up problem. Section II reviews the literature on experiments testing theories related to the hold-up problem. Section III describes the theories that this experiment tests. Section IV describes the experimental design (i.e., the hypothetical facts that the subjects participating in the experiment will analyze before taking their decisions, the payments that they will receive, and the predictions of the results). Section V summarizes the results of the experiment. Finally, Section VI concludes.

## I. THE ECONOMICS OF THE HOLD-UP PROBLEM

The hold-up problem occurs when a company refrains from entering a contract and making a relationship-specific investment,<sup>7</sup> to avoid the risk that the other party to the contract will extort a modification for the exclusive benefit of the party who did not make the investment.<sup>8</sup> In this article, the victim of a hold-up is called the “held-up

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<sup>7</sup> See Aaron S. Edlin & Stefan Reichelstein, *Holdups, Standard Breach Remedies, and Optimal Investment*, 86 AM. ECON. REV. 478, 478 (1996) (discussing relationship-specific investments are those highly valuable for the parties while they are performing the contract but whose value is significantly less or even zero for third parties or for the parties themselves when the contract ends).

<sup>8</sup> This is an original definition of the hold-up problem. See Daniel A. Graham & Ellen R. Peirce, *Contract Modification: An Economic Analysis of the Hold-up Game*, 52 LAW & CONTEMP. PROBS. 9, 9 (1989); Abraham L. Wickelgren, *The Limitations of Buyer-Option Contracts in Solving the Holdup Problem*, 23 J. LAW, ECON. & ORG. 127, 127 (2007). On the other hand, a modification might be of two kinds: (1) a surplus-maximizing modification or (2) a distributive modification. A surplus-maximizing modification makes at least one of the parties better off, without making anyone worse off. As a result, a surplus-maximizing modification is Pareto efficient. See, e.g., A. MITCHELL POLINSKY, AN INTRODUCTION TO LAW AND ECONOMICS 7 n.4 (3d ed. 2003) (providing a redistributive modification, in contrast, is not Pareto-efficient but a zero-sum result. Redistributive modifications occur where a better bargain for one party entails a worse bargain for the other party). The modifications that arise due to the hold-up problem are redistributive modifications because, if the offer is accepted, then the contractual share of the held-up party will be reduced while the share of the non-investing party will be increased by the same amount.

party” while the party making the demand for a modification is called the “non-investing party.”

The main effect of this problem is underinvestment. Professors Robert Scott & Paul Stephan provide an example that explains how the hold-up problem leads to underinvestment.<sup>9</sup> A simplified version of this example, using different figures, is as follows: A seller may produce either general-purpose goods or customized goods, whose costs are \$60 and \$100, respectively. The market price of the general-purpose goods is \$70. Buyers, on average, value the general-purpose goods at \$80 while a particular buyer values the customized goods at \$140. This buyer proposes to the seller to buy the customized goods at a price of \$120. If a contract is formed, the seller will make a relationship-specific investment and will receive the price of the customized goods upon their delivery. The seller, although tempted to agree to the price of \$120, anticipates that the buyer, after the relationship-specific investment has been made, will propose a new contract price of \$80 and will threaten to breach if this modification is not accepted. The seller knows that the modification will generate a net loss that amounts to \$20 (the new price of \$80 less the cost of \$100). In case of breach, the customized goods will be scrapped, making the market value zero. Remedies, assuming the absence of legal enforcement, will also be non-existent. Thus, a farsighted seller will reject the buyer’s offer and will prefer to manufacture general-purpose goods, which can be sold to many buyers. In such a case, a certain profit of \$10 (the general purpose goods’ price of \$70, less their cost of \$60) will be better than an uncertain profit of \$20 (the idiosyncratic goods’ price of \$120 less their cost of \$100). The bottom line is that this seller will produce goods that buyers value at \$80 instead of goods that at least a single buyer values at \$140. The deadweight loss for society is \$60 (the buyers’ valuation of the general purpose goods, \$80 less than the value that the customized goods have for at least one buyer, \$140). Table 1, below, summarizes these figures.

TABLE 1 – ILLUSTRATION OF UNDERINVESTMENT AND THE HOLD-UP PROBLEM

Concept	General Goods	Special Goods
Cost (C)	\$60	\$100
Original price (OP)	\$70	\$120
Buyers’ valuation (V)	\$80	\$140
Anticipated renegotiated price (RP)	The original price	\$80
Original seller’s profit (OSP = OP – C)	\$10	\$20
Anticipated seller’s profit (AP = RP – C)	\$10	-\$20
Loss (value of the general goods – value of the customized goods)		-\$60

<sup>9</sup> ROBERT E. SCOTT & PAUL B. STEPHAN, *THE LIMITS OF LEVIATHAN: CONTRACT THEORY AND THE ENFORCEMENT OF INTERNATIONAL LAW* 66 (2006).

Several strategies, the so-called “governance structures,”<sup>10</sup> may be used to deal with the hold-up problem, and to prevent its main harmful effect: underinvestment. Some examples include government regulation, vertical integration between seller and buyer, stringent rules on economic duress, and stringent rules on bad-faith, allowing a held-up party to successfully challenge an extorted modification before a court.<sup>11</sup> The scope of this article, however, is restricted to the discussion of two strategies that may prevent the hold-up problem: penalty clauses and a high level of legal remedies for breach of contract. This is the purpose of the next section.<sup>12</sup>

## II. THE ROLE OF PENALTY CLAUSES AND LEGAL REMEDIES FOR BREACH OF CONTRACT ON THE PREVENTION OF THE HOLD-UP PROBLEM

### A. *The Role of Penalty Clauses on the Prevention of the Hold-up Problem*

#### 1. Introduction

Penalty clauses, by which the parties to a contract provide the level of remedies to be paid in case one of them refuses to honor its duties, may prevent the hold-up problem by making breaches more expensive and, consequently, by reducing the credibility of the threat to breach backing a demand for a redistributive modification. This section will analyze this reasoning in deeper detail.

#### 2. The Legal Rules on Penalty Clauses Under Colombian Law

Colombian Civil Code articles 1592 to 1601 and Colombian Commercial Code article 867 set forth the legal rules governing penalty clauses. These legal rules may be broken down in the following five parts. First, and more importantly, penalty clauses are enforceable in Colombia and, therefore, the breaching party must pay the entire amount.<sup>13</sup> Second, the breaching party shall pay the amount of the penalty clause to the aggrieved party regardless of whether the breach

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<sup>10</sup> See WILLIAMSON, *supra* note 2, at 151.

<sup>11</sup> See Nick Van der Beek, *Long-term Contracts and Relational Contracts*, in CONTRACT LAW & ECONOMICS, 6 ENCYCLOPEDIA OF LAW & ECONOMICS 281, 284 (Gerrit De Geest ed., 2d ed. 2011).

<sup>12</sup> Incidentally, while the analysis of penalties clauses and legal remedies for breach of contract is made under Colombian law, some references to the U.S. law exist.

<sup>13</sup> Compare C.C. art. 1592 (Colom.), C.C. art. 1599 (Colom.), and C. COM. art 867 (Colom.) (permitting penalties for breach) with U.C.C. § 2-718(1) (2014) (permitting liquidated damages for breach, but not penalties) (unless otherwise noted, the references to the U.C.C. in this paper are to the official text that the American Law Institute and the National Conference of Commissioners on Uniform State Laws have enacted).

caused any damages.<sup>14</sup> Third, the aggrieved party may request the payment of the penalty clause, on top of legal damages, if the contract explicitly provides this accumulation of remedies. Under this scenario, a penalty clause will be a real punishment.<sup>15</sup>

If the contract does not explicitly provide for the accumulation of the penalty and damages, the aggrieved party will receive the larger amount between proven legal damages and the penalty clause.<sup>16</sup> In this case, the penalty clause is just an estimation of damages. This closely resembles liquidated damage clauses under U.S. law,<sup>17</sup> and therefore, it is a misnomer. In any event, while both kinds of penalty clauses may prevent the hold-up problem, efficiency is enhanced when the breaching party must pay both the penalty, and the legal damages.<sup>18</sup>

Fourth, a partially performing breaching party, regardless of whether the damages are re-expressible in monetary terms, is entitled to request a pro-rata reduction of the penalty.<sup>19</sup> Fifth, if the breaching party failed either to pay an amount of money or to perform any other duty that is re-expressible in monetary terms, the amount of the penalty shall not be higher than the amount of this duty.<sup>20</sup> For instance,

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<sup>14</sup> See C.C. art. 1599 (Colom.); see also JORGE SUESCÚN MELO, *Derecho Privado, Estudios de Derecho Civil y Comercial Contemporáneo* [Private Law, Studies on Contemporaneous Civil and Commercial Law] 43-45 (1996) (categorizing a penalty clause as an irrebuttable presumption for the breaching party, who cannot claim that the breach did not cause any harm, and as a rebuttable presumption for the aggrieved party, who can prove that damages were larger than the amount of the penalty clause). For arbitral awards holding that the party who seeks the payment of a penalty clause does not need to prove damages resulting from the breach, see also, e.g., *Comercial Okasa Ltda., v. Banco Colpatria Red Multibanca Colpatria S.A.* (mayo 27, 2004) (C. Torrente Arb.).

<sup>15</sup> See Corte Suprema de Justicia [C.S.J.] [Supreme Court], Sala Civ., junio 23, 2000, M.P. G. Gomez, Expediente C-4823, Gaceta Judicial [G.J.] (No. CCXII, p. 482) (Colom.); MELO, *supra* note 14, at 43-45; see also, e.g., *Impsa Andina S.A. v. Argosy Energy International* (diciembre 12, 2000) (J. Cabrera, R. Núñez, H. Chauv Arb.) (mentioning arbitral awards with this dual role of penalty clauses).

<sup>16</sup> See C.C. art. 1600 (Colom.).

<sup>17</sup> See U.C.C. § 2-718(1) (2014).

<sup>18</sup> See Corte Suprema de Justicia [C.S.J.] [Supreme Court], Sala Civ., junio 23, 2000, M.P. G. Ramírez, Expediente C-4823, Gaceta Judicial [G.J.] (No. CCXII, p. 482) (Colom.) (arguing that the amount of a penalty clause must be sufficiently high to persuade the promisor that the only profitable road is compliance with the contract); *Comercial Okasa Ltda., v. Banco Colpatria Red Multibanca Colpatria S.A.* (mayo 27, 2004) (C. Torrente Arb.) (contending that a penalty clause whose amount must be paid on top of legal damages works as a psychological pressure against the promisor).

<sup>19</sup> See C.C. art. 1596; C. Com. art. 867.

<sup>20</sup> See C. Com. art. 867.



and pursuant to a plain-meaning reading of Commercial Code article 867, if the seller fails to deliver the goods, the penalty, in addition to damages,<sup>21</sup> cannot be larger than the contract price.<sup>22</sup>

If, by contrast, the breaching party fails to perform a duty which is not re-expressible in monetary terms, as happens when the quality of the goods is not in accordance with the contract provisions and the quality diminution cannot be measured in money, a court may reduce the amount of the penalty taking into account the equity and the importance of compliance for the aggrieved party.<sup>23</sup>

### 3. The Role of Penalty Clauses on the Prevention of the Hold-up Problem

Penalty clauses have some features that may prevent the hold-up problem. As a first feature, the amount of a penalty clause, by providing at least two kinds of damages that the law rarely awards, might be closer to the actual harm in comparison with conventional damages.<sup>24</sup> On the one hand, unforeseeable damages, such as consequential losses, could be provided.<sup>25</sup> Consequential damages might arise in hold-up situations. To illustrate, suppose that a buyer makes a relationship-specific investment building an aluminum factory and enters into contracts to supply aluminum to its clients downstream. Upstream however, only one seller can provide at competitive prices the main raw material needed to manufacture aluminum: electricity. If this seller breaches the contract, the buyer would suffer the consequential damages resulting from not honoring the contracts for sale of aluminum.

Second, the contract might provide damages that the court considers too remote, speculative, or uncertain to award if not contemplated by the parties at the making of the contract.<sup>26</sup> Penalty clauses might “afford the only possibility of compensation for losses that are

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<sup>21</sup> Cases where the seller fails to deliver the goods might easily lead to damages well in excess of the price. A different reading of the rule would be illogical, since the penalty clause will not cover damages in most cases.

<sup>22</sup> See C. COM. art. 867.

<sup>23</sup> See *id.*; MELO, *supra* note 14, at 45.

<sup>24</sup> *Wassenaar v. Panos*, 331 N.W.2d 357, 366 (Wis. 1983) (“[I]n providing for stipulated damages, the parties to the contract could anticipate the types of damages not usually awarded by law.”).

<sup>25</sup> See E. ALLAN FARNSWORTH, *CONTRACTS* 449, 820 (2008).

<sup>26</sup> See Charles J. Goetz & Robert E. Scott, *Liquidated Damages, Penalties and the Just Compensation Principle: Some Notes on an Enforcement Model and a Theory of Efficient Breach*, 77 COLUM. L. REV. 554, 572 (1977); Aaron Edlin & Alan Schwartz, *Optimal Penalties in Contracts*, 78 CHI.-KENT L. REV. 33, 34-35 (2003).

not susceptible of proof with sufficient certainty.”<sup>27</sup> For example, a buyer might bargain for a penalty clause whose amount includes losses that are non-verifiable to a court, such as the goodwill losses resulting from its seller delivering idiosyncratic goods lacking the quality agreed in the contract.

As a second feature, penalty clauses allow a promisor to credibly communicate to the promisee that the contract will be honored.<sup>28</sup> As Judge Posner put it: “[p]enalty clauses provide an earnest of performance.”<sup>29</sup> The credibility of the promise derives from the promisee’s assumption that a promisor intending to breach would not commit itself to pay an amount in damages larger than the estimated harm (*i.e.*, would not signal its intention to perform its duties).<sup>30</sup>

Penalty clauses, because of their signaling function, might efficiently address hold-up situations. Recall that a potentially held-up party might refrain from making an idiosyncratic investment in order to avoid the risk that the non-investing party demands a redistributive modification under threat to breach during the performance stage. A penalty clause, however, might signal that the non-investing party intends to perform as originally agreed and, therefore, make the potentially held-up party less hesitant to enter the contract and to make a specific investment.

As a third feature, penalty clauses work as an insurance policy against breach that the promisor issues in favor of the promisee.<sup>31</sup> The premium of this insurance policy is the extra price that the promisor charges as consideration for agreeing to pay damages in excess of the estimated loss.<sup>32</sup> This insurance characteristic of penalty clauses may shift the risk from the held-up party to the non-investing party.<sup>33</sup> This

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<sup>27</sup> FARNSWORTH, *supra* note 25, at 811; *see also* Larry A. DiMatteo, *Penalties as Rational Response to Bargaining Irrationality*, 2006 MICH. STATE L. REV. 883, 909 (mentioning that liquidated damages clauses [and penalty clauses as well] may protect subjective valuations that the law does not recognize).

<sup>28</sup> *See* Samuel A. Rea Jr., *Efficiency Implications of Penalties and Liquidated Damages*, 13 J. LEGAL STUD. 147, 156-57 (1984); *see also* RICHARD A. POSNER, *ECONOMIC ANALYSIS OF LAW* 118, 127-28 (7th ed. 2017).

<sup>29</sup> *Lake River Corp. v. Carborundum Co.*, 769 F.2d 1284, 1289 (7th Cir. 1985).

<sup>30</sup> *See* DOUGLAS G. BAIRD, ROBERT H. GERTNER & RANDAL C. PICKER, *GAME THEORY AND THE LAW* 308, 315 (1998) (Signaling means that one party conveys non-verifiable information (*e.g.*, the likelihood of honoring a contract) to the other party).

<sup>31</sup> *See* ROBERT COOTER & THOMAS ULEN, *LAW & ECONOMICS* 216, 236-37 (3rd ed. 2000); UGO MATTEI, *COMPARATIVE LAW AND ECONOMICS* 186, 184 (1997).

<sup>32</sup> *See* Kenneth W. Clarkson, Roger L. Miller & Timothy J. Muris, *Liquidated Damages v. Penalties: Sense or Non-sense*, 1978 WIS. L. REV. 351, 367-68; and COOTER & ULEN, *supra* note 31, at 236.

<sup>33</sup> *See* Rea, *supra* note 28, at 148; MATTEI, *supra* note 31, at 184.

feature is linked to the signaling function and, more particularly, to an efficient distribution of information costs. An investing party cannot ascertain, without considerable expenses, whether the other party will pull a hold up. A penalty clause, working as an insurance policy, provides this information.<sup>34</sup>

Penalty clauses work efficiently as insurance policies when two conditions are present: the promisee will suffer an idiosyncratic loss in case of breach, and the promisor is the cheapest insurer.<sup>35</sup> Both conditions might arise in hold-up situations. To begin with, a held-up party might suffer an idiosyncratic loss if the contract is breached because its relationship-specific investment would likely be scrap and the information about the actual losses may be non-verifiable to a court.<sup>36</sup>

The non-investing party, in turn, is the cheapest insurer or, perhaps, the only insurer in hold-up situations. Since the investment is idiosyncratic, the held-up party will likely be unable to obtain insurance in the market. Assuming, *arguendo*, that such market exists, an insurance policy that a third-party issues would likely be more expensive and less effective than the insurance that the non-investing party is willing to provide through a penalty clause. A promisor is the cheapest insurer because it knows with higher certainty than any other party whether a hold-up situation will arise.<sup>37</sup> On top of that, the transaction costs of issuing an insurance policy have already been incurred in the negotiation of the contract between the investing and the non-investing parties.<sup>38</sup>

Unfortunately for held-up parties, the legal limits and the powers that courts have to reduce the amount of a penalty clause may impair their efficiency on the prevention of the hold-up problem. Notwithstanding, the legal rule stating that a penalty shall not exceed the amount of a duty to pay some money or which is otherwise re-expressible in monetary terms should not restrict the role of a penalty clause on the prevention of the hold-up problem if the contract provides that the penalty is in addition to damage. In contrast, the rule stating that a court may reduce the amount of a penalty when its value is not re-expressible in monetary terms is more favorable, on first impression, for non-investing parties than for held-up parties because equity may lead a court to reduce the amount of a penalty, but rarely to

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<sup>34</sup> See Alan Schwartz & Robert E. Scott, *Contract Theory and the Limits of Contract Law*, 113 YALE L.J. 541, 617 (2003).

<sup>35</sup> See COOTER & ULEN, *supra* note 31, at 236-37.

<sup>36</sup> See Aristides N. Hatzis, *Having the Cake and Eating it Too: Efficient Penalty Clauses in Common and Civil Contract Law*, 22 INT'L REV. L. & ECON. 381, 387 (2006).

<sup>37</sup> See Goetz & Scott, *supra* note 26, at 578-582; Edlin & Schwartz, *supra* note 26, at 38, n.12.

<sup>38</sup> See Goetz & Scott, *supra* note 26, at 580.

keep it unchanged and never to increase it.<sup>39</sup> As a result, a held-up party would find it very difficult if not impossible to precisely predict the percentage of reduction at the time of making an idiosyncratic investment. Such percentage, for instance, may depend on the judges in charge of the case, on their attitudes during the trial, or on the sympathies that the non-investing party generates.<sup>40</sup> Another ground to reduce the amount of a penalty clause is the importance of performance *in nature* for the aggrieved party. This factor should work well for held-up parties, which, by definition, are strongly interested in specific and timely performance to avoid losing their relationship-specific investments.

Summing up, and taking into account not only their features already described but also the fact that they are enforceable in Colombia, penalty clauses might prevent the hold-up problem. This is the good news. The bad news is that the legal caps and the power that courts have to reduce the amount of a penalty may impair its efficiency on the prevention of the hold-up problem. Ultimately, empirical analyses will have the last say about whether the positive effects of penalties are greater than its limitations (the negative effects). The experiment that this article reports is a step in that direction. Before describing its design, the rules on legal remedies for breach of contract and its role on the prevention of the hold-up problem must be analyzed. This is the purpose of the next section.

## B. *The Role of Remedies for Breach of Contract in Prevention of the Hold-up Problem*

### 1. Introduction

While legal remedies are under-compensatory in all contracts,<sup>41</sup> the degree of under-compensation is not always the same. Contracts that can be enforced without too much delay and at a low cost lie at one end of the spectrum; the degree of under-compensation is minimal. Suppose, for instance, that two parties enter a spot con-

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<sup>39</sup> In addition, equity is an important, but nebulous concept. See generally Gillian K. Hadfield, *Weighing the Value of Vagueness: An Economic Perspective on Precision in The Law*, 82 Cal. L. Rev. 541 (1994) (discussing the economic role of vague legal rules).

<sup>40</sup> See JEROME FRANK, *COURTS ON TRIAL: MYTH AND REALITY IN AMERICAN JUSTICE* 162 (1949) (implying that justice is what the judge ate for breakfast).

<sup>41</sup> That legal remedies for breach of contract are inherently under-compensatory is a statement that triggers minimum debate nowadays. The scholars contending that remedies for breach of contract are under-compensatory are legion. See, e.g., Goetz & Scott, *supra* note 26, at 558 n.19; Robert A. Hillman, *Policing Contract Modification Under the U.C.C.: Good Faith and the Doctrine of Economic Duress*, 64 IOWA L. REV. 849, 878 (1979).

tract for the sale of a commodity; in case of breach, the market price and the price of a cover transaction might easily be determined. Assume also that the nature of the transaction, which is standardized, makes the length of trial, or even of a settlement, very short. Hold-up situations, in turn, lie close to the other end of the spectrum; their degree of under-compensation might be significant. After all, a significant part of the damages that an aggrieved held-up party suffers might be uncertain and unforeseeable; thereby, not recoverable under legal remedies.<sup>42</sup>

The under-compensatory nature of legal remedies is the reason why held-up parties are usually better off accepting the offer to modify rather than rejecting it and suing for breach of contract.<sup>43</sup> In accordance with this view, the role of legal remedies for breach of contract is limited to the mitigation of the hold-up problem by minimizing its degree of under-compensation. The degree of under-compensation, however, cannot be reduced below some threshold without triggering undesirable effects, such as deterring some efficient breaches,<sup>44</sup> chilling some efficient contracts if the prospect of a too high level of legal remedies dissuades risk-averse promisors from entering into contracts,<sup>45</sup> triggering higher contract prices intended to compensate for the higher level of legal remedies,<sup>46</sup> and leading promisees to overinvest.<sup>47</sup>

## 2. The Legal Rules on Remedies for Breach of Contract

Unlike U.S. law,<sup>48</sup> as a general rule an aggrieved party to any bilateral contract under Colombian law may choose between seeking

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<sup>42</sup> See COOTER & ULEN, *supra* note 31, at 259 (“In general, the error in the court’s estimation of expectation damages decreases as the ease of substitution increases for the promised performance”).

<sup>43</sup> See, e.g., Hillman, *supra* note 40, at 891-92 n.190; Jason Scott Johnston, *Default Rules/Mandatory Principles: A Game Theoretic Analysis of Good Faith and the Contract Modification Problem*, 3 S. CAL. INTERDIS. L.J. 337, 338(1993); see generally Jeffrey M. Dressler, *Good Faith Rejection of Goods in A Falling Market*, 42 CONN. L. REV. 611, 639 (2009) (“For businessmen, even a case that is won in litigation generally represents [at best] an unwanted annoyance.”).

<sup>44</sup> See Richard Craswell, *Contract Remedies, Renegotiation, and the Theory of Efficient Breach*, 61 S. CAL. L. REV. 629, 669 (1988); Steven Shavell, *Damage Measures for Breach of Contract*, 11 BELL J. ECON. 466, 472 (1980).

<sup>45</sup> See Craswell, *supra* note 44, at 669.

<sup>46</sup> See *id.*; Alan Schwartz, *The Myth that Promisees Prefer Supracompensatory Remedies*, 100 YALE L.J. 369, 370 (1990).

<sup>47</sup> See Craswell, *supra* note 44, at 669; Shavell, *supra* note 44, at 472.

<sup>48</sup> See U.C.C. § 2-716 (2014).

monetary damages and specific performance.<sup>49</sup> In practice, however, specific performance is a very limited remedy in the context of commercial contracts for sale or supply of goods, almost as limited as in U.S. law. While the law does not restrict specific performance to certain parties to a contract, logical considerations dictate that this remedy is not applicable when an aggrieved seller is seeking the price plus any default interest. On top of that, buyers can seek monetary damages only in the form of a price reduction when the breach is minor (e.g., when goods with some small defects are anyway fit for the particular contract purpose).<sup>50</sup>

Given these limitations to the remedy of specific performance, this chapter assumes that the aggrieved held-up party seeks monetary damages, which are divided into two broad categories. The first one is actual damages (in Spanish: *daño emergente*), or the expenses incurred in preparation of performance.<sup>51</sup> An aggrieved party may recover most actual losses without too much difficulty.<sup>52</sup> The second category is lost profits (in Spanish: *lucro cesante*), which amount to the earnings that the aggrieved party would have obtained if the contract would not have been breached).<sup>53</sup>

While lost profits are a notion more linked to the under-compensatory nature of remedies since their calculation is not as easy and precise as actual losses,<sup>54</sup> the recovery of actual damages may also be subject to some limitations. For instance, a court may reject the recov-

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<sup>49</sup> See C. Com. art. 870. For some case law and doctrine regarding the election between monetary damages and specific performance, see, e.g., Corte Suprema de Justicia [C.S.J.] [Supreme Court], Sala Civ., mayo 16, 2002, M.P. J. Santos, Expediente 6877, Gaceta Judicial [G.J.] (No. CCXV, p. 163) (Colom.); Mitsui & Co Ltd. y Sumitomo Corporation, agosto 22, 2002, R. Bernal, A. Mendoza, J. Cubides Arb.).

<sup>50</sup> See C.C. Art. 1924; see generally Philips Colombiana de Comercialización S.A. v. Cosmitet Limitada Corporación de Servicios Médicos Internacionales Them y Cía. Ltda. (abril 21, 2005) (S. Muñoz, M. Silva y M. Plazas Arb.).

<sup>51</sup> See C.C. Art. 1613-14; Granjas El Socorro Ltda. v. Colombiana de Incubación S.A. Incubacol (agosto 5, 2002) (H. Mora, A. Hernández, H. Romero Arb.) [hereinafter Granjas].

<sup>52</sup> See Gallo's Comunicaciones E.U. v. Super 9 Comunicaciones S.A. (noviembre 17, 2004) (C. de la Torre, H. Cardozo y F. Santos Arb.) [hereinafter Gallo's Comunicaciones] (arguing that estimation of actual losses is not so difficult because they refer to past events).

<sup>53</sup> See C.C. Art. 1613-14. For case law regarding lost profits, see, e.g., Corte Suprema de Justicia [C.S.J.] [Supreme Court], Sala. Civ., septiembre 9, 2010, M.P. W. Namén, Gaceta Judicial [G.J.] (No. CCXXXIV, p. 563) (Colom.); Granjas, *supra* note 51.

<sup>54</sup> See Gallo's Comunicaciones, *supra* note 52 (categorizing as uncontroversial that lost profits are much more difficult to prove than actual losses); see also Corte Suprema de Justicia [C.S.J.] [Supreme Court], Sala. Civ., marzo 4, 1998, M.P. C.

ery of the value of a relationship-specific investment, which by definition, is worthless for an aggrieved buyer after its seller has breached. In spite of the fact that the lost investment might be an actual damage, since the held-up party exclusively incurred in this sunk cost to perform the contract, explaining to a court, uninformed of financial and technical matters,<sup>55</sup> that a complex investment was useful for the breaching party, but not for anybody else may be an expensive task at best and an impossible one at worst. Furthermore, since the investment is registered in the ledger books under this name (as an investment) and not as an expense, proving otherwise is still more difficult.<sup>56</sup> This is not just a theoretical concern. In *Ladrillera Santa Fe S.A. v. STK de Colombia S.A.*, the plaintiff invested in some equipment and fiber optic networks without value outside the business relationship between the parties. Nonetheless, the arbitral tribunal denied recovery of this investment because the plaintiff failed to prove that the investment lacked any purpose after breach, and the equipment and fiber optic networks were registered in the ledger books as investments (assets) and not as expenses.<sup>57</sup>

Lost profits, especially if they are unforeseeable or uncertain, may also be unrecoverable.<sup>58</sup> As an example of limitations on unforeseeable losses, a buyer may be denied recovery of the profits resulting from some future sales to its customers of goods manufactured with the raw materials to be acquired from the breaching seller on the ground that this party might have not forecast them. In any event, in contrast with U.S. law and favorably for held-up parties,<sup>59</sup> the extent of lost profits depends on whether the breaching party acted with the positive intention to inflict damage on the other person (in Spanish: “*dolo*”). If the answer is no, then the breaching party is only liable for damages foreseeable at the making of the contract.<sup>60</sup> Alternately, the breaching party is also liable for any loss directly resulting from the breach.<sup>61</sup> In the context of hold-up situations, a non-investing party

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Jaramillo, *Gaceta Judicial* [G.J.] (No. CCXVIII, p. 450) (Colom.); FERNANDO HINESTROSA, *Tratado De Las Obligaciones* [Treaty On Obligations] 224 (3d ed. 2007).

<sup>55</sup> Unless the case is decided by arbitrators with expertise in these topics.

<sup>56</sup> See D. 2649/93 art. 35,40, 61, 64 diciembre 29, 1993, *DIARIO OFICIAL* [D.O.] (Colom.); see also Code of General Procedure [hereinafter C.G.P.] art. 264, enacted by L. 1564/12, julio 12, 2012, *DIARIO OFICIAL* [D.O.] (providing that disputes among merchants will be decided in accordance with their ledger books).

<sup>57</sup> See *Ladrillera Santa Fe S.A. v. STK de Colombia S.A.* (abril 16, 2002) (J. Chemás, N. Zabala, y L. Parra Arb.).

<sup>58</sup> See HINESTROSA, *supra* note 54, at 217-18.

<sup>59</sup> See Eric A. Posner, *Fault in Contract Law*, 107 Mich. L. Rev. 1431 (2009).

<sup>60</sup> See C.C. art. 1616.

<sup>61</sup> See *id.*

always acts with *dolo* because it fails to perform in fulfillment of its threat.

Unlike the restrictions on unforeseeable damages stemming from Civil and Commercial Codes, the limitations regarding uncertain losses lie in case law<sup>62</sup> which has consistently rejected speculative damages.<sup>63</sup> Naturally, the case law acknowledges that lost profits are, by definition, probabilistic and, as a result, that the requirement of certainty is not absolute.<sup>64</sup> Unfortunately, the line dividing lost profits that are probabilistic, but sufficiently certain and other lost profits that are too speculative to be recovered is blurry. As a consequence, the broad powers that courts have to determine whether or not some lost profits are recoverable are not reassuring for a held-up party estimating in advance the damages resulting from breach in order to decide whether or not to accept a demand for an extorted modification.<sup>65</sup>

The kind of losses that are often uncertain are lost opportunities, especially if they are contingent on factors other than performance of the contract. An opportunity is lost when the aggrieved party cannot obtain the profit of some projected transactions, such as some deals that an aggrieved held-up buyer were negotiating with some third-parties and which were suspended shortly after the breach.<sup>66</sup> The doctrine and the case law require a significant amount of certainty about both the causality link between the breach and the lost opportunity and its likelihood (although a lower degree of certainty regarding its amount).<sup>67</sup> Another kind of lost profit, goodwill losses, are usually unrecoverable due to their speculative nature.<sup>68</sup>

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<sup>62</sup> See C.C. art. 1614 (defining lost profits without limiting them).

<sup>63</sup> See, e.g., Corte Suprema de Justicia [C.S.J.] [Supreme Court], Sala. Civ., septiembre 9, 2010, M.P. W. Namén, Gaceta Judicial [G.J.] (No. CCXXXIV, p. 563) (Colom.) (holding that certainty about the lost profits is a condition to recover damages); see also MELO, *supra* note 14, at 197-98 (stating that damages that were just possible at the time of breach are not recoverable); cf. RESTATEMENT (SECOND) OF CONTRACTS § 352 cmt. a (1981) (“The main impact of the requirement of certainty comes in connection with lost profits.”); Cent. Coal & Coke Co. v. Hartman, 111 F. 96, 98 (8th Cir. 1901) (stating that “speculative, remote, or uncertain” damages “may not form the basis of a lawful judgment.”).

<sup>64</sup> See Corte Suprema de Justicia [C.S.J.] [Supreme Court], Sala. Civ., septiembre 9, 2010, M.P. W. Namén, Gaceta Judicial [G.J.] (No. CCXXXIV, p. 563) (Colom.); HINESTROSA, *supra* note 54, at 199-200.

<sup>65</sup> See HINESTROSA, *supra* note 54, at 199-200.

<sup>66</sup> See JAVIER TAMAYO, II LA RESPONSABILIDAD CIVIL [TORTS] 30 (1986).

<sup>67</sup> See *id.* at 357; Productora Tabacalera de Colombia S.A.S. Protabaco S.A.S. (Protabaco) v. División Mayor del Fútbol Colombiano (Dimayor) (septiembre 9, 2011) (M. Castro, E. Rengifo, L. Salazar Arb.); HINESTROSA, *supra* note 54.

<sup>68</sup> See Granjas, *supra* note 51 (rejecting the recovery of good will losses because of its lack of certainty).



Other kind of losses, which do not exactly fit in the categories of actual damages and lost profits, may also be unrecoverable. The expenses necessary to recover at least part of the losses are an example. Colombian law entitles the party prevailing at trial to get back its reasonable attorney's fees and other judgment costs (in Spanish, the so-called "*costas*").<sup>69</sup> At first sight, this is good news for an aggrieved held-up party. The outlook, unfortunately, is not so favorable. To begin with, the costs of enforcing a contract in Colombia add up to 46% of the claim.<sup>70</sup> Courts usually reject a fraction of this 46% on the grounds that it is non-verifiable, unreasonable or higher than the statutory limits.<sup>71</sup>

As an additional restriction to legal remedies, monetary damages are only obtained after considerable delay. Thus, even a party prevailing at trial and obtaining the whole amount claimed as damages suffers a monetary loss in real terms. This loss depends on the length of the legal procedures. The World Bank's study mentioned earlier finds that Colombian legal procedures are very protracted.<sup>72</sup> According to this multilateral institution, 34 procedures and 1,346 days (almost four years) are required to enforce a contract in Colombia.<sup>73</sup> On top of that, the figures indicated above are for standardized commercial disputes.<sup>74</sup> As a result, the time and cost of hold-up litigation may be longer and higher.

In sum, it is settled that legal remedies for breach of contract are inherently under-compensatory, so settled that it is almost a tau-

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<sup>69</sup> See C.G.P. art. 361-66. For the former rule, see C.P.C. art. 392.

<sup>70</sup> This percentage is disaggregated as follows: attorney's fees (23.2%); judgment costs (12.6%); and enforcement costs (12.1%). See THE WORLD BANK, EASE OF DOING BUSINESS IN COLOMBIA (2013), <http://www.doingbusiness.org/data/exploreeconomies/Colombia/#enforcing-contracts> (last visited, Nov. 13, 2014).

<sup>71</sup> See Rule 1887 art. 1 (junio 26, 2003), Sala Administrativa Consejo Superior de la Judicatura; see also L. 794/03 art. 43, enero 8, 2003, DIARIO OFICIAL [D.O.] (setting forth that judgment costs include any expense assumed by the prevailing party in relation to the litigation provided that they are proved, have been useful for the settling of the dispute, and relate to acts that the law authorizes). An aggrieved party will also be unable to recover other non-verifiable litigation expenses such as the monetary value of the personnel's time employed in litigation (e.g., estimating the losses, attempting to reach a settlement, etc.). See *Ladrillera Santa Fe S.A. v. STK de Colombia S.A.* (abril 16, 2002) (J. Chemás, N. Zabala y L. Parra Arb.) (rejecting the expenses on personnel who was allegedly and exclusively dedicated to the litigation on the grounds that the conditions required to be a recoverable damage were not met).

<sup>72</sup> See THE WORLD BANK, *supra* note 70.

<sup>73</sup> See *id.*

<sup>74</sup> See THE WORLD BANK, ENFORCING CONTRACTS METHODOLOGY, <http://www.doingbusiness.org/methodology/enforcing-contracts>. The timing (but not the cost) of arbitration may be much shorter.

tology. Indeed, remedies for breach of contracts cannot be fully compensatory unless some undesirable effects arise, such as deterring efficient breaches. As a result, the role of legal remedies on the prevention of the hold-up problem is limited to mitigation. Despite this limitation, a high level of remedies may mitigate the hold-up problem to a greater extent than a low level. Specifically, high remedies may have a prophylactic effect on the hold-up problem by reducing or eliminating the credibility of the threat to breach the contract that a non-investing party makes.<sup>75</sup> This is the theoretical prediction that needs to be empirically tested.

### III. A REVIEW OF THE LITERATURE ON EXPERIMENTS ON THE HOLD-UP PROBLEM

Since other experiments testing theories related to the hold-up problem provide some guidance for the design of this article's experiment, Section III reviews them, organized from the oldest to the newest. First, Professor Steven C. Hackett predicted that the division of contractual surplus depends on the party who makes a "sunk" investment and on its value. His results confirmed this prediction.<sup>76</sup> Drawing on Professor Hackett's findings, this experiment assumes that the contractual surplus of the parties to a contract for sale of goods depends on the "sunk" investment that the buyer makes and tests whether penalty clauses and legal remedies for breach of contract may attenuate this conclusion. Second, Professors Hessel Oosterbeek, Joep Sonnemans & Susan Van Velzen tested the essential theory underlying the hold-up problem; that is, the theory predicting that people underinvest in relationship-specific assets. They found that the players underinvested although it did not occur to the degree that the theory predicts.<sup>77</sup>

Third, Professors Randolph Sloof, Joep Sonnemans & Hessel Oosterbeek tested the theory predicting that an increase of outside options may induce the efficient level of investment and, as a result, prevent the hold-up problem. Outside options are payments that the held-up party receives when the non-investing party breaches the contract. This experiment is relevant here because both penalties and legal rem-

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<sup>75</sup> See Oren Bar-Gill & Omri Ben-Shahar, *Credible Coercion*, 83 TEX. L. REV. 717, 735 (2005) ("The more severe the remedies that the threatening party expects to bear in case of breach, the less credible his threat.").

<sup>76</sup> See Steven C. Hackett, *Incomplete Contracting: A Laboratory Experimental Analysis*, 31 ECON. INQUIRY 274 (1993).

<sup>77</sup> Hessel Oosterbeek, Joep Sonnemans & Susan Van Velzen, *Bargaining with Endogenous Pie Size and Disagreement Points*, 1999 J. POPULATION ECON. 1, 14 (1999). The authors, however, did not explain why players decided to invest larger sums than the theory predicted. See *id.* at 14.

edies for breach of contract, which may prevent the hold-up problem, are examples of outside options.

In contrast with the theoretical predictions, Professors Sloof, Sonnemans & Oosterbeek found that the level of investments did not depend on the amount of the outside option. According to this finding, the usefulness of outside options to prevent the hold-up problem is "rather limited in practice."<sup>78</sup> Notwithstanding, Professors Sloof, Sonnemans & Oosterbeek also concluded that the under-investment effect of the hold-up problem is not as harmful in practice as it seems in theory after observing that subjects made investments that were below efficient levels but above the levels that the theory predicted.<sup>79</sup>

Fourth, the three authors of the last experiment and Professor Arno Riedl tested the theory by predicting that legal remedies would prevent the hold-up problem and determined whether this excessive protection would lead to overinvestment. The result of this experiment confirmed the predictions of the theory.<sup>80</sup> Fifth, Professors Tore Ellingsen & Magnus Johannesson performed an experiment where bilateral bargaining followed some unilateral investments. The results, as the theory predicted, indicated that relationship-specific investments weakened the bargaining power of held-up parties during the performance stage and, consequently, made them vulnerable to redistributive modifications.<sup>81</sup>

Finally, Professors Jose R. Antiqueira, Sylvia Saes, and Sergio G. Lazzarini tested the theory predicting that relationship-specific investments lead to renegotiations reducing the investing party's surplus. In the first stage, subjects acting as sellers decided whether or not to build a factory to manufacture a product that might be sold to a buyer if a contract were successfully negotiated. Building this factory was a relationship-specific investment since all other buyers' centers were far away. Subjects acting as buyers, in turn, decided whether to buy the product either from the seller making the investment or from a foreign manufacturer at a fixed price.<sup>82</sup> In the second stage, happening after the factory had been built, sellers were informed that the price that the foreign manufacturer was willing to charge might have been reduced; buyers, however, learned that this price has not really

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<sup>78</sup> See *id.*

<sup>79</sup> See *id.*

<sup>80</sup> Randolph Sloof, Hessel Oosterbeek, Arno Riedl & Joep Sonnemans, *Breach Remedies, Reliance and Renegotiation*, 26 INT'L REV. L. & ECON. 263, 290-91 (2006).

<sup>81</sup> See Tore Ellingsen & Magnus Johannesson, *Is There a Hold-Up Problem?*, 106 SCANDINAVIAN J. ECON. 475, 476-77 (2004).

<sup>82</sup> See Jose R. Antiqueira, Maria Saes, & Sergio G. Lazzarini, *'Hold-Up' in Negotiations Involving Specific Investments: An Experimental Investigation* (Jan. 20, 2007) available at <http://ssrn.com/abstract=957790>.

changed. Put it another way, buyers were able to falsely claim that they could replace their sellers with another supplier as a strategy to obtain a renegotiation of the contract price. Professors Antiquiera, Saes, and Lazzarini reported that while 62.7% of the buyers obtained a reduction of the original contract price, the new price was below the seller's costs, making the investment unprofitable in only 14.7% of all cases.<sup>83</sup> Professors Antiquiera, Saes, and Lazzarini speculate that behavioral reasons may explain the differences between the theory, predicting a higher frequency of hold-ups and a larger reduction of the contract price, and the experiment.<sup>84</sup> In particular, reputation concerns or social norms might have deterred some participants from making more aggressive demands.<sup>85</sup>

#### IV. EXPERIMENTAL DESIGN

##### A. *Treatments*

A bargaining experiment with three treatments is used to test the theories about penalty clauses and legal remedies for breach of contract.<sup>86</sup> The first treatment is the control or general one while the second and third treatments respectively test the role of penalty clauses and a high level of legal remedies for breach of contract on the prevention of the hold-up problem.<sup>87</sup> This section describes the first treatment in detail and then explains the other two treatments in reference to the first one.

##### 1. First (General) Treatment

Buyco is a buyer in the business of manufacturing and selling aluminum to its customers downstream while Selco is a seller in the business of extracting and selling bauxite, an indispensable input in the production of aluminum. Selco's costs of extracting and delivering one indivisible unit of bauxite are \$1000. Buyers of bauxite other than Buyco are very far away and, therefore, not willing to pay more than \$500 for the bauxite.

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<sup>83</sup> *Id.*

<sup>84</sup> *Id.*

<sup>85</sup> *Id. at 6.*

<sup>86</sup> See Croson, *supra* note 5, at 938 (explaining that most experimental designs have between three and six treatments).

<sup>87</sup> Thus, the second and the third treatment differ from the first treatment in only one factor. See *id.* at 939 (stating that if treatments differ in two or more factors and result in different behavior, the investigator would not be able to identify which factor is causing the change in the results).

Buyco intends to use the bauxite and other inputs in the manufacturing of one customized indivisible unit of aluminum.<sup>88</sup> This unit is intended to be delivered to a customer downstream, Cusco. The estimated costs of this manufacturing process are \$1000. On top of that, Buyco will make a relationship-specific investment amounting to \$1500 to customize the aluminum in accordance with Cusco's requirements. If, for any reason, Buyco cannot take delivery of the bauxite from Selco and due to this customization, the investment would be almost worthless (it can be sold as scrap at \$500). If Buyco closes the deal with Selco, it would also close the deal with Cusco at a price of \$7500. Otherwise, the contract with Cusco will not be agreed on and, of course, the relationship-specific investment will not be made. Cusco has accepted this price, and not a lower one, on the condition that Buyco delivers the customized aluminum according to a tight schedule provided in the contract because time is of the essence. If Buyco does not deliver the aluminum on time, Cusco will be entitled to refuse delivery; in this case, Cusco will make some adjustments to its plant and will use a non-customized kind of aluminum that it has on inventory.

After learning this information, subjects playing the roles of sellers sent an offer for the sale of bauxite and subjects playing the roles of buyers decided whether to accept or reject it. If the offer was accepted, the contract was formed and subjects participated in the second stage of the experiment. In contrast, if both buyers rejected the offer, their sellers did not participate in the second stage. These participants, however, stayed in the same place doing a moot task in order not to signal to the other subjects that they did not make a contract. For buyers, the moot task consisted of explaining in few words why they did not accept their sellers' offers. All sellers, in turn, assumed that their buyers had accepted their first offers and, if this assumption turned false, the seller's offer in the second stage was moot.<sup>89</sup>

It was efficient for the parties to enter the contract since Selco's costs of manufacturing one indivisible unit of bauxite were \$1000 while Buyco's profit of selling one indivisible unit of aluminum was \$5000 before subtracting the price of the bauxite. Put it differently, Selco should have been willing to sell the bauxite at any price above \$1000 while Buyco should have been willing to buy the bauxite at any

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<sup>88</sup> Most idiosyncratic contracts for sale of goods provide the delivery of several units during the contract term. This experiment, for the sake of simplicity, assumes that the parties to the contract trade one indivisible unit of the goods, which is equivalent to the total number of units that are manufactured and delivered in similar contracts in real business life.

<sup>89</sup> This assumption saved the time that would have been necessary to inform sellers whether or not their buyers had accepted the offers.

price below \$5000. The efficient range of contracting is, therefore, (\$1000, \$5000). Table 2 summarizes these figures.

TABLE 2: MAIN FIGURES OF THE HYPOTHETICAL SCENARIO

Concept	Value
<b>Selco's cost of extracting and delivering one unit of bauxite</b>	<b>\$1000</b>
Price that buyers other than Buyco will pay for the bauxite	\$500
Price of the customized aluminum that Buyco would sell to Cusco (AP)	\$7500
Buyco's costs of manufacturing the customized aluminum (MC)	\$1000
Buyco's investment required to manufacture the bauxite (I)	\$1500
Value of the investment (scrap) if Buyco cannot get the bauxite from Selco	\$500
Buyco's total costs (TC = MC + I)	\$2500
<b>Buyco's profit before subtracting the cost of the bauxite (P = AP - TC)</b>	<b>\$5000</b>
Price at which Selco would sell the bauxite to Buyco	TBD

During the second stage, all participants that entered the contract in the first stage were informed that Buyco had made its relationship-specific investment and that Selco's costs were still \$1000 but that the price that another buyer of bauxite (Thirdco) was willing to pay for this raw material, which had been \$500 during the first stage, might have changed. Due to production constraints, a seller delivering the bauxite to Thirdco would not be able to sell this mineral to Buyco. Buyers were also informed that Thirdco's offer was revealed to sellers in a confidential envelope. All envelopes, however, contained the same price as in the first stage, \$500. The price remained unchanged to create an information asymmetry between sellers and buyers. Thus, sellers were allowed to falsely claim to their buyers that they had received better offers for the sale of one indivisible unit of bauxite. Information about this alternative trading opportunity was non-verifiable for buyers; that is, buyers were unable to check at a reasonable cost in the market the real or approximate price that Thirdco might have offered.<sup>90</sup>

<sup>90</sup> A held-up buyer, instead of a held-up seller, is chosen for this experiment because the undercompensatory nature of remedies is more acute in the former than in the latter case on the following grounds. First, limitations on unforeseeable damages are infrequently a problem when the seller is the aggrieved party. See FARNSWORTH, *supra* note 25, at 826-27 (stating that an aggrieved seller is not entitled to recover consequential damages resulting from its inability to pay some money to its creditors on the grounds that such money is available in the capital markets, unless there is a credit crunch). Indeed, sellers' consequential damages are rare. See JAMES J. WHITE & ROBERT R. SUMMERS, UNIFORM COMMERCIAL CODE 301 (5th ed. 2000). In contrast, an aggrieved held-up buyer may have failed to meet commitments with its customers downstream and, therefore, have suffered significant damages, some of which its seller may have not foreseen. Second, limitations on uncertain or speculative losses are usually less problematic for a seller than for a buyer. See FARNSWORTH, *supra* note 25, at 830-33. Cf. RESTATEMENT

Thus, if Selco breaches, Buyco would be unable to timely find another supplier at a reasonable cost to meet its tight deadline with Cusco (that is, Buyco would breach its contract with Cusco). In such a case, Buyco would not lose either the price of the bauxite because the contract provided payment upon delivery or the costs of manufacturing the aluminum, taking into account that Buyco would have not begun this process at the time Selco would have breached.

Buyco, however, would suffer the following losses. First, Buyco would lose the expected net profit of the transaction with Cusco. This profit equaled the contract price of the aluminum (\$7500) minus the sum of the manufacturing costs (\$1000) and the price of the bauxite, which varied among participants. Thus, the net profit would be \$6500 minus the contract price. Second, Buyco should pay to Cusco the value of a penalty clause, amounting to \$300. Third, the relationship-specific investment (\$1500) would be scrap with a market value of only \$500. Fourth, due to its stained reputation, other Buyco's customers would stop doing business with this company and, as a result, the lost opportunities would amount to \$300. Fifth, Buyco would also suffer other good will losses valued at \$200. Sixth and finally, expected litigation expenses would amount to \$700 (including the cost of enforcing a favorable judgment). These expenses are disaggregated in attorney fees (\$400) and other judgment costs (\$300). On top of that, the expected time between the breach of contract and the enforcement of a favorable judgment is four years while the likelihood of Selco prevailing in court is 10% (e.g., the court holds that Selco did not breach but legally terminated the contract). Table 3 summarizes these figures.

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(SECOND) OF CONTRACTS (1981) § 352 cmt. b (“[P]roof of [seller’s] lost profit will ordinarily not be difficult. If, however, it is the buyer who claims lost profit on the ground that the seller’s breach has caused him loss in other transactions, the task of proof is harder.”). For a seller, even assuming that cover were not possible, a court is not likely to face great difficulties in estimating the difference between the contract price and the costs and other expenses saved due to the breach. See FARNSWORTH, *supra* note 25, at 830. These difficulties are almost nonexistent if a seller is entitled to the contract price. See FARNSWORTH (CONTRACTS), *supra* note 116, at 796. In any event, the experiment could have been the other way without loss of generality; that is, the seller as the held-up party and the buyer as the non-investing company threatening to breach the contract if the price is not decreased. After all, the crucial feature of the hold-up problem in contracts for sale of goods is not the role of the investing party (either the buyer or the seller) but the fact that it cannot make a cover transaction if the contract is breached due to its relationship-specific investment.

TABLE 3: BUYCO'S LOSSES

Losses	Value
Expected profit	\$6500 - contract price
Relationship-specific investment	\$1000
Penalty paid to Cusco	\$300
Loss of business opportunities	\$300
Good will losses	\$200
Litigation expenses	\$700
<b>Total</b>	<b>\$9000 - contract price</b>

If Selco breaches the contract and Buyco sues Selco for this reason, Buyco would recover the following damages. First, although other suppliers of bauxite are far away to deliver this mineral to Buyco at a reasonable cost and taking into account that the available existences of bauxite would have been delivered to Thirdco, this article assumes that a court would deny specific performance.<sup>91</sup> The court, instead, would assume that Buyco might have manufactured standard aluminum using the bauxite and might have obtained a reasonable market profit amounting to \$5850 minus the price of the bauxite.<sup>92</sup> Second, the court would refuse to grant to Buyco the value of the penalty (\$300) that it shall pay to Cusco, and the value of the now almost worthless relationship-specific investment (a loss of \$1000 after taking into account the market value of the scrap) on the grounds that the penalty is a consequential damage that Buyco did not mention to Selco at the making of the contract and that the investment may be used for other purposes.<sup>93</sup> Third, the court would only grant \$200 out of the \$300 value of lost opportunities (this sum already takes into account the 90% likelihood of Buyco prevailing at trial), rejecting the other \$100 due to its speculative nature. The court would refuse to grant any damages related to good will losses on the same grounds. Fourth, the court would only grant to Buyco \$450 for attorney costs and other judgment costs. \$450 is the value of the attorney and other judgment costs that a court would find reasonable (\$500), adjusted for the 90% likelihood of Buyco prevailing at trial.<sup>94</sup> Table 4 summarizes the damages that Buyco would receive in case of breach of contract. These

<sup>91</sup> This assumption is made because the purpose of this experiment is not to test the role of specific performance on the prevention of the hold-up problem. *See generally* C. COM. art. 870.

<sup>92</sup> This profit before taking into account the price of the bauxite might be disaggregated into a market price of \$7000 for standard aluminum and a variable manufacturing cost equal to \$500. The net profit of \$6500, adjusted by the 90% likelihood of Buyco prevailing in trial, equals \$5850.

<sup>93</sup> *See* C.C. art. 1616.

<sup>94</sup> *See* C.G.P. art. 361-66 (providing break out of how damages are awarded, rates, and types of fees).



figures, incidentally, are common knowledge for both buyers and sellers.

TABLE 4: DAMAGES IN THE FIRST TREATMENT

Damages	Actual Loss	Remedies
Expected profit	\$6500 – Contract price	\$5850 - Contract price
Relationship-specific investment	\$1000	\$0
Penalty paid to Cusco	\$300	\$0
Lost opportunities	\$300	\$200
Good will losses	\$200	\$0
Litigation expenses	\$700	\$450
<b>Total</b>	<b>\$9000 – Contract price</b>	<b>\$6500 – Contract price</b>
<b>Difference between actual loss and remedies</b>		<b>2500</b>

Based on this information, the bargaining round began. This round was divided into the following two parts. First, subjects acting as sellers demanded a new price ( $p_1$ ) threatening to breach the contract if Buyco rejected this offer (a take-it-or-leave-it offer). Standard theory, assuming rational actors and that utility only results from money, predicts that the new price ( $p_1$ ) should be higher than the original contract price ( $p_0$ ). Sellers' offers may have either said the truth about Thirdco's offer or may have falsely claimed that the offered price was higher. Sellers used the following message: "We think that the contract price is too low considering the current conditions of the market, especially after receiving a Thirdco's offer for our bauxite at a price of \$\_\_\_\_. We propose to you the following new price \_\_\_\_\_. If this new price is not accepted, our company will breach the contract and sell the bauxite to Thirdco"

Second, subjects acting as buyers decided whether or not to accept the new price ( $p_1$ ). Buyers were not allowed to make counteroffers.<sup>95</sup> If the offer was accepted, the experiment ended with a new price agreement. Otherwise, buyers immediately learned that their sellers did not carry out their threats (that is, that they did not breach the contract). Recall that since Thirdco's offer was \$500, while the original contract price should have been at least \$1000, breach would be inefficient. Thus, in this case, the experiment ended without a new price agreement (i.e., the final price was the agreed price during the first stage).

## 2. Second Treatment – Penalty Clauses

In contrast with the general treatment, the contract between Selco and Buyco in the second treatment provided an enforceable penalty clause. Pursuant to this clause, any party breaching the contract

<sup>95</sup> The rationale of this restriction is that held-up parties usually have little or zero bargaining power.

shall pay to the aggrieved party \$7000 regardless of the quantity of actual damages. This value already takes into account the likelihood of a court reducing its amount.<sup>96</sup> Table 5 summarizes the damages applicable to this treatment.

TABLE 5: DAMAGES IN THE SECOND TREATMENT

Damages	Actual Loss	Remedies
Expected profit	\$6500 – Contract price	\$7000
Relationship-specific investment	\$1000	
Penalty paid to Cusco	\$300	
Lost opportunities	\$300	
Good will losses	\$200	
Litigation expenses	\$700	
<b>Total</b>	<b>\$9000 – Contract price</b>	
<b>Difference between actual loss and remedies</b>		<b>2000 – Contract price<sup>97</sup></b>

### 3. Third Treatment – High level of Legal Remedies

In this treatment, a court would grant a higher level of remedies in comparison with the general treatment. More specifically, a new Colombian legal rule would entitle Buyco to fully recover its relationship-specific investment and also to recover a greater amount of other losses, as Table 6 shows.

TABLE 6: DAMAGES IN THE THIRD TREATMENT

Damages	Actual Loss	Remedies
Expected profit	\$6500 – Contract price	\$5850- Contract price
Relationship-specific investment	\$1000	\$1000
Penalty paid to Cusco	\$300	\$200
Lost opportunities	\$300	\$200
Good will losses	\$200	\$150
Litigation expenses	\$700	\$600
<b>Total</b>	<b>\$9000 – Contract price</b>	<b>\$8000 – Contract price</b>
<b>Difference between actual loss and remedies</b>		<b>1000</b>

### B. Main Features and Controls of the Experiment

Researchers performed this experiment in Medellín, Colombia. Undergraduate students enrolled in law programs in *Universidad*

<sup>96</sup> For example, assume that the original value of the penalty clause is \$9000 and that a court will reduce it to \$6000 and \$4000 with a 25% and 25% likelihood, respectively. It follows that the expected value of the penalty clause is  $\$11,000 \cdot 50\% + \$8000 \cdot 25\% + \$6000 \cdot 25\% = \$7000$ .

<sup>97</sup> Thus, if the original contract price is above \$2000, a breach would make Buyco better off in comparison with performance of the contract (of course, provided that Buyco successfully collect the amount of the penalty from the breaching seller).

*EAFIT* and *Universidad Pontificia Bolivariana* acted as subjects. According to the curriculum of their law programs, they might have had basic knowledge of economic notions but were not expert in these topics. Overall, 180 subjects participated and, since each subject only participated in one treatment, the number of pairs was 90 in total and 30 per treatment.<sup>98</sup> All interactions between buyers and sellers were anonymous (i.e., subjects did not know the identity of their trading partners). Anonymity was preserved to reduce the bias that would have resulted from subjects making decisions based on friendship or peer pressure,<sup>99</sup> on a desire to tease other subjects,<sup>100</sup> or to please the experimenter.<sup>101</sup>

Just for their participation in the experiment, all subjects were entitled to receive a show up fee of \$9,000 Colombian Pesos (“COP”) (around \$5).<sup>102</sup> An additional fee, contingent on the decisions that each subject took was capped at \$30,000 COP (around \$16).<sup>103</sup> These figures are in accordance with other experiments in law and economics.<sup>104</sup> As a rule of thumb, the higher the final price that subjects acting as sellers obtained for their companies or the lower such a price in the case of buyers, the more the money that they received for their participation in this experiment.

More particularly, a seller received the minimum additional payment if the renegotiated price was \$1,000 or less and the maximum payment if the price was \$5,000 or more. Conversely, a buyer received the minimum additional payment (\$0) if the price was \$5,000 or higher, and the maximum payment if the price was \$1,000 or lower. As to other prices, payments were calculated at a pro rata basis. The formulas to calculate the exact value of this additional fee appear in Ta-

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<sup>98</sup> See Croson, *supra* note 5, at 939-942 (indicating that a rule of thumb is having between twenty and thirty observations in each treatment).

<sup>99</sup> For example, without anonymity, subjects might not want to be regarded too greedy by their classmates. See *id.* at 940.

<sup>100</sup> See Antiquiera, Saes, & Lazzarini, *supra* note 82, at 17.

<sup>101</sup> See Jennifer Arlen & Eric L. Talley, *Introduction to Experimental Law and Economics*, in EXPERIMENTAL LAW AND ECONOMICS xv (Jennifer Arlen & Eric Talley eds., 2008); see generally Alvin E. Roth, *Bargaining experiments*, in HANDBOOK OF EXPERIMENTAL ECONOMICS 253 (John H. Kagel & Alvin E. Roth eds., 1995) (indicating that, in comparison with anonymous bargains, there is a lower rate of disagreements in face-to-face experiments where subjects have more difficulty controlling preferences or being rude).

<sup>102</sup> See *Superintendencia Financiera de Colombia* (Colombian Financial Superintendence), <http://www.superfinanciera.gov.co/> (providing exchange rate between Colombian pesos and U.S. dollars) (last visited Nov. 13, 2014).

<sup>103</sup> See Croson, *supra* note 5, at 944 (highlighting that subjects must be paid in accordance to their choices).

<sup>104</sup> See *id.* at 943.

ble 7 ( $p_0$  means the original contract price, and  $p_1$  means the renegotiated price). Payments were rounded to the closest thousands of pesos.

TABLE 7: PAYMENTS IN ADDITION TO THE SHOW UP FEE

	Scenario	Payment Per Treatment (U.S.\$)
<b>Sellers</b>	The buyer rejected its seller's first offer <sup>105</sup>	\$0
	The buyer accepted its seller's first offer	If $p_1 \geq \$5000$ , $payment = \$0$ ; if $p_1 \leq \$1000$ , $payment = \$30.000$ ; if $\$1000 < p_1 < \$5000$ , $payment =$ $\$30.000 * (p_1 - \$1000) / \$4000$
<b>Buyers</b>	The buyer rejected its seller's first offer	\$0
	The buyer accepted its seller's first offer and, regardless of whether the second offer was accepted, the seller did not breach the contract.	If $p_1 \geq \$5000$ , $payment = \$0$ ; if $p_1 \leq \$1000$ , $payment = \$30.000$ ; if $\$1000 < p_1 < \$5000$ , $payment =$ $\$30.000 * (\$5000 - p_1) / \$4000$
	The buyer accepted its seller's first offer, rejected the second offer and its seller breached the contract. <sup>106</sup>	\$0

### C. Qualitative Hypotheses (Prediction of Results)

The prediction of the results under standard economic theory will be made using the method of backward induction. For that purpose, recall that the amount of the unrecoverable losses of a buyer suffering a breach is \$2500 in the general treatment, \$2000 minus the contract price in the penalties treatment, and \$1000 in the remedies treatment. Since the amount of unrecoverable losses depends on the contract price in the penalties treatment, it is necessary to assume a value for this price before applying the method of backward induction. Recalling that the seller's costs are \$1000 and that the buyer's profit is \$5000 before paying the price of the bauxite, it is assumed for the three treatments that the parties split the differences and that the contract price of the bauxite is \$3000. In such a case, the profit in all treatments is \$2000 ( $\$5000 - \$3000$ ) and the unrecoverable losses in

the penalties treatment are -\$1000 (that is, the aggrieved buyer obtains a net benefit from breach provided that it successfully collects the amount of the penalty). An assumption about the likelihood of breach is also necessary to use the method of backward induction: suppose that the buyer estimates this likelihood in 50%.

**Hypothesis 1: There Might Be Differences Among Treatments Regarding the Number of Buyers who Rejects their Seller's First Offers.**

Table 8 shows the payoffs for the three treatments using the method of backward induction.

**TABLE 8: BACKWARD INDUCTION TO DETERMINE WHETHER BUYERS DECIDE TO INVEST**

Treatment	Decision - First Stage	State Of Nature: 2nd Stage	Payoff	Expected Payoff
General	Investing	Breach	$-\$2500 * 50\%$	-\$1250
		Performance	$\$2000 * 50\%$	
	No investing		\$0	\$0
Penalties	Investing	Breach	$\$1000 * 50\%$	\$1500
		Performance	$\$2000 * 50\%$	
	No investing		\$0	\$0
Remedies	Investing	Breach	$-\$1000 * 50\%$	\$500
		Performance	$\$2000 * 50\%$	
	No investing		\$0	\$0

As Table 8 indicates, refusing to invest is a better decision for a buyer in the general treatment (payoff of \$0) than investing (expected payoff of -\$1250). Indeed, a buyer in the general treatment would only invest when the likelihood of breach is estimated at any percentage below 44.4444%. In that case, the expected payoff resulting from breach would be  $\$2500 * 44.4444\% = \$1111.1111$ , the same amount than the expected payoff resulting from performance ( $\$2000 * 55.5556\% = \$1111.1111$ ).

In sheer contrast with the general treatment, investing makes a buyer better off than refusing to invest in the penalty treatment regardless of the likelihood of breach. After all, and due to the amount of the penalty, breach generates a net profit for the buyer. Thus, the expected payoff of investing is \$1500 while the payoff of refusing to invest is, of course, \$0.

Finally, and under an assumption of a 50% likelihood of breach, a buyer is better off investing (expected payoff of \$500) than doing the opposite in the remedies treatment (payoff of \$0). This buyer would only refuse to invest if the likelihood of breach is above 66.6667%. In that case, the expected payoff resulting from breach would be  $\$1000 * 66.6667\% = \$666.6667$ , the same amount that the expected payoff resulting from performance ( $\$2000 * 33.3333\% = \$666.6667$ ).

Naturally, the predictions indicated above are based on standard economic theory. Behavioral reasons and notions such as risk aversion and fairness might alter the decisions of buyers. For instance, the numbers indicated above suggest that a buyer in the penalty treatment should always invest. Such buyer, however, might be afraid of not only suffering a breach but also of failing to collect the amount of the penalty, a situation in which it would suffer an unrecoverable loss. To avoid this scenario, this buyer might prefer to decline the offer to enter the contract. Similarly, and even if the method of backward induction suggests that investing is the optimal decision, a buyer in either the general or in the remedies treatment might refuse to invest after considering that the seller's offer is unfair (e.g., above \$3000).

#### Hypothesis 2: There Should Be Differences Among Treatments Regarding the Price of the Original Contract

As explained earlier,<sup>105</sup> the theory predicts that penalty clauses and a higher level of legal remedies for breach of contract may protect investing parties from suffering a hold-up. These contractual safeguards, however, do not come for free. More particularly, the cost of these safeguards should be a price increase in the penalties and in the remedies treatment in comparison with the general treatment. As to penalties, the seller might only accept to provide a penalty clause in the contract if the buyer accepts a higher price. Regarding remedies, the protection comes from the law and not from the contract itself and the parties cannot change the legal rules (that is, the seller cannot propose to enter a contract governed by less stringent legal rules on remedies). Notwithstanding, a higher level of remedies might make a seller less willing to enter a contract (since it would be more expensive to get rid of it). As a result, the seller might enter the contract, but only after requesting a higher price in comparison with a scenario in which the level of legal remedies is lower.

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<sup>105</sup> Along this chapter, the pronoun "its" is used to refer to the either buyer or seller's counterpart taking into account that both parties are companies. Of course, the pronouns his/her might also be used considering that individuals and not companies took the decisions during the experimental sessions.

The difference between the price in either the penalties or the remedies treatment and the price in the general treatment should be related to the differences in the amount of damages that the seller should pay to the buyer in case of breach. These payments are \$6500 minus the contract price in the general treatment, \$7000 in the penalties treatment, and \$8000 minus the contract price in the remedies treatment. Assuming that the contract price is \$3000, the payments, in the same order, are \$3500, \$7000, and \$5000. It follows that the price differential when a buyer requests a penalty clause should be \$3500 (\$7000 - \$3500) and that the same differential when the law grants a higher level of legal remedies should be \$1500 (\$5000 - \$3500).<sup>106</sup>

**Hypothesis 3: There Should Be Differences Among Treatments Regarding the Number of Buyers who Accepted the First Offer and Rejected the Second Offer**

The theory predicts that both penalty clauses and a higher level of remedies for breach of contract protect investing parties from unfavorable renegotiations during the performance stage.<sup>107</sup> As a result, the number of buyers accepting their first seller's offer and rejecting the second's should be higher in both the penalties and the remedies treatments in comparison with the general treatment. Furthermore, and since the penalty clause seems a better protection against an extorted modification than the higher level of remedies (recall that under the penalty treatment the breach entails a net benefit for an aggrieved buyer), the number of buyers accepting their first seller's offer and rejecting the second's in the penalty treatment should be higher than in the remedies treatment.

**Hypothesis 4: There Should Be Differences Among Treatments as to the Price that Triggers the Rejection in the Second Stage**

For the reasons indicated in the explanation of the third hypothesis, a buyer in the general treatment would only reject the demand for a renegotiation under threat to breach at a price higher than a buyer in the remedies treatment. Similarly, a buyer in the remedies treatment would only reject such a demand at a price higher than a buyer in the penalties treatment. After all, penalties, and a higher level of remedies to a lower extent, should increase the incentives that

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<sup>106</sup> As mentioned earlier, sellers did not breach the contracts because it was inefficient. Buyers, however, did not know that and were informed that if that breach occurred, their additional payment would be zero. This reflects the information asymmetries during the experiment.

<sup>107</sup> See *supra* § III.

an investing party has to reject a demand for a modification or, in other words, to be less afraid of a breach if the threat is carried out.

**Hypothesis 5: There Should Be Differences Among Treatments Regarding the Prices that Sellers Offers in the Second Stage and that Their Buyers Accepts**

For the same reasons indicated in the explanation of the third and the fourth hypotheses, there should be differences among the three treatments regarding not only the renegotiated prices, but also the gaps between these renegotiated prices and the original offers. Thus, the lowest average renegotiated price should appear in the general treatment, which does not include any protection against the hold-up problem. In turn, the average renegotiated price in the remedies treatment should be higher than the same price in the general treatment but lower than in the penalties treatment.

**Hypothesis 6: There Should not Be Differences Among Treatments Regarding the Sellers' False Claims About the Thirdco's Offer for the Bauxite**

Although estimating in advance the seller's false claim about the Thirdco's offer for the bauxite is very difficult, some comments are possible. First, there should not be differences (at least significant) among treatments. Second, the higher the original seller's offer, the higher the false Thirdco's offer. After all, Thirdco's offer should be higher than the original price to increase the likelihood of the buyer accepting the price increase. Third, Thirdco's offer should be lower than the seller's second offer. Otherwise, the buyer would anticipate that the claim is false since it would be better for the seller to deliver the bauxite to Thirdco and not to this buyer.

## V. RESULTS OF THE EXPERIMENT

### 1. There Are Not Significant Differences Among Treatments Regarding the Number of Buyers who Rejected their Sellers' First Offers

Table 9 summarizes the information of pairs who did not reach the second stage.



TABLE 9: NUMBER OF BUYERS REJECTING THEIR SELLERS' FIRST OFFERS

Treatment	Buyers Rejecting The First Offer	Seller's Offer (Average)
General	4	\$2,963
Penalty Clauses	6	\$2,183
Legal Remedies	5	\$2,620
<b>Average</b>	<b>5</b>	<b>\$2,537</b>
Standard Deviation	1	\$994
Pairs Reaching Second Stage	75	\$1,923

Recall that Selco's total costs of extracting and delivering the bauxite were \$1,000 while Buyco's profit was \$5,000 minus the contract price. Thus, sellers should have proposed prices between \$1,000 and \$5,000 and buyer should have accepted these offers provided that they believed that either an unfavorable price renegotiation or a breach were unlikely. In accordance with the first part of this forecast and save two participants who offered prices below \$1,000,<sup>108</sup> all sellers offered prices higher than \$1,000 and lower than \$5,000 (indeed, the lowest price was \$1,000 and the highest was \$4,750). In contrast with the second part of the theoretical prediction, however, some buyers did not accept their sellers' first offers in spite of them being lower than \$5,000. On the other hand, while the number of buyers rejecting their sellers' first offers differs among treatments, such differences are negligible. In more statistical terms, these small differences combined with the also small number of observations does not allow for rejecting the hypothesis stating that the number of acceptance of original offers varied significantly within treatments.

Since it was efficient to enter the contract in the first stage, behavioral and economic reasons must explain why fifteen out of ninety buyers rejected their seller's first offers. Some behavioral reasons might have been either a misunderstanding of the hypothetical case or a feeling that the offer was too high and, therefore, unfair.<sup>109</sup> The economic reasons, in turn, are more related to the hold-up problem and, more particularly, linked to beliefs about the possibility of an unfavorable price renegotiation or breach during the second stage. After all, some participants might have concluded that entering the contract and therefore, making an investment whose profitability depended on the prompt delivery of the bauxite for a seller without competitors in the area triggered a too high risk that was not commensurate with the offer, especially taking into account the likelihood of

<sup>108</sup> Again, behavioral reasons might generate some deviations from these predictions.

<sup>109</sup> See *supra* § III.

breach resulting from a third-party offering a higher amount for the bauxite at a larger stage.

Some qualitative evidence from the experiment supports this statement. Buyers who did not reach an agreement in the first stage explained why they rejected their sellers' offers. Most answers were quite simple, just stating that the offer was too high. Other answers, however, are quite revealing. One buyer of the general treatment and another from the remedies treatment, for instance, rejected their offers because the profit was too low for too risky a business. A third buyer, in the penalty treatment, stated that the offer was too high for a seller lacking any other buyer to purchase the bauxite at a price above its costs. The other two buyers, both in the remedies treatment, claimed that the profit resulting from their sellers' offers was not enough taking into account the investment necessary to manufacture customized aluminum. In short, all these buyers, while presumably arriving to the experiment without knowing anything about the hold-up problem, understood the risks of suffering breach due to a third-party making a better offer for a bauxite and of making an investment necessary to sell customized aluminum for a customer downstream whose profitability depended on the seller of the bauxite timely honoring its promise. Put it another way, such buyers were not willing to accept their sellers' offers unless the prices incorporated the contract risks through a downwards adjustment.

Admittedly, the reluctance to enter the contract should have been ameliorated in both the penalties and the remedies treatment in comparison with the general treatment. After all, both penalties and a higher level of remedies for breach of contract increase the protection against a buyer who might be held-up by its seller. The results, however, do not indicate major differences between the willingness to enter the contract in the general treatment, on the one hand, and in either the penalties or the remedies treatment, on the other hand. As a result, the data does not allow for concluding that either penalties or a higher level of remedies reduce the under-investment effect of the hold-up problem.

Nevertheless, as Table 9 indicates, some differences do exist among treatments regarding the threshold from which buyers are no longer willing to accept their sellers' offers. Indeed, such threshold is lower in the remedies treatment (\$2,620) in comparison with the general treatment (\$2,963) and it is reduced even further in the penalties treatment (\$2,183). Therefore, at first sight, penalties, and also remedies to a lower extent, reduce the price that the investing party tolerates during the contract negotiation and that the non-investing party may obtain if it intends to reach an agreement with its buyer. The differences, however, are not statistically significant at the 10% level since the  $P(T \leq t)$  value is 0.2273 when the general and the penalties

treatment are compared (the *t* stat and the degrees of freedom – hereinafter DF – are, respectively, 1.3078 and 8), and 0.6875 when the general and the remedies treatments are compared (*t* stat=0.4194, and DF=7).

## 2. There Are Descriptive but not Significant Differences Among Treatments Regarding the Price of the Original Contract

Original prices vary among treatments for 75 of the 90 participant pairs in the experiment. Table 10 reflects these prices.

TABLE 10: ORIGINAL PRICES FOR PAIRS REACHING THE SECOND STAGE

<b>Treatment</b>	<b>Buyers Accepting the Original Offer</b>	<b>Original Seller's Offer (Average)</b>
General	26	\$2077
Penalty Clauses	24	\$1778
Legal Remedies	25	\$1901
<b>Average</b>	<b>25</b>	<b>\$1923</b>
Standard Deviation		\$785

At first sight, these numbers suggest that both penalty clauses and a higher level of legal remedies for breach of contract, to a lower extent, have a downward effect on the original seller's offer. More precisely, the difference between the sellers' first offers in the general and in the penalty treatments is 14.3958% while the difference between these offers in the general and in the remedies treatments is 8.4738%. Undeniably, these are not big percentages but neither are negligible amounts, especially when the contract price is in the nine-digits as usually happen in complex contracts leading to hold-up situations.

Since the theory dictates that a rational seller usually accepts a penalty clause in exchange for a premium, it is surprising that the original prices in the penalty treatment were lower than in the general one. A similar statement may be made in respect of the remedies treatment. A more formal statistical analysis, however, does not allow for categorically concluding that either penalties or a high level of remedies push downwards the original offer that a seller makes to its buyer. On the one hand, a *t* test does not allow for rejecting the equality of prices in the general and in the penalty treatments. To be sure, the results are not conclusive taking into account, as Table 11 indicates, that the  $P(T \leq t)$  value is 0.1039, a figure slightly higher than the figure required to reject the hypothesis of equality of prices when the significance level is relaxed to ten-percent.

TABLE 11: TESTING THE EQUALITY OF PRICES IN GENERAL AND IN THE PENALTIES TREATMENT

<b>t - Test</b>	<b>Values</b>
DF	48
<i>t</i> Stat	1.6575
P(T<= <i>t</i> ) two-tail	0.1039
<i>t</i> Critical two-tail	2.0106

In respect of remedies, the results are much clearer. A *t* test does not allow for rejecting the equality of prices in the general and in the remedies treatments, as Table 12 shows.

TABLE 12: TESTING THE EQUALITY OF PRICES IN GENERAL AND IN THE PENALTIES TREATMENT

<b>t - Test</b>	<b>Values</b>
DF	49
<i>t</i> Stat	0.9519
P(T<= <i>t</i> ) two-tail	0.3458
<i>t</i> Critical two-tail	2.0096

3. There Are Not Significant Differences Among Treatments Regarding the Numbers of Buyers who Accepted the First Offer and Rejected the Second Offer

Recalling that sellers' threats to breach were empty ones, an extorted renegotiation occurred whenever a buyer accepted both its seller's first and second offers. In principle, this event should be less frequent both in the penalties and in the remedies treatments than in the general one. In the experiment, however, no significant differences among treatments aroused, as Table 13 shows.

TABLE 13: BUYERS ACCEPTING THEIR SELLERS' FIRST OFFER AND REJECTING THE SECOND ONE<sup>110</sup>

<b>Treatment</b>	<b>Total Pairs - Second Stage</b>	<b>Buyers Rejecting Second Offer</b>	<b>Original Seller's Offer (Average)</b>	<b>Final Seller's Offer (Average)</b>	<b>Difference</b>
General	26	5.0 (19%)	\$2660	\$4050	\$1390
Penalty Clauses	24	5.0 (21%)	\$2020	\$3500	\$1480
Legal Remedies	25	7.0 (28%)	\$2084	\$3029	\$944
<b>Average</b>	<b>25</b>	<b>5.7 (23%)</b>	<b>\$2235</b>	<b>\$3468</b>	<b>\$1233</b>
Standard Deviation		1.2	\$722	\$767	\$705

<sup>110</sup> One seller offered a price of \$800 and another a price of \$780. Of course, their buyers accepted these offers and, less predictably, the sellers offered a new price

The percentage of buyers rejecting the seller's second offer in the penalty treatment and both the percentage and the number of buyers doing the same in the remedies treatment are higher than the figures in the general treatment. Nonetheless, the low number of pairs rejecting the second offer and, more noticeably, the small differences among treatments does not allow for concluding that either penalty clauses or a high level of remedies increase the protection to held-up buyers. To be sure, the data do not support either the opposite conclusion, that is, that penalty clauses and a high level of legal remedies are not useful to prevent the hold-up problem or, more particularly, to reduce the likelihood of rejecting a demand for a modification backed by an empty threat to breach. That the data is inconclusive might be due to a small sample size.

#### 4. There Are Descriptive but not Significant Differences Among Treatments as to the Price that Triggered the Rejection in the Second Stage

As Table 13 indicates, the average price at which a seller's offer in the second stage is rejected is lower in the penalties treatment (\$3,500) than in the general treatment (\$4,050) and it is reduced even further in the remedies treatment (\$3,029). Thus, other things being constant, either the contract providing a penalty clause or the law increasing the level of remedies for breach of contract seems to reduce the maximum price at which a held-up buyer is willing to accept an extorted renegotiation. These results are in sync with the theoretical predictions.<sup>111</sup>

A *t* test fails to confirm this finding in respect of penalty clauses but do so as to legal remedies. On the one hand, the *t* test does not allow for rejecting the hypothesis of equality of prices in the sellers' second offers that their buyers rejected when the general and the penalties treatment are compared ( $P(T \leq t)$  value = 0.27;  $t$  stat = 1.1820, and  $DF = 8$ ). On the other hand, a *t* test rejects the equality of sellers' second offers when the general and remedies treatment are compared provided that the significance level is greater than two percent; that is,

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during the second stage, which was higher but still lower than the cost of extracting the bauxite (\$880 and \$810). Perhaps, these participants did not understand the instructions or the figures of the hypothetical case well. An alternative explanation is also plausible: these sellers did not misunderstand the instructions but were just very risk-averse taking into account that other buyers of bauxite were only willing to pay \$500 for this mineral (that is, they were not making any profit but, at least, reducing the losses).

<sup>111</sup> Nonetheless, this reason does not seem very plausible considering that the efficient range of prices was between \$1,000 and \$5,000 and that the average price of rejected offers was, for all treatments, below the median of this range (\$3,000), which may have signaled a fair distribution of the profits.

the hypothesis cannot be rejected if the significance level is, say, one percent ( $P(T \leq t)$  value = 0.0155);  $t$  stat=2.9137, and  $DF=10$ ).

The empirical confirmation of the theory predicting that a higher level of legal remedies for breach of contract mitigates extorted modifications by reducing the renegotiated price is good news for the prevention of hold-ups. This tandem of experimental results and theoretical predictions indicates that there is at least one strategy to battle the hold-up problem with good chances of obtaining a favorable outcome.

Unfortunately, the fact that the number of seller's offers which were rejected during the first stage did not significantly vary among treatments do not allow to conclude that the hold-up problem (that is, the issue of underinvestment) is also prevented. Furthermore, the low number of observations suggests caution before jumping to general conclusions unless larger samples are analyzed. This article, however, speculates that the results obtained in this experiment regarding renegotiated prices in the remedies treatment will be replicated in other similar experiments.

#### 5. There Are Descriptive but not Significant Differences Among Treatments Regarding the Prices that Sellers Offered in the Second Stage and that Their Buyers Accepted

The theory predicts that the renegotiated price should be lower in both the penalty and the remedies treatment than in the general treatment.<sup>112</sup> On first impression, the experimental data confirm this finding in respect of penalty clauses but not regarding legal remedies. Table 14 summarizes the results.

TABLE 14: PRICES OFFERED AND ACCEPTED DURING THE SECOND STAGE

Treatment	Buyers Accepting Second Offer	Original Seller's Offer (Average)	Final Seller's Offer (Average)	Difference
General	21.0	\$1939	\$2507	\$569
Penalty Clauses	19.0	\$1814	\$2302	\$588
Legal Remedies	18.0	\$1830	\$2542	\$713
<b>Average</b>	<b>19.3</b>	<b>\$1831</b>	<b>\$2451</b>	<b>\$620</b>
<b>Standard Deviation (Price)</b>		<b>\$590</b>	<b>\$820</b>	<b>\$564</b>

On the one hand, the difference between the final price in the general and in the penalty treatments is 8.1771%. While not in the double digits, this percentage may mitigate the hold-up problem by re-

<sup>112</sup> The data in the third and fourth columns of this table considers only the subset of buyers who accepted the first sellers' offer and rejected the second one.

ducing the renegotiated price. Unfortunately for the role of penalty clauses on the prevention of the hold-up problem, a *t* test does not allow for rejecting the hypothesis of equality of prices in the general and the penalties treatment ( $P(T \leq t)$  value is 0.3743,  $t$  stat=0.8990, and  $DF=38$ ).

On the other hand, the renegotiated price is slightly higher in the remedies treatment than in the general one (the difference is 1.3961%). At first glance, this difference might suggest that remedies would not only fail to prevent the hold-up problem but would also aggravate it. The difference, however, is not robust from a statistical standpoint since a *t* test does not allow for rejecting the hypothesis of similarity between the sellers' offers in the general treatments and in the remedies treatment ( $P(T \leq t) = 0.8977$ ,  $t$  stat=-0.1294, and  $DF=37$ ).

As a final note, two out of the seventy-five sellers reaching the second stage (one in the penalty and another one in the remedies treatment) offered the same original price. While they did not explain the reasons to relinquish the opportunity to obtain a higher price (to be sure, the forms did not inquire them about that), moral considerations might have motivated such decisions. In accordance with the principle *pacta sunt servanda*, deeply ingrained in civil law countries, these two participants might have regarded as unfair modifying a price that had been freely agreed some minutes before. Indeed, one of these two participants orally confirmed this reasoning. In words of this participant, the promise made in the first stage was sacred and therefore, only a mean seller would have asked for a price increase.

#### 6. There Were Descriptive but not Significant Differences Among Treatments Regarding the Seller's False Claim About the Thirdco's Offer for the Bauxite

Recall that sellers were allowed to falsely claim that a third-company increased its offer to buy bauxite from \$500 to a higher amount while buyers were unable to check whether or not this statement was true. Table 15 shows the false third-party offers for all pairs who reached the second stage.

TABLE 15: FALSE THIRD-PARTY OFFERS FOR PAIRS REACHING THE SECOND STAGE

Treatment	Pairs	Third-Party's Offer (A)	Seller's Final Offer (B)	Difference (D = B - A)
General	26	\$2673	\$2804	\$131
Penalty Clauses	24	\$2554	\$2551	-\$3
Legal Remedies	25	\$2662	\$2678	\$16
<b>Average</b>	<b>25</b>	<b>\$2631</b>	<b>\$2681</b>	<b>\$50</b>
Standard Deviation	1	\$1083	\$910	\$604

The false third-party's average offer in the penalty clause is slightly lower than in the general treatment (the difference is 4.4519%). The gap between this average offer in the general and in the remedies treatments, in turn, is negligible (the difference is 0.4115%). Both differences are not only very small but also, and not surprisingly, statistically irrelevant since the  $P(T \leq t)$  value when the general and the penalties treatment are compared is 0.7088 ( $t$  stat=0.3757, and  $DF=48$ ), and the same value, when the comparison is between the general and the remedies treatment, is 0.9699 ( $t$  stat=0.0380, and  $DF=49$ ).

On the other hand, the sellers' average final offer is slightly higher than the false third-party's offers (the difference is 1.9004%). Indeed, the seller's offers and the third-party's false offers are so similar that their correlation coefficient is not far from the unit (it is 0.8299). These small differences between these two ranges of prices might indicate a subtle message from the sellers to their buyers, something like the following one: "I received this offer from the third-party but will prefer to keep selling the bauxite to you and, therefore, will turn such offer down if you pay just a little more than that."

## 7. Some Behavioral Reasons May Have Affected the Results

While behavioral law and economics is beyond the scope of this article, some discussion about the effect of reputational and moral considerations is warranted. Recall that only fifteen out of ninety pairs failed to enter a contract. Furthermore, seventeen out of the seventy-five buyers who reached the second stage rejected their sellers' demand for a price increase; in other words, these buyers were not held-up by their sellers. As to the remaining fifty-eight pairs, the difference between the average final price (\$2,451) and the average original price (\$1,831) was only \$620 (33.8613%), a no negligible figure but not a number as high as might have been theoretically expected. In sum, the hold-up problem seems to have been less frequent and harmful in the experiment than in the theoretical predictions.

Sellers might have refrained from more aggressive demands and buyers might have been willing to invest in the first stage and, some of them, to reject the renegotiations demands in the second stage for a variety of behavioral reasons. To begin with, while neither sellers nor buyers knew the identity of their pairs, all of them knew that its counterpart was an individual participant in the same session and, therefore, a classmate and possibly a friend. This feature of the experiment might have refrained sellers from behaving more aggressively. Similar to what happened in this controlled scenario, friendship ties among business people or even courtesy may increase trust in the real business world and, as a result, act as a check against opportunistic in most cases.



As a second reason, people both in experiments and in real business life might refrain from taking advantage of hold-up opportunities on moral grounds. Recall the two participants refusing to demand a higher price during the experimental sessions claiming that it would have been morally wrong. These, however, might have not been the only examples of moral restraint. Other sellers might have decided to demand a low price increase instead of a higher differential based on moral considerations. Thus, the rationale of these sellers might have been along the following lines: "It is immoral to ask for a too high price increase but maybe not wrong to demand a moderate contract change." Of course, the experiment was not designed to verify this rationale and, therefore, other studies will be necessary to either confirm or reject such assumption.

If the hold-up problem was not as frequent and harmful in the experiment as theoretically expected, its significance might be even lower in the real business life. The experiment simulated a one-shot contract; after all, the hypothetical scenario did not mention any other future business between the parties or between the seller and other companies. Therefore, participants acting as sellers should not have been very concerned about reputational consequences of their opportunistic behavior or, more particularly, about losing future contracts with the same or with third parties due to their conduct. In real life, by contrast, the prospect of losing future ventures due to a stained reputation resulting from holding-up business partners might be a check against demanding price modifications backed by a threat of breach.

On balance, this article speculates that although opportunities for a party holding-up its business partners may arise frequently, only a few percentage of these companies take advantage of these chances to behave opportunistically due to moral and reputational reasons.<sup>113</sup> To be sure, this is just a theoretical assumption which, as any theory, needs to be empirically tested. Sadly, these empirical studies are not an easy task. The fact that hold-up situations might arise in practice with less frequency than expected in theory make it difficult to empirically study the hold-up problem except with unusually large numbers.<sup>114</sup>

## 8. Summary of the Results

For the sake of clarity and taking into account that the analysis was divided in several categories, each of them leading to different conclusions (indeed, some of them not leading to strong conclusions), Table 16 summarizes the results. In this table, GT means the General

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<sup>113</sup> See *supra* §III.

<sup>114</sup> See *supra* § III.

Treatment, PT means the Penalty Treatment, and RT means the Remedy Treatment.

TABLE 16: SUMMARY OF THE RESULTS

Item	Differences Based on Descriptive Statistics	Significant Differences Between GT and PT	Significant Differences Between GT and RT
Numbers of buyers rejecting the first offer	Negligible	Not applicable <sup>115</sup>	Not applicable
Average price that sellers offered and that buyers rejected in the first stage	Yes (\$2963 in GT, \$2183 in PT, and \$2620 in RT)	No. $P(T \leq t) = 0.2273$	No. $P(T \leq t) = 0.6875$
Average price that sellers offered and that buyers accepted in the first stage	Yes (\$2077 in GT, \$1778 in PT, and \$1901 in RT)	Yes, provided that the significance level is slightly lower than 10%. $P(T \leq t) = 0.1039$	No. $P(T \leq t) = 0.3458$
Number of buyers that accepted the first offer and rejected the second one	Negligible	Not applicable	Not applicable
Average price that sellers offered and that buyers accepted in the second stage	Yes (\$2507 in GT, \$2302 in PT, and \$2542 in RT)	No. $P(T \leq t) = 0.3743$	No. $P(T \leq t) = 0.8977$
Average price that sellers offered and that buyers rejected in the second stage	Yes (\$4050 in GT, \$3500 in PT, and \$3029 in RT)	No. $P(T \leq t) = 0.2711$	Yes. $P(T \leq t) = 0.0155$
Average price that sellers falsely claimed the third-party offered in the second stage	Yes (\$2673 in GT, \$2554 in PT, and \$2662 in RT)	No. $P(T \leq t) = 0.7018$	No. $P(T \leq t) = 0.9699$

<sup>115</sup> An example might have been the famous vertical integration between Fisher Body and General Motors. Presumably, General Motors, manufacturer of automobiles, bought a significant percentage of shares of Fisher Body, a supplier of car bodies, to avoid being held-up by this company. See K Benjamin Klein, *Why Hold-Ups Occur: The Self Enforcing Range of Contractual Relations*, 34 *ECON. INQUIRY* 444, 461 (1996). But perhaps, and according to Nobel Laureate Ronald H. Coase's version of the story, a hold-up never occurred (even though an opportunity for it existed) and the vertical integration was based on other grounds (such as achieving economics of scale). See Ronald H. Coase, *The Conduct of Economics:*

## CONCLUSION

This experiment leads to some particular and general conclusions. As to the particular conclusions, neither penalty clauses nor remedies seem to clearly affect the willingness to invest in the first stage (that is, to enter the contract). Furthermore, the few number of observations and the small differences among treatments make unclear whether these contractual and legal devices increase the likelihood of the held-up party rejecting an extorted modification backed up by an empty threat to breach.

On the other hand, and from a descriptive statistics standpoint, both penalty clauses and remedies not only pushed downwards the original prices (in comparison with the general treatment), but also the sellers' false claims about the third-party's offers and, more importantly, the sellers' final offers, both when the buyers accepted and rejected them.<sup>116</sup> These results suggest that both penalty clauses and a higher level of remedies, by reducing the amount of the extorted price, mitigate the hold-up problem (or, at least, make it less ruinous for held-up buyers). The price differences among treatments, however, are not statistically significant according to the *t* tests run with the only exception of the prices that sellers offered and buyers rejected in the remedies treatment.

In any event, that the statistical tests did not allow for rejecting the hypotheses of similarity among prices in most cases do not entail that the role of both penalties and remedies on the prevention of the hold-up problem is null. These tests, to be clear, just suggest that the data is not enough to reach strong conclusions. In other words, the data did not prove the theoretical predictions but neither disproved them and, therefore, more experiments are necessary to confirm or reject the preliminary results obtained here.

In light of the above, and until other experiments indicate otherwise, the theoretical predictions stating that penalties and a higher level of remedies mitigate the hold-up problem remain valid. As a result, courts err when they fail to understand the role of penalty clauses on the prevention of extorted modifications and mistakenly reduce their amount in hindsight under the view that it is too high in comparison with the actual damages. Courts might also err when they increase the undercompensatory nature of legal remedies in the context

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*The Example of Fisher Body and General Motors*, 15 J. ECON. & MGMT. STRATEGY 255, 262, 264, 266, 269 (2006) [hereinafter Coase (Conduct)].

<sup>116</sup> See Yoshiro Miwa & J. Mark Ramseyer, *Rethinking Relationship-Specific Investments: Subcontracting in the Japanese Automobile Industry*, 98 MICH. L. REV. 2636, 2641-42, 2665-67 (2000) (arguing that the theory about the role of relationship-specific investments in the structure of firms is more tenuous than it had been assumed).

of complex contracts requiring idiosyncratic investments by requiring a too-high standard of evidence in respect of some kind of damages, such as future losses.

Regarding the general conclusions, this article hopes to have opened the gates for a series of empirical analyses in the realm of contract law and, more particularly, in the field of hold-up situations. Such experiments might study either theories similar to the ones tested here or other hypothesis, such as the role of the rules on good-faith modifications and of economic duress on the prevention of the hold-up problem, just to give two examples. Experiments might also test theories related to the hold-up problem in contracts other than sale of goods (e.g., franchise contracts).