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Empirically Assessing Hadley V. Baxendale

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George S. Geis[*]

The rule of Hadley v. Baxendale *enjoys an important place in the economic analysis of contract law. Over time,* Hadley *has taken on great significance as an archetype for contract default rules that efficiently expose asymmetric information. But a hotly contested debate questions whether economic theories of* Hadley*—and economic approaches to contract law more generally—have failed. There are two concerns. First, it may be hard to empirically measure key variables in the economic models. Second, the models are complex, making it difficult to sum the effects of multiple variables. This Article takes up the challenge of empirically assessing the* Hadley *rule with a new approach that draws upon willingness-to-pay studies in the field of marketing. The first of its kind, this work presents evidence that the* Hadley *rule is a preferable legal default in three simple markets—subject to several important qualifications. This study implies that markets with similar conditions might also benefit from a* Hadley *default rule. More broadly, it suggests that marketing research may be a rich source of data for testing economic theories of contract law.*

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I. INTRODUCTION

Hadley v. Baxendale,[1] one of the most celebrated cases in contract law,[2] sets forth the default rule that unforeseeable consequential damages are unrecoverable.[3] The case has come to represent an important limit to the general rule awarding full expectation damages for breach.[4] And over time, *Hadley* has taken on even greater significance as an archetype for contract default rules that efficiently expose asymmetric information.[5]

A sophisticated line of literature examines the *Hadley* rule from an economic point of view,[6] building theoretical models to determine whether

[1] Hadley v. Baxendale, 156 Eng. Rep. 145 (Ex. 1854).

[2] *See, e.g.*, GRANT GILMORE, THE DEATH OF CONTRACT 83 (2d. ed. 1995) ("*Hadley v. Baxendale* is still, and presumably always will be, a fixed star in the jurisprudential firmament."); Ian Ayres & Robert Gertner, *Strategic Contractual Inefficiency and the Optimal Choice of Legal Rules*, 101 YALE L.J. 729, 734-35 (1992) ("Hadley continues to be one of the most analyzed contracts cases in the law and economic literature."); Russell Korobkin, *The Status Quo Bias and Contract Default Rules,* 83 CORNELL L. REV. 608, 618 n.21 (1998) ("Perhaps the most famous case in all of contract law, *Hadley* has become the example that default rule theorists most often employ to illustrate their conceptual arguments.").

[3] *See* E. ALLAN FARNSWORTH, CONTRACTS § 12.14 (4th ed. 2004); JOHN EDWARD MURRAY, JR., MURRAY ON CONTRACTS § 120 (4th ed. 2001); JOSEPH M. PERILLO, CALAMARI AND PERILLO ON CONTRACTS § 14.5 (5th ed. 2003).

[4] *Id.*

[5] *See* Ian Ayres & Robert Gertner, *Filling Gaps in Incomplete Contracts: An Economic Theory of Default Rules*, 99 YALE L.J. 87 (1989); Lucian Ayre Bebchuk & Steven Shavell, *Information and the Scope of Liability for Breach of Contract: The Rule of* Hadley v. Baxendale, 284 J.L. ECON. & ORG. 284 (1991); Eric A. Posner, *Contract Remedies: Foreseeability, Precaution, Causation and Mitigation*, *in* ENCYCLOPEDIA OF LAW AND ECONOMICS § 4620 at 163-69 (Boudewijn Bouckaert & Gerrir De Geest eds., 2000).

[6] The economic approach to contracts permeates the modern literature. *See* RICHARD A. POSNER, ECONOMIC ANALYSIS OF LAW ch. 4 (6th ed. 2003); ROBERT COOTER & THOMAS ULEN, LAW AND ECONOMICS chs. 6-7 (4th ed. 2004); STEVEN SHAVELL, FOUNDATIONS OF ECONOMIC ANALYSIS OF LAW chs. 13-16 (2004); ENCYCLOPEDIA OF LAW AND ECONOMICS § 4000-4800 (Boudewijn Bouckaert & Gerrir De Geest eds., 2000); THE NEW PALGRAVE DICTIONARY OF ECONOMICS AND THE LAW 174, 425, 436, (Peter Newman ed., 1998). Of course, economic analysis is not the only way to understand contract law, and other approaches yield valuable insights. Economic analysis of contract law—along with the

it is efficient.[7] While many variables matter, one key concern is the distribution of buyer valuations for contract performance.[8] Economic theory suggests that if many buyers place a low value on performance while few buyers value performance greatly (see Figure 1a)—and a buyer's valuation is private, unobservable information—then the *Hadley* rule may be preferable to a rule that awards full expectation damages.[9] Under these circumstances, a *Hadley* default may force private information to be revealed in a way that encourages efficient precautions against breach and minimizes transaction costs from bargaining around the default.[10] If the valuation distributions are reversed (Figure 1b), the *Hadley* rule may be inefficient, and a full damages default might be better.

FIGURE 1a. Positively Skewed Distribution

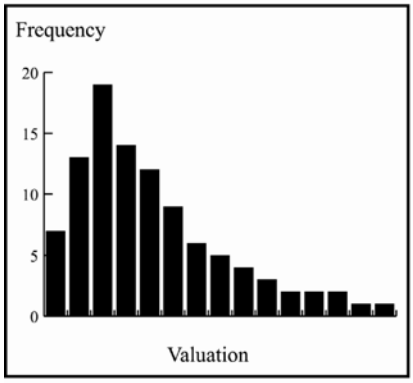
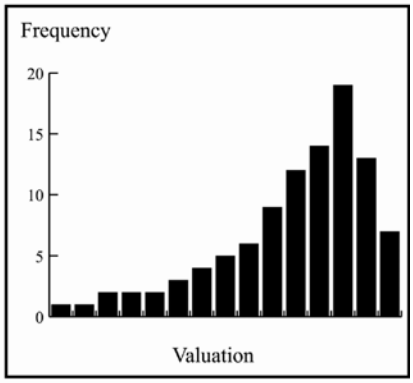


FIGURE 1b. Negatively Skewed Distribution



broader use of economics in the law—also receives its share of external criticisms. For an overview of these criticisms, s*ee* BRIAN BIX, JURISPRUDENCE: THEORY AND CONTEXT 211-12 (3d ed. 2003); Richard Craswell, *Incommensurability, Welfare Economics, and the Law*, 146 U. PA. L. REV. 1419 (1998). For representative critiques, *see* ELIZABETH ANDERSON, VALUE IN ETHICS AND ECONOMICS (1993); AMARTYA SEN, DEVELOPMENT AS FREEDOM (1999); Martha C. Nussbaum, *Flawed Foundations; The Philosophical Critique of (a Particular Type of) Economics*, 64 U. CHI. L. REV. 1197 (1997); Margaret Jane Radin, *Market-Inalienability*, 100 HARV. L. REV. 1849 (1987); Cass R. Sunstein, *Incommensurability and Valuation in the Law*, 92 MICH. L. REV. 779 (1994). This article does not address these concerns. It takes the position, instead, that economic analysis is one way to shape contract law and that empirical analysis remains relevant even when a non-economic approach to contract law is preferred.

[7] *See* Ayres & Gertner, *supra* note 5 (establishing a model for contract penalty defaults based on consequential damages); Bebchuk & Shavell, *supra* note 5 (separately developing formal models of the *Hadley* rule); Jason Scott Johnston, *Strategic Bargaining and the Economic Theory of Contract Default Rules*, 100 YALE L.J. 615 (1990) (analyzing *Hadley* when sellers enjoy market power); Ayres & Gertner, *supra* note 2 (extending Johnston's analysis); Barry E. Adler, *The Questionable Ascent of* Hadley v. Baxendale, 51 STAN. L. REV. 1547 (1999) (further refining the *Hadley* model to reflect the uncertainty of incurring consequential damages in breach).

[8] Ayres & Gertner, *supra* note 5, at 108; Lucian Ayre Bebchuk & Steven Shavell, *Reconsidering Contractual Liability and the Incentive to Reveal Information*, 51 STAN. L. REV. 1615 (1999) ("[I]t seems that the Hadley rule is clearly desirable for cases … in which a minority of buyers has valuations of performance that are substantially higher than the valuations of ordinary buyers.").

[9] *See* Ayres & Gertner, *supra* note 5; Bebchuk & Shavell, *supra* note 5, at 285-86.

[10] *Id.* A comprehensive analysis of the optimal default rule needs to consider additional variables, including transaction costs incurred by high value and low value buyers to contract around the default rule, efficiency gains from tailored precautions, the probability of incurring consequential damages, and several other factors. *See id.*; Adler, *supra* note 7, at 1551-53. An extended discussion of the *Hadley* solutions is found *infra* Part II.B.

Eric Posner, as part of a broader challenge to the economic analysis of contract law, recently calls to question the merits of this *Hadley* model.[11] He makes two arguments. First, it is simply too difficult to gather data needed to test *Hadley*.[12] For instance, Posner doubts that buyer valuations can ever be determined empirically.[13] Second, it is too hard to sum the impact of multiple variables in the model.[14] Even if lawmakers can estimate buyer valuations, they may find it impossible to pick an optimal default rule because other variables—such as the transaction costs of contracting around a default, the efficiency gains from information revelation, and the probability of incurring consequential damages in breach—need to be added into the mix.[15] In short, armchair economic theorizing is not a fruitful endeavor.

Posner's critique echoes a broader cry for empirical analysis[16] throughout legal scholarship.[17] A wide range of academics, practitioners,

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[11] Eric A. Posner, *Economic Analysis of Contract Law After Three Decades: Success or Failure?*, 112 YALE L.J. 829 (2003). ("[T]he economic approach does not explain the current system of contract law, nor does it provide a solid basis for criticizing and reforming contract law.").

[12] *Id.*

[13] *Id.* at 837. *See also,* Posner, *supra* note 5.

[14] Posner, *supra* note 11, at 834, 864-65. Using a choice of remedies example, Richard Craswell synthesizes Posner's claim as follows:

> [W]e cannot decide which remedy is "best" in any overall sense … unless we have some way of measuring the relevant effects, both good and bad, and then summing them to come up with a combined score for each of the possible remedies. But if we lack empirical data to measure the magnitudes of the various effects, any such sum will be difficult—or even impossible—to construct, so we will never know which remedy is truly the most efficient.

Richard Craswell, *In That Case, What is the Question? Economics and the Demands of Contract Theory*, 112 YALE L.J. 903, 908 (2003).

[15] Posner, *supra* note 11, at 838-39.

[16] It is important to distinguish between quantitative empirical analysis and qualitative empirical analysis. Broadly speaking, empirical research uses evidence about the world based on observation or experience. *See* Lee Epstein & Gary King, *The Rules of Inference*, 69 U. CHI. L. REV. 1, 1 (2002). In the legal literature, the term "empirical analysis" often refers more narrowly to quantitative data and statistical techniques. But empirical analysis can also be qualitative (non-numerical). Many legal studies, of course, draw upon qualitative worldly observations to support a hypothesis or contention and can thus be considered empirical in nature. *Id.* at 2-3. In this sense, legal scholarship is often empirical. But consistent with other legal literature, all references to empirical analysis in this Article, unless specified otherwise, refer to quantitative empirical analysis.

[17] The Winter 2002 edition of *The University of Chicago Law Review*, for example, explicitly raised the topic of empirical research in the law. *Exchange: Empirical Research and the Goals of Legal Scholarship*, 69 U. CHI. L. REV. 1 (2002). The provocative exchange debated whether the current state of empirical legal scholarship was "deeply flawed" and whether it even comported with the rules of inference that guide empirical research in the social and natural sciences. A sub-theme of the exchange was a greater need for rigorous empirical analysis in the law. *See* Epstein & King, *supra* note 16, at 1 ("[L]aw professors … appear to be proceeding with little awareness of, much less compliance with, many of the rules of inference, and without paying heed to the key lessons of the revolution in empirical analysis that has been taking place over the last century in other disciplines."); Frank Cross et al., *Above the Rules: A Response to Epstein and King*, 69 U. CHI. L. REV 135 (2002) ("[Epstein and King] miss the targets they seek [as] their assault on legal scholarship violates many of their own rules of inference."); Jack Goldsmith & Adrian Vermeule, *Empirical Methodology and Legal Scholarship*, 69 U. CHI. L. REV. 153 (2002) ("Epstein and King overlook that legal scholarship frequently pursues doctrinal, interpretive, and normative purposes. … [G]iven constraints on time, information, expertise, and research funds, academics face inevitable tradeoffs between rigor and accuracy, on the one hand, and timeliness, relevance, and utility, on the other."); Richard L. Revesz, *In Defense of Empirical Legal Scholarship*, 69 U. CHI. L. REV. 169 (2002) ("[I]n their haste to show that legal academics have failed, Epstein and King miss an important opportunity to explore the ways in which [legal scholarship and the social sciences] can contribute to [each] other."). Around this same time, the *University of Illinois Law Review* sponsored a symposium on empirical legal research,

and judges believe that contract law—along with other legal disciplines—needs greater empirical analysis to test and support scholarly claims.[18] The shortage of quantitative empirical scholarship in the law is attributed to many factors: lack of training among professors, lower prestige for empirical work, greater expense burdens, and a longer research process incompatible with the law's need for timely insights.[19] For whatever reasons, empirical analysis of contract law is in its infancy.[20] And few have

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focusing less on the quality of historical scholarship and more on the potential of future scholarship. *Symposium: Empirical and Experimental Methods in Law*, 2002 U. ILL. L. REV. 791 (2002).

[18] *See* RICHARD A. POSNER, OVERCOMING LAW 210 (1995); Derek C. Bok, *A Flawed System of Law Practice and Training,* 33 J. LEGAL EDUC. 570, 581 (1983); Epstein & King, *supra* note 16, at 4-6; Michael Heise, *The Importance of Being Empirical*, 26 PEPP. L. REV. 807, 834 ("Our legal literature would be enriched if more academics, particularly law professors, became more engaged in empirical legal research and produced more of it."); William M. Landes, *The Empirical Side of Law and Economics*, 70 U. CHI. L. REV. 167, 170 (2003); Russell J. Weintraub, *A Survey of Contract Practice and Policy*, 1992 WISC. L. REV. 1, 4 (1992). The call for more empirical research comes from all ends of the legal realm. *See, e.g.,* Vicki Been & Joel C. Beauvais, *The Global Fifth Amendment? NAFTA's Investment Protections and the Misguided Quest for an International "Regulatory Takings" Doctrine*, 78 N.Y.U. L. REV. 30, 134 (2003) (calling for more empirical data to determine whether NAFTA will chill efficient environmental regulation); Michael A. Livingston, *Reinventing Tax Scholarship: Lawyers, Economists, and the Role of the Legal Academy,* 83 CORNELL L. REV. 365 (1998) (raising a need for more empirical analysis in tax scholarship); Joseph A. Guzinski, *Government's Emerging Role as a Source of Empirical Information in Bankruptcy Cases*, 17 AM. BANKR. INST. J. 8 (1998) (arguing that a lack of empirical information has hindered efforts to reform the bankruptcy code); Michael Korybu, *Searching for Commercial Reasonableness Under the Revised Article 9*, 87 IOWA L. REV. 1383 (2002) (calling for empirical data to understand the treatment of commercial unreasonableness in foreclosure under the revised Article 9 of the Uniform Commercial Code); Kevin R. Reitz, *Sentencing Guideline Systems and Science Appeals: A Comparison of Federal and State Experiences*, 91 Nw. U. L. REV. 1441, 1489 (1997) (raising a need for greater quantitative empirical work in the context of Guideline sentence appeals).

[19] *See* Epstein & King, *supra* note 16, at 9-10; Julius G. Getman, *Contributions of Empirical Data to Legal Research*, 35 J. LEGAL EDUC. 489 (1985) (stating that empirical research takes longer to conduct); Heise, *supra* note 18, at 810; Landes, *supra* note 18, at 176-80; Goldsmith & Vermeule, *supra* note 17, at 165 (arguing that the need for legal scholarship to provide timely guidance to the courts requires information to be occasionally offered under "conditions of empirical uncertainty"). *But see* Epstein & King *supra* note 5, at 118 ("[Legal scholars] can conduct first-rate [empirical] research that they can create and disseminate rapidly."). Recent literature focuses on mitigating these shortcomings by building the institutional infrastructure needed to support empirical research in the law. *See* Lee Epstein & Gary King, *Building an Infrastructure for Empirical Research in the Law*, 53 J. LEGAL EDUC. 311 (2003); Howell E. Jackson, *Analytical Methods for Lawyers*, 53 J. LEGAL EDUC. 321 (2003); Matthew Spitzer, *Evaluating Valuing Empiricism (At Law Schools)*, 53 J. LEGAL EDUC. 328 (2003); David E. Van Zandt, *Discipline-Based Faculty*, 53 J. LEGAL EDUC. 332 (2003). It should be noted, however, that the number of empirical legal articles may be on the rise. A search for "empirical" in the title of all American law reviews published between 1990 and 2000 revealed 231 results. Epstein & King *supra* note 5, at 15-16 & n.37. An updated search for all articles published from 2001 to 2003 yields 145 results. *See also* Gregory Mitchell, *Empirical Legal Scholarship as Scientific Dialog*, 83 N.C. L. REV. (forthcoming 2004), *available at* http://ssrn.com/abstract=528962 (arguing that empirical legal scholarship is increasing and suggesting ways to enhance the scientific status of the work).

[20] A recent review of empirical contracts scholarship in over 500 law journals from 1985 to 2000 yields just 27 articles. Russell Korobkin, *Empirical Scholarship in Contract Law: Possibilities and Pitfalls*, 2002 U. ILL. L. REV. 1033, 1036-37 (2002). By comparison, a search in just 15 top law journals during the 1980 to 2001 period uncovers 71 economics-oriented articles and 52 non-economics oriented articles on contracts. *See*, Gregory Scott Crespi, *The Influence of Two Decades of Contract Law Scholarship on Judicial Rulings: An Empirical Analysis*, 57 SMU L. REV, 105 (2004) (analyzing the incidences of judicial citations of economic, non-economic, and empirical contract scholarship). Several commentators bemoan the low level of empirical contracts research. Korobkin, *supra* at 1037 ("The empirical study of contract law is a very underdeveloped genre of legal scholarship."); Weintraub, *supra* note 18, at 4 ("Despite this need for data, however, there have been only a handful of empirical studies focusing on particular contract problems and relationships."). More broadly, a recent study estimates that just 20.9 percent of all articles on common law subjects (mainly contracts, torts, and property) published in the Journal of Legal Studies from 1972 to 2002 were empirical. By comparison, during this same time period, 55 percent of articles on crime, 52.3 percent of articles on procedure, and 50 percent of articles on public choice in the journal were empirical. Landes, *supra* note 18, at 170. Landes also shows that empirical

studied the *Hadley* rule empirically.[21]

This Article takes up the task of empirically assessing *Hadley* in three simple markets. Drawing upon willingness-to-pay research in the field of marketing, it first estimates the distribution of buyer valuations for a can of Coca-Cola, a piece of pound cake, and an ergonomic pen.[22] Monte Carlo simulation, a technique developed by Manhattan Project scientists, is then used to model complex interactions between multiple variables and the overall impact of alternative default rules on social welfare.[23] Ultimately, this combination of empirical and assumption-based analysis yields several important insights.

The primary claim of this Article is that a *Hadley* default rule is more efficient than a full damages default rule in the simple markets studied. The extended claim is that markets with similar conditions might also benefit from the *Hadley* rule. However, these findings are subject to four important qualifications. First, the *Hadley* rule is not preferable when high value buyers systematically have a much greater chance of incurring consequential damages. Second, a full damages default outperforms *Hadley* when most of the efficiency gains from information revelation go to low value buyers. Third, the *Hadley* rule is not optimal when the transaction costs of contracting around the default rule are much greater for high value buyers than low value buyers. Finally, the analysis assumes perfect competition, and introducing seller power into the empirical model might change the results.

The discussion is organized as follows. Part II reviews the *Hadley* literature, including the concern that economic models of *Hadley* are indeterminate. Part III launches an empirical case study of the *Hadley* rule. More specifically, Section III.A develops a working model of *Hadley* from the existing economic literature, and Section III.B uses willingness-to-pay data to empirically estimate buyer valuations for three simple markets. Section III.C combines this work with other variables to arrive at preliminary conclusions for each market. Section III.D qualifies the findings

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analysis enjoys even greater use among economists outside the legal academy. For instance, 72.4 percent of all articles published in the Journal of Law and Economics (a publication largely edited by business professors and largely focused on scholarship outside the legal academy) during the same 20 year period were empirical in nature. *Id.* at 169-70.

[21] Existing empirical work on the *Hadley* doctrine includes Richard Danzig, Hadley v. Baxendale*: A Study in the Industrialization of the Law*, 12 J. LEGAL STUD. 241 (1975); Janet T. Landa, Hadley v. Baxendale *and the Expansion of the Middleman Economy*, 16 J. LEGAL STUD. 455 (1987); Richard A. Epstein, *Beyond Foreseeability: Consequential Damages in the Law of Contract,* 18 J. LEGAL STUD. 105 (1989); Johnston, *supra* note 7, at 639-48.

[22] *See* Klaus Wertenbroch & Bernd Skiera, *Measuring Consumers' Willingness to Pay at the Point of Purchase*, 39 J. MKTG. RES. 228 (May 2002); Henrik Sattler, *Methods for Measuring Consumer's Willingness to Pay*, University of Hamburg Research Papers on Marketing and Retailing No. 009 (2002); Gerald E. Smith & Thomas T. Nagle, *How Much Are Customers Willing to Pay*, 14 J. MKTG. RES. 20 (2002).

[23] *See* JAMES E. GENTLE, RANDOM NUMBER GENERATION AND MONTE CARLO METHODS (2d ed. 2003); PETER JAECKEL, MONTE CARLO METHODS IN FINANCE (2002).

by conducting sensitivity analysis. Part IV proposes additional research to test the *Hadley* rule in more complicated markets. Finally, Part V suggests that the field of marketing may be a ready-made source of data for contract law scholars. If so, it might be premature to abandon empirical testing of economic theories, at least for the question of consequential damage defaults. A brief conclusion summarizes the results.

II. THE *HADLEY* PROBLEM

A. The Significance of a British Miller

The classic contracts case of *Hadley v. Baxendale*[24] denies recovery for unforeseeable consequential damages—nonstandard damages beyond contemplation of the promisor at the time of contracting.[25] Hadley, a British mill operator, contracted with Baxendale to deliver a broken shaft to a manufacturer, who needed the shaft as a model to make the replacement. Unfortunately, Baxendale was delayed, and the mill shut down for five days. The court denied Hadley compensation for profits lost during this time period because they were unforeseeable consequential damages.[26]

The case has come to represent an important limit to the general rule awarding full expectation damages for breach.[27] Damages are divided into two types, general and consequential. General damages, arising naturally in the usual course of breach, are routinely recoverable.[28] Consequential damages, such as Hadley's lost profits, are not recoverable unless the loss is foreseeable at the time of contracting, or the parties make alternative arrangements.[29] In other words, *Hadley* is a default rule that takes effect only when a contract is silent on the issue of consequential damages. Parties can contract around it if they wish.[30]

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[24] Hadley v. Baxendale, 156 Eng. Rep. 145 (Ex. 1854).

[25] *See* FARNSWORTH, *supra* note 3, at § 12.14; MURRAY, *supra* note 3, at § 120; PERILLO, *supra* note 3, at § 14.5.

[26] FARNSWORTH, *supra* note 3, at § 12.14.

[27] The *Hadley* rule receives widespread acceptance. The Restatement (Second) of Contracts adopts the rule as follows: "Damages are not recoverable for loss that the party in breach did not have reason to foresee as a probable result of the breach when the contract was made." RESTATEMENT (SECOND) OF CONTRACTS §351 (1978). The UCC codifies Hadley. UNIFORM COMMERCIAL CODE § 2-715(2)(a). The Vienna Convention on Contracts for the International Sale of Goods limits damages to losses that the breaching party "foresaw or ought to have foreseen as a possible consequence of breach." CISG Art. 74.

[28] FARNSWORTH, *supra* note 3, at § 12.14.

[29] *Id.*

[30] In fact, many commercial contracts apparently modify this default rule to disclaim liability for *all* consequential damages, whether foreseeable or not. *See* DOUGLAS G. BAIRD ET AL., GAME THEORY AND THE LAW 281 n.16 (1994); FARNSWORTH, *supra* note 3, at § 12.14. Richard Epstein puts it this way:

> All in all, the optimal contracting strategy does not appear to call for the high consequential damages, subject to the defense rules, that courts have tended to adopt. … [W]ithin the class of fixed damage awards, there is reason to expect these damages to be kept relatively limited, which is what the express contracts have typically provided.

Richard A. Epstein, *supra* note 21, at 118. *See also supra* note 47 (exploring UCC drafting committee discussions

Much of contract theory deals with this concept of selecting appropriate default rules to govern incomplete contracts.[31] Parties cannot possibly anticipate everything that might happen over the course of a contract. Even if they could, the costs of negotiating every contingency may outweigh the benefits of planning for small probability events. As a result, no one drafts a complete contract.[32]

The law faces a choice, then, when parties to a contract come across a contingency not addressed by the initial agreement. One option is to dismiss the contract entirely, expunging all contractual liability because the parties have not sufficiently stated a binding agreement.[33] A second option is to fill these contractual gaps somehow and enforce this enhanced contract instead.[34] Economic analysis claims to offer a basis for choosing efficient default rules to govern incomplete contracts.

One way to select a default rule is to simply choose the term that most parties would prefer at the time of contracting.[35] This majoritarian approach

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to abandon the *Hadley* default rule for this reason).

[31] *See, e.g.,* Adler, *supra* note 7, at 1547 ("At the center of contract theory is the role of default rules."); Randy E. Barnett, *The Sounds of Silence: Default Rules and Contractual Consent*, 78 VA. L. REV. 821 (1992); Richard Craswell, *Contract Law: General Theories*, in ENCYCLOPEDIA OF LAW AND ECONOMICS at § 4000, pp. 1-2 (Boudewijn Bouckaert & Gerrir De Geest eds., 2000); Charles J. Goetz & Robert E. Scott, *The Limits of Expanded Choice: An Analysis of Interactions Between Express and Implied Terms*, 73 CAL. L. REV. 261 (1985).

[32] *See* COOTER & ULEN, *supra* note 6, at 211-17; SHAVELL, *supra* note 6; Craswell, *supra* note 31. Alan Schwartz and Robert Scott recently put it this way: "[C]ontracts will inevitably be incomplete. There is an infinite number of possible future states and a very large set of possible partner types. When the sum of the possible states and partner types is infinite and contracting is costly, contracts must contain gaps. Parties cannot write contracts about everything." Alan Schwartz & Robert E. Scott, *Contract Theory and the Limits of Contract Law*, 113 YALE L.J. 541, 594-95 (2003) Parties may also remain silent for a number of strategic reasons. *See* Ayres & Gertner, *supra* note 5; Ayres & Gertner, *supra* note 2; Johnston, *supra* note 7.

[33] Such is the approach taken in a number of classic common law cases. *See, e.g.,* Varney v. Ditmars, 111 N.E. 822 (N.Y. 1916) (holding a promise to give a "fair share of the profits" sufficiently vague to render the contract unenforceable). The Restatement (Second) of Contracts offers some support for this approach. *See* RESTATEMENT (SECOND) OF CONTRACTS § 33(1) (1978) ("Even though a manifestation of intention is intended to be understood as an offer, it cannot be accepted so as to form a contract unless the terms of the contract are reasonably certain."); RESTATEMENT (SECOND) OF CONTRACTS § 33(2) comment b ("contracts should be made by the parties, not by the courts, and hence … remedies for breach of contract must have a basis in the agreement of the parties."). *See also*, Robert E. Scott, *The Theory of Self-Enforcing Indefinite Agreements*, 103 COLUM. L. REV. 1641 (2003) (exploring situations where courts refuse to enforce incomplete contracts).

[34] This approach receives support from the Uniform Commercial Code, which often seeks to supplement incomplete contracts with fair or reasonable terms, especially when parties fail to specify less important terms. *See, e.g.,* Uniform Commercial Code § 2-305 (inserting a reasonable price when none is specified). For more general discussion, see Richard E. Speidel, *Restatement Second: Omitted Terms and Contract Method*, 67 CORNELL L. REV. 785 (1992). Other compromise approaches to enforcing incomplete contracts have also been suggested. *See, e.g.,* Omri Ben-Shahar, *Agreeing to Disagree: Filling Gaps in Deliberately Incomplete Contracts*, Michigan Law and Economics Research Paper No. 04-002 (2004), *available at* http://ssrn.com/abstract=496183 (suggesting an intermediate solution, in some circumstances, which holds parties partially accountable to honor incomplete contracts).

[35] *See* Craswell, *supra* note 31, at 2-5; Charles J. Goetz & Robert E. Scott, *The Mitigation Principle: Toward a General Theory of Contractual Obligations*, 69 VA. L. REV. 967, 971 (1983). The Restatement (Second) of Contracts suggests that lawmakers should supply an essential missing term with one "which is reasonable in the circumstances." RESTATEMENT (SECOND) OF CONTRACTS §204 (1978). It has been suggested that this leads to the use of majoritarian defaults. *See* Speidel, *supra*, note 34. *See also* Uniform Commercial Code § 2-204 (3) ("[A] contract for sale does not fail for indefiniteness if the parties have intended to make a contract and there is a reasonably certain basis for giving an appropriate remedy.").

to default rules allows the law to "economiz[e] on transaction costs" by supplying standard contract terms that parties would otherwise have to adopt by express agreement.[36] While it may be fiction to retroactively divine the parties' intentions, economists can often reason that one term would have been selected over alternatives. Perhaps one party can better manage the risk, for example, or avoid costs easier.[37] By generalizing the preferences of many contracting parties in this manner—or even by looking historically at a large number of executed contracts—lawmakers could conceivably judge which default rules will minimize transaction costs.[38]

But unfortunately, selecting default rules by majority preference may not always lead to the most efficient outcome. A second strain of economic theory suggests that lawmakers should sometimes choose default rules preferred instead by a minority of parties.[39] The reason: minority defaults can, at times, lead to information sharing that increases the overall welfare of an economic system.[40] Selecting the right default can prevent better informed parties from taking a "bigger slice of a smaller pie" by compelling information to come forward that results in the "bigger pie."[41]

From an economic point of view, then, one key challenge is knowing whether to choose majoritarian defaults that save on transaction costs or to choose penalty defaults that force information to be shared. This tension plays out most directly in the economic literature evaluating *Hadley*.[42] In fact, over time, the *Hadley* rule has taken on much greater significance as an archetype for the power of contract default rules to efficiently expose asymmetric information.[43]

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[36] POSNER, *supra* note 4, at 96-97. *Cf.* Frank H. Easterbrook & Daniel R. Fischel, *Limited Liability and the Corporation*, 52 U. CHI. L. REV. 89, 93 (1985).

[37] *See* ROBERT E. HILLMAN, PRINCIPLES OF CONTRACT LAW 254-56 (2004); Goetz & Scott, *supra* note 35. For an example of this in practice, see *National Distillers & Chem. Corp. v. First National Bank of Highland Park,* 804 F.2d 978 (7th Cir. 1986) ("Ambiguities and gaps in contracts should be resolved by finding what the parties would have bargained for had they addressed the matter explicitly at the time.").

[38] *But see* Korobkin, *supra* note 2 (suggesting that default rule preferences of contracting parties may be influenced by the existing default rule); Russell Korobkin, *The Endowment Effect and Legal Analysis*, 97 Nw. U. L. Rev. 1227 (2003) (suggesting that behavioral economic effects may cause contract default rules to be "sticky," preventing parties from efficiently contracting around the rules in some cases).

[39] *See* Ayres & Gertner, *supra* note 5; Craswell, *supra* note 31, at 5-9.

[40] The intuition behind these "penalty defaults" or "information forcing defaults" is to keep better informed parties from strategically hiding socially valuable information during contract formation. To get the information out, "it may be efficient to choose a rule that a majority of people actually disfavor." Ayres & Gertner, *supra* note 5, at 95. *See also* Gwyn D. Quillen, *Contract Damages and Cross-Subsidization,* 61 S. CAL. L. REV. 1125 (1988) (discussing cross-subsidization problems that result when better informed parties keep information private).

[41] Ayres & Gertner, *supra* note 5, at 94 This point is developed further *infra* notes 57-74 and accompanying text.

[42] *See* Ayres & Gertner, *supra* note 5*;* Bebchuk & Shavell, *supra* note 5.

[43] *See id*.; Adler, *supra* note 7. More generally, contracting under asymmetrical information receives extensive treatment in the literature on game theory and the law. *See, e.g.*, BAIRD ET AL., *supra* note 30, at 79-158 (1994).

B. Theoretical "Solutions" to Hadley

The *Hadley* situation is usually modeled by dividing a population of buyers into two classes: those with a low valuation of contract performance and those with a high valuation.[44] Each buyer is risk neutral and knows his valuation type. The selling party has no way to distinguish one type of buyer from the other and must rely instead on the buyer to reveal this private information. From a social point of view, it is desirable for sellers to know this information so they can take efficient precautions.[45] For example, using the facts of Hadley, the carrier could hire another employee to ensure timely delivery for the highest value buyers.[46] While many default rules might govern the issue of consequential damages,[47] two alternative rules are proposed: (1) a *Hadley* default limiting unforeseeable consequential damages unless high value buyers reveal their type; and (2) a full-damages default allowing high value buyers to recover everything without revealing any information.[48] Which default rule will allow sellers to distinguish between buyer types, enabling them to take efficient precautions that maximize social welfare?[49]

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[44] A more realistic approach might be to model the value of performance by the two classes of buyers as two continuous distributions with different means. Such an approach is suggested by Adler, *supra* note 7, at 1561 n.38. This Article extends the analysis in this manner. *See infra* Part III.

[45] The model thus assumes that spending more on precautions will reduce the risk of breach, and therefore the expected damages suffered by each buyer for nonperformance. Said another way, if the low value and high value buyers were conducting these activities themselves, they would each take different levels of care, reflecting the optimal investments to reduce the risk of breach. Other things being equal, one would prefer a default rule that leads to identical results. *See* BAIRD ET AL., *supra* note 30, at 150; Ayres & Gertner, *supra* note 5; Bebchuk & Shavell, *supra* note 5.

[46] This might make sense if the costs of hiring the extra employee were more than offset by the benefits of a greater chance of timely delivery to Hadley. One can also image an inefficient investment in precautions—hiring 10 police to fend off an unlikely attempt at highway robbery, for example. Such an investment might result in price greater than Hadley is willing to pay and is unlikely to occur once full negotiations have taken place.

[47] For example, some members of the drafting committee for the 2003 amendments to Article 2 of the Uniform Commercial Code considered imposing a default rule denying recovery of *all* consequential damages in breach. This discussion did not lead to a formal draft proposal, and Amended Article 2 leaves the *Hadley* rule in place. Interview with William Henning, Former Chair, Drafting Committee to Revise Uniform Commercial Code Article 2, in Tuscaloosa, Ala. (June 16, 2004).

[48] *E.g.*, Ayres & Gertner, *supra* note 5; Bebchuk & Shavell, *supra* note 5; Adler, *supra* note 7.

[49] The concept of greater social efficiency through more tailored precautions can be illustrated with a simple numerical example. Take a population of 100 buyers with a positively skewed distribution of performance valuations as follows (Figure 1a displays this data visually):

Value Placed on Performance	Number of Buyers
1	7
2	13
3	19
4	14
5	12
6	9
7	6
8	5
9	4
10	3

1. The Majoritarian Solution

A lawmaker might argue that the *Hadley* default is preferable because it forces high value buyers to reveal their type by negotiating protection for unforeseeable consequential damages.[50] Of course high value buyers may initially resist disclosing this information to avoid a price increase. But as long as sellers are best situated to invest in extra precautions,[51] high value buyers will realize that they are better off paying the higher price and enjoying greater certainty of performance.

But what happens if a full damages default rule is adopted instead? Now, high value buyers will be compensated fully and need not reveal their special circumstances.[52] Low value buyers, however, will prefer that sellers take fewer precautions in exchange for a cheaper price.[53] They will step forward to reveal this preference, allowing sellers to again distinguish between buyer types and take more granular precautions.[54] Thus, in theory, either the *Hadley* or the full damages default rule will expose private information and lead to efficient precautions.

Under a majoritarian approach, then, the optimal default rule is simply a function of the underlying valuation distribution for the market. The most efficient rule seeks only to minimize transaction costs by putting a default in place that most buyers need not contract around.[55] Lawmakers should

11	2
12	2
13	2
14	1
15	1
TOTAL	100
MEAN	5.1

If sellers cannot distinguish among the types of buyers, they will take precautions reflecting the mean performance valuation of 5.1. However, if they can divide the buyers into just two groups—those above the mean and those below the mean—then they can take precautions reflecting a mean value of 3.2 for the 65 low value buyers and precautions reflecting a mean value of 8.7 for the 35 high value buyers. More granular knowledge of the performance valuations for different buyer classes results in two main benefits. First, sellers can avoid wasting precautions on the 65 low value buyers who would prefer a lower price and higher chance of breach. Second, sellers can take additional precautions—greater than the average levels taken when all buyers are pooled together—to increase the probability of successful performance for the 35 high value buyers. Social gains will continue to accrue with increasing levels of granularity (for example subdividing the two groups of buyers into groups of four, eight or ultimately down to groups of fifteen). Of course these gains may be offset by the increased transaction costs needed to obtain this granularity.

[50] *See,* Posner, *supra* note 11, at 836-37.

[51] One would expect this to be true in many cases, although independent insurance markets, allowing buyers to self insure, if they wish, might exist for some types of contracts. Ultimately this is another issue subject to empirical investigation.

[52] *See* Craswell, *supra* note 31; Posner, *supra* note 11.

[53] *Id.*

[54] *Id.*

[55] This analysis follows from Coasean contractual theory. *See* R.H. Coase, *The Problem of Social Cost,* 3 J.L. & ECON. 1 (1960); Johnston, *supra* note 7, at 624-25.

estimate the buyer valuation distribution for the market and select the default rule accordingly: if buyer valuations skew positively (Figure 1a), then a *Hadley* rule is best; if they skew negatively (Figure 1b), then a full damages default should be chosen. And if buyer valuations are normally distributed, the consequential damages default rule may not matter.[56]

2. The Penalty Default Solution

In some cases, however, a *Hadley* default can be better even when most buyers would not select this rule in advance. The logic is subtle: majority defaults may not lead buyers to reveal their type, while a penalty default rule—reflecting the preferences of fewer buyers—may expose this information.[57]

This can happen because the majoritarian model of *Hadley* assumes away important variables. For instance, the optimal default rule may depend on the magnitude of transaction costs—the costs of contracting around a disliked default rule.[58] Or the best rule may change if low value and high value buyers face different transaction costs.[59] The optimal default might also turn on which buyers benefit the most from tailored precautions.

Consider a situation where the majoritarian default leads to a poor outcome. Assume that a legal system selects a full damages default to govern the negatively skewed market shown in Figure 1b.[60] This default is majoritarian because there are 65 high value buyers—who prefer a full damages rule—and just 35 low value buyers. But the transaction costs incurred by low value buyers to contract around the full damages default may outweigh the gains that they receive from fewer precautions. If so, low value buyers will not reveal their type, and sellers will take average precautions for the entire buyer pool, not more efficient tailored precautions. By contrast, this problem may not occur if lawmakers select a *Hadley* default. If the gains from high value buyers contracting around the *Hadley* default rule sufficiently outweigh the transaction costs incurred, then they will reveal their type. Under these circumstances, a default rule preferred by a minority of buyers leads to greater social welfare, while a default rule preferred by the majority is less efficient.

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[56] Posner, *supra* note 11, at 854.

[57] Ayres & Gertner, *supra* note 5; Bebchuk & Shavell, *supra* note 5; Adler, *supra* note 7.

[58] A majoritarian default might be appropriate if transaction costs are so small that everyone contracts around inefficient defaults or so large that no one does so. *See* Ayres & Gertner, *supra* note 5, at 114-15. But this need not be the case and robust models will explicitly take transaction cost variables into account. *Id. See also,* Alan Schwartz & Joel Watson, *The Law and Economics of Costly Contracting*, 20 J.L. ECON. & ORG. 2, 3 (2004) ("[C]ontracting and renegotiation costs are treated as exogenous parameters, commonly assumed to be either very high or very low. … This article explores the middle ground.").

[59] Korobkin also explores this point. *See* Korobkin, *supra* note 20, at 1058.

[60] The distribution of buyer valuations for this market is just the inverse of the one described *supra* note 49.

A stylized numerical example may help illustrate this point.[61] Simplify the market in Figure 1b even further so there are 35 identical low value buyers and 65 identical high value buyers, and make the assumptions of Table 1.

Table 1. Buyer Assumptions in Negatively Skewed Market

Buyer Type	Number	Valuation	Cost to Contract Around Default
Low	35	50	15
High	65	500	10
Average		342.5[62]	

Assume further that sellers in a perfectly competitive market can choose from three different levels of precautions (Table 2). Taking greater precautions increases the chances that sellers will successfully perform the contract but also costs more. For example, sellers taking medium precautions incur 25 in costs—which they pass on to buyers in perfect competition—and these precautions lead to successful contract performance 60 percent of the time.

Table 2. Seller Precautions Assumptions

Seller Precaution Level	Probability of Performing Contract	Cost of Taking Precaution
Low	40%	5
Medium	60%	25
High	80%	100

With these assumptions, low value buyers prefer contracts where sellers take low precautions:[63]

$Utility_{low} = 50\ (40\%) - 5 = 15$
$Utility_{med} = 50\ (60\%) - 25 = 5$
$Utility_{high} = 50\ (80\%) - 100 = -60$

Conversely, high value buyers prefer contracts where sellers take high precautions:

[61] This example is adapted from the framework established by Bebchuk & Shavell. *See* Bebchuk & Shavell, *supra* note 5, at 287-89 nn. 9-17. Perfect competition is assumed, and all seller costs except precautions are excluded for simplicity.

[62] This value is the weighted average of the low and high buyer valuations: (.35 * 50) + (.65 * 500) = 342.5.

[63] Buyer utility = [(valuation of successful performance) * (probability of successful performance)] - cost of precautions.

$Utility_{low}$ = 500 (40%) – 5 = 195
$Utility_{med}$ = 500 (60%) – 25 = 275
$Utility_{high}$ = 500 (80%) – 100 = 300

And if sellers cannot distinguish buyer types, they will take medium precautions, reflecting average expected preferences:

$Utility_{low}$ = 342.5 (40%) – 5 = 132
$Utility_{med}$ = 342.5 (60%) – 25 = 180.5
$Utility_{high}$ = 342.5 (80%) – 100 = 174

Now imagine that this legal system selects the majoritarian default rule of full damages. High value buyers have no need to contract around this rule—they will be fully compensated regardless.[64] But low value buyers may choose to reveal their type for a cheaper price. Will the economic system benefit if they do so? Consider the social welfare in each possible outcome (Table 3).

Table 3. Social Welfare Under Full Damages Default Rule

	Social Welfare		
	Low Buyers	High Buyers	Total
Low value buyers contract around default (separating)	0[65]	19,500[66]	19,500
Low value buyers do not contract around default (pooling)	175[67]	17,875[68]	18,050*
* Equilibrium result			

If low value buyers incur the costs of contracting around the rule, the buyer population separates by type. Low buyers receive low precautions and high buyers receive high precautions (without incurring transaction costs). Conversely, if low value buyers do not reveal their type, the population pools and everyone receives medium precautions. Society is better off when low value buyers contract around the default rule (19,500 >

[64] *See* Posner, *supra* note 11, at 836-37.

[65] Calculated as follows: (number of low buyers) * (utility to low buyer with low precautions – cost to low buyer of contracting around default) = (35) * (15-15) = 0. Thus, in this context, social welfare is the sum of participant utility and excludes third party effects.

[66] Calculated as follows: (number of high buyers) * (utility to high buyer with high precautions) = (65) * (300) = 19,500.

[67] Calculated as follows: (number of low buyers) * (utility to low buyer with medium precautions) = (35) * (5) = 175.

[68] Calculated as follows: (number of high buyers) * (utility to high buyer with medium precautions) = (65) * (275) = 17,875.

18,050), but they will not. Each low buyer faces a cost of 15 to contract around the rule yet only benefits by 10—the difference between utility with low precautions and utility with medium precautions. The equilibrium is a pooling one where no one reveals information.

In this example, however, the results change when the *Hadley* default is selected, even though fewer buyers prefer this rule. Now the 65 high value buyers must decide whether to reveal their type. Consider the resulting social welfare under both outcomes (Table 4).

Social welfare is greater when high value buyers contract around the *Hadley* default rule, and they will do so. The increase in utility when they move from medium precautions to high precautions, a net gain of 25, outweighs the transaction costs of 10. While the greatest social welfare comes when low value buyers contract around a full damages default,[69] this outcome never occurs. *Hadley* thus offers the best obtainable outcome.

Table 4. Social Welfare Under *Hadley* Default Rule

	Social Welfare		
	Low Buyers	High Buyers	Total
High value buyers contract around default (separating)	525[70]	18,850[71]	19,375*
High value buyers do not contract around default (pooling)	175[72]	17,875[73]	18,050
* Equilibrium result			

This example illustrates how self-interested buyer behavior sometimes prevents majoritarian defaults from exposing socially valuable information. Different assumptions, of course, might support majoritarian defaults.[74] The penalty default solution to *Hadley* argues that limited consequential damages should sometimes be imposed to force efficient precautions, even though the rule may be preferred by few contracting parties. This means that lawmakers considering the *Hadley* rule need to analyze more than just

[69] This is true because total transaction costs incurred when low buyers contract around the default, 35*15 = 525, is less than the total transaction costs incurred when high value buyers do so, 65*10 = 650. *Cf.*, Bebchuk & Shavell, *supra* note 5. This need not always be the case. If, for example, transaction costs of high value buyers are reduced to 5, the resulting welfare when they contract around the *Hadley* default is 19,700—which exceeds the social welfare when low value buyers contract around the full damages default.

[70] Calculated as follows: (number of low buyers) * (utility to low buyer with low precautions) = (35) * (15) = 525.

[71] Calculated as follows: (number of high buyers) * (utility to high buyer with high precautions – cost to high buyer of contracting around default) = (65) * (300-10) = 18,850.

[72] Calculated as in *supra* note 67.

[73] Calculated as in *supra* note 68.

[74] For example, reducing transaction costs for low buyers to 5 would cause them to separate in a full damages regime. A majoritarian default thus results in the most efficient outcome.

the number of high value and low value buyers in a market. Additional buyer data—including the magnitude of performance valuations, costs incurred when contracting for other rules, and efficiency gains from tailored precautions—are needed to select the better default.

3. Introducing Stochastic Damages

The solution gets more complicated, however, when consequential damages are stochastic instead of certain.[75] Using the facts of *Hadley*, imagine, for example, that there was only some chance that the miller would lose profits from a delayed delivery—maybe he was searching neighboring mills for a spare shaft.[76] Barry Adler recently modeled this nuance,[77] finding that the change narrows the circumstances where penalty defaults lead to the optimal outcome.[78] A few changes to the previous example will illustrate this point (see Table 5).

Table 5. Revised Buyer Assumptions

Buyer Type	Number	Valuation: General Damages	Valuation: Consequential Damages	Probability of Incurring Consequential Damages[79]	Cost to Contract Around Default
Low	35	25	75	60%	15
High	65	25	475	90%	10
Average		25	335[80]	79.5%	

Buyer valuation is now split between general damages and consequential damages, and the *Hadley* rule is modeled differently. Consequential damages incurred by low value buyers are considered foreseeable, and thus recoverable under Hadley.[81] Consequential damages beyond this amount are unforeseeable. High and low value buyers also have different chances of suffering consequential damages.

In the stylized example, then, the first 75 in consequential damages is foreseeable, while the incremental 400 incurred by high value buyers is not. High buyers also suffer damages with greater probability. Assumptions for

[75] *See* Adler, *supra* note 7.

[76] Or to borrow from Adler, image that Hadley hired a mechanic, who had a chance to fix the mill without the missing mill shaft. *Id.* at 1560.

[77] *Id.*

[78] *Id.* at 1551-53.

[79] For simplicity, this probability of incurring consequential damages is modeled with certainty. *Cf. id.* at 1561 n.38. The working model used *infra* Part III.A models this variable stochastically.

[80] This value is the weighted average of the low and high buyer consequential damages: (.35 * 25) + (.65 * 475) = 335. Similarly, the average probability of incurring consequential damages is the weighted probability of low and high value buyers.

[81] *See* Adler, *supra* note 7, at 1561-62.

seller precautions remain the same.

With this modeling refinement, high value buyers are more likely to conceal their type inefficiently, even under a *Hadley* default. As before, low value buyers prefer contracts where sellers take low precautions,[82] high value buyers prefer contracts where sellers take high precautions,[83] and sellers take medium precautions when they are unable to distinguish buyer type.[84] Under a full damages regime, the outcome mirrors the earlier example (see Table 6).

Table 6. Revised Social Welfare Under Full Damages Default Rule

	Social Welfare		
	Low Buyers	High Buyers	Total
Low value buyers contract around default (separating)	280[85]	17,030[86]	17,310
Low value buyers do not contract around default (pooling)	595[87]	16,023[88]	16,618*
* Equilibrium result			

Social welfare is greater if low value buyers separate, but they will pool. Transaction costs of 10 exceed the net benefit of 6 that accrues to low value buyers moving from medium to low precautions.

In the earlier example, instituting a *Hadley* default resulted in a switch from a pooling equilibrium to a separating one. But this time, changing the default rule will not cause separation. Clearly, social welfare is again

[82] The calculation here is slightly more complicated, as buyer utility under each precaution level now depends on the probability of consequential damages occurring. Thus buyer utility = [probability of no consequential damages * ((general damages * the probability of successful performance) – the cost of precautions)] + [probability of consequential damages * (((general damages + consequential damages) * the probability of successful performance) – the cost of precautions)]. Using this formula for low value buyers,

$Utility_{low}$ = [40%*((25*40%) – 5)] + [60%*(((25+75)*40%)-5)] = 23
$Utility_{med}$ = 17
$Utility_{high}$ = -44

[83] For high value buyers,
$Utility_{low}$ = [10%*((25*40%) – 5)] + [90%*(((25+475)*40%)-5))]= 176
$Utility_{med}$ = 246.5
$Utility_{high}$ = 262

[84] For average buyers,
$Utility_{low}$ = [20.5%*((25*40%) – 5)] + [79.5%*(((25+335)*40%)-5)] = 111.5
$Utility_{med}$ = 149.8
$Utility_{high}$ = 133.1

[85] Calculated as follows: (number of low buyers) * (value to low buyer with low precautions – cost to low buyer of contracting around default) = (35) * (23-15) = 280.

[86] Calculated as follows: (number of high buyers) * (value to high buyer with high precautions) = (65) * (262) = 17,030.

[87] Calculated as follows: (number of low buyers) * (value to low buyer with medium precautions) = (35) * (17) = 595.

[88] Calculated as follows: (number of high buyers) * (value to high buyer with medium precautions) = (65) * (246.5) = 16,023.

greater with buyer separation (See Table 7). Furthermore, the gains to high value buyers moving from medium to high precautions (15.5) exceed the transaction costs of contracting around the default rule (10). But high value buyers must now pay an additional cost if they identify their type: sellers will charge them for the higher probability of incurring the initial 75 in consequential damages.[89] In this example, high value buyers pay an extra 7.8 when identifying their type.[90] Facing this calculus, high value buyers keep quiet,[91] resulting in a pooling equilibrium—even with the *Hadley* rule.

Table 7. Revised Social Welfare Under *Hadley* Default Rule

	Social Welfare		
	Low Buyers	High Buyers	Total
High value buyers contract around default (separating)	805[92]	16,380[93]	17,185
High value buyers do not contract around default (pooling)	595[94]	16,023[95]	16,618*
* Equilibrium result			

This does not mean that penalty defaults never work,[96] only that they may work less frequently than otherwise believed.[97] A nuanced model of *Hadley*, then, needs to add variables for the chances that high and low buyers will incur consequential damages.

To summarize, the choice of a default rule to govern consequential damages depends on several variables, including (1) the magnitude and distribution of valuations that buyers place on contract performance;[98] (2) the transaction costs incurred when high value buyers bargain around a *Hadley* default or low value buyers bargain around a full damages default;[99] (3) the social efficiency gains when high or low value buyers disclose

[89] *See* Adler, *supra* note 7, at 1565-66.

[90] Calculated as follows: (probability of consequential damages for high buyers – probability of consequential damages for average buyers) * foreseeable consequential damages = (90% - 79.5%) * 75 = 7.8.

[91] 15.5 in benefits < 17.8 in total costs.

[92] Calculated as follows: (number of low buyers) * (value to low buyer with low precautions) = (35) * (23) = 805.

[93] Calculated as follows: (number of high buyers) * (value to high buyer with high precautions – cost to high buyers of contracting around default) = (65) * (262-10) = 16,380.

[94] Calculated as in *supra* note 87.

[95] Calculated as in *supra* note 88.

[96] To see this in the example, change low buyer consequential damages from 75 to 25. With this modified assumption, the gains to high buyers from identifying themselves outweigh the costs of doing so, and buyers separate under the *Hadley* rule.

[97] *See* Adler, *supra* note 7, at 1551-53. Responses to Adler's article echo this belief. *See* Ian Ayres & Robert Gertner, *Majoritarian v. Minoritarian Defaults*, 51 STAN. L. REV. 1591, 1592-93 (1999); Bebchuk & Shavell, *supra* note 8, at 1618-19.

[98] *See* Ayres & Gertner, *supra* note 5; Bebchuk & Shavell, *supra* note 5.

[99] *Id.*

private information, thus enabling more tailored precautions against breach;[100] and (4) the probability that high or low buyers will incur consequential damages in breach.[101]

Given this complexity, it may be difficult for lawmakers to unpack these variables and determine which default rule should apply in any given context. One commentator has remarked that "accurate evaluation of a penalty-default rule's efficacy in [the *Hadley*] setting could be a heroic task."[102]

C. The Indeterminacy Concern with Economic Contracts Scholarship

Eric Posner takes the argument further, suggesting that complex economic models of contract law—including the *Hadley* model for consequential damages—are indeterminate.[103] In his view, economic analysis of contract law has become so complicated that the theories do not lead to observable implications or concrete normative suggestions. The argument is twofold. First, key variables in the economic models cannot be estimated with any degree of confidence.[104] Second, even if one variable can be measured in isolation, there is no way to aggregate all of a model's variables to obtain meaningful outcomes.[105] Take each argument in turn.

The first claim is that key variables are too hard to measure. In other words, "we do not have enough empirical data to be able to guess which rule is based on assumptions that are closer to reality."[106] For *Hadley*, an example of an indeterminate variable might be the distribution of buyer valuations. How could lawmakers ever estimate the range of values for a given contract? What is the relevant population? How would they gather a sample? Why would participants ever feel compelled to reveal their actual valuation?[107] If there is truly no way to estimate this variable empirically, then it may be impossible to state an optimal default rule for consequential

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[100] *Id.*

[101] *See* Adler, *supra* note 7. Other refinements to the model are possible. Most notably, Jason Scott Johnston has introduced a game theoretical model of the *Hadley* rule where he relaxes assumptions of perfectly competitive markets. In other words, sellers are no longer "identical price-taking firms." This introduces an incentive for sellers to learn about buyer valuations, not to take efficient precautions but to increase their individual profits. It also introduces another dimension of information revelation, as buyers would now like to learn whether different sellers have different probabilities of breach. *See* Johnston, *supra* note 7, at 625-26. Other commentators emphasize the complications of crafting defaults in markets with seller power. *See* Ayres & Gertner, *supra* note 2; Alan Schwartz, *The Default Rule Paradigm and the Limits of Contract Law*, 3 S. CAL. INTERDISC. L.J. 389 (1994). These issues are discussed in greater detail *infra* notes 177-81 and accompanying text.

[102] Adler, *supra* note 7, at 1552.

[103] *See* Posner, *supra* note 11, at 830.

[104] *Id.* at 864-65.

[105] *Id*.

[106] *Id.* at 837.

[107] Posner concludes that "no one has tried to determine the shape of this distribution through empirical research, and indeed it is hard to imagine how this could be done." *Id.* at 854. Barry Adler puts it this way: "A determination [of the optimal default rule] depends on perhaps unobtainable information about the full range of each type's [high and low buyers] expected damages from breach." Adler, *supra* note 7, at 1552.

damages.

More generally, if most economic models of contract law contain unverifiable terms, then economic analysis may be of little use. Models lacking a basis for empirical testing will ultimately fail to provide guidance to lawmakers. Even if more sophisticated models refine the variables and circumstances under which different default rules are preferable, they will remain indeterminate. Other approaches are needed to fill contract gaps at a more granular level.[108]

The second claim is that the overall effects of multiple variables cannot be summed.[109] In the *Hadley* context, even if lawmakers can estimate buyer valuation distributions with confidence, they would still need to estimate all of the other variables for the same population and aggregate the impact. How significant are the transaction costs? What are the efficiency gains from more tailored precautions? And what are the interactions between each of these variables? The optimal default rule could only be selected upon completion of this arduous analytic work.[110]

In fact, there may be further concerns. Suppose lawmakers can measure, with some confidence, all relevant variables in a single experiment, thus solving the "vague variable" and the "summing up" problem. And image that they do this over several different markets. It is entirely possible that the optimal default rule in one market is empirically different than the optimal rule in another. Maybe the valuation distribution curves of home construction, for example, skew negatively, indicating a preference for a full damages default, while valuations of delivery contracts skew positively, advocating a *Hadley* rule. In this case, should lawmakers prefer customized default rules—where each market gets its optimal default—or, in the interests of contracting certainty, should they select just one global default for the issue of consequential damages?[111] A parallel problem exists for

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[108] Or maybe contract gaps should not be filled at all. Alan Schwartz and Robert Scott suggest that lawmakers should dismiss contracts that run into contingencies not spelled out explicitly, at least for contracts between sophisticated parties. They support this approach by arguing that most state imposed default rules are inefficient and do not address the myriad of situations that occur in contract law. Instead of lowering transaction costs, these rules may force parties to contract around the defaults and raise the overall costs of contracting. *See* Schwartz & Scott, *supra* note 32; Robert E. Scott, *Rethinking the Default Rule Project*, 6 VA. J. 84 (2003). The buyer and seller would then be free to renegotiate terms or abandon the deal entirely. Ultimately, the parties might come to understand the consequences of this approach and adjust their contracting strategies accordingly. Schwartz & Scott, *supra,* at 594-609. Of course, this refusal to set default rules would itself be a type of default rule. Richard Craswell puts it this way:

> The law could, of course, simply refuse to enforce any contract … that fell short of absolute completeness. But such a rule would itself be a 'default rule': it would be a legal rule defining the obligations (or lack of obligations) that result when a contract does not itself specify what rules should govern. As long as actual contracts fall short of full completeness, then, the existence of default rules is not so much a choice as a logical necessity.

Craswell, *supra* note 31, at 2.

[109] Posner, *supra* note 11, at 838, 880.

[110] *Id.* at 836-37.

[111] This tension is raised in Ayres & Gertner, *supra* note 5.

heterogeneous contractors within a single market.[112] Should lawmakers use *Hadley* for one set of home builders and full damages for another? These choices raise fundamental jurisprudential issues of rules versus standards that permeate many areas of the law.[113]

At its heart, though, Posner's challenge to economic contracts scholarship highlights a need for empiricism. If key variables are truly immeasurable, then the economic approach to contract default rules may be futile. But if there are ways to get at the variables—or at least at some of the variables—empirically, then economic models may offer a tangible foundation for reforming contract law. Posner acknowledges that empirical analysis could conceivably spark a "renaissance" in the economic study of contract doctrine:

> [Economic] models enjoy some intellectual advantages … for they would enable us to make complex and interesting predictions about contract law if we had sufficient information about the empirical conditions. But because we do not have such information, and it is—in my view although others might disagree—unlikely that we ever would, the complex economic theories do not get us much closer to an understanding of contract law … .[114]

And so far, empirical scholarship in contract law is indeed rare. A recent review of contracts scholarship in over 500 law journals from 1985-2000 yields just 27 empirical articles, a surprisingly small body of work.[115] In actuality, economists—largely outside the legal academy—have compiled a substantial body of empirical work on contracts, examining the contract terms selected in specific markets or situations.[116] But this work rarely considers explicit doctrinal implications for contract law.[117] Said

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[112] *Id. See also* Craswell, *supra* note 31, at 4-5.

[113] For greater discussion of rules versus standards in the contracts context, *see* Craswell, *supra* note 14, at 908-09; Avery Weiner Katz, *The Economics of Form and Substance in Contract Interpretation,* 104 COLUM. L. REV. 496 (2004). On the rules versus standards issue more generally, *see* Colin S. Driver, *The Optimal Precision of Administrative Rules,* 93 YALE L.J. 65 (1983); Louis Kaplow, *Rule Versus Standards: An Economic Analysis*, 42 DUKE L.J. 557 (1992); Duncan Kennedy, *Form and Substance in Private Law Adjudication*, 89 HARV. L. REV. 1685, 16887-1713 (1976); Pierre Schlag, *Rules and Standards,* 33 UCLA L. REV. 379 (1985).

[114] Posner, *supra* note 11, at 864-65.

[115] *See* Korobkin, *supra* note 20, at 1036-37 ("Despite the fact that … contract law is a relatively rich area for legal scholarship, I was able to identify fewer than thirty articles relevant to this review, and many of these either only arguably met the definition of 'empirical' or provide a tenuous link between the data gathered and any contract doctrine."). *See also supra* note 20 for evidence that non-empirical approaches to contract doctrine are much more prevalent.

[116] *See, e.g.,* Douglas Allen & Dean Lueck, *Contract Choice in Modern Agriculture: Cash Rent Versus Cropshare*, 35 J.L. & ECON. 397 (1992); Victor P. Goldberg & John R. Erickson, *Quantity and Price Adjustment in Long-Term Contracts: A Case Study of Petroleum Coke*, 30 J.L. & ECON. 369 (1987). For a survey of this work, see P.A. Chiappori & B. Salanie, *Testing Contract Theory: A Survey of Some Recent Work* (Institut National des Etudes Economiques, Working Paper No. 2002-11), *available at* http://www.crest.fr/doctravail/document/2002-11.pdf. While this literature dates back to the 1980's, much of the work has occurred in the past five years. *Id.* at 27. And even here, "the empirical validation of the theory has long lagged behind the theoretical work." *Id.* at 1.

[117] *See* Korobkin, *supra* note 20, at 1035-36 ("[A]lthough there is a very large body of empirical studies of contracting, there is extremely little empirical contract law scholarship being produced in the legal academy

differently, the models of contract default rules developed by legal scholars have been subjected to little empirical testing. This is true even though scholars often call for empirical study.[118]

An empirical analysis of *Hadley*, then, might take on a greater significance. If key variables can be measured empirically, a growing body of scholarship could test and refine economic models of contract law. It is to this possibility—through a case study assessing the *Hadley* rule—that the next Part turns.

III. AN EMPIRICAL CASE STUDY OF *HADLEY V. BAXENDALE*

This Part launches an empirical case study of the *Hadley* rule. Section III.A describes the model used for the test.[119] Section III.B presents data from several marketing studies and uses this data to empirically estimate buyer valuation distributions in three simple markets. Section III.C runs Monte Carlo simulations to incorporate the effects of multiple variables. These simulations find that a *Hadley* default typically generates more welfare than a full damages default in each market studied. Finally, Section III.D qualifies these findings by conducting sensitivity analysis on other variables in the model.

A. Developing a Working Model of Hadley

One hundred buyers must decide whether to contract with a seller. Each buyer has a different valuation of contract performance (VALUE) chosen randomly from a predetermined probability distribution.[120] This valuation is split between general damages (GD) and consequential damages (CD). Specifically, the first portion of damages is deemed general—up to a constant assumption for GD—and the balance of VALUE is CD.[121] General damages always occur with breach, but buyers may not incur consequential damages.[122] The probability of suffering consequential damages (PROBCD)

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today.").

[118] *See, e.g.,* Ian Ayres, *Valuing Modern Contracts Scholarship*, 112 YALE L.J. 881, 900 (2003) ("I join [Eric] Posner in welcoming and predicting a shift from the theoretical to the empirical."); Korobkin, *supra* note 20, at 1061 ("[T]he surprising dearth of empirical research in contract law scholarship … presents a sizeable opportunity for scholars to help define an emerging field."); Schwartz & Watson, *supra* note 58, at 23 ("That so little data exist relating contracting costs to contract form implies the need for serious empirical research.").

[119] The model is also available, upon request, from the author, *at* ggeis@law.ua.edu. The model is built in Microsoft Excel, and users will also need to download and install Crystal Ball, an Excel add-in simulation program available from Decisioneering at <http://crystalball.com>.

[120] The shape and parameters of the probability distribution differ for each market and are derived empirically *infra* Part III.B.

[121] If the random VALUE for any buyer is less than the constant assumption for GD, then all damages are considered general. For example, if general damages are assumed to be $0.20 and buyer number 26 values contract performance just $0.15, then all of that buyer's damages are deemed general (GD = $0.15), and no damages are consequential (CD = $0.00).

[122] *Cf.* Adler, *supra* note 7.

is determined randomly for each buyer, again from a known distribution of values.[123]

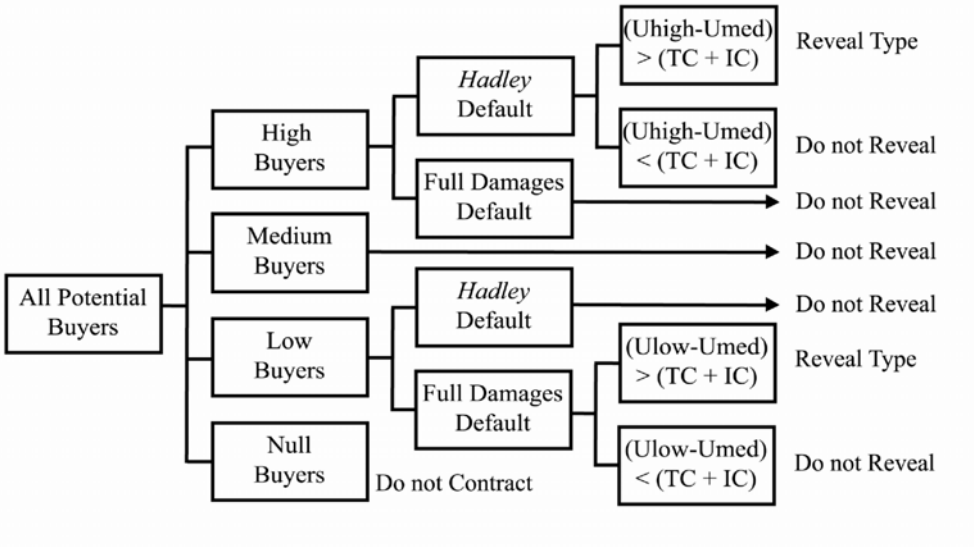
The seller may take low, medium, or high precautions for each buyer. Greater levels of precautions increase the probability of successful contract performance (PROBLOW, PROBMED, PROBHIGH) but also cost more (COSTLOW, COSTMED, COSTHIGH). Without knowing a buyer's specific valuation, the seller will take precautions reflecting the average buyer's preference.[124]

Most buyers sort into low, medium, or high value buyers based on their preferred level of precautions. This is determined by calculating the expected utility for each buyer under the three precaution levels according to the following formula:

$$Utility_x = ((1\text{-}PROBCD) * (GD * PROB_x - COST_x)) + (PROBCD * ((GD + CD) * PROB_x - COST_x))$$

(where x is low, medium, or high). Buyers with very low valuations may refuse to contract because they derive no utility under any level of precautions. These null buyers are excluded from further analysis.

FIGURE 2. Buyer Decision Flowchart



All other buyers must then decide whether to inform sellers of their

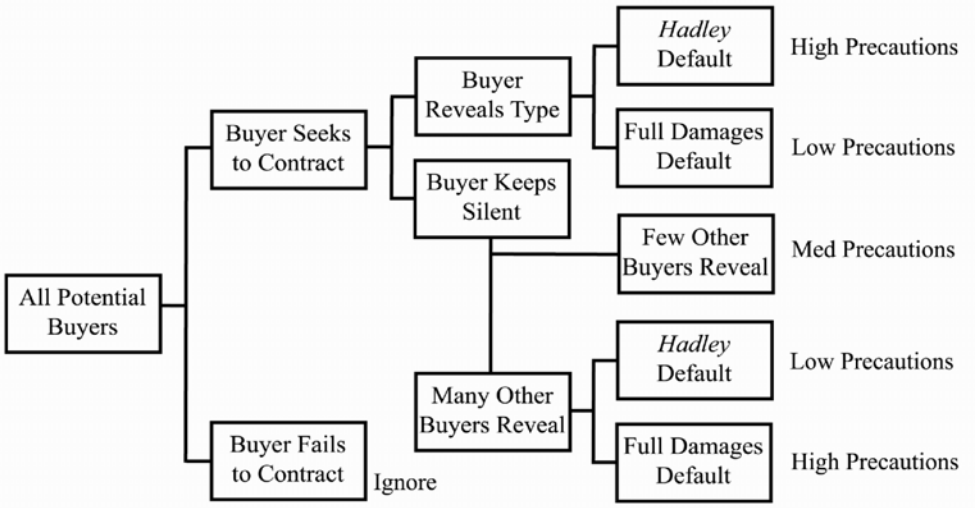
[123] Initial values are selected from a normal probability distribution with a mean of 90 percent, a standard deviation of 5 percent, a minimum value of 0, and a maximum value of 100 percent (the tails of the normal distribution below 0 and above 100 percent are distributed proportionately along the rest of the curve). Changes to this distribution are discussed *infra* notes 183-87 and accompanying text.

[124] Thus it is also assumed that sellers know the overall probability function for buyer valuations but not the actual valuation for any given buyer. Similarly, there is no other way for buyers to signal their type to sellers. *Cf.* Bebchuk & Shavell, *supra* note 2.

valuation type. They make this decision based on four factors (see Figure 2): the legal default rule (*Hadley* or full damages), the net benefits of moving to tailored precautions, the transaction costs required to contract around the default (TCLOW or TCHIGH), and the cost or benefit of revealing their probability of suffering consequential damages. This last factor relates to the additional information costs modeled by Adler (and is thus labeled IC in Figure 2): if PROBCD for a buyer exceeds the average probability of incurring consequential damages, then he will be charged a higher price. Conversely, if PROBCD is below average, the buyer will enjoy another benefit from revealing his type.[125]

More specifically, high value buyers will reveal their type under a *Hadley* default rule when the benefits of moving from medium to high precautions outweigh the transaction costs and information costs of doing so.[126] Low value buyers will reveal their type under a full damages default rule when the benefits of moving from medium to low precautions outweigh the costs.[127] Since medium buyers prefer medium precautions, they have no incentive to reveal their type under either default rule.

FIGURE 3. Seller Decision Flowchart



The seller must then choose how to treat each buyer (see Figure 3). Buyers refusing to contract will be ignored, and buyers revealing their type will be given their requested level of precautions. But how should the seller treat silent buyers? There are two options. If few other contracting buyers

[125] *Cf.* Adler, *supra* note 7. This assumes there are no reliability concerns with the buyer's information revelation.

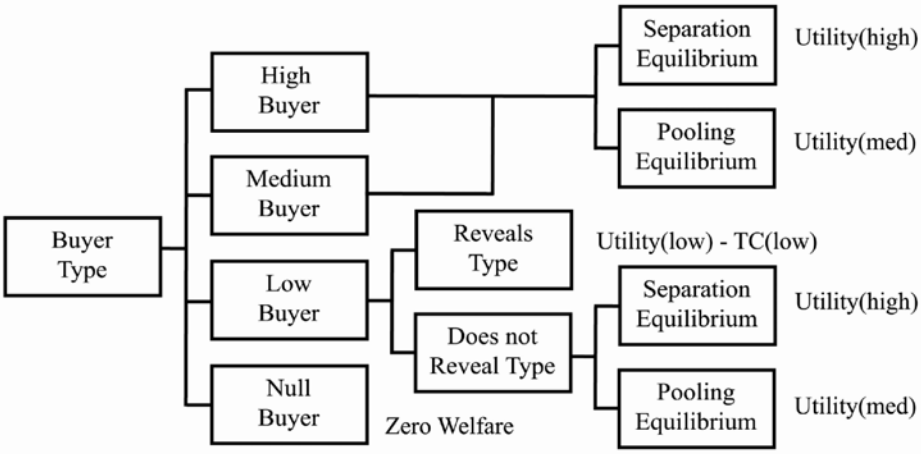
[126] $\text{Utility}_{high} - \text{Utility}_{med} \geq$ TCHIGH + information costs

[127] $\text{Utility}_{low} - \text{Utility}_{med} \geq$ TCLOW + information costs

have revealed their type, then the seller may continue to take average precautions for all silent buyers. Alternatively, if many other buyers reveal their type, the seller may deduce that silent buyers want more tailored precautions (*i.e.*, low precautions in a *Hadley* regime, or high precautions in a full damages regime).

Separation variables (SEPHIGH and SEPLOW) are used to model this seller decision. If the proportion of revealing, contracting buyers[128] exceeds the variable, then sellers will take tailored precautions for everyone (including medium buyers) and a separating equilibrium results.[129] Conversely, if the number of revealing buyers falls short of the separation variable, a pooling equilibrium results, and all silent buyers receive medium precautions.

FIGURE 4. Social Welfare Flowchart: Full Damages Default



After all decisions take place, the model calculates total social welfare under both default rules for the given set of 100 buyers. Null buyers generate no welfare. Under a full damages default (see Figure 4), high and medium buyers contribute $utility_{high}$ under a separation equilibrium and $utility_{medium}$ under a pooling one. Low buyers revealing their type contribute $utility_{low}$, minus the transaction costs incurred.[130] Low buyers remaining

[128] Buyers refusing to contract at all (null buyers) are ignored in this calculation.

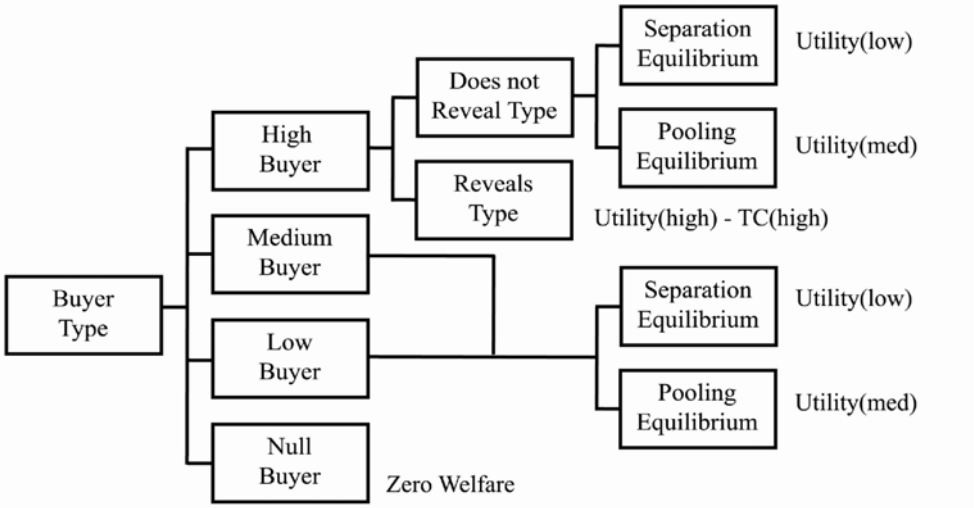
[129] For example, as initially modeled, under a *Hadley* default at least 20 percent of all contracting buyers need to identify themselves as high buyers before the non-identifying buyers—low buyers, medium buyers, and high value buyers refusing to identify their type—receive low precautions. If less than 20 percent of high buyers reveal their type, then non-identifying buyers receive medium precautions. Of course, buyers choosing to identify their type will continue to receive their bargained-for level of precautions. As will become apparent through sensitivity analysis, this is an important variable. *See infra* notes 192-96 and accompanying text.

[130] Information costs are excluded from the utility calculation because they are merely transferred from buyer to seller. In other words, these costs plays into the buyers decision but are not a deadweight loss for social welfare.

silent are treated like high and medium buyers.

The social welfare calculations are similar under a *Hadley* default (see Figure 5). Low and medium buyers contribute $\text{utility}_{\text{low}}$ if the buyer population separates and $\text{utility}_{\text{medium}}$ if it does not. High value buyers contribute the same utility if they remain silent. If they reveal their type, they contribute $\text{utility}_{\text{high}}$ minus transaction costs.

FIGURE 5. Social Welfare Flowchart: *Hadley* Default



Finally, once both sets of calculations are made, the total social welfare under each default rule can be compared to determine the more efficient default. An easy way to summarize the results is to calculate the net benefit of a *Hadley* default by subtracting the total social welfare under a full damages regime from the total welfare under a *Hadley* regime. A positive number means that *Hadley* outperforms full damages. A negative number means that full damages would be better.

But the real power of simulation modeling comes from the ability to play out the efficiency effects of both default rules hundreds or thousands of times. In each trial, a different set of 100 buyers is generated, and the net benefit (or cost) of a *Hadley* default is recalculated. Taken together, this analysis leads to a much greater understanding of the better default rule for a given market, along with the likely range of outcomes. Before running the simulations, however, the distribution of buyer valuations must be derived empirically for the three markets to be studied.

B. Estimating the Distribution of Buyer Valuations Empirically

1. Data and Methodology

Across the quadrangles of most universities, scholars in the field of marketing have long been interested in estimates of buyer valuation, although they call this variable by another name: willingness-to-pay (WTP).[131] Marketing researchers need WTP data to estimate product demand and to set prices.[132] WTP also becomes the yardstick by which new products, or modifications to existing products, must be measured. Over the years, marketing researchers have developed several techniques for estimating buyer WTP, which they use to conduct vast numbers of empirical studies.[133]

In 2002, Klaus Wertenbroch and Bernd Skiera published a series of experiments in the *Journal of Marketing Research* where they estimated a population's WTP for three simple consumer products: a can of Coca-Cola, a piece of pound cake, and a type of ergonomic pen.[134] The technique used in these studies is called the Becker, DeGroot and Marschak procedure (the BDM procedure),[135] which the authors find more reliable than other WTP

[131] *See* Wertenbroch & Skiera, *supra* note 22; Sattler, *supra* note 22; Smith & Nagle, *supra* note 22.

[132] The typical use of marketing research in this context is not just for setting spot prices, but more broadly to seek an actionable consumer segmentation that allows sellers to capture consumer surplus through more sophisticated price discrimination. This requires sellers to estimate the distribution of buyer valuations, translate this data into a demand curve, identify a given customer's position on the demand curve, and price accordingly. *See, e.g.,* KENT B. MONROE, PRICING: MAKING PROFITABLE DECISIONS (3d. ed. 2003); David Besanko et al., *Competitive Price Discrimination Strategies in a Vertical Channel Using Aggregate Retail Data*, 49 MGMT. SCI. 1121 (2003); Andrea Shepard, *Price Discrimination and Retail Configuration*, 99 J. POL. ECON. 30 (1991). On the use of WTP methods to determine demand for private goods s*ee, e.g.,* Philip M. Clark, *Valuing the Benefits of Mobile Mammographic Screening Units Using the Contingent Valuation Method*, 32 APPLIED ECON. 1647 (2000); George Dranitsaris et al., *The Economic Value of a New Insulin Preparation, Humalog Mix 25: Measured by a Willingness-To-Pay Approach*, 3 PHARMAECONOMICS 275 (2000); Diane Bruce Anstine, *How Much Will Consumers Pay? A Hedonic Analysis of the Cable Television Industry*, 19 REV. IND. ORG. 129 (2001). On the use of WTP methods—especially contingent valuation—to determine the demand for public goods see*, e.g.,* Adam Finn et al., *Valuing the Canadian Broadcast Corporation*, 27 J. CULTURAL ECON. 177 (2003); Catherine M. Chambers & John C. Whitehead, *A Contingent Valuation Estimate of the Benefits of Wolves in Minnesota*, 26 ENVTL. & RESOURCE ECON. 249 (2003); D. Whittington et al., *Estimating Willingness to Pay for Water Service in Developing Countries: A Case Study of the Use of Contingent Valuation Surveys in Southern Haiti*, 38 J. ENVTL. ECON. & MGMT. 27 (1990).

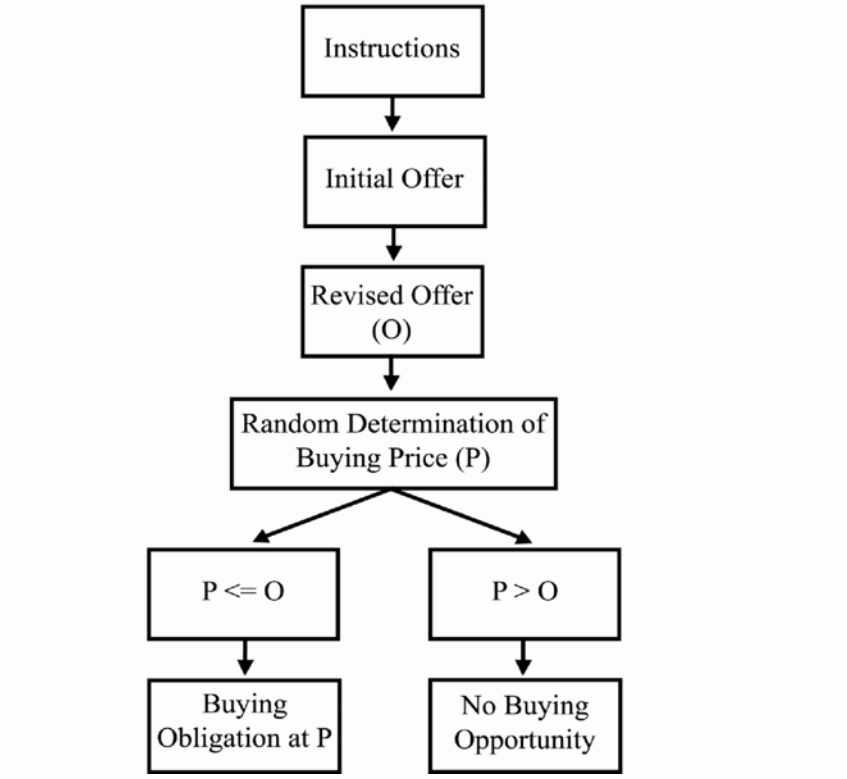
[133] These techniques include actual transactions data, contingent valuation, incentive compatible auctions, and lottery procedures, such as the Becker, DeGroot and Marschak procedure (BDM). In an actual transactions study, researchers gather scanner data or other historical sales data to view buyer reactions at different price points. *See, e.g.,* Alvin J. Silk & Glen L. Urban, *Pre-Test-Market Evaluation of New Packaged Goods: A Model and Measurement Methodology*, 15 J. MKTG. RES. 171 (1978). Contingent valuation measures buyer WTP via stated preferences, looking to behavioral intentions and responses to hypothetical choices. *See, e.g.,* ROBERT CAMERON MITCHELL & RICHARD T. CARSON, USING SURVEYS TO VALUE PUBLIC GOODS: THE CONTINGENT VALUATION MTHOD (1989); Richard T. Carson, *Contingent Valuation: A User's Guide*, 34 ENVTL. SCI. & TECH. 1413 (2000). Incentive compatible auctions are designed to give all bidders the incentive to reveal their true WTP. One example is a Vickrey auction, which allocates products to the highest bidder at the price offered by the second highest bidder. *See* William Vickrey, *Counter Speculation, Auctions and Competitive Sealed Tenders*, 16 J. FIN. 8 (1961). Finally, the BDM procedure uses a random number lottery process to determine a consumer's willingness to pay. *See* Gordon M. Becker et al., *Measuring Utility by a Single-Response Sequential Method*, 9 BEHAV. SCI. 226 (1964).

[134] *See* Wertenbroch & Skiera, *supra* note 22.

[135] *See* Becker et al., *supra* note 133. This specific description is taken from the studies conducted by Wertenbroch & Skiera, *supra* note 22, at 230-32, 235.

measurement techniques.[136] Wertenbroch and Skiera have agreed to share the data from these studies for use in this Article.

FIGURE 6. Overview of the Becker, DeGroot, and Marschak Procedure



The BDM procedure works as follows (see Figure 6): a participant is presented with an opportunity to purchase a product at a price no greater than what she is willing to pay. The product is described, instructions are given, and the participant then makes an offer. The seller may give her a chance to revise the offer after emphasizing that she has every incentive to bid her true WTP. After the final offer (O) is made, the buying price (P) is randomly chosen from a pre-specified distribution—perhaps the participant draws P from an urn, or a computer generates P randomly.[137] If P is less

[136] The studies find that the BDM procedure outperforms contingent valuation on measures of face, internal, and criterion validity. Wertenbroch & Skiera, *supra* note 22, at 232-34. Face validity was determined by correlating final offer prices with a number of other questions, such as "How thirsty are you now" and "How much do you like Coca-Cola." Internal validity was determined using logit analysis of purchase probabilities to estimate demand and by correlations between observed and expected demand. Criterion validity was measured by the percentage of consumers who followed through with their purchase obligations and by other post-transaction questions (for example, "How satisfied are you with your purchase? Do you wish that you had bid higher?"). *Id.*

[137] The random numbers in the urn or computer model are typically taken from a reasonable distribution of price increments. For example, experiments selling a can of Coca-Cola may use random numbers ranging from 25 cents to $1.50, increasing in 5 cent increments. *E.g.,* Wertenbroch & Skiera, *supra* note 22, at 231. This price

than or equal to O, the participant has a buying obligation at price P. If P is greater than O, she has no buying opportunity.[138]

Conducted under these conditions, the BDM procedure should induce the participant to reveal her WTP.[139] For example, if she bids $10 below her WTP, and P is randomly selected at $5 below her WTP, then she loses consumer surplus by missing the buying opportunity. If she bids $10 above her WTP, and the random number selected is $5 greater than her WTP, then she must purchase at a price greater than her valuation. Finally, the ultimate price is determined exogenously from the offer, giving her every incentive to reveal true WTP.[140]

The BDM procedure may provide reliable valuation data for several other reasons. Unlike some other WTP estimation techniques, it creates opportunities for transactions at real point of purchase locations, allowing for better sample selection conditions.[141] Second, the procedure imposes a buying obligation on the consumer, removing a hypothetical bias that can come with research techniques where a participant need not pull out her purse.[142] Third, the BDM procedure avoids an anchoring bias by never stating a reference price and keeping the random price distribution secret.[143] Finally, studies present evidence that the BDM procedure is easier to administer and less confusing for participants than other WTP research methods.[144]

So far the BDM method has only been used on consumable products and simple consumer durables, and it is unknown whether the domain of applicability will extend to more complex contracting situations.[145] It may be hard, for example, to envision a BDM study that tests WTP for oil

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distribution is not disclosed to participants to avoid anchoring effects. *See* Amos Tversky & Daniel Kahneman, *Judgment Under Uncertainty: Heuristics and Biases*, 185 SCI. 1124 (1974); Gretchen B. Chapman & Eric J. Johnson, *Incorporating the Irrelevant: Anchors in Judgments of Belief and Value, in* HUERISTICS AND BIASES: THE PSYCHOLOGY OF INTUITIVE JUDGMENT 120 (Thomas Gilovich et al. eds., 2002).

[138] For example, if the participant offers $20 and selects a random price of $15 from the urn, then she must buy the product for $15. By contrast, if she selects a random price of $25 from the urn, then she has no opportunity to buy the product and the exercise is concluded. *Cf.* Becker et al., *supra* note 133; Wertenbroch & Skiera, *supra* note 22.

[139] *See* Becker et al., *supra* note 133; Wertenbroch & Skiera, *supra* note 22.

[140] *See* John H. Kagel, *Auctions: A Survey of Experimental Research*, *in* THE HANDBOOK OF EXPERIMENTAL ECONOMICS 501 (John H. Kagel & Alvin E. Roth eds., 1995); Vickrey, *supra* note 133.

[141] *See* Wertenbroch & Skiera, *supra* note 22, at 230.

[142] *Id.* at 230-31. *See also* Frank B. Cross, *Natural Resource Damage Valuation*, 42 VAND. L. REV. 269, 320 (1989); Jeffrey C. Dobbins, Note, *The Pain and Suffering of Environmental Loss: Using Contingent Valuation to Estimate Nonuse Damages,* 43 DUKE L.J. 879, 921-29 (1994); Note, "*Ask a Silly Question …": Contingent Valuation of Natural Resource Damages*, 105 HARV. L. REV. 1981, 1982 (1992) ("CV measurements of nonuse values are so speculative that the costs of using CV to assess damages to natural resources almost always outweigh the benefits.").

[143] Indeed, it is critical not to disclose the probability distribution of random prices to participants to avoid anchoring effects. *See* Peter Bohm et al., *Eliciting Reservation Prices: Becker-DeGroot-Marschak Mechanisms vs. Markets*, 107 ECON. J. 1079 (1997). *See also* sources cited *supra* note 137. Of course, the participant's WTP may be influenced by existing market price benchmarks, especially for less complicated products.

[144] Wertenbroch & Skiera, *supra* note 22, at 232.

[145] *Id.* at 234.

refinery construction or complex derivatives. In theory, there is no reason why the BDM procedure could not be applied to more sophisticated markets, providing an empirical basis for estimating buyer valuation more broadly.[146] But for now, extended application of the BDM procedure is untested.[147]

The data that is available, however, can be used to estimate buyer valuation distributions in simple consumer markets.

2. Fitting the Data to a Probability Distribution

Table 8. Descriptive Statistics for Valuation Data

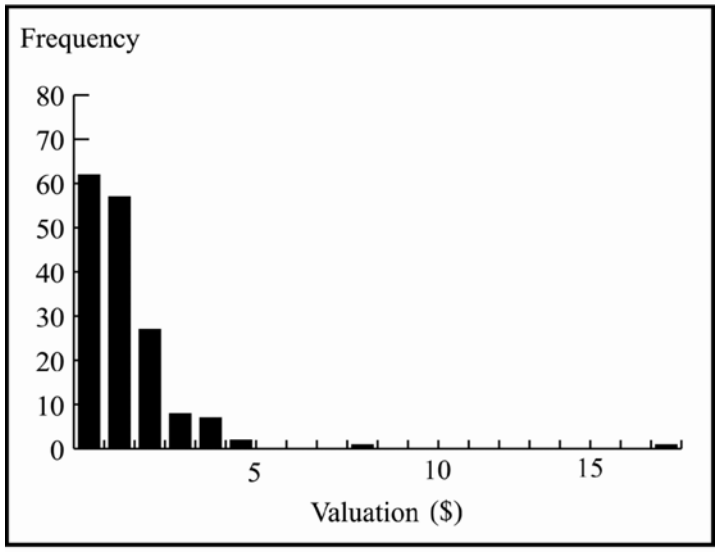
	n	Minimum value	Maximum value	Mean	Std.	Skewness	SE Skewness
Pens*	165	0.00	16.00	1.38	1.57	5.58	0.19
Coke**	100	0.00	3.00	1.07	0.65	0.22	0.24
Cake**	100	0.00	2.50	1.12	0.56	-0.29	0.24
* value in $; ** value in DM							

[146] Conducting these experiments might require some additional steps. For example, researchers would need to select a meaningful sample, provide detailed product information, and establish credit mechanisms to avoid liquidity constraints. Similarly, spot credit mechanisms could conceivably open more complex markets to empirical testing. *See* Wertenbroch & Skiera, *supra* note 22, at 234.

[147] There may be other concerns, not necessarily with the BDM method itself, but with the use of experimental data more generally. All field based methods for estimating WTP might be subject to strategic misrepresentation by participants. *See* Wertenbroch & Skiera, *supra* note 22, at 234-36. For example, if participants believe that a study is being used to explore a price increase, then they may falsely under-report WTP in order to strategically keep prices low. A second form of strategic misrepresentation, the escalation of commitment, relates to behavioral economics. A participant may overstate her WTP because having agreed to participate in the study, she does not want to walk away empty handed. *E.g.,* Kagel, *supra* note 140. Wertenbroch & Skiera test for this by giving one group of participants a reward for participating in the study, regardless of the ultimate purchase outcome. Wertenbroch & Skiera, *supra* note 22, at 234-35. They find that the two groups—the reward group and the non-reward group—do not differ statistically in their valuation of the product, arguing against a significant escalation of commitment bias in the BDM context. *Id.* at 235-36. A third strategic problem may occur if a participant bids more than her WTP in order to secure an option to buy, but walks away without buying if the random price P is too high. *See* Jeff T. Casey & Philippe Delquie, *Stated vs. Willingness to Pay Under Risk,* 61 ORG. BEHAV. & HUMAN DEC. PROCESS 123 (1995); Wertenbroch & Skiera, *supra* note 22, at 234. This is why it is critical that participants in an experiment follow through with buying obligations. *See* Elizabeth Hoffman et al., *Using Laboratory Experimental Auctions in Marketing Research: A Case Study of New Packaging for Fresh Beef*, 12 MKTG. SCI. 318, 328 (1993). Studies thus far suggest that this effect is minimal: just 4 out of 91 buyers refused to purchase in the Wertenbroch study, and just 2 out of 765 buyers refused to purchase in the Hoffman study. Wertenbroch & Skiera, *supra* note 22, at 234; Hoffman et al., *supra,* at 328. Fourth, some studies suggest that just placing extra attention on a product causes participants to systematically overstate their WTP: by trying to measure WTP distributions, researchers might affect the results. *See* Ziv Carmon & Itamar Simonson, *Price-Quality Tradeoffs in Choice vs. Matching: New Insights into the Prominence Effect,* 7 J. CONSUMER PSYCH. 323 (1998); Wertenbroch & Skiera, *supra* note 22, at 234. Finally, broader issues of bounded rationality may surface. *Compare* Daniel Kahneman et al., *Experimental Tests of the Endowment Effect and the Coase Theorem*, 98 J. POL. ECON. 1325 (1990) (exploring behavioral inconsistencies between WTP and Willingness-to-Accept (WTA) for identical products), *with* W.M. Hanemann, *Willingness to Pay and Willingness to Accept: How Much Can they Differ*?, 81 AMER. ECON. REV. 635 (1991) (suggesting that differences between WTP and WTA can be consistent with economic theory). On the differences between WTP and WTA and the implications of these differences for economic analysis of the law, see Elizabeth Hoffman & Matthew L. Spitzer, *Willingness to Pay vs. Willingness to Accept: Legal and Economic Implications*, 71 WASH. U. L.Q. 59 (1993).

Table 8 calculates summary statistics for the three markets studied by Wertenbroch and Skiera, and Figure 7 graphically displays the valuation distribution for pens.[148] The pen data skews heavily to the right—there are many low value buyers and just a few high value buyers (one generous soul offers $16).

FIGURE 7. Buyer Valuation Distribution for Pens (n=165)



This sample data provides a basis for estimating the overall distribution of values in the ergonomic pen market, at least for the population covered in the study. Statistical goodness-of-fit tests, such as the Chi-Square test, measure how well the data fits a number of common probability distributions.[149] For the pen data, a lognormal distribution—which is often used in situations where values are positively skewed—offers the tightest

[148] Wertenbroch & Skiera, *supra* note 22. A convenience sample of university students was used for the pen experiment, possibly limiting inferences from this data to a greater population. Random sampling was used in the Coke and cake experiments. For additional details on the study methodology, see *id.* at 231-35. For details on the face validity, internal validity, and criterion validity of this experiment, see *id.* at 234-35. While the authors divided the 165 pen participants into 2 different treatment groups, they reported no statistical difference in the WTP of both groups, so the data are combined in this Article. Data from participants offering contingent valuation estimates of their WTP for pens are excluded. *Id.* at 235.

[149] The Chi-Square test breaks down the known distributions into areas of equal probability and compares the sample data points within each area to the number of expected data points. Similarly, the Kolmogorov-Smirnov test essentially calculates the largest vertical distance between the two cumulative distributions. The Anderson-Darling test is similar, but it weighs the differences between the two distributions at their tails greater than at their mid-ranges. *See* DEREK ROWNTREE, STATISTICS WITHOUT TEARS 150-54 (1981); THOMAS H. WONNACOTT & RONALD J. WONNACOTT, *INTRODUCTORY STATISTICS* 486-98 (5th. ed. 1990).

fit[150] and will be used to select the random VALUE variable for each buyer in the pen market simulation.[151]

FIGURE 8a. Buyer Valuation Distribution for Coca-Cola (n=100)

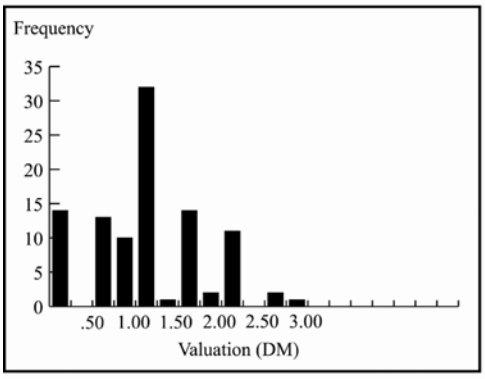
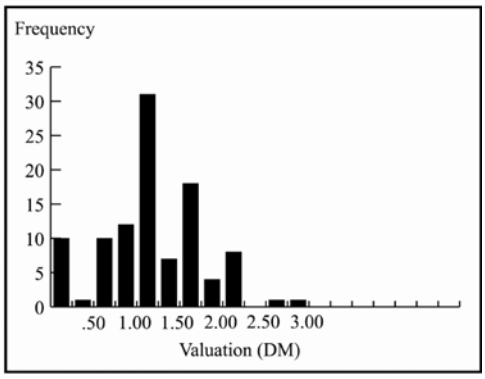


FIGURE 8b. Buyer Valuation Distribution for Cake (n=100)



The analysis can be replicated for the other markets. Figure 8a reveals that the distribution of buyer WTP for a can of Coca-Cola looks quite different than the valuation distribution for ergonomic pens. Statistical tests confirm that buyer valuation for Coke is better modeled with a logistic

[150] Here are goodness-of-fit statistics for the pen valuation data:

Distribution	Chi-Square Test	Kolmogorov-Smirnov	Anderson-Darling
Lognormal*	70.55	0.11	16.23
Exponential	83.45	0.15	12.10
Extreme Value	84.18	0.13	1.61
Logistic	105.09	0.14	3.76
Weibull	102.73	0.20	8.19
Beta	103.45	.022	15.70
Gamma	113.64	0.18	5.86
Normal	118.18	0.21	11.62
Uniform	771.8	0.75	218.47
* Mean = 1.73; standard deviation = 2.42			

The lognormal distribution is commonly used to model situations where values are positively skewed—such as securities or real estate valuation. The natural logarithm of the variable yields a normal distribution. This means that the variable can increase without limits but cannot fall below zero. Most of the values are near the lower limit. While the lognormal distribution offers the best fit for this data, the goodness-of-fit tests do not have a high level of statistical significance. The main point of this example, though is not to argue that this specific data fits the lognormal distribution with a high level of confidence, but rather to ground the distribution of buyer valuations in empirical data. Another approach is to build a custom probability distribution reflecting the *exact* experimental results. The results of this Article hold when this approach is taken. In fact, rerunning the analysis with a custom probability distributions substituted for the lognormal distribution causes the *Hadley* default to outperform the full damages default even *more* frequently than 90 percent. The qualifications discussed *infra* Part III.D also hold with a custom probability distribution—although the percentage of results where a full damages default generates more welfare changes slightly.

[151] The specific distribution parameters (mean 1.73; standard deviation 2.42) are calculated with raw data from the Wertenbroch and Skiera study.

probability distribution.[152]

Finally, the pound cake data is graphed in Figure 8b. The evidence supports a probability distribution similar to the one selected for Coke.[153] The normal distribution is also a closer fit for this data.

3. An Aside: Testing the Majoritarian Solution to *Hadley*

As a brief aside, if the majoritarian solution to *Hadley* was sufficiently robust, it would be straightforward to use this data to empirically determine the optimal default rule for any given market. Lawmakers could conduct an experiment to solicit WTP data from a random sample of buyers in the market. They would then make inferences about the distribution of valuations for the broader contracting population. This might recommend a majoritarian, and thus most efficient, default rule.

For example, suppose a lawmaker faces a sample of 100 buyers with performance valuations distributed as in Figure 1a.[154] The lawmaker could immediately observe that 65 percent of the buyers in this sample have

[152] Here are the statistical tests for the Coca-Cola valuation data:

Distribution	Chi-Square Test	Kolmogorov-Smirnov	Anderson-Darling
Logistic*	47.8	0.10	1.19
Beta	48.1	0.16	24.32
Weibull	51.7	0.14	4.25
Normal	55.5	0.11	1.35
Gamma	55.0	0.11	1.52
Triangular	59.4	0.16	7.12
Lognormal	63.0	0.19	28.45
Exponential	73.0	0.25	30.18
Uniform	115.0	0.32	16.43
* Mean = 1.06; scale = 0.37			

A logistic distribution with a mean of 1.06 and a scale of 0.37 will be used in the simulation. The logistic distribution is commonly used to describe growth—for example, the size of a population over time. The logistic distribution is truncated at 0 to avoid negative valuations, and the negative tail is reallocated proportionally to the positive values.

[153] Here are the goodness-of-fit statistics for the cake valuation data:

Distribution	Chi-Square Test	Kolmogorov-Smirnov	Anderson-Darling
Logistic*	25.3	0.08	0.84
Triangular	25.3	0.11	2.43
Beta	26.2	0.16	13.04
Normal	35.1	0.11	1.08
Gamma	34.1	0.13	1.66
Weibull	34.2	0.13	2.36
Uniform	50.7	0.21	7.19
Lognormal	51.4	0.14	15.42
Exponential	124.9	0.30	22.50
* Mean = 1.14; scale = 0.32			

A logistic distribution with a mean of 1.14 and a scale of 0.32 will be used in the simulation. As with the Coca-Cola distribution, the probability is adjusted slightly to avoid negative values.

[154] This figure is identical to the table of value distributions presented *supra* note 49.

valuations below the mean.[155] This suggests that the *Hadley* rule, appropriate with many low value buyers, looks promising. Using inferential statistics, the lawmaker might then generalize from the sample to the relevant population by testing the following hypothesis:

H_0: Buyer valuations for the population are not skewed positively ($\mu_3 \leq 0$)
H_a: Buyer valuations for the population are skewed positively ($\mu_3 > 0$)

The statistic for skewness, μ_3, measures the degree of asymmetry of a distribution around its mean.[156] Positive skewness indicates a distribution with a right-sided tail; negative skewness indicates the opposite.[157] In this example, the lawmaker could reject the null hypothesis at the 99% confidence level:

$\mu_3 = 1.086 \pm (2.58) *$ (the standard error)
$\mu_3 = 1.086 \pm (2.58) * (0.241)$
$\mu_3 = 0.464$ to 1.708
Therefore, reject H_0 at the 99% confidence level

Such an inference supports the *Hadley* rule as the superior default. The sample of 100 buyers yields a highly confident inference that buyer valuations for the entire population are not skewed to the right.[158] A lawmaker subscribing to the majoritarian solution should reject the full damages default rule and impose a *Hadley* default rule to lower transaction costs and increase social welfare.

This same analysis would advocate the *Hadley* rule in the market for pens. The skewness statistic is so large that the null hypothesis can be rejected with great confidence.[159] The data for Coke and cake, however, do not conclusively point to a majoritarian default; the null hypothesis cannot be rejected in both cases.[160]

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[155] Specifically, the first 65 buyers have a valuation less than the mean of 5.1.

[156] More specifically, skewness is based on the relationship between the mean and the mode: greater distances between the mean and mode lead to a higher value for the skewness statistic. ROWNTREE, *supra* note 149, at 61.

[157] *Id.*

[158] This is true because the inferred skewness for the population is greater than zero, rejecting a right-skewed population at the 99 percent confidence level.

[159] Taking the statistics from Table 8:
$\mu_3 = 5.58 \pm (2.58) * (0.19)$
$\mu_3 = 5.09$ to 6.56
Therefore, reject H_0 at the 99% confidence level

[160] Again, using the statistics calculated in Table 8. For Coke:
$\mu_3 = 0.22 \pm (2.58) * (0.24)$
$\mu_3 = -0.40$ to 0.84
Therefore, do not reject H_0 at the 99% confidence level.
For cake:

But as discussed earlier, the majoritarian solution does not fully capture the intricacies of contracting under asymmetric information.[161] The next task is to combine information on buyer valuation distributions with other variables in the *Hadley* model.

C. Selecting the Better Default Rule

In the 1940's, Stanislaw Ulam, a Polish mathematician working with John von Neumann and Edward Teller on the Manhattan Project, wanted to estimate his chances of winning a game of 52 card solitaire.[162] To solve the problem, he programmed a computer to play out the card game continually and track the results.[163] From Ulam's musings at Los Alamos came the modern analytical technique of Monte Carlo simulation, which uses statistical computer sampling to approximate solutions to quantitative problems.[164] Random values are repeatedly generated to model the impact of uncertain variables on a range of outcomes. Monte Carlo simulation, deriving its name from similarities to the games of chance played in Monaco, has been used extensively to model decision-making under uncertainty in physics, engineering, business, and mathematics.[165] There is also precedent for running Monte Carlo techniques in legal scholarship.[166]

Using Monte Carlo simulation, this section finds that *Hadley* typically outperforms a full damages default rule in three simple markets. The distribution of buyer valuations for each market is grounded in empirical research from the Wertenbroch and Skiera studies.[167] But to conduct the simulation, assumptions must be made for other variables in the *Hadley* model.[168]

Table 9 displays a list of initial assumptions, chosen to reflect a

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$\mu_3 = -0.29 \pm (2.58) * (0.24)$

$\mu_3 = -0.91$ to 0.33

Therefore, do not reject H_0 at the 99% confidence level.

[161] *See supra* notes 57-74 and accompanying text.

[162] *See, e.g.*, Carolyn T. Greer, *Factoring Uncertainty into Retirement Planning,* FORTUNE, Jan. 11, 1999, at 200.

[163] *Id.*

[164] *Id. See also* RUSSELL DAVIDSON & JAMES G. MACKINNON, ECONOMETRIC THEORY AND METHODS 157 (2004); GENTLE, *supra* note 23; JAECKEL, *supra* note 23; ISTVAN MANNO, INTRODUCTION TO THE MONTE CARLO METHOD 9 (1999).

[165] *Id.*

[166] *See, e.g.,* BRUCE ACKERMAN & IAN AYRES, VOTING WITH DOLLARS: A NEW PARADIGM FOR CAMPAIGN FINANCE 229-31 (2002) (using Monte Carlo simulation to test a campaign finance secrecy algorithm); Howard F. Chang & Hilary Sigman, *Incentives to Settle Under Joint and Several Liability: An Empirical Analysis of Superfund Litigation,* 29 J. LEGAL STUD. 205 (2002); Frank Partnoy, *The Siskel and Ebert of Financial Markets?: Two Thumbs Down for the Credit Rating Agencies*, 77 WASH. U. L.Q. 619 (1999). On the related concept of using agent based computer simulation to inform legal doctrine, see Randal C. Picker, *Simlaw 2011*, 2002 U. ILL. L. REV. 1019 (2002).

[167] *See supra* notes 131-53 and accompanying text.

[168] Additional experiments that simultaneously estimate these other variables might yield more robust results. See *infra* Part IV.

reasonable contracting system (each assumption is relaxed later to conduct sensitivity analysis).[169] Note that three variables—the probability of incurring consequential damages, transaction costs, and the separation threshold—do not differ initially between low and high buyers. The impact of different assumptions by buyer type for these variables is considered shortly.[170]

Table 9. Key Assumptions in the *Hadley* Simulation Model

Variable	Assumption
1. Buyer valuation (VALUE)	Market specific
2. General Damages (GD)	$0.20[171]
3. Probability of consequential damages (PROBCD)	N (90%, 5%)[172]
4. Success with low precautions (PROBLOW)	50%
5. Cost of low precautions (COSTLOW)	$0.20
6. Success with medium precautions (PROBMED)	70%
7. Cost of medium precautions (COSTMED)	$0.40
8. Success with high precautions (PROBHIGH)	90%
9. Cost of high precautions (COSTHIGH)	$0.75
10. Transaction costs for low buyers (TCLOW)	$.05
11. Transaction costs for high buyers (TCHIGH)	$.05
12. Separation threshold for low buyers (SEPLOW)	20%
13. Separation threshold for high buyers (SEPHIGH)	20%

With these assumptions, the welfare benefits of a *Hadley* default versus a full damages default can be played out many times. Each trial generates a new set of performance valuations for the 100 buyers. The model then determines how many low buyers reveal their type under a full damages default and how many high value buyers reveal their type under a *Hadley* default. If enough buyers reveal their type, the population separates, and non-identifying buyers receive tailored precautions under the default rule. Ultimately, the model calculates total social welfare under both default rules—according to the algorithms of Figures 3 and 4—and compares the results.

1. Pens

For example, a single iteration for the pen market might yield the

[169] For example, the precaution variables are chosen such that low precautions cost less and are less effective than medium precautions, and so the average buyer prefers medium precautions.

[170] *See infra* Section III.D.

[171] All damages are assumed to be general damages if a buyer's total valuation is less than $0.20.

[172] This variable is randomly selected from a normal distribution with a mean of 90 percent and a standard deviation of 5 percent.

outcome shown in Table 10. In this instance, the most generous buyer values the pen at $9.76, and the minimum value is $0.08. The total social welfare under each default rule is quite close, but the *Hadley* default does slightly better.

Table 10. Results of One Iteration of the *Hadley* Simulation Model (Pens)

	Result
1. Total number of buyers	100
2. Buyers choosing to contract	82
3. Number of low buyers	36
4. Number of medium buyers	22
5. Number of high buyers	24
6. Lowest buyer	$0.08
7. Highest buyer	$9.76
8. Buyers identifying their type under full damages	23%
9. Buyers identifying their type under *Hadley*	24%
10. Social welfare under full damages	68.5
11. Social welfare under *Hadley*	70.8
12. Net benefit from *Hadley* default rule	2.3
Better default rule	*Hadley*

Of course, the results of one trial are not very meaningful. After saving this data, the simulation next generates a different sample of 100 random buyer valuations and reevaluates the superior default rule. The process is repeated hundreds or thousands of times to arrive at a range of outcomes indicating the likely efficiency benefits of one default rule over another. Monte Carlo simulation thus allows lawmakers to live in a thousand or more parallel universes, where they can compare the effects of both default rules.[173]

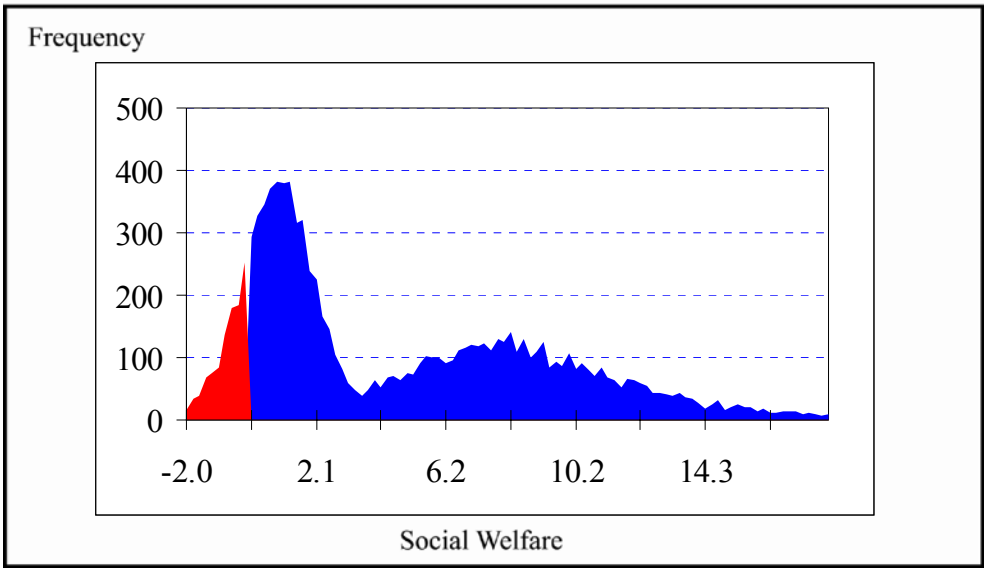
A run of 10,000 trials for the pen market—under the assumptions of Table 9—generates the results displayed in Figure 9. This figure graphs the net efficiency benefit of a *Hadley* default rule; a number greater than zero indicates that *Hadley* outperforms a full damages default. In this simulation, almost 90 percent of the results are positive, suggesting that the *Hadley* rule leads to a more efficient outcome much of the time. The expected value is 4.8.

The distribution of the results is also important. The minimum result is negative 3.2, while the maximum is 29.7, and the positive area under the curve exceeds the negative area. In other words, the upside from choosing a *Hadley* default far outweighs the potential downside. Note two clusters of

[173] *See* GENTLE, *supra* note 23; JAECKEL, *supra* note 23; MANNO, *supra* note 164.

data. There is a break point around 3.5—about half of the trials are less than this value, while the other half exceeds it. The lower set of results occurs when the full damages default leads to a separating equilibrium. *Hadley* often does slightly better in these cases, but the range of outcomes is tight, and the default rule may not matter much.

FIGURE 9. Net Benefit of *Hadley* Rule Over Full Damages Rule - Pens
(n = 10,000 trials)



When the full damages default leads to a pooling equilibrium, however, the benefits from choosing the *Hadley* rule can be quite large. Extremely high value buyers, who get greater social welfare with high precautions, drive much of this difference. They receive medium precautions under a pooling full damages equilibrium. But if the *Hadley* rule causes separation, these high value buyers get high precautions. And even when *Hadley* pools, the highest value buyers often contract around the default individually. This follows classic penalty default theory,[174] and the level of precautions received by extreme value buyers in the pen market has a major impact on the relative efficiency of the two defaults.

The analysis is quite complicated, though, and *Hadley* causes at least three other effects. First, there is another group of high value buyers who end up with less efficient contracts under *Hadley*. These buyers derive almost as much utility under medium precautions, and they choose not to incur the transaction costs (and sometimes the information costs) of contracting around a *Hadley* default. But when the buyer pool separates,

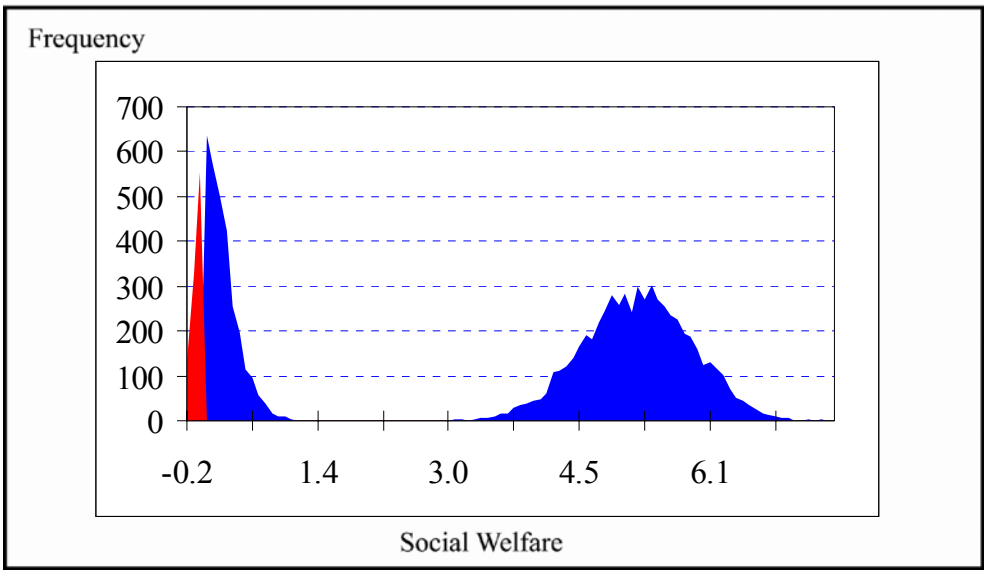
[174] *See* Ayres & Gertner, *supra* note 5*;* Bebchuk & Shavell, *supra* note 5; Craswell, *supra* note 31, at 5-9.

these buyers end up being mistaken for low value buyers and they receive inefficiently low precautions. Second, medium buyers can also do worse with this default. They receive low precautions under *Hadley* instead of the medium precautions that they prefer, and get, with a full damages pooling equilibrium. Finally, most low value buyers come out better under a *Hadley* separating equilibrium: they receive their preferred precautions without needing to incur transaction costs. The *Hadley* rule can thus cause many different effects, some of which may be unintentional.

2. Coke and Cake

Figures 10 and 11 present the Monte Carlo simulation results in the markets for Coca-Cola and pound cake. The default rules in these two markets behave similarly, and both markets can be analyzed together. *Hadley* still generates more welfare than full damages—89 percent of the time with Coke, and 83 percent of the time with cake. The expected value in both markets remains positive. But there are different reasons for *Hadley's* superiority in these two markets.

FIGURE 10. Net Benefit of *Hadley* Rule Over Full Damages Rule - Coke
(n = 10,000 trials)



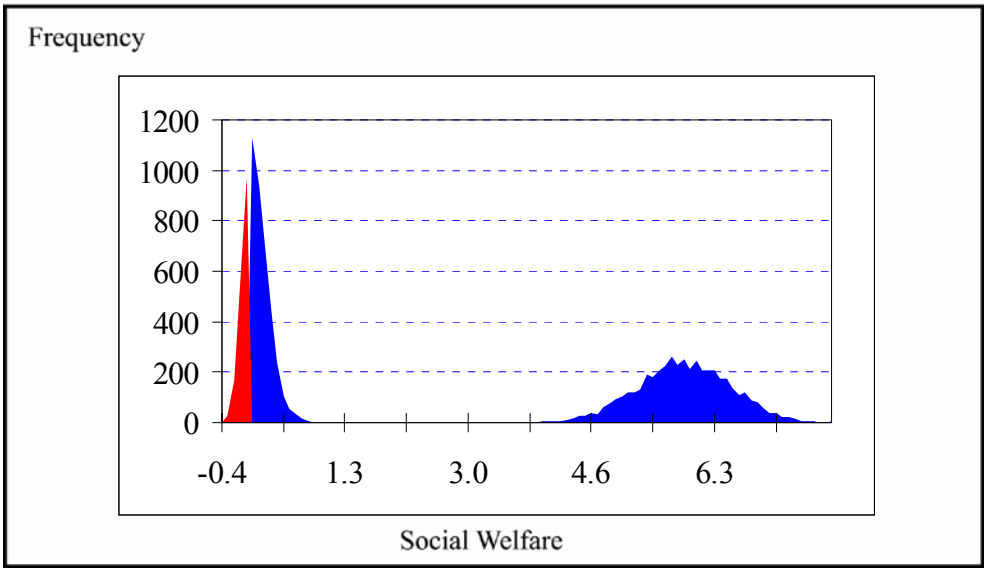
The most important difference is that there are fewer high value buyers. This means that the *Hadley* rule almost never leads to a separating equilibrium—there are not enough high value buyers to signal their type. It also means that, unlike the pen study, extremely high value buyers are very rare and do not have much impact on the choice of default rule.

As before, the results divide into two clusters. In the Coke market, for example, about 40 percent of the trials result in a net *Hadley* benefit under 2.0; the other 60 percent exceeds 2.0. The lower set of values occurs when both default rules cause a pooling equilibrium. The choice of default rule here is a close call, based on many small effects. The *Hadley* rule generally does better, but not by much.

By contrast, *Hadley* outperforms full damages by a significant margin in the second data cluster. These results occur when the full damages default leads to separation, while buyers in the *Hadley* default continue to pool. This is a counterintuitive result: how could a *Hadley* rule leading to pooling—and thus less tailored precautions—outperform a full damages rule leading to separation?[175]

The explanation is subtle. There is a group of low value buyers who gain almost as much utility contracting under medium precautions. With a full damages default, the benefit to these buyers of moving to low precautions does not exceed the transaction costs, and they do not reveal their type. However, enough other low value buyers do benefit from low precautions (or from information disclosure benefits) that the buyer pool separates. This means that the first group of low value buyers now receives high precautions, which are much less efficient. Under the *Hadley* default, these low buyers continue to receive medium precautions, resulting in a net gain to social welfare.

FIGURE 11. Net Benefit of *Hadley* Rule Over Full Damages Rule - Cake (n = 10,000 trials)



[175] *Contra* Ayres & Gertner, *supra* note 5.

More generally, if transaction costs prevent some low value buyers from revealing their type, but the buyer pool still separates under a full damages default, there is a social welfare loss as these low value buyers receive inefficiently great levels of precautions. The seller mistakenly concludes that they are high value types.

In these simulations, then, the *Hadley* default rule outperforms a full damages default nearly 90 percent of the time in all three markets. This happens largely for two different reasons. In the market for pens, extreme value buyers do not always receive high precautions with a full damages default, while they will contract for these efficient precautions with *Hadley*. This is an empirical example of the classic penalty default theory.[176] In the markets for Coke and cake, the *Hadley* default does better less through the effects of extreme value buyers (there are fewer of these), but rather because low value buyers who do not contract around a full damages default rule sometimes receive inefficiently high precautions by mistake.

D. Qualifying the Findings

The analysis thus far might be criticized for relying too heavily on assumption-based modeling. While the distribution of buyer valuations is grounded in empirical data, the other variables in the *Hadley* model take on assumptions. This Section uses sensitivity analysis to address this concern, and it finds that the merits of the *Hadley* default rule must indeed be qualified. In fact, there are lessons to be learned through a detailed examination of the various situations where *Hadley* may generate *less* social welfare.

Specifically, in the markets studied, the *Hadley* rule does not outperform a full damages default in four important circumstances. First, *Hadley* is not preferable when high value buyers systematically have a much greater chance of incurring consequential damages. Second, a full damages default outperforms *Hadley* when most of the efficiency gains from information revelation go to low value buyers. Third, the *Hadley* rule is often worse when the transaction costs of contracting around a default rule are much greater for high value buyers than for low buyers. Finally, the analysis assumes perfect competition, and introducing seller power into the empirical models might change the results.

Take the last qualification first. Jason Scott Johnston has developed a game theoretical model of the *Hadley* rule where he relaxes assumptions of perfectly competitive markets.[177] In other words, sellers are no longer

[176] *See* Ayres & Gertner, *supra* note 5*;* Bebchuk & Shavell, *supra* note 5; Craswell, *supra* note 31, at 5-9.
[177] *See* Johnston, *supra* note 7.

"identical price-taking firms."[178] This introduces several new complexities. For instance, sellers now have an incentive to learn about buyer valuations, not to take efficient precautions, but to increase their individual profits through price discrimination.[179] It also adds another dimension of information revelation: buyers seek to learn whether different sellers have different probabilities of breach.[180] Rerunning the empirical analysis with a model that incorporates these effects might lead to new conclusions.[181]

The balance of this Section addresses the other qualifications in turn, illustrating with results from the ergonomic pen study.[182] It also considers the important role played by the separation variable.

1. High Buyers Suffer Consequential Damages More Frequently

Barry Adler's work on the *Hadley* doctrine suggests that it may not result in an efficient outcome when consequential damages are modeled stochastically.[183] This section provides empirical support for this finding, while also exploring the boundary conditions necessary for *Hadley* to succeed. Recall that the earlier analysis assumes that a buyer's chance of incurring consequential damages (PROBCD) is taken from a normal probability distribution with a mean of 90 percent and a standard deviation of 5 percent.[184] This assumption is used for every buyer.

The *Hadley* rule becomes inferior when two changes are made to this assumption. First, there must be a very wide difference in the probability of incurring consequential damages. This is illustrated by changing the parameters of PROBCD to a mean of 70 percent and a standard deviation of 15, which means that most buyers face a probability of incurring consequential damages ranging from 40 to 100 percent. Second, the probability of incurring consequential damages must be correlated with buyer valuation. In other words, high value buyers are more likely to incur consequential damages than low value buyers (a correlation coefficient of 0.8 is used in this analysis). With these changes, a full damages default is usually more efficient than *Hadley* (see Figure 12).

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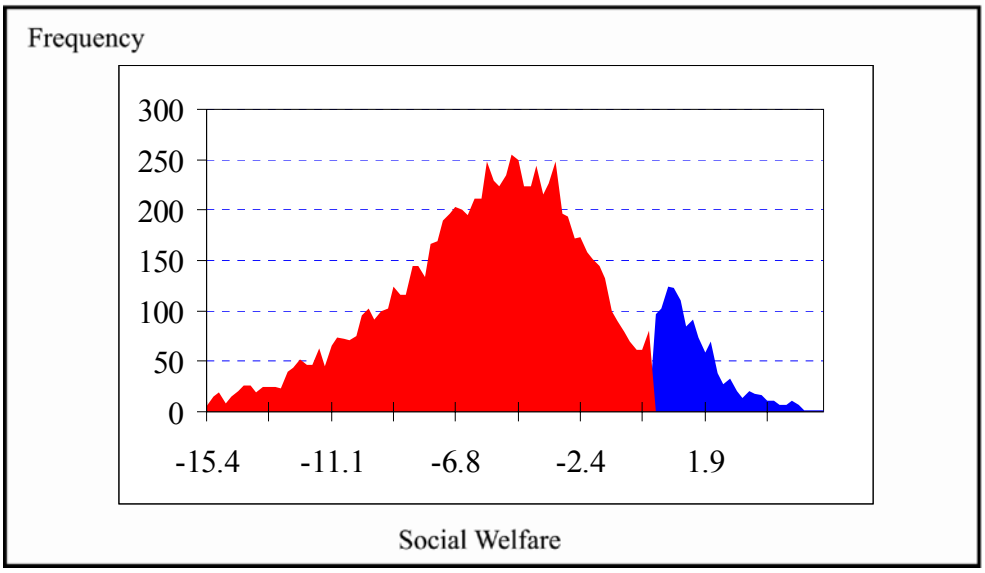
[178] *Id.* at 625.
[179] *Id.* at 625-26
[180] *Id.*
[181] *Id*. *See also* Ayres & Gertner, *supra* note 2; Schwartz, *supra* note 101. This Article, while acknowledging these complications, leaves empirical analysis of models with seller market power for another day. It is worth noting, however, that even in these models the distribution of buyer valuations is an important variable, and insights from empirical simulation models might convey useful information.
[182] Unless noted otherwise, the qualifications also hold true for the Coca-Cola and pound cake data.
[183] *See infra* notes 75-97 and accompanying text.
[184] *See infra* note 123.

FIGURE 12. High Buyers Face Greater Probability of Consequential Damages (n = 10,000 trials)



This change is explained largely by high value buyer behavior. Facing much greater information costs, high value buyers rarely reveal their type under a *Hadley* default. At the same time, low value buyers, with cheaper information costs, separate even more frequently under a full damages rule. When this happens, high value buyers get efficient high precautions, and the benefits of a full damages rule are large.[185] If both rules result in a pooling equilibrium, *Hadley* is often slightly better.

Table 11. Consequential Damage Assumptions - Sensitivity Analysis

PROBCD Mean (percent)	PROBCD Standard Deviation (percent)	Correlation between PROBCD and VALUE	Percent of Results Where *Hadley* Superior (n = 500 trials)
70	5	0	92.6
70	5	0.8	78.6
70	15	0	59
70	15	0.8	13.8

The optimal default rule changes only if both adjustments to PROBCD take place. With a tight standard deviation, the information cost effects are

[185] This exception rarely holds in the markets for Coke and Cake. There are fewer high value buyers and the benefits of tailored precautions under full damages is much diminished. *Hadley* usually remains the superior default rule.

too small to matter. And if PROBCD and VALUE are uncorrelated, then *Hadley* remains the better default (see Table 11).[186] As Adler's theoretical model suggests, stochastic consequential damages can affect the optimal default[187]—but only when the probability of incurring damages deviates greatly and is tied disproportionately to high value buyers.

2. Low Buyers "Take Most of the Benefits" from Tailored Precautions

Each seller precaution level might be viewed as a discrete tradeoff along two dimensions: cost and effectiveness (modeled in this case as the probability of successfully completing performance). Decreasing the cost or increasing the effectiveness of any one precaution level will make it more attractive relative to the other precaution choices. But making a precaution level especially attractive does not necessarily change the optimal default rule; very cheap low precautions or very expensive high precautions may still result in an economic system where *Hadley* generates more welfare.[188]

Different precaution assumptions can, however, cause a full damages default to become more efficient than *Hadley*. The key concern is the differentiation between low, high, and medium precautions on the cost-effectiveness spectrum. Specifically, a full damages default can become optimal when low precautions are positioned very far away from medium precautions, or when high precautions are positioned very close to medium precautions. In a sense, these changes allow low buyers to "take most of the benefits" from tailored precautions. High buyers may as well stick with medium precautions.

In the initial analysis, the cost-effectiveness positions of low, medium, and high precautions are evenly spaced.[189] This means that high and low value buyers each benefit similarly by moving to tailored precautions. Figure 13 portrays four ways to adjust evenly-spaced precautions. Low precautions become more differentiated (or sharper) relative to medium precautions by reducing COSTLOW and PROBLOW. Conversely, low precautions become less differentiated (or duller) by raising COSTLOW and PROBLOW. High precautions follow a similar pattern.

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[186] With a wide deviation in PROBCD, the effects are magnified: very low levels of correlation between the two variables can cause a full damages default to outperform *Hadley*.

[187] *See* Adler, *supra* note 7.

[188] For example, reducing the cost of low precautions in the pen market from $0.20 to $0.05 causes *Hadley* to still perform better nearly 60 percent of the time. If the cost of low precautions continues to be lowered, however, the full damages default rule will typically become more efficient due to the effects described in this Section.

[189] One slight exception: the cost of moving from low to medium precautions ($0.20 to $0.40) is a bit cheaper than the cost of moving from medium to high precautions ($.40 to $0.75), reflecting diminishing marginal returns to the precaution investment.

FIGURE 13. Adjustments to Seller Precautions

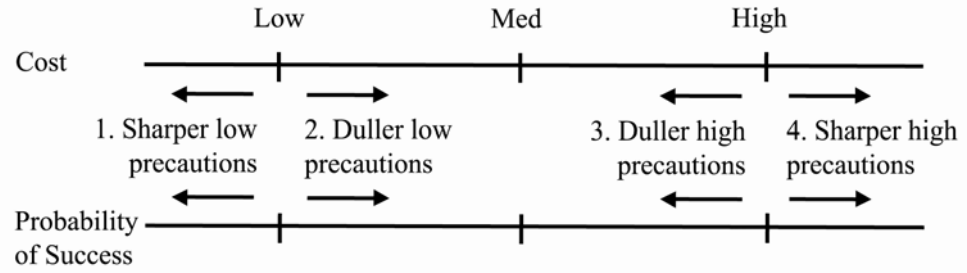

Table 12 shows the results of the Monte Carlo simulation with different precaution scenarios. Sharper high precautions or duller low precautions cause Hadley to outperform full damages almost 100 percent of the time. But dulling high precautions drops the effectiveness of *Hadley* to 75 percent. The full damages default usually generates more welfare than *Hadley* when low precautions are very sharp. And it outperforms *Hadley* over 97 percent of the time when low precautions are sharpened and high precautions are dulled at the same time.

Table 12. Precautions Sensitivity Analysis

COSTLOW	PROBLOW (Percent)	COSTHIGH	PROBHIGH (Percent)	Percent of Results Where *Hadley* Superior (n = 500 trials)
.20	50	.75	90	90.0
.05	35	.75	90	29.2
.30	65	.75	90	99.8
.20	50	.60	80	75.2
.20	50	.90	95	99.2
.05	35	.60	80	2.8

Sharpening low precautions causes several effects. First, cheaper prices entice null buyers to enter the market, resulting in many more low value buyers. These buyers usually reveal their type, and a separating equilibrium typically occurs under full damages. If *Hadley* pools, these low buyers do worse with medium precautions. And *Hadley* is often less efficient when it leads to a separating equilibrium, as well. Medium buyers are much worse off with the sharper low precautions—which they receive in a *Hadley* separation—than with the high precautions that they receive under a full damages default.

The analysis is reversed when high precautions are dulled. High value buyers have less cause to reveal their type, and the *Hadley* default pools

more often. Even when *Hadley* separates, high value buyers that keep quiet receive inefficient low precautions. These buyers are better off under full damages, receiving either medium precautions (with pooling) or high precautions (with separation).

Simultaneously sharpening low precautions and dulling high precautions magnifies both effects.

3. High Buyers Incur Much Greater Transaction Costs

The optimal default rule can also change when transaction costs incurred by high value buyers are much greater than those incurred by low value buyers. There are two interesting scenarios—either of which prevents *Hadley* from performing better than full damages. First, the transaction costs for low buyers might be so cheap that they can easily contract around inefficient defaults. Second, the transaction costs for high buyers might be very expensive,[190] hindering them from contracting around inefficient defaults. The two scenarios are related and cause similar effects, but do so through different means.

For instance, when TCLOW is reduced to $0.01, *Hadley* outperforms the full damages default rule only 12 percent of the time (see Table 13). Because low buyer transaction costs are so cheap, full damages always leads to a separating equilibrium. Most of the time the *Hadley* rule also results in separation, but high buyers with a high probability of incurring consequential damages will not reveal their type. Under *Hadley*, they are treated as low buyers and get inefficiently low precautions. Under full damages, they are treated as high buyers and get efficient precautions.[191]

Table 13. Transaction Cost Sensitivity Analysis

TCLOW	TCHIGH	Percent of Results Where *Hadley* Superior (n = 500 trials)
.05	.05	91
.01	.05	12
5.00	.05	100
.05	.01	100
.05	5.00	7

When TCHIGH is increased to relatively high levels, it becomes too expensive for high value buyers to separate, and the *Hadley* rule results in a pooling equilibrium. When full damages leads to separation, it is the more

[190] This might be true, for instance, if it becomes quite complicated to make special arrangements to protect against high levels of consequential damages.

[191] Again, this qualification is not necessary in the markets for Coca-Cola and Cake for the reason described *supra* note 185.

efficient outcome because high value buyers receive efficient precautions that they do not get under *Hadley*. Full damages usually fares better in a pooling equilibrium, as well, although very rarely the *Hadley* rule results in greater total welfare. An extremely high value buyer may benefit so much from high precautions that she incurs the high transaction costs and still comes out ahead. As TCHIGH approaches infinity, however, this no longer occurs, and the full damages default is always better.

4. The Impact of the Separation Variable

Recall that the separation variable indicates the minimum number of buyers required to identify their type before silent buyers receive tailored precautions. For example, if more than 20 percent of buyers identify their type in a *Hadley* regime, sellers will give all other buyers low precautions. This concept receives little discussion in the contracts literature because most models assume identical valuations for low and high buyer classes.[192] In this simulation model, however, valuations vary within each group. This means that buyer identification is not an all or nothing affair—the model needs to manage an intermediate level of separation.

Changing the separation variable by itself has little effect on the results in Section III.C. The *Hadley* rule continues to outperform a full damages default even when low buyers always separate (SEPLOW equals 0) and high buyers always pool (SEPHIGH equals 101 percent).[193]

But adjusting the separation variable will sometimes mute or magnify the qualifications discussed in this Section. For example, doubling the separation variable for low buyers to 40 percent reinstates *Hadley* as the superior default rule when high buyers have a greater probability of incurring consequential damages.[194] The full damages default now leads to a pooling equilibrium most of the time, and high buyers no longer receive efficient precautions. Similarly, raising SEPLOW mutes the impact of cheap transaction costs for low value buyers.[195]

The way that sellers treat silent buyers, then, might significantly affect the optimal consequential damages default rule. Further research is needed on this topic.[196]

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[192] *E.g.,* Bebchuk & Shavell, *supra* note 5; Adler, *supra* note 7. Adler suggests that modeling buyer valuation stochastically might be a fruitful endeavor. *See* Adler, *supra* note 7, at 1561 n.38.

[193] This is generally caused by low buyers who refuse to identify their type in a full damages regime and receive inefficiently high precautions. They derive more utility in a *Hadley* regime where they get medium precautions. And recall that extremely high value buyers will still contract around the *Hadley* default rule for efficiently high precautions, even when it results in a pooling equilibrium.

[194] *See supra* notes 183-86 and accompanying text.

[195] For example, rerunning line 2 in Table 13 (TCLOW = .01; TCHIGH = .05) with a higher separation variable for low buyers (TCLOW = 35%) leads to a result where *Hadley* does better in 54 percent of the trials.

[196] It would be interesting to test empirically whether sellers choose different separation variables based on

IV. SUMMARY AND BROADER IMPLICATIONS

This case study offers evidence that the *Hadley* default rule typically generates more welfare than a full damages default rule. The work implies that markets with similar conditions might also benefit from the *Hadley* rule. In markets where there are few high value buyers—such as the market for pens—*Hadley* induces these extreme value buyers to contract for efficiently high precautions. A full damages default for the same buyer population will sometimes lead to a pooling equilibrium instead, and the resulting welfare loss can be large. In short, this study provides empirical support for the classic penalty default literature.[197]

The Coke and cake studies suggest that *Hadley* can also outperform a full damages default in markets where buyer valuations are less skewed. This occurs when *Hadley* leads to a pooling equilibrium and the full damages default causes separation—a counterintuitive result. The explanation is that some buyers have a slight preference for low precautions but not enough to incur the transaction costs of contracting around a full damages default rule. If enough other low value buyers do incur these costs, the population separates, and the first group of buyers receives inefficiently high precautions. They are mistaken for high value buyers.

For both of these reasons, an efficiency-minded lawmaker selecting a consequential damages default rule in markets with similar conditions might be justified in choosing the *Hadley* limitation. While *Hadley* does not always perform better, it is the surer bet.

Under several circumstances, however, *Hadley* is an inferior choice. If high value buyers systematically have a much higher probability of incurring consequential damages, then they are less likely to contract around the default. An additional cost is imposed as sellers learn this information. Extreme differences can change the optimal default rule.

Second, the findings will not hold when low value buyers take most of the benefits from tailored precautions—*i.e.*, the cost-effectiveness tradeoff of low precautions is strongly differentiated from those of medium and high precautions. The treatment of medium value buyers, in part, drives this change. Medium buyers now do worse under a *Hadley* default because they receive inefficiently low precautions.

Third, if transaction costs for high value buyers are very expensive, they will not contract around inefficient defaults. Similar results occur (for different reasons) when transaction costs for low value buyers are very

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their underlying knowledge of buyer type. For example, if sellers realize that only 10 percent of buyers are high value types, they might require just 5 to 10 percent of all contracting buyers to reveal their type before other buyers receive tailored precautions. The number of medium value buyers might also play into this calculus.

[197] *See* sources cited *supra* notes 5, 7.

cheap.

While selecting a consequential damages default rule is a tricky task, fraught with competing effects,[198] empirical research can help lawmakers learn more about the right conditions for imposing a *Hadley* default—or for shunning one. This case study provides a framework for empirical analysis. But the work also raises new questions, and additional research would help along multiple fronts.

First, more complicated markets need to be examined. The techniques used by marketing scholars to measure buyer willingness-to-pay, such as the BDM procedure, will conceivably extend into more complex markets.[199] Applying data from these studies might lead to tighter fitting buyer valuation distributions. Work on complex markets would also move the research closer to the typical domain of contract law.

Second, it would be powerful to conduct empirical research that simultaneously measures multiple variables in the *Hadley* model. This Article grounds buyer valuation in empirical research and models the other variables with assumptions and sensitivity analysis.[200] Research that extends this work by empirically measuring buyer valuations, probability estimates for incurring consequential damages, cost and effectiveness of seller precautions, and the transaction costs needed to choose different precaution levels would yield more meaningful results.

Third, more work is needed on selecting the optimal level of granularity for contract default rules.[201] Exploring the classic jurisprudential rules versus standards tension might be helpful in the *Hadley* context.[202] Building a greater empirical database on the merits of the *Hadley* rule versus a full damages default in other markets would be a good start. Lawmakers are unlikely to launch primary WTP research to select a default rule for any given dispute, but additional research might lead to a sharper set of rules—or provide other guidance—for courts deciding when to award consequential damages in a specific case.

Finally, scholars need to launch empirical research that incorporates seller market power. Moving empirical *Hadley* analysis to game-theoretical models that relax assumptions of perfect competition will yield more robust insights.[203]

V. USING MARKETING DATA IN CONTRACT LAW SCHOLARSHIP

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[198] *See, e.g.,* Adler, *supra* note 7; Ayres & Gertner, *supra* note2; Johnston, *supra* note 7; Schwartz, *supra* note 101.

[199] *See* Wertenbroch & Skiera, *supra* note 22, at 234. *See also supra* notes 145-47 and accompanying text.

[200] *See supra* Part III.C.

[201] *See supra* notes 111-13 and accompanying text.

[202] *See* Driver, *supra* note 113; Kaplow, *supra* note 113; Katz, *supra* note 113.

[203] *See* Johnston, *supra* note 7; Ayres & Gertner, *supra* note 2; Schwartz, *supra* note 101.

The *Hadley* case study illustrates the potential benefits of testing economic theories of contract law with empirical research. It challenges the *a priori* claim that economic contracts scholarship has reached a dead end.[204] But more generally, the study hints that marketing research might be a fruitful source of data for contract law scholars. The Part briefly explores some possible benefits of connecting the two disciplines.

The case for using marketing research in contract law scholarship is straightforward. Contract theory, on one hand, needs empirical data to test a variety of claims.[205] Marketing scholars, on the other hand, have conducted vast amounts of empirical research over the past several decades.[206] In some cases, this research may address the same questions being asked in contract law. Both disciplines, after all, deal with issues of transactional exchange and consumer preferences.[207] Where there is overlap, contract theory might reap immediate benefits by drawing upon this marketing work.

The potential applications of empirical research span most branches of contract law. On the contract formation side, economic theory wrestles with offer and acceptance,[208] promissory estoppel,[209] unconscionability,[210] mistake,[211] impossibility,[212] and other issues. Contract interpretation raises some of the same questions as *Hadley*: what default rules should be imposed to guide interpretation problems that arise with incomplete or ambiguous contracts.[213] And scholars draw heavily upon economic analysis to study contract remedy issues ranging from expectation damages[214] and

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[204] *See supra* notes 103-14 and accompanying text.

[205] *See* Korobkin, *supra* note 20, at 1036-37; Landes, *supra* note 18, at 170; Weintraub, *supra* note 18, at 4.

[206] *See, e.g.,* DAVID A. AAKER ET AL., MARKETING RESEARCH (7th ed. 2001); DONALD T. CAMPBELL & JULIAN C. STANLEY, EXPERIMENTAL AND QUASI-EXPERIMENTAL DESIGNS IN RESEARCH (1963); PHILIP KOTLER, MARKETING DECISION MAKING (1971).

[207] *Compare* Schwartz & Scott, *supra* note 32, at 555-56, *and* Russell Korobkin, *Bounded Rationality, Standard Form Contracts, and Unconscionability*, 70 U. CHI. L. REV. 1203, 1216-18 (2003) (contracts), *with* AAKER ET AL., *supra* note 206, at 627, 665, *and* Steven M. Shugan, *Editorial: Defining Interesting Research Problems*, 22 MKTG. SCI. 1, 14 (2003) (marketing).

[208] *See, e.g.,* Richard Craswell, *Offer, Acceptance, and Efficient Reliance,* 481 STAN. L. REV. 481 (1996).

[209] *See, e.g.,* Avery Katz, *When Should an Offer Stick?: The Economics of Promissory Estoppel in Preliminary Negotiations*, 105 YALE L.J. 1249 (1996); Steven Shavell, *An Economic Analysis of Altruism and Deferred Gifts*, 20 J. LEGAL STUD. 401 (1991).

[210] *See, e.g.,* Richard A. Epstein, *Unconscionability: A Critical Reappraisal*, 18 J.L. & ECON. 293 (1975); Korobkin, *supra* note 207; Alan Schwartz, *A Reexamination of Nonsubstantive Unconscionability*, 63 VA. L. REV. 1053 (1977).

[211] *See, e.g.,* Melvin Eisenberg, *Mistake in Contract Law*, 91 CAL. L. REV. 1573 (2003); Eric Rasmussen & Ian Ayres, *Mutual and Unilateral Mistake in Contract Law,* 22 J. LEGAL STUD. 309 (1993).

[212] *See, e.g.,* Richard A. Posner & Andrew M. Rosenfield, *Impossibility and Related Doctrines in Contract Law: An Economic Analysis,* 6 J. LEGAL STUD. 83 (1977); Alan O. Sykes, *The Doctrine of Commercial Impracticability in a Second-Best World*, 19 J. LEGAL STUD. 43 (1990); George G. Triantis, *Contractual Allocations of Unknown Risks: A Critique of the Doctrine of Impracticability,* 42 U. TORONTO L.J. 450 (1992).

[213] *See* Posner, *supra* note 11, at 842.

[214] *See* SHAVELL, *supra* note 6; John H. Barton, *The Economic Basis of Damages for Breach of Contract,* 1 J. LEGAL. STUD. 277 (1972); Steven Shavell, *Damage Measures for Breach of Contract*, 11 BELL J. ECON. 466 (1990) (refining the circumstances under which expectation damages are desirable). For a more general economic treatment of contract remedies, see Lewis A. Kornhauser, *An Introduction to the Economic Analysis of Contract Remedies,* 57 U. COL. L. REV. 683 (1986).

specific performance,[215] to limitations on damage recovery such as mitigation,[216] subjective loss,[217] and the *Hadley* rule.[218] All of these economic theories might gain from empirical testing.

And across campus, marketing researchers follow a long tradition of empirical research.[219] Over the last several decades, they have pioneered numerous data driven studies that guide managerial decision making in diverse situations.[220] Marketing scholars build dedicated research centers to capture and analyze data.[221] They research applied business problems with vast data sets and sophisticated analytical techniques.[222] This proliferation of empirical research is aided, no doubt, by technological advancements that allow easier data capture at the point of purchase and comprehensive analysis at the back end.[223] The work yields vast repositories of empirical

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[215] *See, e.g.*, Alan Schwartz, *The Case for Specific Performance*, 89 YALE L.J. 271 (1979); Thomas S. Ulen, *The Efficiency of Specific Performance: Toward a Unifies Theory of Contract Remedies*, 83 MICH. L. REV. 341 (1984).

[216] *See, e.g.*, Goetz & Scott, *supra* note 35.

[217] *See, e.g.*, Timothy J. Muris, *Cost of Completion or Diminution in Market Value: The Relevance of Subjective Value*, 12 J. LEGAL STUD. 379 (1983).

[218] *See* sources cited *supra* note 7.

[219] *See, e.g.*, CAMPBELL & STANLEY, *supra* note 206; KOTLER, *supra* note 206; David H. Ahl, *New Product Forecasting Using Consumer Panels*, 7 J. MKTG. RES. 159 (1970); N. D. Cadbury, *Where, When and How to Test the Market*, HARV. BUS. REV., May-June 1975, at 96; Gerald Albaum & Robert A. Peterson, *Empirical Research in International Marketing, 1976-1982*, 15 J. OF INTL. BUS. STUD. 161 (1984).

[220] To illustrate the range of topics addressed by the marketing sciences, consider Eyal Biyalogorsky et al., *Overselling with Opportunistic Cancellations*, 18 MKTG. SCI. 605 (1999) (offering techniques to improve profitability through pricing); Randolph E. Bucklin & Catarina Sismeiro, *A Model of Web Site Browsing Behavior Estimated on Clickstream Research*, 40 J. MKTG. RES. 249 (2003) (examining browsing behavior of 5000 random visitors to the Web site of an Internet automotive reseller); Ganesh Iyer, *Coordinating Channels Under Price and Non-Price Competition*, 17 MKTG. SCI. 338 (1998) (exploring how sellers should coordinate distribution channels when retailers compete on both price and non-price terms); Ramya Neelamegham & Pradeep Chintagunta, *A Bayesian Model to Forecast New Product Performance in Domestic and International Markets*, 18 MKTG. SCI. 115 (1999) (offering a methodology to forecast the success of new product launches based on past launches); Sanjeev Swami, Jehoshua Eliashberg & Charles B. Weinberg, *Silverscreener: A Model Approach to Movie Screen Management*, 18 MKTG. SCI. 352 (1999) (offering a decision support system in the media industry). The work speaks to many different audiences, including managers, consumers, regulators, investors, litigators, and consultants. *See,* Shugan *supra* note 207, at 8-13 (suggesting fifteen different audiences likely to benefit from marketing research). Of particular interest is Professor Shugan's suggestion that litigation is a "fertile area for provocative and important [marketing] research problems." *Id.* at 13. He goes on to discuss, for example, how marketing research can contribute to damages assessment in private litigation disputes. *Id.*

[221] A few notable marketing research centers include the Kilts Center for Marketing at the University of Chicago, *at* http://gsbwww.uchicago.edu/kilts/ (last visited June 15, 2004); the Center for Retail Management at Northwestern's Kellogg School of Management, *at* http://www.kellogg.northwestern.edu/research/retail/index.htm (last visited June 15, 2004); the Alfred West, Jr. Learning Lab at The University of Pennsylvania Wharton School, *at* http://www.wharton.upenn.edu/doctoral/research/#learning (last visited June 15, 2004); and the Haas School of Business Center for Marketing and Technology at the University of California, Berkeley, *at* http://groups.haas.berkeley.edu/CMT/index.html (last visited June 15, 2004).

[222] *E.g.*, sources cited *supra* note 220.

[223] Silk & Urban's ASSESSOR application pioneered this type of research. *See* Silk & Urban, *supra* note 133. Other technological models include Robert Blattberg & John Golanty, *Tracker: An Early Test Market Forecasting and Diagnostic Model for New Product Planning*, 15 J. MKTG. RES. 192 (1978) (the TRACKER model); Yankelovich et al., *LTM Estimating Procedures*, *in* NEW PRODUCT FORECASTING 249 (Y. Wind et al. eds., 1981) (the LTM model); L.W. Pringle et al., *NEWS: A Decision Oriented Model for New Product Analysis and Forecasting*, 1 MKTG. SCI. 1 (1982) (the NEWS model); and J.R. Hauser & S.P. Gaskin, *Application of the 'DEFENDER' Consumer Model*, 3 MKTG. SCI. 327 (1984) (the DEFENDER model). AC Neilson offers a BASES service for testing new products and price points prior to broad market release; it bills

data.

In some cases, marketing researchers may be asking the same questions as contract law scholars. The use of willingness-to-pay research to test *Hadley* models is one example.[224] A similar approach might benefit other areas of contract law.[225] For instance, there may be immediate connections with other problems related to measuring expectation damages—such as reduced recovery for subjective loss[226] or the lost-volume seller problem.[227] Economic work in these areas also depends on buyer valuation estimates or seller cost estimates that might be tested with marketing data. Similarly, marketing research may speak to issues of contract interpretation[228] or contract formation.[229] It is worth exploring explicit connections more carefully.[230]

While the call for empirical contract law research is loud, the work thus far is sparse.[231] This may be explained by the significant investments of time, money, and training needed to conduct empirical projects.[232] Thus, importing data from another research discipline might bring immediate benefits. The field of marketing may be a ready-made source of data for testing and refining economic models of contract law.

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this service as "the global leader in Simulated Test Marketing." http://www.bases.com/images/pdf/BASES%20Brochure.pdf (last visited June 17, 2004).

[224] *See supra* Part III.

[225] The lost volume seller problem might also benefit from empirical research. This approach might also extend to issued of contract interpretation or contract formation.

[226] A number of commentators suggest that the appropriate default rule again depends on value distributions of the contracting population. Imposing a market value default rule, for example, might force parties with high subjective values to reveal this preference by contracting around the default. *See* Goetz & Scott, *supra* note 35; Muris, *supra* note 217.

[227] The issue here is whether a breached-against seller who resells the good for the same price should receive any compensation for lost sales volume. Lawmakers may want to choose a default rule that exposes a seller's cost structure so buyers will take efficient precautions against breach. For instance, a penalty default awarding no lost profit damages could force high cost retailers to come forward and contract for a nonrefundable deposit or liquidated damages. The situation thus parallels *Hadley*, but now the distribution of seller costs—or seller willingness-to-accept (WTA), to use the marketing term—is a key variable. *See* Charles J. Goetz & Robert E. Scott, *Measuring Seller's Damages: The Lost Profits Puzzle*, 31 STAN. L. REV. 323 (1979); Victor P. Goldberg, *An Economic Analysis of the Lost-Volume Retail Seller*, 57 S. CAL. L. REV. 283 (1984); Robert Cooter & Melvin Aron Eisenberg, *Damages for Breach of Contract*, 73 CAL. L. REV. 1432 (1985).

[228] For example, interpretation issues can raise similar doctrinal choices between majoritarian defaults that mimic popular desires and penalty defaults that force efficient disclosure of private information. *See* Posner, *supra* note 11. This approach may also help private parties, as opposed to lawmakers, design efficient mechanisms for contract interpretation. In fact, private parties might be able to populate the models with their own historical data, mitigating some of the challenges of gathering empirical information. *Cf.*, Katz, *supra* note 113.

[229] Economic models of the mutual mistake doctrine, for example, depend on variables for buyer valuation and seller costs. *See* Rasmussen & Ayres, *supra* note 210. There are likely to be other doctrinal applications related to contract formation.

[230] *See* George S. Geis, *Using Marketing Data to Empirically Assess Contract Law Theory* (work in progress).

[231] *See* Heise, *supra* note 18, at 816; Korobkin, *supra* note 20; Landes, *supra* note 18, at 180.

[232] *See* Goldsmith & Vermule, *supra* note 17; Heise, *supra* note 18; Landes, *supra* note 18.

CONCLUSION

The last three decades of contract law scholarship have increasingly relied on economic theory to support normative claims. But as the models grow more complicated, commentators are beginning to question whether economic analysis of contract law has failed. A new wave of empirical research is needed to test and refine theoretical claims, but it is unclear whether meaningful empirical projects are even possible.

The famous rule of *Hadley v. Baxendale* illustrates this tension, perhaps better than any other area of contract law. *Hadley* takes on great significance in the literature as an archetype for contract default rules that improve an economic system by exposing asymmetric information. But *Hadley* does not always work, and unfortunately it is difficult to determine when it will. Key variables in the *Hadley* models—such as the distribution of buyer valuations—are hard to measure. And the impact of multiple effects needs to be summed. Ultimately, there are hard questions about the appropriate level of granularity for the default rule—should it be applied to a single buyer, a single product, a single market, or the entire legal system?

Drawing upon recent work in the field of marketing, this Article has conducted an empirical assessment of the *Hadley* rule in three simple markets. It finds that *Hadley* typically generates more social welfare than a full damages default rule, suggesting that markets facing similar conditions might also benefit from the *Hadley* rule.

But these conclusions must be qualified. They do not hold when high value buyers are much more likely to incur consequential damages or face very high transaction costs. A full damages default rule is often better when low value buyers take most of the benefits from tailored precautions. And introducing seller market power might also change the results. Thus, the work presents evidence in support of *Hadley,* but it also raises the need for more research in this area.

Finally, this Article suggests that existing work in the field of marketing may serve as a ready-made source of data for testing economic theories of contract law. Marketing enjoys a rich tradition of empirical research, and the case for linking contract and marketing scholarship appeals on an intuitive level. Both disciplines deal fundamentally with transactional exchange. The use of willingness-to-pay data to assess the *Hadley* rule is one example of the connection. It is possible that broader use of marketing research can address other perceived dead-ends in contract law theory.