

IMPERFECT INFORMATION IN MARKETS FOR
 CONTRACT TERMS: THE EXAMPLES OF WARRANTIES
 AND SECURITY INTERESTS

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TABLE OF CONTENTS

I.	REGULATION OF CONTRACT TERMS	1394
II.	WARRANTY MARKETS	1396
	A. <i>Conventional Views</i>	1396
	1. <i>Signalling Explanations</i>	1396
	2. <i>Comparative Advantage Explanations</i> ..	1398
	B. <i>A Model of a Warranty Market</i>	1402
	1. <i>A Simple Search Equilibrium Model for</i> <i>Price Terms</i>	1402
	2. <i>A Warranty Model</i>	1406
	a. <i>All Consumers Prefer Warranties</i> ..	1408
	b. <i>No Consumers Prefer Warranties</i> ..	1412
	C. <i>Preliminary Normative Implications</i>	1414
	1. <i>All Firms Selling a Similar Product Line</i> <i>Offer the Same Warranty, Which Provides</i> <i>Less Than Full Protection Against</i> <i>Product-Related Harms</i>	1416

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- 2. *Most Firms in a Market Offer the Same Warranty, but a Few Offer Greater Coverage on Important Components* 1418
- 3. *Most Firms in a Market Offer the Same Warranty, but a Few Restrict Coverage* 1419
- 4. *Concluding Remarks* 1419
- III. SECURITY INTEREST MARKETS 1420
- IV. UNDERLYING ASSUMPTIONS 1425
 - A. *Imperfect Information in the First Sense: Knowing the Odds* 1425
 - 1. *Market Responses to Consumer Error* 1426
 - a. *Consumer Error Is Random* 1426
 - b. *Consumers in the Aggregate Are Pessimistic* 1427
 - c. *Consumers in the Aggregate Are Optimistic* 1429
 - 2. *Consumer Optimism: The Nature of the Problem* 1431
 - 3. *Cognitive Errors and Optimism* 1435
 - a. *The Odds of Product Failure* 1436
 - b. *The Odds of Default* 1442
 - B. *The Assumption That Consumers Cannot Affect the Odds* 1446
 - C. *The Assumption That All Consumers Read the Contract* 1450
- V. GENERALIZATIONS AND POLICY IMPLICATIONS 1452
 - A. *Imperfect Information in a Fourth Sense* 1453
 - B. *Policy Implications* 1456
 - 1. *Banning Contract Terms* 1456
 - 2. *Requiring Disclosure* 1459
- VI. CONCLUSION 1461
- APPENDIX 1: TABLE OF MATHEMATICAL SYMBOLS 1463
- APPENDIX 2: IMPERFECT INFORMATION IN CONSUMER FINANCIAL MARKETS 1466

CONTRACTS between firms and consumers are regulated extensively. Courts and legislatures prohibit the use of certain terms, require the use of others, and, if firms make appropriate disclosures, permit the use of still others. Decisionmakers and commentators often justify this regulation on the ground that “imper-

fect information" exists in consumer markets. They seldom distinguish, however, the differing forms of imperfect information, nor do they appreciate the various normative implications that attach to each of these forms. This article attempts to clarify the imperfect information justification for regulation as it applies to contract terms.

Imperfect information that may affect contract terms occurs in three forms. First, consumers may be uninformed about the risks that these terms allocate, making them unable to choose terms that correctly reflect their preferences. Firms are said to exploit this ignorance by degrading contract quality. For example, if consumers believe products to be more reliable than they in fact are, consumers will accept warranty disclaimers too readily, and firms will respond by using disclaimers too frequently. Second, consumers may be unaware of the array of prices and terms that the firms in a market can offer. Consumers who lack this information may accept poor bargains because they do not know that better ones exist, and firms consequently will have little incentive to offer better deals because these will not increase sales. Third, consumers may not understand the legal relationships that their purchase contracts create because they do not read the language in those contracts. Firms have an incentive to exploit this ignorance by using "hidden" terms that will disadvantage consumers if circumstances cause these terms to be invoked.

The analysis below assumes that this third form of imperfect information is absent—that consumers always know what their contracts say. This assumption limits the scope of our conclusions, but the limitation is less serious than is commonly supposed, for the problem that the third form of imperfect information creates is overstated. Consumers may not read an entire contract, yet still know what much of it does. Moreover, evidence suggests that consumers know generally how they are affected by important terms—those dealing with price or governing risks that materialize often or cause serious harm when they do materialize. It is therefore worthwhile to analyze cases in which consumers know that particular terms exist but either cannot make correct choices respecting these terms or are ignorant of the full range of choices that the market offers.¹

¹ The assumption that all consumers know what the contract says is weaker than it

Imperfect information about the risks being allocated and imperfect information about market opportunities both imply that firms will respond poorly to consumer preferences. A focus on the latter form of imperfect information, however, yields insights that differ strikingly from those derived from focusing on the former type. Emphasis on imperfect information about risks implies two types of regulation: (1) firms should be required to explain matters to consumers so consumers can choose correctly, or (2) firms should be prohibited from degrading contract quality through disclaimers or similar risk-shifting terms. If consumers are instead ignorant of market opportunities, firms may respond by degrading contract quality. We show, however, that firms are much more likely to react to this second form of imperfect information by supplying those contract terms that consumers prefer, though at supracompetitive prices.² Hence, even when consumers are sufficiently informed about risks to choose contract terms correctly and are getting the contract terms they want, an information problem may exist: firms could be charging supracompetitive prices for

seems. As we later show, if consumers who care enough about purchase choices to shop for favorable deals know the term at issue and if there are enough such consumers, markets will respond as if all consumers were aware of that term. Part III briefly considers cases in which not enough consumers shop to generate the best outcome and in which the nonshoppers are ignorant of contract content. Researchers also show that consumers possess considerable awareness of warranty terms. See Darden & Rao, *A Linear Covariate Model of Warranty Attitudes and Behaviors*, 16 *J. Mktg. Research* 466 (1979); Whitford, *Strict Products Liability and the Automobile Industry: Much Ado About Nothing*, 1968 *Wis. L. Rev.* 83. Claims that consumers are unaware of creditors' rights to repossess on default when security interests exist or that consumers do not know the prices of goods they buy are understandably rare. A consumer makes many transactions over the course of a life and is on close terms with others who engage in commercial activity. Hence, consumers can develop considerable knowledge about contract content if there is overlap in the legal substance of the contracts that these consumers make. Such overlap seemingly exists. For example, purchase money security interests and repair and replacement warranty clauses assume similar forms in both sales of cars and sales of refrigerators. It therefore seems plausible to suppose that most consumers know what the important terms in their contracts achieve. These terms are the subject of this article.

² Recent articles assuming that imperfect information adversely affects consumer contracts and suggesting extensive regulation of contract content include Davis, *Revamping Consumer-Credit Contract Law*, 68 *Va. L. Rev.* 1333 (1982); Rakoff, *Contracts of Adhesion: An Essay in Reconstruction*, 96 *Harv. L. Rev.* 1173 (1983). These articles fail to distinguish clearly between ignorance of market opportunity sets and ignorance of contract content. Yet firms are much less likely to degrade contract quality in response to ignorance of available market alternatives than in response to ignorance of what risks the contract allocates. Consequently, the recommendations that these articles make rest more heavily on the premise that consumers are ignorant of contract terms than the authors appear to suppose.

terms in response to consumer ignorance of market opportunities. Conventional legal analysis completely overlooks this problem.

Supracompetitive pricing is not only an overlooked information problem in markets for contract terms, but is often the only problem serious enough to justify regulatory concern. This is because the incorrect choice problem arises only in a limited set of cases. If consumers' mistakes regarding the risks contract terms allocate fluctuate randomly around true values in an unbiased way, firms will behave as if consumers choose correctly. If consumers are pessimistic—systematically overstating the risks associated with purchase decisions—firms will often act as if consumer choices are correct. Also, pessimism causes consumers to demand more protection, in the form of favorable contract terms, than their better informed selves would choose; such overprotection is not thought to raise serious policy problems. Firms will reduce contract quality in undesirable ways only if consumers systematically understate the risks associated with purchase choices. Consumers may be “optimistic” in this way if they lack data about risks or if they misprocess relevant data so as to underestimate its adverse implications. In most cases, neither possibility is likely. Consumers have incentives to become informed about important risks, and the evidence indicates that they often act upon these incentives.³ Moreover, an analysis of the psychological literature dealing with cognitive error suggests that consumers in the aggregate seldom misprocess product-related data such that they act optimistically.⁴ The principal exception to these conclusions involves inexpensive, frequently purchased products that cause serious personal harm in rare cases, such as a soda bottle that explodes. We show that the purchasers of these products are unlikely to search for information about the low risk of harm and may respond optimistically to whatever information about this risk comes their way.

That few cases fit within this exception suggests that imperfect information about market opportunities has considerably greater normative significance than imperfect information in its other aspects. Consequently, regulatory schemes designed to resolve information problems should differ significantly from the ones now in place. Decisionmakers ought to “improve” contract quality by ban-

³ See *infra* text accompanying notes 73-76.

⁴ See *infra* text accompanying notes 77-101.

ning contract terms less frequently than they do now. Instead, they should attempt to identify and prevent supracompetitive pricing for the most frequently used contract terms. Because comparison shopping reduces prices, decisionmakers can best implement this latter goal by providing consumers with explanations of transactions *and* by lowering the costs of comparing the prices and terms that firms offer.

In Part I, the article briefly summarizes current regulatory responses to imperfect information as it is thought to affect contract terms. Part II sets out our model of a market for warranties; Part III then sets out a security interest model. Warranty and security interest terms allocate important risks between consumers and firms in very different ways. Therefore, policy implications drawn from an analysis of these terms probably generalize to other terms in consumer contracts. Part IV next asks whether these implications continue to hold when certain key assumptions that underlie them are relaxed. For example, our model of a warranty market supposes that consumers know the odds that products will be defective. We drop this assumption in Part IV and analyze the consumer optimism question just described. Part V then considers and rejects additional theories of the possible effects of imperfect information and sets out several recommendations for increasing comparison shopping for contract terms.

Throughout this article, we assume that competitive outcomes in markets for contract terms are normatively desirable. This premise follows naturally from concern with imperfect information. Imperfect information is a species of market imperfection that enables firms to charge supracompetitive prices or impose unwanted terms on consumers. Regulatory responses designed to provide consumers with information or ameliorate the effects of its absence⁶ must therefore assume that competitive outcomes are desirable. Moreover, when a market is in competitive equilibrium, firms provide goods and contract terms at the lowest possible cost consistent with the continued existence of these firms. Thus, assuming a

⁶ Many of these regulatory initiatives are discussed and analyzed in Beals, Craswell & Salop, *The Efficient Regulation of Consumer Information*, 24 *J.L. & Econ.* 491 (1981); Schwartz & Wilde, *Intervening in Markets on the Basis of Imperfect Information: A Legal and Economic Analysis*, 127 *U. Pa. L. Rev.* 630, 666-82 (1979); Trebilcock & Dewees, *Judicial Control of Standard Form Contracts*, in *The Economic Approach to Law* 93 (P. Burrows & C. Veljanovski eds. 1981).

given distribution of wealth, consumers cannot do better than purchase in competitive markets.⁶

The economic and psychological theory relevant to the performance of markets for contract terms is relatively primitive: our models of these markets, for instance, are the only formal ones which assume that consumers cannot costlessly inform themselves about the offerings of different firms. Hence, our policy conclusions should be taken more as serious suggestions than as hard recommendations. Still, policy suggestions grounded in theory seem an advance over the atheoretical intuitions that now influence regulation of contract terms.

⁶ A fuller justification of the view that the state should intervene in markets *on information grounds* only when noncompetitive equilibria occur is provided in Schwartz & Wilde, *supra* note 5, at 635-39, 666-71. We do not discuss two possible objections to this premise. The first is that poor consumers may prefer to yield contract protections so that they may buy better food or decent shelter; to describe market outcomes that reflect such preferences as desirable is morally wrong. This objection is irrelevant to our analysis. The poor consumers in the illustration are assumed to make informed choices, and we are concerned here only with the question when the existence of uninformed choices should lead to state regulation. Requiring firms to provide better contracts would, in any event, not help consumers put to the choice between food or shelter and such contracts. These consumers would instead be made worse off by the requirement because they prefer the former but are compelled to take the latter. The wealth distribution concern that generates this objection is better solved by transfer payments to poor consumers or by subsidizing the production of particular contract terms. The latter possibility is discussed in Schwartz, *A Reexamination of Nonsubstantive Unconscionability*, 63 Va. L. Rev. 1053, 1063 (1977).

A second set of objections to our premise that competitive equilibria are *prima facie* desirable follows from the view that it is morally problematic for the state to give controlling weight to presently held preferences. Initially, such preferences may be "adaptive." An adaptive preference reflects a more or less unconscious adjustment to evil social conditions. For example, persons may come to prefer discipline as a way of making tyranny psychologically tolerable. Such preferences have little normative value. See, e.g., Elster, *Sour Grapes—Utilitarianism and the Genesis of Wants*, in *Utilitarianism and Beyond* 219 (A. Sen & B. Williams eds. 1982). Similarly, people may sometimes consume in a manner inconsistent with their true best interests; they may, that is, consume excessively or without regard to the effect of their consumption decisions on others whose interests they profess to hold important. This could occur because the ideology of a market economy regards self-interested consumption as desirable behavior and thereby may prevent persons from recognizing that their market preferences are inconsistent with their real wants and needs. See R. Geuss, *The Idea of a Critical Theory* (1981). We make the perhaps strong assumption that these varieties of false consciousness do not exist. We do not know how to distinguish "ordinary" preferences for contract terms from adaptive or otherwise false preferences. Given this inability, the question is whether to regard particular preferences as provisionally true or false. We regard them as true because this is more consistent with a respect for the autonomy of persons. Later in the article, we discuss a final difficulty with allowing present preferences to control, that they may be unstable over time. See *infra* text accompanying notes 111-14.

I. REGULATION OF CONTRACT TERMS

Decisionmakers respond to imperfect information either by requiring disclosure or by banning disfavored contract clauses. Disclosure regulation typically seeks to explain the individual transaction to each consumer rather than help the consumer compare contract terms offered by different firms. For example, regulations under the Truth in Lending Act⁷ require disclosure of "the circumstances under which a finance charge may be imposed . . . including an explanation of whether or not any time period exists within which any credit extended may be repaid without incurring a finance charge"; such disclosure must be made clearly, conspicuously, and in meaningful sequence.⁸ Similarly, regulations implementing the Magnuson-Moss Warranty Act⁹ require firms to provide a "step-by-step explanation of the procedure which the consumer should follow in order to obtain performance of any warranty obligation."¹⁰

Regulation of the substantive terms of transactions is also common. Six states ban warranty disclaimers in all sales of consumer goods,¹¹ and the Magnuson-Moss Act bans such disclaimers whenever a firm makes a written express warranty respecting the product.¹² Almost all states have adopted strict tort liability for product defects, so that firms must warrant against defects that cause personal injury or property damage.¹³ Moreover, when firms promise to repair or replace defective parts of consumer products, courts commonly require them to repair such products quickly or replace them; the promise to attempt to repair parts is thus converted into

⁷ 15 U.S.C. §§ 1601-1667e (1982).

⁸ Truth in Lending, 12 C.F.R. §§ 226.6(a)(1)-(3), 226.17(a) (1983).

⁹ Magnuson-Moss Warranty—Federal Trade Commission Improvement Act, 15 U.S.C. §§ 2301-2312 (1982).

¹⁰ Disclosure of Written Consumer Product Warranty Terms and Conditions, 16 C.F.R. § 701.3(5) (1983).

¹¹ Kan. Stat. Ann. § 50-639(a) (1976 & Supp. 1982); Me. Rev. Stat. Ann. tit. 11, § 2-316(5) (1982); Md. Com. Law Code Ann. § 2-316.1 (Supp. 1982); Mass. Gen. Laws Ann. ch. 106, § 2-316A (West Supp. 1983); Vt. Stat. Ann. tit. 9A, § 2-316(5) (Supp. 1983); W. Va. Code § 46A-1-107 (1980).

¹² 15 U.S.C. § 2308(a) (1982) ("No supplier may disclaim or modify . . . any implied warranty to a consumer with respect to a consumer product if (1) such supplier makes any written warranty to the consumer with respect to such consumer product . . .").

¹³ See Restatement (Second) of Torts § 402A (1965).

a warranty to supply a well-functioning whole.¹⁴ States are beginning to adopt this rule by statute.¹⁵ The Uniform Consumer Credit Code prevents sellers from taking security interests in consumer goods other than purchase money security interests,¹⁶ and several states have either adopted the Code or passed similar statutes.¹⁷ The Federal Trade Commission also recently agreed to limit the taking of security interests in consumer goods.¹⁸ The existence of imperfect information is often used to justify all these regulatory schemes. In addition, most findings of unconscionability depend largely on the apparent presence of uninformed consumers.¹⁹

Disclosure requirements and the banning of contract terms apparently assume that comparison shopping will seldom improve consumer welfare because the former does not aim seriously at increasing the amount of comparison shopping that occurs, and the latter eliminates consumer choice altogether. Current schemes for regulating contract terms also assume that what a consumer learns in one transaction will not be applied in others like it.²⁰ Statutes and legal doctrines that ban contract terms additionally suppose that firms typically exploit the existence of imperfect information by offering terms that consumers would reject were they properly informed. This article argues that all of these assumptions are wrong or problematic, at least as applied to terms likely to be significant to consumers.

¹⁴ See A. Schwartz & R. Scott, *Commercial Transactions: Principles and Policies* 200-06 (1982).

¹⁵ Cal. Civ. Code § 1793.2(d) (West Supp. 1983); 1982 Conn. Acts 287 (Reg. Sess.).

¹⁶ Unif. Consumer Credit Code § 3.301(1) (1974).

¹⁷ For examples of these laws, see Schwartz, *The Enforceability of Security Interests in Consumer Goods*, 26 *J.L. & Econ.* 117, 123 nn.22-24 (1983). Restrictions on the taking of security interests are often justified on noninformational grounds, such as that creditors allegedly fail to maximize the proceeds from repossessed collateral. The article just cited argues that such justifications are unpersuasive. The security interest legislation referred to in the text is therefore evaluated here in informational terms.

¹⁸ 45 *Antitrust & Trade Reg. Rep.* (BNA) No. 1124, at 86 (July 21, 1983) (barring certain collection practices).

¹⁹ See Schwartz, *supra* note 6, at 1076-82.

²⁰ See Landers & Rohner, *A Functional Analysis of Truth in Lending*, 26 *U.C.L.A. L. Rev.* 711 (1979); Schwartz & Wilde, *supra* note 5, at 677.

II. WARRANTY MARKETS

A. *Conventional Views*

We have already outlined the three forms imperfect information may take. Sophisticated conventional explanations of the positive and normative aspects of warranties suppose that imperfect information in two of those forms is absent: consumers are assumed to read warranties and know market opportunities perfectly. These explanations differ in their treatment of the other form of imperfect information—that consumers may lack information about the risks particular terms allocate. “Signalling” theories suppose consumers to be poorly informed about product quality. “Comparative advantage” explanations assume the opposite, but sometimes consider how their conclusions would change if consumers were uninformed about the risk of product defects. Authors of both types of explanations seldom examine the relationship between their assumptions and their results; this failing obscures the dependence of these results on the assumption that consumers are perfectly informed about prices and terms. Accordingly, we begin by analyzing the role this assumption plays in conventional warranty theories. This serves as a useful prelude to our analysis of how imperfect consumer knowledge of market opportunities affects warranty coverage.

1. *Signalling Explanations*

Proponents of signalling theory assert that a warranty “signals” to consumers the quality of a firm’s product.²¹ Such explanations rest on four assumptions: (1) Consumers cannot distinguish among competing products based on their likelihood of failure; (2) Consumers believe that product quality correlates positively with the extent and duration of warranty coverage; (3) The cost to firms of making warranties varies inversely with product quality—the more likely a product will fail, the more expensive it will be to comply with warranties for that product; (4) If firms do not signal their

²¹ For representative explanations of signalling, see Grossman, *The Informational Role of Warranties and Private Disclosure About Product Quality*, 24 *J.L. & Econ.* 461, 470-77 (1981); Spence, *Consumer Misperceptions, Product Failure and Producer Liability*, 44 *Rev. Econ. Stud.* 561, 569-71 (1977). See also Priest, *A Theory of the Consumer Product Warranty*, 90 *Yale L.J.* 1297, 1303-07, 1326-27 (1981) (criticizing signalling theory).

level of product quality to consumers, the consumers will assume that average quality in a market is relatively low. Were consumers to suppose average quality to be high, firms would exploit them by selling low quality products at high quality prices.

Based on these four assumptions, warranty coverage should correlate positively with product quality. Firms with products whose quality is better than the low expectation consumers start with have an incentive to signal this better quality. According to assumption (2), they can best do this by making "strong" warranties. Assumption (3) then implies that firms with poor products will be unable to duplicate these warranty "signals" because the cost of complying with them would be too high. Therefore, if product quality varies, a variety of warranties should exist, each of them signalling the quality of the product it accompanies.

Signalling explanations necessarily assume that consumers know prices and contract terms well because firms have no incentive to send signals that will not be received. Consequently, signalling models often add a fifth assumption, that consumers can costlessly observe the prices and terms of every firm in the market. This "zero search cost" assumption is always false in fact, and its falsity seems at least partly responsible for the major difficulty with signalling explanations—their inconsistency with the data. Three counterexamples to the theory should suffice to demonstrate this inconsistency. First, signalling theory predicts that firms with more durable products will make warranties that cover longer time periods. In fact, actual warranties in given markets generally cover identical time periods, which in turn are considerably shorter than the useful life of the products they accompany.²² Second, signalling theory implies that warranties in commercial markets either will not exist or will differ substantially from those in consumer markets. According to the theory, firms make warranties to inform otherwise ignorant consumer buyers about product quality, while many commercial buyers are presumably well informed about product quality. Yet warranties in commercial markets seem as common as those in consumer markets and take quite similar forms.²³ Third, the theory predicts a strong positive correlation between warranty coverage and product reliability. That correlation

²² See Priest, *supra* note 21, at 1328-31.

²³ See A. Schwartz & R. Scott, *supra* note 14, at 189-94, 196-206.

seems difficult to detect in practice. Frequency of repair data sometimes shows wide variations among firms, while the products themselves sell under similar or identical warranties.²⁴

To summarize, signalling explanations do not account for important facts about markets for warranty terms and, for this and other reasons,²⁵ are not useful for policy purposes. Moreover, the zero search cost assumption seemingly contributes to the theory's inability to explain the data. Analysis of signalling explanations thus suggests that warranties may be better understood if that assumption is abandoned.

2. Comparative Advantage Explanations

Comparative advantage theorists argue that warranty coverage reflects the comparative advantages of firms and consumers in reducing the costs of, or insuring against, product defects.²⁶ Large consumer appliances such as refrigerators offer a good illustration of how comparative advantage determines warranty content. The theory in this context rests on six assumptions: (1) Firms can reduce the costs of defects in refrigerator motors more cheaply than consumers because firms have more expertise regarding motors and benefit from economies of scale in buying repair tools; (2) Consumers can better ensure the durability of refrigerator doors and shelves because these items are best preserved through careful use; (3) Consumers are perfectly informed as to the risk of product defects and know what steps are necessary to reduce this risk; (4) Search costs are zero—consumers can costlessly observe every

²⁴ See, e.g., Garvin, *Quality on the Line*, 61 Harv. Bus. Rev. 564 (1983).

²⁵ The welfare effects of signalling equilibria are very hard to evaluate. If and when they exist, these equilibria reflect only the sustained confirmation of consumers' beliefs. For example, if consumers believe that warranty coverage correlates positively with product durability and if sellers of more durable products find it cheaper to make warranties than do sellers of less durable products, the former sellers have an incentive to make more extensive warranties. If they actually do so, warranty coverage will vary directly with durability. In this event, the informational content that consumers attribute to the warranty signal is confirmed by the signals they see so that a signalling equilibrium could exist. This equilibrium would be efficient, however, only if the increased costs to firms of sending such warranty signals are less than the welfare gains to consumers of being able to make more accurate distinctions about product durability. This comparison is very difficult to make.

²⁶ Early but still interesting comparative advantage explanations are found in G. Calabresi, *The Costs of Accidents* 161-73 (1970); McKean, *Products Liability: Trends and Implications*, 38 U. Chi. L. Rev. 3, 25-34 (1970); Oi, *The Economics of Product Safety*, 4 Bell J. Econ. & Mgmt. Sci. 3 (1973).

price and contract term that all firms in the market do or could offer; (5) Consumers minimize net purchase costs; (6) Firms maximize profits.

Under these assumptions, firms will offer the optimal refrigerator warranty. Assumptions (1) and (2) imply that product defect costs are minimized if firms assume the risk of defective motors but shift the risk of defective doors and shelves to consumers. Because, according to assumption (3), consumers know the risk of product defects, they will recognize that this risk allocation minimizes their costs; and by assumption (5), they will prefer it to any other risk allocation that firms could offer. Because consumers can costlessly search for the best warranty according to assumption (4), each firm knows that by offering it, the firm will necessarily take sales from rivals who offer different warranties. Assumption (6) then ensures that every firm will offer the optimal warranty.

Comparative advantage explanations of warranty content seem plausible because consumers and firms do have differing abilities to reduce or insure against product risks. Also, the assumptions that consumers act as if they minimize costs and firms act as if they maximize profits are consistent with a very large amount of data. In addition, these explanations account for certain warranty-related behavior. For example, firms are not required to repair or replace defective parts of consumer products, but only to pay damages should such defects arise.²⁷ Nevertheless, firms often agree to repair or replace. The theory predicts this result because repairs of new products by firms commonly are less costly than repairs by consumers.

Comparative advantage explanations, however, cannot generate unambiguous explanations of warranty behavior when their informational assumptions—(3) and (4) above—are relaxed. Yet these assumptions must be relaxed, for they are false in fact. The difficulty this causes is best illustrated by examining the most recent major comparative advantage explanation, that of Professor George Priest.²⁸ We show that the conclusions Professor Priest drew respecting warranty content do not follow from his theory. Although some of these conclusions, we later argue,²⁹ are sustaina-

²⁷ U.C.C. §§ 2-712 to -715 (1978).

²⁸ See Priest, *supra* note 21.

²⁹ See *infra* note 120 and accompanying text.

ble in a richer theoretical framework, it is essential for policy purposes that this framework be built because it is very hard to test warranty theories empirically.

Professor Priest's theory rests on the six assumptions set out previously and one more—that some consumers want broader warranty coverage than others. These seven assumptions imply that actual warranty coverage should be alike in the ways consumer preferences are alike and different in the ways those preferences differ. For example, virtually all consumers want coverage against defects in refrigerator motors, so all firms should offer basic coverage against such defects. On the other hand, some consumers (those with large families, for instance) might prefer stronger than usual warranty coverage, so at least some firms should offer relatively extensive warranties. When Professor Priest examined actual warranties, he observed patterns of homo- and heterogeneity in warranty coverage that seemed consistent with his theory, but in some cases the sample sizes were small and occasional counterexamples existed.³⁰

Professor Priest concluded that the coverage he observed was probably optimal, but the evidence alone cannot sustain this claim. Suppose that consumers are imperfectly informed respecting the risk of product defects. Such consumers could still have heterogeneous preferences for warranty protection: some may mistakenly think they need broad warranties while others could mistakenly think they need narrow ones. If firms maximize profits and search costs are zero, firms will still offer the warranties that these consumers want. The warranties will, however, be inefficient.³¹ Thus, Professor Priest's observation of varied warranty coverage cannot establish his claim that consumer warranties probably reflect "manufacturer and consumer investments to optimize product services."³² To sustain this claim, he must show that firms always

³⁰ Priest, *supra* note 21, at 1347.

³¹ In a competitive equilibrium involving incorrect consumer choices, firms nevertheless make zero profits; consumers, however, are less well off than they could be because they are purchasing the wrong warranties. Hence, it is possible to make the consumers better off, by providing them with the information to choose correctly, while making firms no worse off, for they will also earn zero profits in the "correct" competitive equilibrium. A state of affairs in which some persons can be made better off, at least in theory, while no one would be made worse off is inefficient.

³² Priest, *supra* note 21, at 1347.

know what warranties consumers actually need and will not sell consumers the wrong warranty. Alternatively, he must independently support his assumption that consumers accurately value risks or show that this assumption is irrelevant to efficiency analysis.

In addition, the warranties that Priest observed may not correctly reflect consumer preferences for warranty coverage, whether those preferences were based on mistaken or accurate assessments of risk. Suppose that consumers no longer face zero search costs but have identical preferences for warranty coverage. If the remaining assumptions that comparative advantage explanations make are retained, the economic literature on search theory suggests that firms may still offer diverse warranty terms. Analysts working in this literature commonly suppose all firms to sell a homogeneous product under a sales contract that has only one term, the price. Consumers must have identical preferences as to this term: they want it to be as low as possible. Thus, all consumers want to purchase at the competitive price, which by definition is the lowest price at which firms can stay in business. A standard result in this literature, however, is that price diversity can exist when it is costly for consumers to inform themselves of the prices that different firms charge even though all consumers prefer the same price.³³ Inferring that consumers prefer different prices because different prices exist would plainly be a mistake; the variety in prices can only be the result of positive search costs.

In the following section, we extend this standard result to warranty terms, showing that when search costs are positive and all consumers prefer the same warranty, it is theoretically possible for firms not to offer it. The diversity in warranty coverage that Professor Priest observed could thus have been caused either by heterogeneous consumer preferences, as he supposed, or by positive search costs. If search costs actually explain Priest's data, his conclusion that warranty coverage accurately reflected consumer preferences is incorrect. To exclude this possibility, one must analyze how warranty markets behave when consumers face positive search costs. Neither Professor Priest nor any other comparative advan-

³³ The search theoretic literature is reviewed in Schwartz & Wilde, *Imperfect Information, Monopolistic Competition, and Public Policy*, *Am. Econ. Rev.*, May 1982, at 18 (papers and proceedings of the 94th annual meeting of the American Economic Association).

tage theorist has made such an analysis. Thus, although comparative advantage explanations correctly identify important influences on warranty content, it is essential to explore the comparative advantage idea in a world of positive search costs.

B. A Model of a Warranty Market

1. A Simple Search Equilibrium Model for Price Terms

To develop the logic that underlies our analysis of warranty markets, we will begin with a search equilibrium model involving only the price term. The word "search" refers to the process by which consumers become informed about the products, prices, and terms that firms offer. The object of this class of models is to describe the outcomes ("equilibria") that markets reach when consumers seek information in particular ways (pursue "search strategies") and firms pursue specified profit-maximizing strategies.³⁴ An understanding of these models is essential to anyone concerned with the effect that imperfect information has on the way markets perform.

Our relatively simple price search model rests on seven assumptions.³⁵ (1) A large number of firms exist. (2) These firms sell the same product, all of whose features are observable before purchase. Hence, no uncertainty about product quality exists. (3) Firms do not advertise, but instead inform consumers when they visit the firms. (4) Consumers are numerous; all will purchase no more than one unit of the product. (5) All consumers have the same "limit price," so that every consumer will buy if he or she observes a price equal to or less than this limit, but none will buy at prices above

³⁴ These models use the Nash equilibrium concept. Each actor in a market is assumed to pursue a specified strategy designed to achieve a particular objective, such as minimizing purchase costs or maximizing profits. A set of strategies is in a Nash equilibrium when no actor has an incentive to alter his or her strategy, given that other actors continue to pursue their strategies. Because no one has an incentive to change, a market outcome described by such a Nash equilibrium set of strategies is stable. Conversely, when at least one actor has an incentive to alter his or her strategy, given that other actors pursue their strategies unchanged, the resulting market outcome is unstable; it is not in equilibrium. From a public policy viewpoint, the equilibria in a model reflect the model's predictions of what the world is like. They are thus useful to decisionmakers in understanding and evaluating market outcomes. See R. Luce & H. Raiffa, *Games and Decisions* 170-79 (1957); Schwartz & Wilde, *supra* note 5, at 640-41.

³⁵ The model is set out in Wilde & Schwartz, *Equilibrium Comparison Shopping*, 46 *Rev. Econ. Stud.* 543, 545-51 (1979).

the limit. (6) Consumers inform themselves about prices by using a "fixed sample size" search strategy:³⁶ each consumer, before entering the market, decides how many firms to visit, then visits all firms in the sample before purchasing at the lowest price observed, if that price is no greater than the limit price. (7) Some consumers have sample sizes of one—they visit only one firm before buying—while others have sample sizes of two or more. We label these consumers "nonshoppers" and "shoppers," respectively.

Such models raise three questions: First, what results does the model yield? Second, are the model's assumptions sufficiently plausible or its predictions sufficiently confirmed for these results to be taken seriously? Third, if the results do deserve serious consideration, what are their implications?

A major result of this model is that the only possible equilibrium in which all the firms charge the same price occurs when that price is competitive. To see why, first suppose that all the firms in the market charge the same price, " p_0 ," which is less than the common limit price, " p_L ," and greater than the competitive price " p^* ." Then let one firm lower its price a small amount below p_0 . This price-cutter will sell to all nonshoppers who visit it; it will also sell to all shoppers who visit because its price will be the lowest one the shoppers observe. Thus, price-cutting will be a profitable strategy for the firm if all other firms continued to charge the old price, p_0 . But these firms have the same incentive to reduce their prices below p_0 . Consequently, p_0 cannot be the equilibrium price because at least some firms would undercut it. The competitive price, p^* , could be an equilibrium price because no firm would sell below it. This price by definition equals each firm's minimum average cost, which means that revenue from a sale just equals the lowest cost necessary to generate that sale. Because price cuts below this point must produce losses, firms have no incentive to reduce prices below the competitive level.

If prices are at that level, no firm will raise its price unless too few consumers comparison shop. Let one firm consider raising its price above the competitive price, p^* . This firm would continue to sell to nonshoppers who visit it if its new price does not exceed the

³⁶ The formal model assumes that consumers gather all their information from shopping, so that both communication with other consumers and repeat purchases do not provide sources of information about product quality.

common price limit, p_L . Shoppers will not buy at this price, however, because it will exceed those they see at other firms. Because the firm would lose all shoppers' business at any price above p^* and keep all nonshoppers' business at any price not exceeding p_L , it would therefore charge the limit price, p_L , if it chose to deviate from the competitive price. Whether it will deviate thus depends on whether the gains from charging p_L to nonshoppers exceed the lost profits from foregone sales to shoppers. If enough shoppers exist, raising prices would be a losing strategy. Therefore, the competitive price will be the equilibrium price in a particular market if enough comparison shopping occurs there.

If too few comparison shoppers existed to sustain a competitive equilibrium, many firms might still charge the competitive price because of the pressure the shoppers exert. Other firms, however, will find it profitable to sell to a mix of shoppers and nonshoppers at supracompetitive prices. In this situation, price dispersion exists, though the products sold and consumer preferences are both homogeneous. Finally, if *very* few consumers comparison shop, raising prices above the competitive level could be profitable for all firms; if sufficiently few shoppers existed, prices would converge toward the common limit price, p_L .

Having discussed elsewhere the assumptions that generate these results,³⁷ we will comment here only on the assumption that consumers use a fixed sample size shopping strategy. There are three reasons for making this assumption. First, fixed costs to search sometimes exist: the main shopping expense could be getting to the shopping district. A fixed sample size strategy minimizes these fixed costs by spreading them over visits to several stores. Second, search sometimes is a consumption activity: consumers who enjoy shopping may therefore plan to exhaust a sample of several stores. The third reason is more complex. When consumers have limited knowledge of the range of prices available to them, they must choose either to set a fixed sample of stores or to vary the number of stores they visit according to the prices they see. A consumer pursuing the latter strategy who visits two stores and sees the same price at both might stop searching, believing it unlikely that lower prices exist. In contrast, such a consumer who saw two different prices might visit several more stores, believing substantial price

³⁷ See Schwartz & Wilde, *supra* note 5, at 646-48.

dispersion to exist. This strategy makes the number of stores visited partly a function of the prices observed. Experimental evidence suggests that using a "sequential rule" of this sort is no easy matter; unless consumers know (or can intelligently guess) beforehand how much price variability there is, they can shop considerably less or more than the actual price distribution warrants.³⁸ A fixed sample size strategy is less subject to this difficulty and, therefore, seems a more sensibly conservative strategy for consumers to adopt.³⁹

This simple search model predicts that price diversity sometimes will exist in actual markets, and it does. The model also predicts that market prices may fall if more consumers can be induced to comparison shop. Evidence drawn from actual markets is consistent with this prediction.⁴⁰ Accordingly, the model's assumptions and predictions seem sufficiently plausible to warrant concern with its implications.

Chief among these implications is that information about market choices need not be perfect. A market can be in competitive equi-

³⁸ See *id.* at 646-50.

³⁹ Regarding other important assumptions of the model, one of us has shown elsewhere that the model's qualitative results do not change when consumers may purchase more than one unit. Sadanand & Wilde, *A Generalized Model of Pricing for Homogeneous Goods Under Imperfect Information*, 49 *Rev. Econ. Stud.* 229 (1982). These results also obtain if each consumer has an individual limit price. In such a case, one could derive a demand function for every firm from the distribution of individual limit prices; the model would then behave similarly to the model found in Sadanand & Wilde, *supra*. Search models typically do not do this because their results are qualitatively unchanged under the simplifying assumption.

⁴⁰ Two researchers, for example, provided consumers with comparative price information and a weighted index of prices on 65 common food items for supermarkets in a Canadian city for a five-week period. Prices in the sample market declined substantially and price dispersion decreased during the experimental period, while prices and dispersion were largely unaffected in the control market. See Devine & Marion, *The Influence of Consumer Price Information on Retail Pricing and Consumer Behavior*, 61 *Am. J. Agric. Econ.* 228, 230-32 (1979). The primary results of this study were confirmed in McCracken, Boynton & Blake, *The Impact of Comparative Food Price Information on Consumers and Grocery Retailers: Some Preliminary Findings of a Field Experiment*, 16 *J. Consumer Aff.* 224 (1982). Other studies report similar findings. See McNeil, Nevin, Trubek & Miller, *Market Discrimination Against the Poor and the Impact of Consumer Disclosure Laws: The Used Car Industry*, 13 *L. & Soc'y Rev.* 695 (1979); Russo, Krieser & Miyashita, *An Effective Display of Unit Price Information*, *J. Mktg.*, Apr. 1975, at 11. Several studies also report lower prices where price advertising is permitted than where it is not. See Craswell, *Tying Requirements in Competitive Markets: The Consumer Protection Aspects*, 62 *B.U.L. Rev.* 661, 676 n.63 (1982) (summarizing studies).

librium even though the ratio of comparison shoppers to all consumers is much less than one. These competitive equilibria are best obtained by increasing comparison shopping, for the model also shows that greater comparison shopping correlates positively with lower prices. The model that generates these conclusions assumes that firms sell a homogeneous product, but we have argued elsewhere that the conclusions also hold when firms may vary product quality.⁴¹ The next section analyzes the extent to which the lessons drawn from this relatively simple model change when firms are allowed to vary contract quality.

2. *A Warranty Model*⁴²

This model retains the seven assumptions about firms and consumers posited in the search equilibrium model⁴³ and adds four new ones about consumers. First, we assume that consumers do not know in advance which firms offer warranties and which do not. Hence, nonshoppers sample one firm at random from among all firms before purchasing, while shoppers sample more than one firm at random from among all firms. A store visit reveals the firm's price and whether it offers a warranty. Consumers are therefore imperfectly informed respecting prices and terms but know the contracts of the firms they visit. We denote the ratio of nonshoppers to total consumers by " a_1 " and the ratio of shoppers to total consumers by " a_2 ," so that $a_1 + a_2 = 1$.

Second, consumers differ in their preference for warranties. A consumer prefers a warranty, in this model, if the consumer sees the product offered with a warranty at the competitive price and offered without a warranty at the competitive price, and would then purchase the product with the warranty. A consumer therefore is said not to prefer a warranty if he or she would be unwilling to pay the lowest possible premium that firms must charge to pro-

⁴¹ Schwartz & Wilde, *Competitive Equilibria in Markets for Heterogeneous Search Goods Under Imperfect Information: A Theoretical Analysis with Policy Implications*, 13 *Bell J. Econ.* 181 (1982).

⁴² Technical versions of this model appear in Schwartz & Wilde, *Consumer Markets for Warranties*, Cal. Inst. Tech. Social Science Working Paper No. 445 (1982); Schwartz & Wilde, *Warranty Markets and Public Policy*, 1 *J. Information Econ. & Pub. Pol'y* 55 (1983). The present discussion is meant to make the technical analysis accessible to lawyers and to stress its normative implications.

⁴³ See *supra* text accompanying notes 35-36.

vide warranty protection.

Third, this model slightly modifies the assumption that all consumers have the same limit price because a consumer may now buy with or without a warranty. Let " h_w " be the limit price, or willingness to pay, for the product with a warranty and " h_N " be the limit price for the product without a warranty. Here, h_w is always greater than h_N because a warranty is a desirable product feature: no consumer would pay more for a product with no contract guarantees than for a product that has such guarantees, even if the consumer does not prefer the guarantee at competitive prices. The term $h_w - h_N$ represents a consumer's marginal willingness to pay for warranty protection. A consumer prefers a warranty when $h_w - h_N > p_w^* - p_N^*$, where p_w^* is the competitive price for the product with a warranty and p_N^* is the competitive price for the product without a warranty.

The last two assumptions imply that a consumer who prefers a warranty at competitive prices will purchase a product without a warranty if he or she only sees the product offered without a warranty, and the price equals or is less than the limit price (h_N). Similarly, a consumer who does not prefer warranties will buy the product with warranty protection if the consumer sees only warranties and the price equals or is less than the limit price (h_w). These limit prices incorporate all relevant information respecting consumer preferences. For example, other things equal, the spread between h_w and h_N will be greater if consumers strongly prefer warranties.

Fourth, consumers purchase one unit of a product that has a positive probability, π , of breaking and becoming useless; π 's value is known to firms and consumers and does not depend on the care with which consumers use the product. Thus, although the product can fail, no uncertainty about product quality exists. In the terminology used here, imperfect information concerning the risks contracts allocate is absent.

Respecting the firms in the model, we add four further assumptions. First, firms produce the product with a fixed cost, " F ," and a constant marginal cost over some range, " c ." This marginal cost is incurred whether a warranty is made or not. Firms can sell with a warranty or without, but cannot do both. Second, a warranty in this model consists of a promise, which is always redeemed, to re-

place any defective product with a new one at no charge.⁴⁴ Third, offering the product with a warranty does not directly affect each firm's marginal cost, but may require additional fixed costs, "F'." These additional fixed costs may arise from administrative or other expenses that a replacement program could cause. Fourth, marginal cost nevertheless increases when a firm sells under warranty. A firm that sells with a warranty must plan for the replacement of defective products, and the replacements could also be defective. Hence, the firm must produce more than one unit to "support" a sale of one unit; the total amount that must be produced per sale is $1/(1 - \pi)$, where π is the failure probability. Then, with a constant marginal cost of production, c , the firm's total variable cost if it makes a warranty and sells x units is $cx/(1 - \pi)$. Its marginal cost of selling with warranties, called " c_w ", is this total variable cost divided by total effective output, or $c/(1 - \pi)$, which is greater than c because π is positive but less than one. Finally, let " s " be the firm's output in competitive equilibrium when it sells without warranties. Then, a firm that sells with warranties has a total output in competitive equilibrium of " s_w ", where $s_w = (1 - \pi)s$. The output s_w is less than s because the firm must provide for replacements.

We are now ready to consider the model's results in two paradigm cases. In the first, all consumers prefer warranties. We analyze this case because decisionmakers and commentators commonly assert that consumers want more warranty protection than markets provide. Thus, we consider what would likely happen if every consumer in a market preferred a warranty, but firms were allowed to disclaim. In the second paradigm case, we examine the opposite situation in which no consumer prefers a warranty.

a. All Consumers Prefer Warranties

Three mutually exclusive outcomes are possible when every consumer prefers warranties. The most desirable of these occurs when all firms offer the product with a warranty at the competitive price. The likelihood that this happy state of affairs will occur de-

⁴⁴ We make this assumption because it is analytically tractable. The making of a warranty in the model raises a firm's marginal cost and reduces its effective output because the firm must provide for replacements. Any warranty that has these features, such as a promise to repair or replace, is captured by our model.

depends once more on the amount of comparison shopping by consumers. The logic that underlies this result is similar to that in the price-search equilibrium model. Let all firms in the market sell with warranties at a price $p_0 > p_w^*$, where p_w^* is the competitive price. Then every firm has an incentive to cut its price by a small amount because it would continue to sell to nonshoppers and capture all of the shoppers who visit it. The price-cutting strategy is not profitable at prices below the competitive price p_w^* ; hence, a single price equilibrium can occur only if all firms charge this price. If all firms sell with warranties at p_w^* , a firm that wants to deviate in the price dimension will charge the limit price h_w because it will sell only to nonshoppers. This would be an unprofitable strategy if enough shoppers existed, for then the increased revenue gained from the nonshoppers would be more than offset by the losses resulting from the disappearance of the shoppers.

A firm also could deviate from a competitive equilibrium in which all firms sold with warranties at p_w^* by offering the product without a warranty. This firm too would sell only to nonshoppers, for, by assumption, every consumer in the market prefers a warranty and each shopper would see at least one other firm selling with a warranty at p_w^* . Hence, a deviating firm not only would disclaim but also would raise its price to h_N —the most consumers would pay when not getting a warranty. Again, if enough shoppers existed, disclaiming warranties while charging monopoly—i.e., limit—prices would be an unprofitable strategy. In summary, then, when all consumers prefer warranties and enough consumers comparison shop, the market will provide warranties at competitive prices.

If too few comparison shoppers exist to sustain a competitive equilibrium, two possibilities remain: first, all firms will sell with warranties but some or all of them will charge prices above the competitive level; second, some or all firms will sell without warranties and charge supracompetitive prices. Which of these outcomes occurs depends on whether firms have a comparative advantage at selling with or without warranties.

Comparative advantage in this context differs from the comparative advantage discussed earlier,⁴⁵ because it is a function not only of costs but of demand. We define comparative advantage by refer-

⁴⁵ See *supra* notes 26-33 and accompanying text.

ence to the number of customers that a firm would need to break even when it charged the limit price—the highest price consumers would be willing to pay. If, because of a firm's cost structure and consumer preferences, that firm would need fewer customers to break even when selling at the limit price with a warranty (h_w), we then say that the firm has a comparative advantage at selling with warranties. Similarly, if a firm would need fewer customers to break even when selling at the limit price without a warranty (h_N), the firm has a comparative advantage at selling without warranties.

To understand how this concept of comparative advantage is relevant, suppose that all firms in the market offer the product with a warranty at the competitive price (p_w^*). In this illustration, too few comparison shoppers exist to make any deviation from the competitive price unprofitable. Because a firm that considers deviating from this price knows that it will sell only to nonshoppers, it will charge the limit price, but it has the option of making a warranty and charging h_w or disclaiming warranties and charging h_N . If the firm would need fewer customers to break even when selling at h_w , it will offer a warranty. This strategy would yield higher profits because the firm reaches its break-even point with fewer sales. On the other hand, if the firm would need fewer customers to break even when selling at h_N , the firm will disclaim warranties. In fact, when firms have a comparative advantage at selling without warranties and very few consumers comparison shop, warranties could be wholly absent from the market even though every consumer preferred them.

To summarize, firms that have a comparative advantage at selling with warranties will not disclaim them in response to a lack of comparison shopping. When the comparative advantage runs the other way, some firms will disclaim, but, unless comparison shopping is slight, other firms will offer warranties if consumers prefer them. No matter which way the comparative advantage breaks, however, firms will respond to a lack of comparison shopping by charging supracompetitive prices.

Because much turns on the notion of comparative advantage, it is important to ask what its determinants are. A firm has a comparative advantage at selling with warranties when making a warranty adds little to the firm's fixed cost (F' equals zero or is small) and consumers strongly prefer warranties. If consumers strongly

prefer warranties, their limit price for the product with a warranty should significantly exceed their limit price for the product without a warranty. Hence, a firm selling at the limit price will need fewer customers to break even when selling with warranties than when selling without them, unless fixed costs are considerably higher when warranties are made. The condition that fixed costs are small rules this possibility out. The model therefore shows that warranties will be more common when they cost relatively little to make and are strongly preferred by consumers, even though considerable imperfect information exists.

The three possible outcomes just discussed can be characterized mathematically. In addition to the notation used above, let " α_w " be the comparative advantage of selling with warranties, and " α_N " be the comparative advantage of selling without warranties. Then

$$\alpha_w = (F + F')/(h_w - c_w)$$

and

$$\alpha_N = F/(h_N - c).$$

Given these definitions,

(1) The necessary and sufficient condition for all firms to sell with warranties at competitive prices is

$$a_1 s_w \leq \min \{ \alpha_w, \alpha_N \}.$$

(2) The necessary and sufficient condition for all firms to sell with warranties, but with some or all firms charging supracompetitive prices, is

$$\alpha_w \leq \min \{ a_1 s_w, \alpha_N \}.$$

(3) The necessary and sufficient condition for some (possibly all) firms to sell without warranties and at supracompetitive prices is

$$\alpha_N \leq \min \{ \alpha_w, a_1 s_w \}.$$

All firms will sell without warranties in this case if

$$(a) \ a_1 s_w > (a_1 + 2a_2)\alpha_N, \text{ and}$$

$$(b) k_w \leq a_1 F' / (a_1 + 2a_2) \alpha_N, \text{ where } k_w = (h_w - c_w) - (h_N - c).$$

Respecting the last two conditions in case (3), the first implies that a complete deterioration of warranty content is unlikely if a fair number of consumers shop, for then $a_1 s_w$ will be small relative to $(a_1 + 2a_2) \alpha_N$; the inequality is then less likely to be satisfied. The second condition implies that a complete deterioration of warranty content is unlikely if consumers strongly prefer warranties, for then $h_w - c_w$ should be considerably larger than $h_N - c$. In this event, k_w also will be large, and so the second inequality is less likely to be satisfied.

b. No Consumers Prefer Warranties

A warranty is an insurance policy that sellers offer against product-related losses. In the case considered here, consumers prefer to spend relatively less on insurance. For convenience, we analyze the effect of a consumer preference for no warranty protection; the analysis can be generalized to situations where consumers want "limited" warranties though firms are prepared to offer "full" warranties.⁴⁶ Our central result is the same in either case: firms will never offer more warranty protection than consumers desire.

We retain the assumptions of the previous section respecting consumers and firms,⁴⁷ but change the notation slightly. Here " l_w " is the consumer's willingness to pay or limit price for the product with a warranty while " l_N " is the consumer's willingness to pay for the product without a warranty. The lack of a preference for warranties can be captured by the expression $l_w - l_N < p_w^* - p_N^*$: a consumer's marginal willingness to pay for warranty protection is less than the minimum premium firms must charge to sell with warranties. Also, the comparative advantage to firms of selling with warranties is then " β_w ," where $\beta_w = (F + F') / (l_w - c_w)$; the comparative advantage to firms of selling without warranties is then " β_N ," where $\beta_N = F / (l_N - c)$.

⁴⁶ Under the Magnuson-Moss Act, 15 U.S.C. §§ 2303-2304 (1982), a firm makes a full warranty if it agrees to remedy defective products at no charge "within a reasonable time," agrees not to limit the duration of implied warranties, and agrees to replace any defective products it cannot fix. *Id.* § 2304(a)(1)-(4). Lesser warranties must be labeled "limited." *Id.* § 2303(a)(2).

⁴⁷ See *supra* text accompanying notes 43-44.

If enough consumers comparison shop, all firms will sell without warranties at the competitive price. The logic is similar to that used in the previous section. If all firms sell without warranties at the competitive price, a firm wishing to deviate will sell only to nonshoppers. Should it deviate in the price dimension only, it will charge l_N ; should it deviate in both price and warranty dimensions, it will make a warranty and charge l_w . Once more, if enough shoppers exist, the losses incurred by losing their business will outweigh the gains from either deviation strategy. Hence, a competitive equilibrium in which no firms offer warranties is sustainable. The necessary and sufficient conditions for this equilibrium to obtain are

$$(1) a_1 \leq \beta_N/s$$

and

$$(2) a_1 \leq \beta_w/s_w.$$

If too few shoppers exist to sustain a competitive equilibrium, firms will deviate from the competitive outcome only in the price dimension; they will never offer unwanted warranties. A consumer's willingness to pay for warranty protection is the difference between the highest price that the consumer would pay for the product with a warranty and the highest price he or she would pay for the product without one. If this difference is less than the marginal cost to firms of offering warranties, no warranty will ever be offered. This is because a firm could induce a consumer to take a warranty only by offering it at less than marginal cost, and profit-maximizing firms will not make such sales.

A consumer's willingness to pay for warranty protection may be written as $l_w - l_N$, and the additional marginal cost necessary to sell with a warranty is $c_w - c$. Hence, no warranties are offered when $l_w - l_N < c_w - c$. This condition does not necessarily hold under the relatively restrictive assumption we make that firms have constant marginal costs and thus sell up to a capacity constraint in competitive equilibrium. This assumption is made for analytical tractability; were we to relax it, such that firms had more "normal" cost curves, it would turn out that $c_w = p_w^*$ and $c = p_N^*$: price equals marginal cost. Then, under this natural condition, that $l_w - l_N < p_w^* - p_N^*$ would imply that $l_w - l_N < c_w - c$. Hence, we assume this latter inequality to hold. When it does, con-

sumers who dislike warranties would never be willing to pay for warranty protection; thus, no warranties would ever be observed. If an insufficient number of shoppers exist to sustain a competitive equilibrium, firms will increase prices. This occurs when $a_1 > \beta_N/s$.⁴⁸

C. Preliminary Normative Implications

Firms are commonly said to respond to the existence of "imperfect information" by supplying less warranty coverage than consumers want.⁴⁹ The forgoing model shows, in contrast, that when consumers prefer warranties, markets frequently will supply just the warranty coverage they desire. It further shows that not every consumer must shop for warranties to make warranty markets responsive to consumer preferences. These results are significant for three reasons. First, assuming that consumers can make correct choices—they know failure probabilities perfectly—the competitive equilibria that actually occur are efficient. Second, noncompetitive equilibria take a different form than is commonly supposed. Firms are thought to reduce warranty coverage in these situations,⁵⁰ but they are more likely to offer the correct coverage at supracompetitive prices. This has obvious policy implications that we pursue below.⁵¹ Third, consumers in our model will purchase warranties only if they believe warranty protection to be worthwhile; that is, only if warranties are offered for sale at or below the consumers' limit prices. Persons in general seem better off if they can get what they want—though they sometimes may have to pay too much for it—than if their desires are frustrated altogether.

⁴⁸ The text describes models of warranty markets in two special cases—when all consumers prefer warranties and when none do. It does not describe the intermediate case in which some consumers prefer warranties but others do not. This case is less important normatively than the models set out above, is tedious to analyze, and is unlikely to yield different results. The two polar cases imply outcomes that run in the same direction—firms in both cases commonly respond to insufficient shopping with higher prices rather than lowered contract quality. An intermediate case is unlikely to generate outcomes that run in a different direction. In a related model, we characterized necessary and sufficient conditions for competitive equilibria to obtain in markets for goods of different qualities when consumers have heterogeneous quality preferences. See Schwartz & Wilde, *supra* note 41. This model yielded results that are consistent with those described above.

⁴⁹ See, e.g., *Henningsen v. Bloomfield Motors, Inc.*, 32 N.J. 358, 161 A.2d 69 (1960).

⁵⁰ See, e.g., *id.*

⁵¹ See *infra* text accompanying notes 116-21.

Finally, the model is suggestive respecting the question whether imperfect information causes a warranty market to behave noncompetitively. Economic models often are hard to apply *directly* to real world problems because it is difficult to gather the data on which their application depends. For example, explicit warranty prices seldom are observable because firms commonly sell a joint product for a single price—the item with a warranty. Also, the necessary and sufficient conditions for the various equilibria include terms referring to firms' marginal costs (c_w and c); marginal cost data is notoriously hard to get. Hence, a model such as ours is useful for policy purposes only if it tells a story that is more plausible than competing but equally difficult to test explanations. The model also may assist in the evaluation of actual market outcomes if, in addition, it suggests factors that correlate with normatively relevant states of the world *and* if decisionmakers can observe such factors relatively conveniently. Our model satisfies all of these criteria fairly well.

The model rests on the plausible intuition that firms will satisfy consumer preferences when doing so would increase profits. If enough consumers will withdraw business from firms that ignore their interests, satisfying those interests then becomes the profit-maximizing strategy. Normatively desirable equilibria in our model—those in which consumer preferences for warranty terms are satisfied—therefore correlate positively with the extent of *comparison shopping* in which consumers engage. The model also rests on the intuition that consumers will get what they want if they are willing to pay for it. In particular, if consumers strongly prefer warranties, firms are unlikely to have a comparative advantage at selling without warranties; consequently, the probable response of firms to imperfect information will be to raise prices rather than dilute warranty content. Thus, normatively desirable equilibria in our model also correlate positively with consumers' *willingness to pay*. The factors of comparison shopping and willingness to pay generate a story about warranty markets that seems more plausible than the signalling and comparative advantage explanations.⁵² These two factors may also be of use to decisionmakers in evaluating actual markets.

⁵² See *supra* text accompanying notes 21-34.

To understand how these factors might be used, it is helpful to look first at typical consumer warranties. Perhaps the most important fact about such warranties is their homogeneity. Almost identical warranty coverage often exists within and even across product lines. "Hard" goods, for instance, are often sold under a standard warranty that (1) disclaims implied warranties of merchantability and fitness, (2) expressly warrants against defects in materials and workmanship, (3) limits buyers' recovery under this warranty to repair or replacement of defective product parts, (4) limits the time within which warranty claims can be brought, and (5) when personal injury or serious property damage is possible, excludes recovery for consequential damages.⁵³ Deviations from this pattern, broadly speaking, are of two major types. Some firms will reduce coverage, either by limiting recovery to the original purchaser or excluding it for specified uses, such as racing a passenger vehicle. Other firms may expand coverage, primarily by lengthening the standard term within which claims can be brought. Because of the very small sample sizes in existing research of actual warranties and because researchers often compare warranties across industries rather than within particular product lines, it is impossible to know how frequently these deviations from the standard warranty actually occur. Accordingly, we consider three hypothetical cases in light of our warranty model.

1. All Firms Selling a Similar Product Line Offer the Same Warranty Which Provides Less Than Full Protection Against Product-Related Harms

Our model shows that consumers will get no more coverage than they want but may get less. Thus, identical warranties offering less than full protection could reflect either firms satisfying consumer preferences or diluting warranty coverage in identical fashion. Decisionmakers could use the factors of comparison shopping and consumer willingness to pay to determine which interpretation is

⁵³ This pattern used to describe both consumer and commercial warranties, but consumer warranties have been modified by the Magnuson-Moss Act, which prohibits disclaimers of implied warranties if firms make express warranties, and by the strict liability doctrine, which requires firms to bear the risk of consumers' personal injuries. See also U.C.C. § 2-719(3) (1978). Warranty patterns are described in A. Schwartz & R. Scott, *supra* note 14, at 189-94; Priest, *supra* note 21, at 1307-13.

more likely to be correct. The following example illustrates how such an analysis might work.

When consumers prefer a given level of warranty protection, all firms in a market will offer less protection if and only if each of three conditions is satisfied:

$$(1) \alpha_N \leq \min \{ \alpha_w, a_1 s_w \};$$

$$(2) a_1 s_w > (a_1 + 2a_2) \alpha_N;$$

$$(3) k_w \leq a_1 F' / (a_1 + 2a_2) \alpha_N, \text{ where } k_w = (h_w - c_w) - (h_N - c).$$

Let

$$F = \$1,000$$

$$F' = \$200 \text{ (for a fuller warranty)}$$

$$s_w = 100 \text{ units}$$

$$c = \$45$$

$$c_w = \$46 \text{ (for a fuller warranty)}^{54}$$

$$h_w = \$62 \text{ (for a fuller warranty)}$$

$$h_N = \$59$$

$$a_1 = .80 \text{ (80\% of the consumers are nonshoppers).}$$

The first of the three conditions is satisfied because $\alpha_N = 71$, $\alpha_w = 75$, $a_1 s_w = 80$, and thus, $\alpha_N \leq \min \{ \alpha_w, a_1 s_w \}$. Because firms have a comparative advantage at selling without warranties, some of them could limit coverage in response to a lack of comparison shopping. The second of the three conditions is not satisfied, however. Because $a_1 s_w = 80$ and $(a_1 + 2a_2) \alpha_N = 85$, the left side of the inequality is less than the right side. Thus, the identical coverage could not stem from frustration of consumer preferences. Moreover, because too little comparison shopping would lead some firms to reduce coverage, that no firms in this illustration have done so implies that comparison shopping is actually sufficient to sustain a competitive equilibrium.⁵⁵

We have defined a consumer's willingness to pay for warranty coverage as the difference between the highest prices the consumer

⁵⁴ This illustration supposes π to be .01. Then, if $c = \$45$, $c_w = \$46$ because $c_w = c/(1 - \pi)$.

⁵⁵ Because firms will offer less protection if and only if all three conditions are met, we need not examine the third condition, the second not being met.

would pay for the good with and without that coverage. In our illustration, this difference is \$3. Let the willingness to pay for a warranty rise to \$4.50. Then the comparative advantages are reversed; α_N remains at 71 while α_w declines to 68. Now firms will find it more profitable to sell with warranties than without; accordingly, they will not respond to imperfect information by reducing coverage. Thus, although the figures themselves are imaginary, they do suggest that if a moderate amount of comparison shopping occurs (twenty percent in the example) and if consumers strongly prefer warranties, an outcome in which all firms offer the same warranty is unlikely to reflect a complete frustration of consumer preferences.⁵⁶

2. *Most Firms in a Market Offer the Same Warranty, but a Few Offer Greater Coverage on Important Components*

Because consumers again will not get more warranty coverage than they want, this pattern reflects one of three things. First, it may reflect "noise": the deviating firms may be making promotional warranties or experimenting to find actual consumer preferences. Second, previously unnoticed differences in products or consumer preferences may account for differences in warranty protection.⁵⁷ Third, a lack of comparison shopping could be causing most firms to reduce warranty coverage.

These possibilities suggest what factors a decisionmaker should explore. Promotional warranties are easy to identify because they are commonly associated with the introduction of new products. As for the other two possibilities, the question is whether consumers comparison shop for the products that have and those that lack the better warranty. Suppose that consumers who purchase the

⁵⁶ Searching for terms is probably more costly than searching for prices—and thus less term searching may occur—because it presumably takes more time to absorb and compare information about terms than about prices. See Schwartz & Wilde, *supra* note 5, at 660. Accordingly, a consumer may discover the price and warranty by a store visit, but not learn about some other terms. As to these terms, firms may reduce contract quality. See *supra* note 1 and accompanying text; *infra* note 106.

⁵⁷ A decisionmaker evaluating coverage must make an initial, largely impressionistic judgment as to what products are in the same market. The Renault Alliance, for example, is unlikely to compete with the Mercedes 300SD. Diverse warranty coverage thus may indicate previously unnoticed differences in product types or consumer wants. The existence and relevance of product and consumer heterogeneity are discussed in more detail *infra* pp. 1446-50.

warranty most firms use would not purchase the better one, even if available, because they believe the additional protection is not worth its cost to them. Two markets would then exist, one for a product with the standard warranty and the other for a product with the more extensive warranty; coverage in each market would be homogeneous and can be evaluated as in the first illustration.⁵⁸ But if consumers would pay the premium required for greater warranty protection so that only one market in fact exists, market performance would be unsatisfactory. Many firms would then be offering less preferred coverage at supracompetitive prices.

3. Most Firms in a Market Offer the Same Warranty, but a Few Restrict Coverage

As with the last example, this pattern could reflect unsuspected variety in consumer preferences: consumers who purchase the restricted warranty might be unwilling to pay the premium required to obtain the usual warranty. Alternatively, one market exists and a few firms in it are reducing warranty protection. In this event, prices for the standard warranty will likely be too high, for insufficient comparison shopping occurs to sustain the competitive equilibrium. If investigation rules out heterogeneity in consumer preferences, a decisionmaker would know that although warranty protection is not a serious problem—only a few firms reduce coverage—pricing should be. An analysis of actual pricing patterns would then establish the nature and seriousness of any supracompetitive pricing that exists.

4. Concluding Remarks

Two general remarks should be made about using our model to analyze warranty markets. First, the factors that we suggest seldom can be precisely applied. They rely heavily on survey data, such as inquiries into how much shopping occurs and whether consumers would pay for broader warranty protection. Such data is expensive to gather and will sometimes suffer from response bias: a consumer might, for example, tell an interviewer that he would pay a large sum for warranty coverage because he wants to portray himself as a prudent person, while in fact he would buy without a

⁵⁸ See *supra* pp. 1416-18.

warranty if given the choice. Nevertheless, consumer surveys may yield useful data and are employed in other legal fields for purposes similar to those suggested here. In ruling on the competitive effects of mergers, for example, consumer attitudes toward possible price movements are used to determine whether products trade in the same market.⁵⁹ Moreover, decisionmakers now evaluate the effect of imperfect information on warranty terms without reference to either theory or data. Suggestive data, the relevance of which is implied by plausible theory, should yield more sensible policy.

Second, both the relatively happy normative outcomes that the model predicts—that consumers will often get the warranties they want and that competitive equilibria are efficient—and the positive analysis itself depend heavily on the model's assumptions. For example, if consumers choose warranties incorrectly because they lack information about risks, market responsiveness to consumer choices may not be especially desirable. The model's assumptions thus require more detailed analysis. After setting out our model of a security interest market, then, we consider the effect of relaxing some of the important assumptions on which both models rest.

III. SECURITY INTEREST MARKETS

Security interests in consumer goods have been extensively regulated.⁶⁰ Because the central concern of this regulation has been the use of seemingly overbroad security terms,⁶¹ the question is whether firms exploit imperfect information by exacting more dra-

⁵⁹ See, e.g., *United States v. E.I. Du Pont De Nemours & Co.*, 351 U.S. 377 (1956).

⁶⁰ The Uniform Consumer Credit Code (U.C.C.C.), which has been adopted in 10 states, generally limits the security interest which a seller may take in consumer goods to the goods themselves. U.C.C.C. §§ 2.407 - .409 (1969) (adopted with modifications in Colorado, Idaho, Indiana, Iowa, Kansas, Maine, Oklahoma, South Carolina, Utah, and Wyoming). A number of states which have not adopted the U.C.C.C. have enacted similar restrictions. See, e.g., Mass. Gen. Laws Ann. ch. 255D, §§ 15, 18 (West Supp. 1983); N.Y. Pers. Prop. Law §§ 410, 421 (McKinney 1976 & Supp. 1982); N.C. Gen. Stat. §§ 25A-23, 25A-27 (Supp. 1981); Ohio Rev. Code Ann. § 1317.071 (Page 1979); W. Va. Code §§ 46A-2-107 to -109 (1980).

⁶¹ One of the few exceptions to the general rule that the seller can take a security interest only in the goods themselves arises when the buyer purchases more than one item on credit from the seller. In this circumstance, most states allow the seller to take an interest in the previously purchased goods to secure payment of the later purchased goods. Legislatures, however, typically protect against these seemingly overbroad security terms by requiring the seller to apply all payments to the earliest purchased item and to release its security interest in that item as soon as it is paid in full. See, e.g., U.C.C.C. § 2.409 (1969); state statutes cited *supra* note 60.

conian security interests than well-informed consumers would grant. As before, we first assume that consumers can choose security interests correctly and then set forth a model of a security interest market in which consumers are imperfectly informed of market prices and terms.⁶² This model shows that firms will not respond to insufficient consumer search by exacting overbroad security interests, but may charge supracompetitive interest rates for those security terms that consumers prefer. Hence, regulation restricting security on imperfect information grounds is misconceived if consumer choices for and against security are correct, a question we take up in Part IV.

Our model initially rests on seven assumptions about firms. (1) Creditors are banks, all of which lend a fixed amount "L." (2) The likelihood of consumer default is " π ," which is known to both firms and consumers. (3) Consumers who default may go bankrupt; the probability that a consumer will go bankrupt given that he or she has defaulted is " λ ." (4) Firms recover a fraction of the unpaid debt, " ρ ," in bankruptcy proceedings. (5) A firm can lend with or without a security interest, but cannot do both. Security interests in this model are purchase money; the bank provides credit to enable the consumer to buy the product.⁶³ If a firm takes security, it can recover the value of the used good, " V ," whether the consumer goes bankrupt or not.⁶⁴ We assume that the collateral on repossession is worth less than the outstanding debt ($L > V$). (6) The interest rate is " r "; " S " represents the total amount of funds available for loans and $S/L = s$ is the firm's capacity, the total number of loans that can be made. (7) " F " is the firm's fixed cost in making loans, and " c " is its marginal cost. This marginal cost is mea-

⁶² A technical version of this model is attached as Appendix 2. Several explanations of why security is given exist. For example, security is said to reduce net lending costs or signal the creditworthiness of debtors. These explanations are unpersuasive. See Schwartz, *Security Interests and Bankruptcy Priorities: A Review of Current Theories*, 10 *J. Legal Stud.* 1 (1981). We are not concerned here with why security is used, but only with whether imperfect information will cause it to be used in ways that frustrate consumer preferences.

⁶³ This assumption is made for convenience. The model's qualitative results are unchanged if other common forms of security are assumed.

⁶⁴ Firms have more difficulty recovering consumer goods in bankruptcy than this assumption suggests partly because bankruptcy courts can stay the enforcement of security interests and also because consumers in some cases can keep the collateral if they make specified payments on it. See Bankruptcy Act, 11 U.S.C. §§ 362, 522(f), 1322, 1325 (1982). This difficulty in foreclosing can be captured by substituting for V an expected value for the collateral, $E(V)$, where $E(V) < V$. The analysis then proceeds unaffected.

sured as an interest rate—the opportunity cost of forgoing loans in commercial markets. Let “ c_s ” be the marginal cost of lending with security and “ c_N ” the marginal cost of lending unsecured. If a firm does take security, its fixed costs increase by an amount “ F ”: F includes the cost of drafting security agreements, administering a resale facility for repossessed collateral, and so forth.

Based on these assumptions, a firm’s expected marginal rate of loss from consumer bankruptcy is $\pi\lambda(1 - \rho) \equiv k$.⁶⁵ If the firm takes a security interest, it can recover the value of the used good, V . Because it otherwise might have to seek this value in bankruptcy, and its rate of loss on the sum would then be k , the value of security to the firm is Vk ; a security interest saves the firm this amount. The additional cost per loan of taking a security interest is F'/s , where F' is the increased cost of security and s is the number of loans. We assume $F'/s < Vk$; in other words, the cost of security to a firm (F'/s) is less than the gain (Vk). If r_N^* is the competitive interest rate on a loan without security and r_S^* is the rate with security, it then follows that $r_N^* > r_S^*$; interest rates fall when firms take security because, in competitive equilibrium, price equals cost and security lowers a firm’s costs.

Respecting consumers, we make four additional assumptions. (1) Each consumer wants to borrow L dollars or none. (2) Consumers shop exactly as they do for warranties. In particular, consumers set fixed sample sizes before searching for loans, with some sample sizes equaling one (the nonshoppers) and some sample sizes exceeding one (the shoppers). (3) Consumers again have two limit prices (or interest rates), one for an unsecured loan (h_N) and one for a secured loan (h_S). Because consumers will pay higher interest rates when no security interest attaches, $h_N > h_S$. (4) Consumers prefer not to give security. A consumer offered the choice between borrowing at competitive interest rates with or without giving security will pay the premium necessary to compensate firms for lending unsecured.⁶⁶

This model implies that, if enough comparison shopping occurs,

⁶⁵ If a firm recovers a fraction of the unpaid debt, ρ , in bankruptcy proceedings, it loses the fraction $(1 - \rho)$ when the consumer goes bankrupt. The probability of default is π , and the probability of bankruptcy given default is λ . Thus, the total expected rate of loss from bankruptcy is the product of these factors, $\pi\lambda(1 - \rho)$, which we denote by k .

⁶⁶ For convenience, consumers are said to prefer no security at all; the analysis also applies when consumers prefer less security than firms would like to obtain.

the only single price equilibrium is at the competitive price without security (r_N^*). The logic underlying this result is similar to that used in the warranty model.⁶⁷ Let all firms lend at the competitive rate without security. A firm wishing to raise its price above r_N^* but lend unsecured will lose the business of every shopper. Shoppers will see other firms lending unsecured at r_N^* . The deviating firm will therefore lend only to nonshoppers and will charge them h_N , the highest rate for a loan without security that consumers will pay. If too few nonshoppers exist, the firm would be better off charging r_N^* than raising its interest rate to the limit. Similarly, any firm that demands a security interest will also lend only to nonshoppers. The shoppers, we have assumed, prefer borrowing unsecured at r_N^* to borrowing secured at the lowest price possible for secured loans, r_S^* . Thus, a firm that demands a security interest will sell only to nonshoppers and will raise its price to h_S , the highest interest rate consumers are willing to pay for secured loans. Once more, if too few nonshoppers exist, this strategy will be less profitable than continuing to lend unsecured at r_N^* .

If too few shoppers exist to sustain a competitive equilibrium, firms will charge supracompetitive interest rates but would not demand security. Recall that a firm's marginal cost for lending with and without security is c_S and c_N , respectively. Firms will not forgo security unless consumers are willing to pay them the cost of giving it up. This cost is $c_N - c_S$; the consumers' willingness to pay to avoid security is $h_N - h_S$. Hence, firms will not demand security if $h_N - h_S > c_N - c_S$. Again, though this inequality does not necessarily hold given the restrictive constant marginal cost assumption we make, we assume it to hold for it would be the case that $c_N = r_N^*$ and $c_S = r_S^*$ were firms supposed to have more normal cost curves. Therefore, if consumers do not prefer security at competitive rates, but too few of them shop to generate a competitive equilibrium, firms will charge supracompetitive interest rates, but will not exact unwanted security interests.

Consumers may prefer to grant security if the cost savings to firms from having security (Vk) is large. In this event, consumers' willingness to pay to avoid security may be less than the premium firms would charge to lend unsecured ($h_N - h_S < r_N^* - r_S^*$); consumers will want the interest rate reductions that security makes

⁶⁷ See *supra* p. 1409.

possible. The analysis is then similar to that of the warranty model. If enough consumers comparison shop, all firms will lend with security at r_s^* . If too little shopping occurs to sustain a competitive equilibrium and firms have a comparative advantage at selling with security, all firms will demand security but some or all will charge supracompetitive prices. Finally, if insufficient shopping occurs and the comparative advantage is the other way, firms will both charge supracompetitive prices and lend without security. Firms will have a comparative advantage at lending with security if the fixed cost of security (F') is low and the consumers' desire ($h_N - h_S$) for the lower interest rate that accompanies it is high. Hence, consumers who prefer to borrow with security will be able to do so if their preference is sufficiently strong and security is not excessively costly for firms to take, even if little shopping for credit terms occurs.

This analysis implies that current regulation of security interests in consumer goods may be misconceived to the extent that it is made to rest on the notion that consumers are imperfectly informed about the possibilities respecting security that the market offers. Current regulation aims almost exclusively to restrict the ability of firms to demand security. But firms will not demand more security than consumers wish to give (although they may exact less because taking security involves some cost to the firm). Also, the competitive equilibria that exist in markets for security interests are efficient, assuming consumers can make correct choices concerning security. Thus, the principal problem that can occur in markets for security is that interest rates may be at supracompetitive levels. This problem, however, has already been addressed with some success by legislation such as the Truth in Lending Act.⁶⁸ Again, though, the positive and normative implications of this analysis are sensitive to its assumptions. For example, we suppose that consumers can make correct choices respecting security but have given no grounds in support of this assumption. We thus turn to an analysis of the important but seemingly controversial assumptions that underlie our models.

⁶⁸ 15 U.S.C. §§ 1601-1667e (1982). See also Schwartz & Wilde, *supra* note 5, at 656-58.

IV. UNDERLYING ASSUMPTIONS

Economic models commonly make assumptions for heuristic purposes that may be false in fact. Although these assumptions often are innocuous,⁶⁹ they may, at times, vitally affect the implications of an economic model. Three of the assumptions on which the warranty and security interest models rest may seem particularly problematic: (1) consumers can value the risks contract terms allocate—they know the “odds”; (2) consumers cannot affect the odds; this assumption, among other things, allows us conveniently to suppose that consumer preferences for warranty and security interest terms are homogeneous; (3) all consumers read the contract. Although the results of these models must be qualified in light of a more realistic appraisal of these assumptions, the qualifications do not seem especially serious.

A. Imperfect Information in the First Sense: Knowing the Odds

The typical person's estimate of the odds of product failure or of his or her own default will seldom equal the true probabilities. Firms are commonly supposed to exploit these errors by imposing unwanted contract terms. Firms, however, respond to consumers as an aggregate, not as individuals; consequently, no firm knows or could know any particular consumer's estimate of the odds.⁷⁰ Thus, the question is whether consumers in the aggregate systematically

⁶⁹ For example, our models assume that consumers have peculiar demand functions—they always buy one unit or none. The models also assume that firms have peculiar cost structures—they have constant marginal costs so that average costs decline steadily until the level of output is reached at which costs are minimized, after which they become infinite. The implications of the models do not change when these strong assumptions are relaxed. See Sadanand & Wilde, *supra* note 39. The models further assume that consumers have common limit prices and use fixed sample size search strategies. The former assumption is false and the latter is only a plausible surmise, yet the predictions of our homogeneous goods model, which used these assumptions, are consistent with actual market behavior. See authorities cited *supra* note 40.

⁷⁰ The text assumes that firms cannot learn enough about consumers in typical transactions to offer each consumer a different contract based on that consumer's sophistication. The pervasiveness of standard form contracts is consistent with this premise. See Leff, *Contract As Thing*, 19 *Am. U.L. Rev.* 131 (1970). This article adopts the standard assumption that consumers hold beliefs about the odds and that these beliefs influence purchase choices: consumers who think products are reliable will care less about warranties than will consumers who think products are likely to fail, other things being equal.

err such that firms have incentives to degrade contract content. We next argue that error of this sort is uncommon.

1. *Market Responses to Consumer Error*

We shall begin with consumer beliefs about product reliability. A consumer's subjective estimate of the odds of product failure is related to but is not wholly determined by actual failure probabilities for two reasons. First, a consumer's subjective belief about the odds probably bears some relation to the actual odds. A new car model, for example, is unlikely to be very much more or less reliable than prior models. A consumer often will have owned an earlier model or something similar to it or have talked with friends who have owned one or who own the new model. Moreover, magazines and newspapers often discuss the characteristics of many new models. Hence, the actual odds should affect individual consumers' estimates of what those odds are. Second, because consumers lack the expertise and resources to test products and because some product characteristics are only revealed through use, a consumer's estimate of the actual odds will seldom be completely accurate.

That the facts and personal perceptions of those facts affect the way consumers estimate risks can be represented mathematically. Let "S" represent a consumer's subjective belief of the likelihood of product failure, "A" the actual odds, and "e" an error term reflecting the existence of imperfect information. Then $E(S) = E(A) + E(e)$, where "E" denotes the expected odds and errors are assumed to be additive. If a consumer is optimistic, thinking the product more reliable than it is, e is on average negative, so that $E(S) < E(A)$. If the consumer is pessimistic, believing the product to be less reliable than it actually is, e is on average positive, so that $E(S) > E(A)$. For the unbiased consumer, e is zero: $E(S) = E(A)$.

a. *Consumer Error Is Random*

Suppose that consumers in the aggregate hold subjective beliefs (S) that fluctuate randomly around the true value (A) such that consumer error (e) is "unbiased." An error term is unbiased when positive and negative estimates of the true value cancel out; hence, for consumers in the aggregate the mean estimate $\bar{E}(S)$ will equal the true value $E(A)$. Because consumers in our model shop ran-

domly, each firm will probably see a representative sample of the market. In this event, firms will respond as if the consumers visiting them knew the odds perfectly. Thus, if consumer estimates of the odds of product defects, or of any other odds, fluctuate randomly around true values, imperfect information about the risks being allocated may exist but will not cause policy problems.

b. Consumers in the Aggregate Are Pessimistic

Markets also commonly correct for consumer pessimism. To see how, we shall consider the two ways in which pessimism is manifested. First, consumers would prefer a warranty at competitive prices if they knew the actual odds but are pessimistic about the possibility of product failure. In this instance, pessimism is reflected in the limit price for the product without a warranty, h_N , which declines; pessimistic consumers have a lower demand for products sold without warranty protection. Pessimism of this sort will not cause firms to reduce contract protection. Indeed, disclaimers are less likely than if consumers knew the actual odds of product failure. When h_w increases relative to h_N , firms will more likely have a comparative advantage at selling with warranties. The pessimism of consumers who would want warranties were they perfectly informed therefore reduces the likelihood that firms will reduce warranty coverage in response to a lack of comparison shopping.

Suppose now that consumers would, if perfectly informed, prefer no warranty protection, but pessimism respecting the odds of product breakdown causes consumers to want a warranty. Comparison shopping can ensure that consumers pay competitive prices for warranty coverage, but consumers would be purchasing more coverage than they really want. This problem does not seem serious for two reasons. First, substantial consumer pessimism may be short-lived because firms have an incentive to dissipate it. Pessimistic consumers not only prefer unnecessary warranties when they buy, but also buy fewer products than they would were they well informed. Hence, firms should make efforts to prevent or reduce systematic pessimism. Second, pessimism at worst causes consumers to be overinsured. Consumers seemingly are worse off if they are without protection against product-related losses than if

they sometimes have too much protection.⁷¹

Consumer choices of security terms can be analyzed similarly. If consumers err randomly in their estimate of the odds of default, firms will respond as if consumers knew the actual odds. Respecting pessimism, suppose first that consumers would reject security interests if well informed and that consumers believe default more likely than it is in fact. These consumers will be willing to pay more than they should to avoid security interests. Comparison shopping, however, can prevent firms from exploiting this greater willingness to pay by charging excessive interest rates. Suppose next that well-informed consumers would prefer security but pessimism respecting the odds of default causes actual consumers to reject it. Then, although comparison shopping would cause interest rates for unsecured loans to be competitive, consumers would be borrowing under the wrong contract. This problem does not seem serious for the same reasons that the identical warranty problem does not appear bothersome. Firms have an incentive to dissipate pessimism because not only will pessimistic consumers reject se-

⁷¹ The model has assumed that all consumers in a market hold similar views respecting the odds, but the shoppers may hold different views. The results of the model are not affected when this possibility is admitted because shoppers will probably be more pessimistic than nonshoppers when the two groups differ. To understand the effect of this relative pessimism, consider three cases. Suppose first that all consumers would prefer warranties if they were properly informed, that nonshoppers hold unbiased or pessimistic views respecting the odds, and that shoppers are pessimistic. Because firms respond to pessimistic shoppers as if they make correct choices, when the nonshoppers hold unbiased or pessimistic views the relatively greater pessimism of the shoppers is irrelevant. In both cases, firms will act as if all consumers make correct choices.

Now suppose that all consumers would prefer warranties if they were properly informed, that nonshoppers are optimists, and that shoppers are pessimists. If all consumers are optimists, a policy problem exists, but the optimism of the nonshoppers may be moderated by the relatively greater pessimism of the shoppers. For example, firms may offer warranties in response to the shoppers' pessimism.

Finally, suppose that no consumers would prefer warranties if properly informed, that nonshoppers hold correct or optimistic estimates in the aggregate, and that shoppers are pessimistic. Firms may respond to the shoppers by offering unwanted warranties, but the text argues that this is not a serious problem. Hence, if shoppers and nonshoppers hold different views respecting the odds, but the shoppers are relatively more pessimistic than the nonshoppers, the analysis is unaffected.

The shoppers probably will be at least as pessimistic as the nonshoppers because, as we later show, search is partly motivated by the perception that purchases are risky. Consumers search for information about products in part to reduce the psychological discomfort they would otherwise experience by bearing risks. See *infra* text accompanying notes 75-76. Because pessimists are likely to experience this discomfort while optimists are not, shoppers as a class will be more pessimistic, if anything, than nonshoppers.

curity, but they will also be less anxious to incur debt. Moreover, the perceived policy problem in this area is that security interests place consumers at the mercy of firms; pessimism at worst causes consumers to be less at the mercy of firms than they would be if fully informed.

c. Consumers in the Aggregate Are Optimistic

Markets may correct poorly for consumer optimism. Suppose that consumers would want warranty protection if they knew the odds of product failure, but actual consumers are optimistic about these odds. In this case, optimism is reflected in the consumer's limit price, h_N , which is higher than it would be were the true odds known: optimistic consumers have an artificially high willingness to pay for goods without warranties. If comparison shopping is insufficient to sustain a competitive equilibrium, firms are more likely to reduce warranty coverage than if consumers were fully informed. This is because when h_w falls relative to h_N —the limit price for the product without a warranty—firms will more likely have a comparative advantage at selling without warranties. Hence, when well-informed consumers would want warranties and actual consumers are optimistic, insufficient comparison shopping is likely to yield both supracompetitive prices and suboptimal coverage. This problem can be cured, at least in theory, by facilitating comparison shopping, but optimism causes a second problem that is less easily treated.

If well-informed consumers would want warranties but optimism causes these consumers not to demand them, warranties will probably not appear. Firms lack an incentive to offer broader warranties than consumers demand because warranties are costly: firms must redeem their warranty guarantees. Optimistic consumers might resist the price increases necessary to cover this cost. On the other hand, optimistic consumers who purchase too narrow warranties will often be disappointed; they will experience significant uninsured losses. Firms consequently will lose goodwill. Hence, firms seemingly are better off if consumers would make correct choices, for then firms can preserve good will by making appropriate warranties, yet recover the full costs that these warranties create. Curing consumer optimism, however, could be difficult. Firms would be reluctant to conduct an advertising campaign the theme of which is "Our widgets break a lot." A more promising response

is to make correct warranties but bury the cost in the total price of the product. How often this is done is not known. Also, some firms might maximize profits by exploiting consumer optimism in the short run. Thus, systematic consumer optimism respecting product failure rates creates a policy problem, but its seriousness is unknown.

If consumers in security interest markets believe default to be less likely than it is in fact, they will not resist demands for security interests strongly enough, for they will think foreclosure is unlikely. We showed above that firms will not demand security when consumers are willing to pay to avoid it. This occurs if $h_N - h_S > c_N - c_S$. Optimistic consumers, however, may set h_N too low or h_S too high; in either event, the difference between h_N and h_S will be smaller than it should be, increasing the likelihood that this difference will not exceed the marginal cost to firms of forgoing security interests. Thus, if consumers are optimistic regarding the odds of default, they will make too many secured loans. Moreover, lenders will be unlikely to correct consumers' misperceptions by stressing how likely a default may be because such an action will decrease lenders' profits from making loans. Hence, consumer optimism about the odds of default also seems a policy problem, albeit one of which the scope is unknown.⁷²

To summarize, aggregate consumer estimates of the odds will be unbiased, systematically pessimistic, or systematically optimistic. The first two possibilities do not create serious policy problems independent of those caused by insufficient consumer shopping for favorable terms itself, but the latter might. Thus, we next ask whether reasons exist to believe consumers are systematically optimistic respecting the consequences of commercial choice.

⁷² The goodwill loss to lenders from borrower optimism seems less significant than the loss to firms of selling products to optimistic consumers. First, borrowers may not fix blame for their financial difficulties on the lender: unlike the seller of a faulty product, creditors do not themselves cause the harm that their defaulting customers incur. Second, lenders may not want repeat business from defaulting borrowers, unlike product sellers who want the repeat business of even those buyers whose products break. Accordingly, consumer optimism is less likely to self-correct in markets for security interests than in markets for warranty terms.

2. *Consumer Optimism: The Nature of the Problem*

Whether or not consumers are systematically optimistic respecting the odds that products will fail or that they themselves will default on loans is unknown. Also, rigorous tests of an optimism hypothesis seem difficult to conduct. Thus, it is necessary to ask whether decisionmakers should *assume* consumers are optimistic or not pending the gathering of data.

In the case of product risks, imperfect information seems primarily a problem for infrequently purchased goods. Consumers buy toothpaste, milk, and razor blades often enough to know how reliably they perform. Moreover, such goods are inexpensive, and the risks that come with them are generally either very improbable or limited to the low cost of the product involved. The law justifiably seems more concerned with expensive mistakes than with cheap ones. Hence, the question is whether consumers believe that expensive, infrequently purchased products perform better than they do in fact. Consumer optimism may be caused in either of two ways. First, markets may provide insufficient data on which reliability can be gauged, and persons may respond to uncertainty with optimism. Second, the data exists but persons may erroneously make more optimistic predictions than the data permits.

Insufficient data is thought to exist because when consumers purchase infrequently, they cannot rely on their own experience. New washers, the argument goes, are different from ten-year-old washers. But consumers can search for information about new washers. Accordingly, insufficient data will exist only if consumers fail to search for it or firms fail to offer it. Neither possibility seems plausible. Economic analysis suggests that persons will seek more information about expensive products than about cheap ones largely because people want to avoid risk and because risk generally increases with product price. This increased search should compensate for the relative lack of personal experience with the risks that attend expensive products.

The analysis that generates these conclusions rests on five assumptions about the risks involved and the way consumers react to them. (1) Persons dislike uncertainty and will incur costs to reduce it. (2) Uncertainty about product reliability can be represented as the range of odds in consumers' estimates. Consumers might, for instance, be confident that the chance that a product will fail is between ten and thirty percent, but not know where in that range

the odds actually fall. (3) The "odds range" does not shrink as products become more expensive: expensive goods are at least as difficult to evaluate as cheap ones. (4) There are economies of scale to search. (5) Consumers believe they can reduce uncertainty by acquiring more information about products.

These assumptions imply that persons will search relatively more for reliability data when they buy expensive items. Suppose that a product costs \$100 and becomes useless when it breaks, a consumer believes the chance of a breakdown is between ten and thirty percent, and increased search could reduce this range to between ten and fifteen percent. Without search, the expected value of a loss ranges \$20, from \$10 to \$30. Search could reduce the range by \$15 to between \$10 and \$15. Now let the product cost \$1,000. Assumptions (1) and (5) imply that consumers will be motivated to search in both cases to reduce the range. Assumption (3) asserts that the odds range does not shrink with the product's price; thus, the expected loss now has a range of \$200 and can be reduced \$150 by search. This relatively large reduction creates a substantial incentive for consumers to search. And assumption (4) implies that search itself is more fruitful in this second case because the more expensive the product, the greater the return per search dollar in reducing uncertainty about possible losses. Hence, consumers should attempt to find out relatively more about product reliability when they buy expensive items.

The assumptions on which these results rely seem sound. The notion that expensive products are generally as difficult to assess as cheap ones seems unexceptionable. The assumption that persons will incur costs to reduce uncertainty fits with the penchant of people to buy insurance, which substitutes certain for uncertain outcomes, and with behavior in financial markets, where investors frequently pay to reduce the variance in expected returns. Finally, economies of scale to search about reliability flow logically from the fact that a large portion of these search costs are fixed. For example, a consumer who wants to discover reliability data for electric can openers and cars could in both cases go to the public library and read ratings in consumer magazines. The cost of both searches is close to identical, but the dollar reduction in the range of possible losses is much greater for cars because they cost much more. Dollars invested in searching for data about cars thus bring relatively greater returns than dollars spent in searching for infor-

mation about can openers. Greater search should therefore occur for precisely those products for which the assumption that consumers know the odds is most commonly questioned.

Psychological discussion of "perceived risk" supports the same conclusion.⁷³ According to this concept, consumers experience a subjective risk when they purchase.⁷⁴ The size of the perceived risk varies directly with the degree of uncertainty and the gravity of the perceived potential harm the risk represents. Moreover, people are said to dislike risk and to wish to reduce it.⁷⁵ This can be done by reducing uncertainty—by obtaining more information about the purchase—or by reducing the potential harm. Intuitively, it seems that consumers will opt to reduce uncertainty rather than financial impact. Rich people, for instance, may worry about the risk of purchasing expensive cars—a Mercedes costs more to replace than a Volkswagen—but not many will choose to reduce risk by buying subcompacts. Instead, they will seek information about the expensive cars among which they normally choose. This effect should become more pronounced as the product involved becomes more expensive because the costs of uncertainty grow with the price. Hence, the psychological model also predicts that the amount of search will increase with product price.

The evidence is consistent with the predictions of both the economic and psychological models: people seek more information about expensive goods than about cheap ones.⁷⁶ Thus, inadequate data about the odds will be a problem only if firms lack sufficient incentives to respond to consumer requests. Because information about product reliability has public goods aspects, it is difficult to

⁷³ The perceived risk literature is surveyed in Ross, *Perceived Risk and Consumer Behavior: A Critical Review*, 2 *Advances in Consumer Research* 252 (1975).

⁷⁴ *Id.*

⁷⁵ *Id.*

⁷⁶ See *id.*; Schwartz & Wilde, *supra* note 5, at 648. A recent study also reported considerable search for consumer durables and for the credit with which to finance their purchase. The average number of store visits by consumers in the researchers' sample was 3.49, and these consumers averaged one additional visit to a "cash loan source" such as a bank. Because the stores also offered credit, the consumers in fact made several visits to creditors as well as to stores. See Shay & Brandt, *Public Regulation of Financial Services: The Truth in Lending Act*, in *Regulation of Consumer Financial Services* 168, 195-99 (A. Heggestad ed. 1981). See also Westbrook & Fornell, *Patterns of Information Source Usage Among Durable Goods Buyers*, 16 *J. Mkt. Research* 303, 305 (1979) (68.6% of consumers in sample visited two or more stores when shopping for durable goods; 46.2% also used "neutral" information sources such as books and magazines).

say that firms will produce the optimal amount of it. Impressionistic evidence suggests, however, that there is much data about expensive, infrequently purchased consumer goods. There are several independent rating magazines, and many supposedly disinterested publications rate automotive and electronic equipment. Moreover, because consumers can learn much about products by using them, word of mouth is also a useful information source. Thus, the case for systematic consumer optimism must rest more on consumers' inability to process data than on the absence of data to process.

A small but significant exception to this conclusion may exist. Suppose an inexpensive, frequently purchased product causes serious personal harm a very low percentage of the time. The soda bottle that explodes is one obvious example. The chances of explosion are not revealed by use; rather, explosions just happen. Moreover, explosions occur so infrequently that consumers may act as if they never occur; that is, consumers may act optimistically. Because the product is inexpensive, consumers will not find it worthwhile to search for much information about it. Thus, data that would otherwise correct the optimism will not be gathered in the course of a general product evaluation. On the other hand, if consumers are aware that products such as soda bottles can malfunction in dangerous ways, it is a separate question whether they understate the risk of this harm.

Consumer misperception must explain systematic optimism regarding the odds of default if such optimism exists. Poor financial planning is a significant cause of consumer default. Firms maximize profits by lending to people who are likely to repay because repayment is a less costly way to collect debts than repossession and a lawsuit. Firms accordingly have incentives to refuse credit to optimists. Given these incentives, consumers could systematically incur debts that their finances should preclude in only two ways. First, perhaps firms routinely lend to unjustified risks. Although occasional mistakes of this sort occur, there is no reason to think that they are made systematically. Second, perhaps consumers have more information about their repayment prospects than firms do; this information in turn implies a higher likelihood of default than does the data available to firms; and consumers systematically misprocess this data such that they overestimate their likelihood of repayment. In other words, consumers may have more data with which to assess the risk of default than firms do and

thus will act optimistically regarding this risk only if they mis-process what they know.

Health problems and unemployment also may cause default. Consumers have more information respecting their own health prospects than firms do. Moreover, although a bank may know more about the prospects of the auto industry than a potential worker/debtor does, the worker probably knows more about his chances of avoiding layoffs than the bank does. Again, lack of information on which to base an evaluation seems unlikely to cause consumer error. That error, if it exists, must depend on consumers' inaccuracy in calculating their exposure based on the information they possess.

3. Cognitive Errors and Optimism

No general theory of how people make inferential judgments exists. In recent years, however, psychologists have extensively studied how these judgments are made. The central theme of this research is that people err in ways that are at once serious, systematic, and predictable.⁷⁷ Will these errors cause people in the

⁷⁷ This psychological literature is thoroughly reviewed in R. Nisbett & L. Ross, *Human Inference: Strategies and Shortcomings of Social Judgment* (1980). See also *Judgment Under Uncertainty: Heuristics and Biases* (D. Kahneman, P. Slovic & A. Tversky eds. 1982) [hereinafter cited as *Judgment Under Uncertainty*]. Whether someone is making a cognitive error is determined by reference to the task the person is attempting to accomplish. Thought processes that routinely generate errors when persons are performing discrete, relatively simple tasks may work well in environments in which the actors make continuous decisions and receive feedback or in environments "of great complexity." See Einhorn & Hogarth, *Behavioral Decision Theory: Processes of Judgment and Choice*, 32 *Ann. Rev. Psychology* 53, 73 (1981); Hogarth, *Beyond Discrete Biases: Functional and Dysfunctional Aspects of Judgmental Heuristics*, 90 *Psychological Bull.* 197 (1981); Lopes, *Some Thoughts on the Psychological Concept of Risk*, 9 *J. Experimental Psychology: Human Perception & Performance* 137 (1983). In the following discussion, we assume that the task of choosing contract terms is discrete and relatively simple, so that the thought processes that have produced errors in other contexts will produce the same errors in this context. Also, the concept of rationality used here has at least two aspects: a person is behaving irrationally if he chooses means that are unlikely to achieve his ends or if he pursues crazy ends. The literature on cognitive error presupposes the rationality of persons' ends in the environments in which these persons are studied, but claims that people pursue these ends irrationally because they systematically make mistakes. Because we suppose consumers hold rational preferences for contract terms, we adopt this approach here and then ask whether consumers will make correct choices given those preferences. The entire line of psychological research used here is strongly, though in our view not persuasively, criticized in Cohen, *Are People Programmed to Commit Fallacies? Further Thoughts About the Interpretation of Experimental Data on Probability Judgment*, 12 *J. Theory Soc. Behav.* 251 (1982).

aggregate to misprocess information and therefore understate the odds of defects or defaults? This section argues that the principal cognitive errors that seemingly plague human inference in most cases will cause people to make random errors, will incline people toward pessimism in the case of products, *or* will be irrelevant to the question whether people generally are optimistic or pessimistic respecting the odds.

a. The Odds of Product Failure

Four sources of cognitive error could affect people's assessment of the odds of product defects: cognitive dissonance, misuse of the "availability" and "representativeness" heuristics, and a possible tendency to ignore very low probability events. The cognitive dissonance idea derives from the theory of cognitive consistency. According to this theory, people resist holding in awareness two conflicting ideas simultaneously. Thus, they tend to ignore or distort evidence relevant to the truth of one of these ideas.⁷⁸ For example, people are said to believe that they are intelligent and prudent and consequently will make intelligent and prudent choices; hence, the theory predicts that people will devalue evidence that impeaches their choices *after* these choices have been made. A fair amount of evidence supports the theory. As illustrations, workers taking jobs in unsafe occupations apparently come to believe that the industries are safe—"smart, careful people would not work in dangerous places." Similarly, some buyers may have more affirmative attitudes towards products after purchasing than before.⁷⁹

Cognitive dissonance seemingly could not cause persons to ignore unfavorable information in the case that concerns us, when consumers are deciding whether to buy. Consumer purchases of major items are discrete events that have high salience; people view them as beginnings—"my *new* car." Dissonance is unlikely to occur when people consciously gather evidence in order to decide.

⁷⁸ An analysis of cognitive dissonance as it applies to economic issues is found in Akerlof & Dickens, *The Economic Consequences of Cognitive Dissonance*, 72 *Am. Econ. Rev.* 307 (1982). A difficulty with the discussion in the next few pages follows from a difficulty with the psychological literature itself. This literature seldom asks when any of the four sources of cognitive error that we discuss are more likely to occur than the others. Instead, it commonly analyzes them in isolation. Accordingly, we follow the unsatisfactory practice of discussing each of these possible sources of error largely as if no other source existed.

⁷⁹ *Id.* at 308-10.

Even where consumers' self-images are not at stake in their estimation of product risks, the method they use to assess those risks may be flawed. The "availability heuristic" can cause persons to make mistakes about the frequency with which events occur. One making inferential judgments by use of this heuristic tends to ignore statistical data in favor of evidence that seems germane and is "in awareness"—is available. For example, a person may understate the correlation between cigarette smoking and lung cancer because his judgment of this correlation was excessively influenced by his knowledge of two neighbors, each of whom smoked for fifty years and died of stroke. The availability heuristic misleads when the association between cause and effect that is in awareness, or is easily summoned up, correlates poorly with the frequency with which possible causes and effects actually are covariant, as in the cigarette example. Psychologists believe that such mistakes occur frequently because the existence of evidence in awareness is largely a function of its "vividness"—its emotional interest, ability to evoke imagery, spatial and temporal proximity, and concreteness.⁸⁰ Vivid evidence is not necessarily the most probative evidence.

If people actually use the availability heuristic to judge product reliability, their errors should in the aggregate either be random (and therefore unbiased) or pessimistic. Respecting the first possibility, suppose potential car buyers assess the reliability of new Saabs not by published repair data but by reference to what they know about cars in general and by what they can recall about Saabs. Evidence of this sort will include rumor and the stories of acquaintances, and it is likely to suffer from the biases of small sample sizes: any one person's sample will have too few data points to reveal the correct odds for a particular model. Yet, although faulty, the method will generate estimates that are influenced by the true odds. Everyone has some knowledge of how cars in general perform, and the performance of Saabs is not excessively dissimilar from the norm. More important, the results of each person's sample will be affected by how reliable Saabs actually are. If Saabs always broke down, no one could have a friend with a good word to say about them. Finally, the errors that this method of assessing data generates are unlikely to lean in one direction. Some people may have had good experiences with cars or know people with

⁸⁰ R. Nisbett & L. Ross, *supra* note 77, at 45-59.

good Saabs while others may have had bad experiences or know people with bad Saabs. Hence, if the availability heuristic influences consumer estimates of the odds of product breakdown, those estimates should be unbiased in the aggregate.

If they are not random, consumer errors will likely tend toward pessimism because negative evidence is often more vivid than positive evidence. This fact explains why people tend to draw insufficiently strong inferences from events that fail to happen.⁸¹ If a product performs well most of the time but fails noticeably, people may believe it less reliable than it is because they give too little weight to the absence of failure, and too much weight to its presence. In addition, psychologists refer to a familiar "script" for defective cars. Scripts are dramatic stories people tell themselves to organize thought and experience:

Once evoked, this [automobile] script in turn can elicit a wealth of additional images and stored episodes about other "lemons" one has known. The "lemon" script is particularly rich and potent. With its cast of characters (impassive or evasive service managers, bumbling mechanics, snickering neighbors who told you that you could have had a nice Blatzmobile for half the price), and its stock scenes (waiting for buses in the rain, begging rides, bringing the car home only to hear some ominous new sound as you pull into the driveway), the lemon script is capable of strongly influencing one's inferences and behavior. Mere statistics describing drive-train dependability records or average per-year costs are less likely to call up the rich and evocative lemon script and its various instantiations and are consequently less likely to influence our inferences and behavior.⁸²

In consequence of the vividness of much information about product failure and the relative pallidness of information about reliability, consumers in the aggregate may overestimate the likelihood of defects.

Another source of cognitive error that might lead to mistaken estimates of the odds is what psychologists have labeled the "rep-

⁸¹ Id. at 45-49.

⁸² Id. at 54. Consumers appear to attach disproportionate weight to negative information about products. See Lynch & Skrull, *Memory and Attention Factors in Consumer Research: Concepts and Research Methods*, 9 J. Consumer Research 18 (1982); Mizerski, *An Attribution Explanation of the Disproportionate Influence of Unfavorable Information*, 9 J. Consumer Research 301 (1982).

representativeness heuristic." A considerable amount of evidence suggests that, when seeking an event's cause, people are strongly influenced by superficial likenesses between some possible causes of the phenomenon under study and the phenomenon itself. The "gambler's fallacy" is one illustration of the error that outcomes "represent" their underlying causes. Each turn of a fair roulette wheel or the toss of a fair coin is uncorrelated with prior turns or tosses. Therefore, the probability that a particular turn will be red is slightly less than .5 (a zero and double zero exist), and the probability of heads is approximately one half. If a long run of blacks or tails has occurred, a victim of the gambler's fallacy will assign a much greater probability than fifty percent to the chance that the next turn will produce a red or the next toss a heads. This mistake is believed to occur because people perceive the process that generates outcomes to be random, and random sequences of reds and blacks or heads and tails seem more representative of such a process than a long run of blacks or tails.⁸³

The apparent pervasiveness of the gambler's fallacy suggests that people might make pessimistic assessments of product reliability. Most products, particularly appliances, work reliably. Yet consumers know that appliances are made by people, that human error often exists, and that industrial workers may lack the sense of craft their ancestors had. A consumer whose appliances work well and who sees the manufacturing process in this way could believe his next purchase will be less reliable than his last: consistent success is unrepresentative of a system characterized by human error and a lack of craft sense. In the gambler's fallacy, the consumer errs by overstating the correlation between present and past—a run of heads implies a tails next time. For product purchases, the analogous error would assume that too many product successes imply a forthcoming failure. There is some evidence that consumers actually make this error. A study by the University of Michigan Survey Research Center reported that people perceived a need for repairs in new home appliances that was much greater than their

⁸³ See, e.g., Kahneman & Tversky, Subjective Probability: A Judgment of Representativeness, *in* *Judgment Under Uncertainty*, supra note 77, at 32; Zukier, The Dilution Effect: The Role of the Correlation and the Dispersion of Predictor Variables in the Use of Nondiagnostic Information, 43 *J. Personality Soc. Psychology* 1163 (1982).

actual need for repairs in the past.⁸⁴ Hence, use of the representativeness heuristic may bias people toward pessimism.

In addition to cognitive consistency and the biases in mental processes just discussed, consumers may ignore very low probability risks, even though these risks cause catastrophe when they do materialize. For example, people buy less flood and earthquake insurance than the objective probabilities of those disasters warrant.⁸⁵ Similarly, personal injuries are a much less frequent consequence of product defects than ordinary malfunction. People may therefore optimistically ignore the odds that products will physically harm them and demand less warranty protection against personal injuries than they should.⁸⁶

This possibility cannot be dismissed, but, aside from one narrow exception,⁸⁷ it provides a shaky basis for policy judgments. At the outset, the mental process that underlies the refusal to insure phenomena is unclear. Some argue that it reflects cognitive dissonance.⁸⁸ "A smart, prudent person would not buy a farm that has a nontrivial risk of being destroyed by flood." Thus, people who own farms will ignore evidence of flood danger, and studies show that people in this circumstance are inadequately informed about the possibility of natural disasters.⁸⁹ This explanation implies that farm owners discount the risk of flood after purchasing the farm because only then have they chosen wisely or foolishly. Accordingly, even if the same effect applies to consumer product purchases, it will not necessarily affect consumers' prepurchase estimate of the odds of breakdown. The flood risk example could indicate consumer optimism about product risks only if research showed that the price of land did not reflect the risk of flood—in

⁸⁴ See Courville & Hausman, *Warranty Scope and Reliability Under Imperfect Information and Alternative Market Structures*, 52 J. Bus. 361, 372-73 (1979) (citing study; authors do not interpret the results).

⁸⁵ Much of this research is described in Slovic, Fischhoff & Lichtenstein, *Regulation of Risk: A Psychological Perspective*, in *Regulatory Policy and the Social Sciences* (R. Noll ed. forthcoming 1983). See also Slovic, Fischhoff, Lichtenstein, Corrigan & Combs, *Preference for Insuring Against Probable Small Losses: Insurance Implications*, 44 J. Risk & Ins. 237 (1977).

⁸⁶ Cf. Note, *Enforcing Waivers in Products Liability*, 69 Va. L. Rev. 1111, 1127-36 (1983) (arguing that high probability risks of malfunction and low probability personal injury risks should be "packaged" to avoid consumer misperception problems).

⁸⁷ See *infra* text p. 1442.

⁸⁸ See Akerlof & Dickens, *supra* note 78.

⁸⁹ See, e.g., *id.*

other words, that buyers of farms discount low probability risks when making purchase decisions. Such evidence does not now exist.

The tendency to ignore low probability events may also reflect use of the availability heuristic. These sorts of events may seldom be in awareness because they occur rarely, so people respond inadequately to them. Some grounds exist for believing that the availability heuristic is partly responsible for the phenomenon. For example, while people seem insufficiently concerned with flood, fire, and earthquake, they express great concern about the risks of nuclear power and recombinant DNA, although the probability that these phenomena will cause harm is quite low. This may be because these latter risks are more "available," as they are much discussed and would cause awful harm if they materialized; there may be "scripts" for nuclear meltdowns and genetic mutations.

If the availability heuristic is actually at work, it is premature to base policy on the penchant of people sometimes to ignore low probability events. What is needed but does not exist is a way to link the extent to which events may be in awareness with the objective probabilities that persons tend to ignore. For example, if a product carries a .01 risk of causing personal injury, will people act as if that risk is zero? How can a decisionmaker know when a risk of a particular harm is below the threshold of attention? If people are concerned about nuclear power but unconcerned about floods, could they be similarly concerned about cars but not about skateboards? That is, if it is the availability heuristic that is misleading people, are generalizations about odds thresholds warranted?⁹⁰ Until cognitive theory develops enough to permit an-

⁹⁰ Surveys show that people overestimate the frequency of deaths from some causes such as accidents, homicides, and tornadoes and underestimate the frequency of deaths from other causes such as smallpox vaccination, diabetes and asthma. Researchers have attributed these mistakes to the availability heuristic. See Slovic, Fischhoff & Lichtenstein, *Facts versus Fears: Understanding Perceived Risk, in Judgment Under Uncertainty*, supra note 77, at 463, 466-67.

Psychologists have sought to develop general theories that explain the use of the heuristics described above. Two observers recently stated: "[A]ll these theories claim that in an inference situation the subject's decision is a function of a subset of the most salient dimensions which are processed sequentially in order of salience." Wallsten & Barton, *Processing Probabilistic Multidimensional Information for Decisions*, 8 *J. Experimental Psychology: Learning, Memory, and Cognition* 361, 362 (1982). Results of experimental tests are consistent with this hypothesis but also are far from conclusive. See *id.* The hypothesis does suggest, though, that the failure to insure against some low probability events is a function of

swers to questions of this sort, that people insure insufficiently against certain kinds of low probability events cannot support factual inferences respecting other such events. In the absence of such inferences, it seems unwise to require insurance by mandating warranties.

An exception to this conclusion may exist for frequently purchased, inexpensive items that cause serious personal harm a very small percentage of the time. No case for optimism in the purchase of these products can be derived from the representativeness or availability heuristics, but optimism may be implied by the cognitive dissonance paradigm. This is because consumers often will learn about the possibility of dangerous malfunction after they have made a commitment to the product, for they *frequently* purchase it. Such negative information could be devalued. The risk that serious personal harm may occur from using such products as soda in bottles, nonprescription drugs, and food thus could be in the class of risks against which insufficient insurance tends to be purchased.

b. The Odds of Default

Are people optimistic respecting the odds of their own defaults, such that they will resist a creditor's demand for security less than their own better-informed preferences would dictate? This question differs from the one just asked about products, for there the issue was whether consumers could correctly infer an objective frequency—the odds that a product would fail. In this case, people must predict the joint influence of their own abilities and objective circumstances. For example, a person about to take out an auto loan must consider whether he or she is a sufficiently prudent manager to be able to make the payments under stable personal financial circumstances and must also assess the likelihood of unemployment. People generally have as much data about their own abilities as outsiders do; we also have argued that they are likely to have as much data about their objective circumstances as others will have.⁹¹ The question we take up here is whether the cognitive errors people may make in processing this data will bias them in

the low salience these events have for the persons they may affect.

⁹¹ See *supra* pp. 1434-35.

particular directions.

Current psychological theory suggests that people assess themselves in the same way that they assess others.⁹² In particular, people seem to search for causal candidates to explain their own traits and actions, use theories to evaluate these possible causes, and make inferential judgments about them from objective events, just as they do when assessing outsiders.⁹³ Self-knowledge seems a product of much the same process as knowledge of others. For example, one may come to see himself as prudent not by consulting some peculiarly private source revelatory of his traits, but by inferring that characteristic from facts concerning how he conducts his own financial affairs. If people actually make self-assessments in this fashion, an outsider who observed these same facts would draw the same conclusion respecting the existence of prudence that the person himself did. Evidence shows that when actors and observers use the same theories and evidence to assess the actors' attitudes and judgments, the two groups reach similar conclusions.⁹⁴ Actors, however, are believed to have an advantage over observers because actors have more information about themselves and their circumstances.⁹⁵ Thus, if actors and observers have the same notion of prudence, a typical actor will be able to summon up more instances of his or her own behavior relevant to the existence of this trait than any observer can.

This analysis implies that a consumer/actor will make at least as good a judgment of how the interaction between his or her traits and circumstances will influence repayment prospects as will a bank/observer unless the consumer uses inferior theories to assess this interaction or uses the same theories as banks do but applies them badly. Both possibilities are nontrivial, but neither would bias consumers in particular directions.

The clearest example of the first problem is the common "fundamental attribution error." Attribution theory in psychology "is

⁹² See R. Nisbett & L. Ross, *supra* note 77, at 195.

⁹³ See *id.*

⁹⁴ See *id.* at 195-225.

⁹⁵ See generally *id.* (actors usually more accurate than observers because actors possess more data, but observers sometimes possess superior data and theories); K. Shaver, *An Introduction to the Attribution Process* 73-92 (1975) (actors should have more complete information than outsiders, but many people seem not to be in touch with their own dispositions despite this information advantage).

concerned with the attempts of ordinary people to understand the causes and implication of the events they witness.”⁹⁶ The fundamental attribution error is to place too much weight on characterological factors and too little weight on situational ones when assessing or predicting behavior. For example, people tend to attribute an honest act to an honest disposition rather than to the presence of factors that encourage honesty such as the monitoring of behavior or the need for the approval of others. Attributions are said to be mistaken in life because psychologists have been able in laboratories to induce actors to perform widely divergent behaviors by varying situational factors.⁹⁷ Environments may, in short, influence behavior more than many people believe.

Regarding the risk of default, one might suppose that consumers, when assessing this risk, place too much weight on their own traits such as prudence and too little weight on situational factors such as a shaky economy. If people ordinarily think highly of their abilities, they will then be more sanguine about their repayment prospects than their circumstances actually warrant. The fundamental attribution error, however, partly derives from the availability heuristic: people commonly have more salience for observers than situations have; as a result, observers tend to focus more on the influence of actors than on their environments. If this explanation is correct, people should commit the fundamental attribution error less when assessing their own behavior than when evaluating others' actions. The actor, being always present, has relatively less salience for himself than circumstances do. The evidence is consistent with this prediction: actors tend to see their own behavior as situationally determined while observers see the same behavior as dispositionally determined.⁹⁸ Hence, at this early stage in the un-

⁹⁶ Ross & Anderson, *Shortcomings in the Attribution Process: On the Origins and Maintenance of Erroneous Social Assessments*, in *Judgment Under Uncertainty*, supra note 77, at 129.

⁹⁷ See R. Nisbett & L. Ross, supra note 77, at 202-17.

⁹⁸ See id. at 123-24; Kiesler & Munson, *Attitudes and Opinions*, 26 *Ann. Rev. Psychology* 415, 429-30 (1975). A recent review of the relevant research concludes that both actors and observers tend to attribute more importance to traits than to situations when making attributions, but people have a greater tendency to attribute causality to the environment when assessing their own actions than when assessing the actions of others. That is, actors commit the fundamental attribution error less than observers do. See Watson, *The Actor and the Observer: How Are Their Perceptions of Causality Divergent?*, 92 *Psychological Bull.* 682 (1982). The experimental evidence supports the relative salience explanation of this phe-

derstanding of these issues, there seems an insufficient basis on which to predict that people will be systematically optimistic about the odds because, thinking well of their abilities, they are led by the fundamental attribution error to give those abilities undue weight.

Lay persons also tend to slight statistical data. A bank officer, for instance, will likely use past rates of default among similar consumers to guide lending practices,⁹⁹ while individual borrowers may rely on less probative factors such as their own and their friends' histories. The errors that such methods could cause seem random. As an illustration, most people know that job loss is an important cause of default. If they evaluate this possibility by use of the availability heuristic, they may overstate the likelihood of job loss if they personally know unemployed persons and understate it if they do not. The effect of these errors is presumably random.¹⁰⁰ People may use the representativeness heuristic and ask themselves whether their own traits and circumstances are representative of high- or low-risk debtors, rather than use statistical data on default rates.¹⁰¹ This inferential process will mislead unless the traits that consumers believe predict default correlate strongly with the traits that actually do predict it. Unfortunately, no one

nomenon—environments are less vivid for observers than for actors. *Id.* at 698.

Another explanation, called "prediction and control," also has some evidentiary support. According to this theory, actors see their own traits and response patterns as to some extent immutable. Thus, actors can maximize "their ability to predict and control future events by focusing on the response requirements of specific situations and on the effects that these situations have on their behavior." *Id.* at 692. In contrast, observers need to understand the persons with whom they deal; thus, they can enhance their ability to predict and control events "by categorizing people they meet according to important trait dimensions." *Id.* This explanation is consistent with our view that persons will give appropriate weight to situational factors when assessing their own creditworthiness.

⁹⁹ The factors that credit managers should and do consider when making consumer loans are summarized in R. Brealey & S. Myers, *Principles of Corporate Finance* 573-76 (1981).

¹⁰⁰ At any given time, more people are employed than unemployed, so that more borrowers may discount the risk of unemployment than overstate it. Still, unemployment is more vivid than employment, so those with jobless friends will probably err more strongly than those who know only people with jobs. Moreover, those who know many unemployed people are precisely those who themselves have a high risk of unemployment, such as workers in a factory where layoffs are common. Thus, high rates of employment do not imply aggregate consumer optimism about the odds of job loss.

¹⁰¹ Some evidence exists that inexperienced persons may use the representativeness heuristic when attempting to predict bankruptcy. See Johnson, *Representativeness in Judgmental Predictions of Corporate Bankruptcy*, 58 *Acct. Rev.* 78 (1983).

knows whether consumers routinely focus on the wrong traits, nor is it known in which direction their errors run.

In sum, people may sometimes use inferior theories to evaluate the odds of their own default, but there is no reason to believe these theories will routinely lead to optimism. Moreover, people will often use the same theories that banks use: in assessing their fitness to assume debt, people will probably look to their own incomes and job histories just as lending officers do. Potential debtors probably make more mistakes when using these theories than do banks because the debtors have less expertise. But again, there is no reason to think that these mistakes lead to a systematically optimistic bias, nor is there any way to know how serious they are.

B. The Assumption That Consumers Cannot Affect the Odds

We supposed earlier that consumers could not affect the odds that they will default or that the products they buy will fail. If this assumption is relaxed, two possible difficulties could exist. First, moral hazard might affect warranty coverage. Second, consumer preferences for contract terms could be heterogeneous. Moral hazard has little effect on the conclusions reached earlier, but the existence of heterogeneous consumer preferences may make it difficult to evaluate actual market outcomes by using our warranty and security interest models.

Moral hazard might exist because the marginal cost to a consumer of using a product carefully is positive, for time and effort are costs, while the marginal gain of extra care is apparently zero to one who has purchased warranty coverage, for the warranty insures the consumer against product-related harms. Hence, consumers protected by warranties could be less careful in their use of products than consumers who do not have warranties. The warranty, in short, might create a "moral hazard."

Moral hazard seems unlikely to exist in warranty markets. The standard market response to moral hazard is coinsurance: the insured bears part of the risk of accidents, as with deductibles in insurance policies. The portion of the risk retained by the insured gives him an incentive to avoid accidents. Even broad consumer warranties employ a form of coinsurance. Consumer durables are bought for use, and buyers seldom keep spares. Moreover, firms require many warranted repairs to be made off the consumer's premises. Consequently, product breakdown imposes substantial

costs on consumers in lost use even when firms fulfill their warranty obligations. The marginal gain of being careful is therefore always positive and often large. Because of this, moral hazard will seldom be a serious problem.

Also, the possible existence of moral hazard does not significantly affect conclusions about how warranty markets work. Initially, the existence of moral hazard will increase the likelihood that competitive equilibria are sustainable. When all consumers prefer warranties, $a_1 s_w \leq \min \{ \alpha_w, \alpha_N \}$ is a necessary and sufficient condition for an equilibrium in which all firms offer the product with a warranty at the competitive price. Here, s_w , the level of output in competitive equilibrium for a firm selling with warranties, equals $s(1 - \pi)$. If consumers are more careless when they have warranties than when they do not, π rises and s_w falls. The intuition behind this mathematical statement is that consumer carelessness requires firms to provide more replacements at any volume of sales, which in turn causes output to fall. The comparative advantages to firms of selling with and without warranties respectively are: $\alpha_w = (F + F')/h_w - c_w$ and $\alpha_N = F/(h_N - c)$. If moral hazard exists, warranties are more important to consumers because warranties will save consumers greater precaution costs; consequently, h_w rises more than c_w , thereby causing α_w to fall. If the fixed costs of making warranties (F') are relatively small, however, s_w will fall faster than α_w . Then, $a_1 s_w$ is more likely to be less than $\min \{ \alpha_w, \alpha_N \}$; a competitive equilibrium is more likely to exist. This is not to say that moral hazard is desirable; because it increases product-related accidents, it raises costs and thus prices. These prices are, however, more likely to be competitive.

Also, the existence of moral hazard makes it more likely that firms will respond to insufficient shopping by raising price rather than by reducing coverage. This is because moral hazard causes consumers to have a greater desire for warranty protection, and the likelihood that firms will have a comparative advantage at selling with warranties is largely a function of the strength of consumer preferences for warranty protection. Stated mathematically, moral hazard causes h_w to rise and thus causes α_w to fall, but leaves h_N and consequently α_N unaffected: moral hazard cannot exist when no warranties are made. Because α_w falls relative to α_N , firms are more likely to have a comparative advantage at selling with warranties. In sum, should moral hazard occur, competitive

equilibria are more likely, and firms are more likely to provide warranties when consumers want them, although in either case prices will be higher than when consumers are appropriately careful.¹⁰²

If consumers can affect the odds of product defects, they may have heterogeneous preferences for warranty coverage. A consumer with ten children, for instance, may prefer a stronger warranty on a washing machine than a childless buyer. Variation in consumer preferences does not affect our analysis if firms that offer warranties do not compete with firms that sell without warranties. Warranty and nonwarranty markets will "segment" unless each of the following two conditions are met.¹⁰³ First, consumers who prefer warranties will buy products without warranty coverage when that is the only choice their shopping uncovers, and consumers who do not prefer warranty coverage will nevertheless buy such coverage when their search discloses only firms that warrant. If this condition is unsatisfied, two markets will exist in each of which homogeneous goods are sold—products with and products without warranties. Second, the marginal cost to firms of making warranties must exceed the willingness to pay for them of consumers who do not prefer warranties, but must be less than the willingness to pay for them of consumers who want warranty coverage. To understand this condition, suppose that the marginal cost of making warranties exceeds the willingness to pay for them of consumers who do and do not want warranties; then, no one would buy a product with a warranty. Suppose next that the marginal cost of warranties was less than every consumer's willingness to pay for them; then, all consumers would buy with warranties. If markets segment because this second condition is not met, all consumers in a particular market would prefer warranties or none would; this in fact is the situation in the warranty model. Neither of these conditions

¹⁰² The existence of a security interest will not increase the level of moral hazard that otherwise exists in loan transactions. A consumer who has granted security is at a disadvantage after default relative to consumers who have not because security gives a firm greater power to compel payment. Thus, consumers who grant security will be at least as careful respecting repayment prospects as those who do not.

¹⁰³ These conditions are formally derived and explained in Schwartz & Wilde, *supra* note 41. The following analysis of segmentation is theoretical background to the previous analysis of when firms that offer different warranties actually sell in the same market. See *supra* pp. 1418-19.

for "nonsegmentation" is trivial, and both must be satisfied for warranty and nonwarranty markets to interact. Hence, it is plausible to assume that firms selling with and firms selling without warranty protection often will in effect be competing in separate markets.

When warranty and nonwarranty markets do interact, two problems arise. First, competitive equilibria are more difficult to sustain.¹⁰⁴ Some firms in these markets will sell with warranties and some without them. This variety in market offerings dilutes the effectiveness of search. To see why, suppose that all shoppers visit no more than two stores. If a shopper who prefers warranties visits one store that offers them and another that does not, he or she is effectively a nonshopper for both products; it is as if all firms offered warranties and the consumer went only to one of them. The effect is identical for consumers who do not prefer warranties. In short, if consumer shopping sample sizes are held constant, the effectiveness of search varies inversely with product and contract variety. Because competitive equilibria are a function of search effectiveness, they are less likely to occur when markets interact.

A second problem is that no one has yet characterized the outcomes that arise in markets in which both products and consumers are heterogeneous and not enough shopping occurs to sustain competitive equilibria. We therefore do not know how firms respond to insufficient search in these sorts of markets, nor do we know the features by which we can recognize normatively undesirable outcomes. On the other hand, there is no reason to believe that interactive markets behave much differently than the markets we have modeled. Such markets do, for instance, respond favorably to increased comparison shopping.¹⁰⁵

¹⁰⁴ *Id.*

¹⁰⁵ See *supra* note 40; Schwartz & Wilde, *supra* note 41. An additional assumption we make that is standard in the economic literature is that each firm sells a single product: each firm, for example, sells with warranties or without them, but none offers both. In actual markets, firms sometimes sell with a standard warranty, but offer consumers an optional warranty that is either more extensive or of longer duration than the regular warranty. The welfare effects of this practice are ambiguous. The gain to consumers is an increased likelihood of getting warranties they want at reduced search costs. Because consumers search for desired warranty coverage as well as for low prices, however, the presence of "multicoverage firms" may in fact reduce search, which could cause prices to rise. Regulation requiring firms to expand warranty coverage has similarly ambiguous welfare effects. If

Consumer preferences respecting security interests could also vary, although the essential similarity of loan transactions makes this less likely than heterogeneity of warranty preference. If security preferences are heterogeneous, however, the analysis just made concerning warranties applies.

C. The Assumption That All Consumers Read the Contract

We supposed earlier that all consumers read the contract, but it may seem plausible to assume that only the shoppers read. In the mass transactions that are the subject of our analysis, firms probably cannot distinguish the consumers who read from those who do not. Hence, if enough shoppers exist to sustain a competitive equilibrium, that the nonshoppers do not read is irrelevant; they benefit from the shoppers' efforts. If too few shoppers exist, however, that the nonshoppers fail to read makes it more likely that firms will degrade contract content.

To see how this occurs, we shall begin with warranties and make four assumptions. (1) Insufficient comparison shopping exists to sustain a competitive equilibrium. (2) All consumers prefer warranties. (3) Only the shoppers read the contract.¹⁰⁶ (4) If all consumers read the contract, firms would have a comparative advantage at selling with warranties ($\alpha_w < \alpha_N$). A firm that considers deviating from the competitive price will sell only to nonshoppers. Suppose nonshoppers believe warranties always exist whether firms offer them or not. Then, they will have only one limit price, h_w . In this event, it must be that $\alpha_w > \alpha_N$; the comparative advantage in favor of warranties is the reverse of assumption (4). This is because α_w is still $(F + F')/(h_w - c_w)$, but α_N is $F/(h_w - c)$ rather than $F/(h_N - c)$; the consumer in effect substitutes h_w for h_N . Because the marginal cost of selling without warranties is less than the marginal cost of selling with them ($c < c_w$), it will be that

consumers would search less because they knew that every firm offers a good warranty, prices could rise. On the other hand, if firms must offer warranties only when they have a comparative advantage at selling without warranties and search in the market is insufficient to generate a competitive equilibrium, the regulation may produce net welfare gains, administrative costs aside.

¹⁰⁶ If even shoppers do not read the contract but compare only price terms, firms may degrade contract quality despite consumer preferences. It seems plausible to believe that at least shoppers read contract terms if only because warranty terms, which cost firms some positive amount to offer, exist in real-world markets.

$h_w - c > h_w - c_w$, or $\alpha_w > \alpha_N$; firms that deviate from the competitive price now have a comparative advantage at selling without warranties. This result also is intuitively plausible; when consumers will pay as much as h_w and firms can incur costs as low as c by disclaiming, firms selling at h_w that do disclaim will need fewer customers to break even than firms that warrant.

If the nonshoppers assume instead that firms will never offer warranties, the comparative advantage in favor of warranties again is $\alpha_w > \alpha_N$, the reverse of assumption (4), and warranties once more are less likely to be offered.¹⁰⁷ In this case, though, consumers who do not get warranties pay the "appropriate" price, for their limit price is h_N and firms could charge no more than this. Unlike the former consumers, they would not be paying h_w for the product without a warranty.

The nonshoppers' failure to read thus gives firms a comparative advantage at selling without warranties. Theorem 3 of the warranty model shows that in this event, when insufficient comparison shopping exists to sustain a competitive equilibrium, some firms will still make warranties unless very few consumers shop.¹⁰⁸ Therefore, that the nonshoppers are uninformed about the contract does not mean that all firms will disclaim warranties in the noncompetitive case. It means only that there is a greater likelihood that firms will respond to insufficient comparison shopping by reducing warranty coverage. Moreover, most consumers probably do know what the warranty terms in their contracts are.¹⁰⁹

A similar analysis applies to security terms. If consumers will pay to avoid security, it will not be seen; $h_N - h_s > c_N - c_s$. Let a firm lend only to nonshoppers—insufficient comparison shopping occurs—and let these nonshoppers believe that security is never taken whether it is or not. Then they would be willing to pay as much as h_N for a loan, while security would reduce a lender's costs

¹⁰⁷ When nonshoppers believe warranties do not exist, they have only one limit price, h_N . Then α_w becomes $(F + F')/(h_N - c_w)$, while α_N remains $F/(h_N - c)$. Because $c_w > c$, $h_N - c_w < h_N - c$. Then $\alpha_N < \alpha_w$; firms have a comparative advantage at selling without warranties. Intuitively, it is pointless for a firm selling only to nonshoppers to incur the additional cost of making a warranty when the nonshoppers will pay no more than a nonwarranty limit price. If it would be the case that $\alpha_N < \alpha_w$ when all consumers read their contracts, the analysis is unaffected because the failure of the nonshoppers to read cannot reverse the comparative advantage so that it runs in favor of making warranties.

¹⁰⁸ See *supra* text pp. 1411-12.

¹⁰⁹ See *supra* note 1 and accompanying text.

below those that are incurred without it. In this event, a firm selling only to nonshoppers will include a security term. Hence, if the nonshoppers do not read, security is more likely to be seen. Again, though, comparison shopping can prevent this result, and all consumers seem aware of security interest terms. Part V nevertheless considers reforms that are at least partly responsive to the problem that some consumers may not read the contract.

V. GENERALIZATIONS AND POLICY IMPLICATIONS

Warranty terms allocate the risk of product defects between firms and consumers; security interest terms can make loans more or less risky for lenders and borrowers. Although both allocate risk in consumer contracts, the two have little in common. An analysis that applies to both, therefore, probably applies to any contract term the function of which is to allocate risk. Regarding any such term, a combination of comparison shopping and a sufficient willingness on the part of consumers to pay for preferred terms should cause firms to satisfy consumer preferences. Moreover, consumers are unlikely to assess the risks that these terms govern in ways that differ widely from those described in warranty and security interest markets.

This suggests that much regulation of contract terms on imperfect information grounds is misconceived. This article focuses on contracts for the purchase of consumer goods but its results generalize to other types of contracts. For example, statutes specify terms that must appear in trust indentures, on the apparent ground that the indentures sold in unregulated markets provided investors with insufficient protection in the event of default.¹¹⁰ A trust indenture, however, is only a contract between an individual investor and a firm whereby the investor lends money to the firm on terms that the firm initially proposes. Because individual firms seeking to borrow are unlikely to have structural market power in capital markets and because investors or their representatives are likely to care about the important terms in indenture contracts, our analysis suggests that borrowing firms probably would not reduce the quality of these contracts had they the legal power to do

¹¹⁰ E.g., Trust Indenture Act of 1939, 15 U.S.C. §§ 77aaa et seq. (1982). The purposes and results of this statute are discussed in V. Brudney & M. Chirelstein, *Corporate Finance Cases and Materials* 91-97 (2d ed. 1979).

so. If investors did not search sufficiently in unregulated bond markets, they probably would lend under contracts that contained the protections that they wanted but at interest rates lower than they would have obtained had they more actively pursued lending opportunities. Statutes such as the Trust Indenture Act of 1939 and other statutes that mandate the use of protective terms in loan or stock contracts thus deserve reconsideration in light of our analysis.

The regulation criticized here assumes that consumers often assess risks incorrectly, supposes that firms exploit these mistakes by offering unwanted terms, and responds to this supposed exploitation by mandating those terms that consumers presumably do or should want. Regarding clauses that shift risks, however, firms will most likely respond to imperfect information by satisfying consumer preferences at excessive prices rather than by frustrating those preferences. If consumer preferences are entitled to controlling weight, then, regulation should seek to ascertain when pricing problems are present and to remedy these problems.

Before discussing how these regulatory tasks are best done, we shall take up an objection to our argument, that our notion of a correct choice is too restrictive. Such an argument conceives of four forms of imperfect information, so that consumer choice cannot be correct unless (1) the consumer knows what he or she is choosing, (2) the choice reflects a correct assessment of the odds, (3) the choice reflects a correct appreciation of the market opportunity set, and (4) the person holding the preference that generated the choice correctly predicts that the preference will persist over time. We neglect this possible fourth aspect of a correct choice. The next section argues that this neglect is justifiable. We then return to the general implications for contract terms that derive from our analysis of warranties and security interests.

A. Imperfect Information in a Fourth Sense

A central tenet of liberal theory is that persons' choices should control political and market outcomes. This tenet is easily derived from utilitarianism as it is commonly understood, from Kantian morality, and from Judeo-Christian ethics.¹¹¹ Liberal theory ac-

¹¹¹ See A. Donagan, *The Theory of Morality* (1979).

commodates the existence of imperfect information by recognizing exceptions to consumer sovereignty when persons are ignorant of the market opportunities or of the risks they face. When either exception applies, state intervention of some sort is justifiable within the theory to correct for the distorting effect of information problems. In recent years, another form of imperfect information has been thought to exist. This fourth form is based on the notion that the effects of many decisions that people make are felt years in the future and people's preferences change over time. Consequently, a person deciding whether to buy, borrow, or vote must consider whether present choices will satisfy future preferences as well as present ones. People are said systematically to get this decision wrong: they often do not know what they will come to prefer. When private decisions involve an important temporal aspect and imperfect information in the sense of being ignorant of one's future self exists, the state is thought to have a legitimate justification for regulation. Decisionmakers should make laws that will satisfy people's future preferences when those are likely to be inconsistent with their present preferences.¹¹²

This fourth aspect of the imperfect information concept cannot justify regulation of contract terms because it derives from a form of utilitarianism that is unworkable in this context.¹¹³ For this sort of utilitarianism to work, decisionmakers ("planners") must have a comparative advantage in predicting future preferences over persons whose future desires they wish to predict. At least as to personal consumption decisions, this advantage seems nonexistent. A person's future preferences are a function of how his or her present self will change as a result of internal growth and external circumstances, and of the particular external circumstances. The best

¹¹² This position is strongly argued in R. Goodin, *Political Theory and Public Policy* 39-56 (1982), who also cites earlier papers in the same vein. See also Kennedy, *Distributional and Paternalistic Motives in Contract and Tort Law, with Special Reference to Compulsory Terms and Unequal Bargaining Power*, 41 *Md. L. Rev.* 563, 624-49 (1982) (arguing for paternalistic intervention in consumer contract contexts). The phenomenon of changing preferences is discussed in detail in J. Elster, *Ulysses and the Sirens: Studies in Rationality and Irrationality* 36-111 (1979). Elster, however, believes that the welfare state is justified not on the ground that preferences may change but rather on the apparently distributional ground that risk-taking should be a partially cushioned activity. *Id.* at 85-86. Such distributional concerns are irrelevant to the analysis in this article. See *supra* note 6.

¹¹³ See R. Goodin, *supra* note 112, at 12-18 (justifying, on utilitarian grounds, regulation on the basis of future preferences).

predictor of how the self will metamorphose seemingly is the self's own history of change. Persons have much more data about their pasts than planners will. A person who today prefers purchasing a house to renting an apartment has a lifetime of experiences on which to draw when asking herself whether this preference will persist. She knows how she has come to feel about previous dwelling places, how those dwelling places furthered or retarded her life's plan or otherwise affected her happiness, how her major consumption decisions have turned out, and so forth. No planner could know as much. Hence, planners could have a comparative advantage over persons in predicting future preferences only when the planners are better able to predict the occurrence of future events that may alter those preferences.

The future events that could alter preferences respecting past consumption choices, however, are likely to be particular to individuals. One's present preference for an apartment over a house seems more likely to change because of his or her acquiring more wealth, a family, or a new hobby than because of changes in the political or social landscape. People in general are better predictors of changes in their own circumstances than planners are. Thus, planners seem better able to predict future preferences regarding consumption choices only in the unusual case when those preferences change as a result of events of widespread consequence that planners are better able to anticipate and comprehend.

Even this apparent advantage dissolves under analysis. The planner has no specific information about each of the many individuals whose preferences he or she must predict, and so the task is to decide how the typical person's preferences will change as a result of major shifts in public policy or social relations. To make such predictions requires a theory, of a psychological or psychiatric sort, that explains how preferences alter over time in response to particular changes in the external environment. No such theory exists. In consequence, the likely outcome of attempts to predict future preferences will be the substitution of planners' preferences for those of their constituents. A planner who thinks that security interests should be banned because they will operate harshly against consumers in the coming hard times is strongly predisposed to predict that if security interests are banned consumers will come to prefer their absence.

When planners are authorized to regulate on the basis of per-

sons' future preferences but lack both data as to these preferences and a theory of preference change, they most probably will plan by reference to their own conception of the common good. In consequence, regulation of consumption decisions on the basis of supposed predictions of persons' future preferences cannot be justified by utilitarianism at all, for such regulation will correlate with these preferences only by happenstance. Nor is it easy to derive a justification for such regulation from deontological schemes now in frequent use, such as those premised on respect for the autonomy of persons. Under prevailing notions of political morality, then, current individual preferences respecting contract terms should be regarded as controlling unless imperfect information in its more usual senses exists.¹¹⁴

B. Policy Implications

When consumers know what their contracts say, imperfect information to which the state should respond may exist in two forms—consumers may be ignorant of the market opportunities they face or of the odds of misfortune implicit in particular choices. The state can respond to either problem by banning a particular term or by requiring firms to disclose relevant information.

1. Banning Contract Terms

Decisionmakers may ban a particular term altogether. Some states, for example, have prohibited disclaimers in sales of consumer goods.¹¹⁵ We refer to this approach as a "general ban." Alternatively, the decisionmaker can decide case by case; he or she could, for instance, ban disclaimers only when firms in a particular market have a comparative advantage at selling without warranties and too little comparison shopping occurs there to sustain a competitive equilibrium. To contrast this with the more generalized approach, we label it a "particular ban."

¹¹⁴ A possible exception to this conclusion may exist for very long-term contracts. Some persons may prefer an institutional mechanism that periodically reviews their commitments to such contracts as life insurance or home mortgages because these persons know that they are likely to change substantially over decades. Self-paternalism of this sort is beyond the scope of this article, for the effects of almost all the contract terms we consider will be felt in the relative short term.

¹¹⁵ See *supra* note 11.

General bans are seldom an appropriate response to imperfect information about market opportunities. Firms are more likely to respond to this form of imperfect information by raising prices for terms that consumers want, rather than by offering unwanted terms. Hence, general bans will likely be inconsistent with consumer preferences. Moreover, it apparently takes a relatively small amount of comparison shopping to prevent firms from wholly neglecting consumer preferences respecting contract terms.¹¹⁶ Therefore, if one suspects a widespread reduction in contract quality because of insufficient shopping, a disclosure solution should produce satisfactory results.

Nor are general bans a solution to imperfect information about the odds of misfortune. The relevant questions are whether consumers systematically underestimate the true odds and, if so, whether that error will persist. Answers to these questions are both difficult and context-dependent. We argued earlier that people may be pessimistic about the risk of product breakdown because they attach too much weight to vivid data—spectacular accidents are more vivid than mere absence of failure.¹¹⁷ On the other hand, vivid positive data about a particular product could have a strong, if temporary, influence. A new product may have obvious attractions but subtle drawbacks. Accordingly, a decisionmaker should presume pessimism or unbiased estimates regarding the risk of product failure, yet remain open to the possibility of consumer optimism in particular cases. In such cases, however, the situational factors that affect consumer risk assessments could change fairly quickly. Once our attractive new product begins to fail in dramatic fashion, optimism could give way to pessimistic risk assessment. Such changes in situational factors are difficult for decisionmakers to predict.¹¹⁸ As a result, general bans based on incorrect consumer choice are justifiable only when systematic optimism is both pre-

¹¹⁶ See *supra* text accompanying note 56.

¹¹⁷ See *supra* notes 81-82 and accompanying text.

¹¹⁸ Recent evidence suggests that this difficulty may be great, for it shows that persons' risk assessments are partly a function of mood. Persons who learn about tragic accidents may believe for a time that life generally is very hazardous while persons who learn about happy events may believe the reverse. See Johnson & Tversky, *Affect, Generalization and the Perception of Risk*, 49 *J. Personality & Soc. Psychology* 20 (1983). Hence, it is difficult to know when particular over or underestimations are the product of transient stimuli or are stable.

sent and likely to persist. We have identified one such case involving frequently purchased, inexpensive items that malfunction so as to cause personal injury a very low percentage of the time.¹¹⁹ Strict liability is appropriate for transactions involving such products. Otherwise, general bans of terms on information grounds seem without justification.¹²⁰

Case-by-case determinations such as those that courts make under the unconscionability doctrine are slightly less problematic. One might suppose that decisionmaking by judges in individual cases would avoid the rigidity and overbreadth that may inhere in general bans. Still, there are three related reasons for not implementing particular bans through case-by-case judicial decisionmaking. First, imperfect information in the forms discussed here will seldom cause firms to reduce contract protections. Firms respond to consumer ignorance of market opportunities more by raising prices than by offering unwanted terms; they exploit consumer ignorance of the odds of harm only when consumers are optimistic in the aggregate, an apparently unlikely state of affairs. Thus, when a contract clause is challenged on information grounds, courts should initially presume that the term accurately reflected consumer preferences. Second, courts will have difficulty acquiring the data required to overcome this presumption. The fact that some consumers did not shop or that many consumers might have mistaken the odds should not suffice to ban a contract term. Instead, courts must find out whether the factors that correlate with poor market performance existed when the term was used. Such factors include low levels of comparison shopping, willingness to pay for preferred terms, and a pervasive underestimation of the odds of harm. Lawsuits involving consumers will seldom have high enough stakes to induce litigants to bear the considerable expense of producing evidence relevant to these concerns. Finally, because firms will generally satisfy consumer preferences regarding contract terms and because it is difficult to know when firms have not

¹¹⁹ See *supra* text pp. 1434, 1442.

¹²⁰ This analysis implies that the informational assumptions that comparative advantage warranty theorists such as George Priest make are less fatal to their conclusions than the critics of these assumptions claim. See *supra* notes 26-33 and accompanying text. Comparative advantage theorists, however, miss the problem that correct coverage may be offered at supracompetitive prices as well as the problem that coverage may be incorrect in the case of inexpensive, frequently purchased, occasionally dangerous goods.

done so, judges seemingly should base their decision to ban contract terms at least partly on the gravity of the risk involved. For example, one might decide to relax the presumption against bans when the contract shifts a large risk to a consumer, as when car dealers shift the risk of all product breakdown to car buyers. It is in precisely these cases, however, that consumers are most likely to search for product information and to pay attention to the information they get. The presumption that firms are satisfying consumer preferences therefore should become stronger as the stakes increase.¹²¹ This suggests that a court should ban a term on information grounds when the risk that the term shifts has a relatively low value but the term is widely used, so that the possible total efficiency loss it causes could be large, *and* the evidence suggests that it is the wrong term for satisfying consumer preferences. Such cases will be litigated infrequently and, in any event, their number is uncertain. In short, cases may exist in which judicial banning of terms on informational grounds makes sense, but those cases are probably few.

2. *Requiring Disclosure*

The apparent solution to consumer ignorance of the odds is to require the odds to be disclosed. Unfortunately, this solution is simpler in theory than in practice. Decisionmakers face substantial practical problems in correctly ascertaining the odds, developing concise and comprehensible formats for disclosure, and conveying the essential facts in such a way that consumers will pay attention to them. For example, a car could fail in several different ways and in varying degrees. Aggregating different failure probabilities into a composite failure probability seems very difficult, while presenting consumers with a series of discrete estimates may be more confusing than useful. Moreover, product failure is a function both of manufacture and of improper use. Because firms cannot observe consumers' use patterns except at great cost, they may be unable to disclose true failure probabilities.¹²² These problems may vary

¹²¹ An exception to this argument is the case of the low probability, inexpensive, high-risk product such as the soda bottle that explodes. This case, however, should be covered by a general ban of the sort that the strict liability in tort doctrine enacts.

¹²² See Gerner & Bryant, *The Demand for Repair Service during Warranty*, 53 *J. Bus.* 397, 413 (1980) ("The impact consumers have on . . . repairs . . . may have particular im-

in their magnitude, but they suggest that strict liability is a more efficient solution to consumer ignorance of the odds than mandatory disclosure in those cases when ignorance of the odds problems are serious.

Requiring disclosure seems more promising as a means of remedying ignorance of market choice sets. The extent of comparison shopping varies inversely with the costs to consumers of comparing market alternatives. Reducing these costs will lead to more widespread knowledge of the available alternatives. Three different types of disclosure might be useful. First, the format in which important contract terms are set out should be standardized. Standardization is preferable to plain language laws, which commonly require contracts to be written in clear and simple fashion.¹²³ Facilitating comparisons across firms is best done by requiring firms to use the same language, rather than by allowing uncomplicated but different language. Standardization is also a partial response to the existence of imperfect information in its third aspect—consumer ignorance of what the contract says. Whether a consumer reads a particular contract may depend on whether the consumer perceives the expected gain from reading to exceed the cost. If a consumer once reads a standardized clause that is in common use, the cost of reading this clause in subsequent contracts will be much reduced; the subject matter would grow more familiar with each reading. Thus, standardization not only facilitates comparison shopping but could increase overall knowledge of consumer contracts.

Second, the state might require firms to quote price and major terms over the telephone. Quotes need be effective only for short periods—"our price is \$100 until Friday"—and firms could be free to charge less but not more than the quoted prices. Because many firms now quote prices by phone, the proposal is not farfetched. Problems of too many consumer requests could be remedied by permitting firms to limit the number of quotes per caller or by requiring them to provide quotes only for expensive items. The cost-reducing potential of telephone shopping seems great enough for this reform to be tried.

portance in any attempt to label appliances with their expected failure rates, since in part that failure rate will be the result of consumers themselves.").

¹²³ E.g., Conn. Gen. Stat. Ann. §§ 42-151 to -158 (West Supp. 1982); N.Y. Gen. Oblig. Law § 5-702 (McKinney Supp. 1982.)

Third, the state should in some cases help pay to produce and distribute lists of the prices and important contract terms that firms offer. If consumers have this information before they begin to shop, firms will face considerable pressure to offer competitive prices and terms, and evidence shows that providing comparative price data yields lower prices.¹²⁴ There are practical difficulties involved in providing this information,¹²⁵ but recent technological advances offer potentially useful vehicles for transmitting comparative data. "Teletext" and "videotext" are two such vehicles whose utility has been insufficiently explored.¹²⁶

Teletext is a one-way communication system that broadcasts or sends information on cable to homes where it appears on television screens. Videotext is a two-way system, in which one requests information by telephone, and the data is received on a television screen. Comparative price and term data could be sent through either medium, and this would plainly facilitate interfirm comparisons. Because cable television companies now sometimes transmit price data, the teletext proposal has a real world analogue. In addition, the number of both cable channels and subscribers continues to multiply. When insufficient shopping seems to be a problem, therefore, the state should consider transmitting comparative price and term data over selected cable channels or, should it become more widely used, over teletext.

VI. CONCLUSION

The regulation of consumer contracts on information grounds is itself uninformed. Imperfect information exists when consumers are uninformed about risk, are unaware of the array of choices that firms offer, or do not know what the contract says. Firms are likely to respond to the second form—ignorance of market opportunities—by charging supracompetitive prices for those contract terms that consumers prefer, rather than by offering unwanted terms.

¹²⁴ See *supra* note 40.

¹²⁵ See Schwartz & Wilde, *supra* note 5, at 673-77.

¹²⁶ These vehicles are explored in J. Tydeman, H. Lipinski, R. Adler, M. Nyhan & L. Zwimpfer, *Teletext and Videotext in the United States: Market Potential, Technology, Public Policy Issues* (1982). An interesting discussion of how videotext systems can be designed to make information available to consumers is Biehal, *Implications of Consumer Information Processing Research for the Design of Consumer Information Systems*, 17 *J. Consumer Aff.* 107 (1983).

The best remedy for this aspect of imperfect information is to reduce the costs to consumers of comparing the offers of different firms: comparison shopping drives prices down and reduces further the likelihood that firms will frustrate consumer preferences respecting terms. In addition, comparison shopping partly resolves the problems that may arise from failure to read contracts.

Imperfect information in the sense of incorrect choice is thought to be pervasive, but this is because decisionmakers and commentators focus on representative individual consumers, each of whom may lack the data and skill to calculate risks perfectly. Firms, however, commonly respond to consumers in the aggregate and not as individuals. Thus, the question is whether consumer error in assessing risks is biased in the aggregate such that firms will act as if each consumer makes incorrect choices. If consumers as a group err in evaluating the odds in ways that are either systematically pessimistic or unbiased, firms generally will respond as if their choices were correct. Moreover, pessimistic choices seldom seriously disadvantage consumers. Firms have an incentive to exploit consumers only if consumers routinely understate the adverse consequences of purchase choices, and an analysis of the psychological literature dealing with cognitive error suggests that such systematic consumer optimism respecting the odds seldom exists.

Much of the regulation of contract terms on informational grounds is devoted to "improving" contract quality by banning terms that supposedly result from imperfectly informed consumer choice. Yet the presumed existence of imperfect information seldom supports bans of terms with which consumers are familiar. Warranties and security interests are examples of such terms, but clearly do not exhaust the set. Thus, if consumers actually care about important contract terms, legislatures should facilitate comparison shopping for them and courts should ban only those trivial terms that seem unfair.

This conclusion suggests the directions that further research should take. Policymakers need to know what terms consumers read and understand and which trivial terms are sufficiently unfair to ban. As to contract terms that consumers know, attention should turn to the difficulties involved in recognizing when markets are behaving poorly for informational reasons and to the practical difficulties of reducing the costs of comparison shopping.

APPENDIX 1: TABLE OF MATHEMATICAL SYMBOLS
USED IN TEXT

The following mathematical symbols are defined in the order they appear in the text.

Search Equilibrium Model

p_0 = price actually charged for the product by all firms in a market

p_L = consumers' common limit price

p^* = competitive price

Warranty Markets

a_1 = ratio of nonshoppers to total consumers in the market

a_2 = ratio of shoppers to total consumers in the market

h_w = consumers' limit price for the product with a warranty, under the assumption that, at competitive prices, all consumers prefer warranties

h_N = consumers' limit price for the product without a warranty, under the assumption that, at competitive prices, all consumers prefer warranties

p_w^* = competitive price for the product with a warranty

p_N^* = competitive price for the product without a warranty

π = probability of the product's breaking and becoming useless

F = fixed cost of producing the product

c = marginal cost of producing the product

F' = additional fixed costs of offering the product with a warranty

x = number of units of the product sold

c_w = marginal cost of offering the product with a warranty

s = firm's output in competitive equilibrium when selling the product without warranties

s_w = firm's output in competitive equilibrium when selling the product with warranties

α_w = comparative advantage of selling the product with a warranty, under the assumption that, at competitive prices, all consumer prefer warranties

- α_N = comparative advantage of selling the product without a warranty, under the assumption that, at competitive prices, all consumers prefer warranties
- k_w = $(h_w - c_w) - (h_N - c)$
- l_w = consumers' limit price for the product with a warranty, under the assumption that, at competitive prices, no consumers prefer warranties
- l_N = consumers' limit price for the product without a warranty, under the assumption that, at competitive prices, no consumers prefer warranties
- β_w = comparative advantage of selling the product with a warranty, under the assumption that, at competitive prices, no consumers prefer warranties
- β_N = comparative advantage of selling the product without a warranty, under the assumption that, at competitive prices, no consumers prefer warranties

Security Interest Markets

- L = fixed amount of a loan by all creditors
- π = probability of consumer default
- λ = probability of consumer bankruptcy given default
- ρ = fractional amount of unpaid debt recovered by firms in bankruptcy proceedings
- V = value of the used good recovered from defaulting consumer
- r = interest rate
- S = total amount of funds available for loans
- s = total number of loans which can be made by a single firm
- F = fixed cost of making loans
- c = marginal cost of making loans
- c_s = marginal cost of lending with security
- c_N = marginal cost of lending without security
- F' = additional fixed costs incurred by a firm if it takes security on loans
- k = firm's rate of marginal loss from consumer bankruptcy
- r_N^* = competitive interest rate on a loan without security

- r_s^* = competitive interest rate on a loan with security
 h_N = limit rate for a loan with no security term
 h_s = limit rate for a loan with a security interest

Underlying Assumptions

- S = consumer's subjective belief of the odds of product failure
A = actual odds of product failure
e = error term reflecting the existence of imperfect information about the future occurrence of product failure
E(S) = expected consumer subjective belief
E(A) = expected actual odds
E(e) = expected error

APPENDIX 2: IMPERFECT INFORMATION IN CONSUMER FINANCIAL MARKETS

We are concerned here with consumer financial markets in which lenders may or may not take a security interest in goods that consumers will purchase with the loan. Consider a consumer who wishes to finance the purchase of a car. He or she goes to a bank to obtain a loan. The bank charges some interest rate and may or may not take a security interest in the car. The loan is made. Afterward, there is some chance that the consumer will default on the loan payments. This may be because the consumer goes bankrupt or it may be for some other reason. If the consumer defaults, the bank sues for breach of contract. If the consumer is not bankrupt, the bank recovers in full any unpaid principle. Otherwise, how much it recovers depends on whether it has taken a security interest. If the bank has taken a security interest, it recovers the car, and if the value of the used car exceeds the unpaid principle, it returns the difference to the consumer. If the value of the used car is less than the unpaid principle, however, the bank must sue to recover the difference. Because the consumer is bankrupt, the bank generally will recover only a portion of this remaining debt.

If the bank does not take a security interest and the consumer defaults due to bankruptcy, the entire unpaid principle must be recovered through the courts. Again, only a portion will generally be obtained because the consumer's debts exceed his or her credits. Of interest here is whether banks will request security interests and how the answer to that question is related to loan rates and consumer information.

To begin a formal analysis of these issues, we assume all loans are for a fixed amount, L . The probability of default is π and the probability of bankruptcy given default is γ . The rate of recovery in a bankruptcy proceeding is ρ . The value of the used good is V .

We also need to specify the "technology" facing the lending institutions. We assume that each firm offers loans either with or without a security interest, but does not offer a choice. Let r be the interest rate they charge consumers. Let S be the total amount of funds available for consumer loans and $S/L \equiv s$ be the total number of loans that can be made. Let F be the fixed costs associated with lending in this market and c the marginal (or "opportunity") cost, measured as an interest rate, of making loans; i.e., the margi-

nal cost of loaning L dollars is cL . Finally, let F' be any additional fixed costs associated with taking a security interest (essentially the costs of selling used goods on a wholesale market).

On the demand side, we assume each consumer desires a loan of L dollars or none. The total number of consumers is fixed at A . Of these, A_1 are nonshoppers and A_2 are shoppers, the latter of whom sample precisely two firms. The ratio of nonshoppers to total consumers is $a_1 = A_1/A$ and the ratio of shoppers to total consumers is $a_2 = A_2/A$. Initially, we assume consumers prefer *not* to have security interests taken. We let h_N be the limit price (or interest rate) when no security interest is taken and h_S be the limit price (or interest rate) when a security interest is taken.

A summary of notation to be used follows:

- L = size of loan
- r = interest rate charged
- π = probability of default
- γ = probability of bankruptcy given default
- ρ = recovery rate in bankruptcy proceeding
- V = value of used good
- S = total funds available for consumer loans
- $s = S/L$ = maximum number of loans
- F = fixed cost with no security interest
- F' = additional fixed cost with security interest
- c = marginal cost of making loans (as an interest rate)
- h_N = consumer limit rate given no security interest
- h_S = consumer limit rate given security interest.

In addition, we will use the following:

- $k = \pi\gamma(1-\rho)$ = expected net marginal loss due to bankruptcy
- r_N^* = competitive interest rate given no security interest
- r_S^* = competitive interest rate given security interest
- α_N = break-even demand for a monopolist taking no security interest
- α_S = break-even demand for a monopolist taking a security interest.

The Case in Which Consumers Prefer Loans Without Security Interests if Priced Competitively

Several assumptions will be used in the analysis.

Assumption 1: $L > V$.

This assumption will be used in the following way. To keep things simple, dynamic elements of the problem will be ignored. This will have no qualitative effect but helps the analytics. In particular, all interest rates will be treated as simple interest in a one-period framework. No "down-payments" will be made, and any defaults will occur before any of the principle has been paid. Thus, if $L > V$, the used good is worth less than the new good the instant it is purchased. Because many defaults occur after some time has passed and some payments on the loan have been made, this assumption captures the most common case—that in which a security interest is not adequate to cover the remaining principle after a default.

Assumption 2: $h_N > h_S$.

This assumption is obvious—consumers are willing to pay more if no security interest is taken than if one is taken. Somewhat stronger is the following:

Assumption 3: $h_N - r_N^* > h_S - r_S^* > 0$.

Assumption 3 states that consumers *prefer* no security interest to a security interest, given the opportunity to take loans with or without a security interest at the relevant competitive price. The terms $h_N - r_N^*$ and $h_S - r_S^*$ represent consumer surplus and are assumed to be strictly positive.

Two more assumptions of a more specialized and technical nature will turn out to be useful.

Assumption 4: $F'/s < Vk$.

Assumption 5: $h_N > Vk/L(1 - \pi)$.

The first two of these assumptions guarantees that $r_N^* > r_S^*$, i.e., the competitive interest rate on a loan with a security interest is less than that on a loan without a security interest. It implies this because F'/s is the additional average cost of taking security interests when the maximum number of loans are made and Vk is the additional gain per loan from taking a security interest since, with

a security interest, the value of the used good V is gained before the bankruptcy process is initiated and k is the rate of loss from being forced into that process. The second assumption is more obscure. It is equivalent to Assumption 3 except that instead of using r_N^* and r_S^* , one uses $(c + k)/(1 - \pi)$ and $[c + k + (Vk/L)/(1 - \pi)]$ respectively. This is the "differentiable" average cost function analogue to our "fixed cost, constant marginal cost, fixed capacity" formulation and is generated by letting $F' = 0 = F$. Its role in the analysis which follows will be made clear.

To begin this analysis, we need to characterize profits as a function of the level of demand, x , and of the interest rate charged consumers, r , for firms who make loans with and without a security interest. They are denoted $\pi_S(x;r)$ and $\pi_N(x;r)$, respectively. Namely:

Lemma 1:

$$\begin{aligned}\pi_N(x;r) &= Lx[r(1 - \pi) - c - k] - F, \\ \pi_S(x;r) &= Lx[r(1 - \pi) - c - k] + xVk - (F + F').\end{aligned}$$

Proof: Consider first no security interest.

$$\begin{aligned}\pi_N(x;r) &= [(1 + r)Lx - F - (1 + c)Lx] + \\ &\quad \pi x[-(1 + r)L + (1 - \gamma)L + \gamma L\rho] \\ &= Lx\{r - c + \pi[\gamma(\rho - 1) - r]\} - F \\ &= Lx[r(1 - \pi) - c - k] - F.\end{aligned}\tag{1}$$

The first bracketed term in this equation represents direct profits if there were no defaults. With x loans, πx is the expected number of defaults. Initially $(1 + r)L$ is lost on each default. But $1 - \gamma$ percent of the defaulters are not bankrupt, and for these the entire principle L is recovered. For bankruptcies (γ percent of the defaults), the recovery rate is ρ . Hence, the second bracketed term is net recoveries given default. Similarly,

$$\begin{aligned}\pi_S(x;r) &= [(1 + r)Lx - (F + F') - (1 + c)Lx] + \\ &\quad \pi x\{- (1 + r)L + (1 - \gamma)L + \gamma[V + (L - V)\rho]\} \\ &= Lx r - c + \pi[-r - \gamma(1 - \rho)] + xVk - (F + F') \\ &= Lx [r(1 - \pi) - c - k] + xVk - (F + F').\end{aligned}\tag{2}$$

The difference between this equation and the first is the additional fixed cost F' and the additional expected recoveries given default. If the consumer is bankrupt, V is recovered with certainty and the balance $L - V$ is recovered at rate ρ because only it is forced into the bankruptcy process. Q.E.D.

Using Lemma 1 we can characterize r_N^* and r_S^* explicitly.

Lemma 2:

$$r_N^* = [(F/Ls) + c + k]/(1 - \pi)$$

$$r_S^* = \{[(F + F')/Ls] + c + k - (Vk/L)\}/(1 - \pi).$$

Proof: Competitive interest rates are defined by zero profits at capacity s . Hence, for no security interest:

$$0 = \pi_N(s; r_N^*) = Ls[r_N^*(1 - \pi) - c - k] - F,$$

or

$$r_N^* = [(F/Ls) + c + k]/(1 - \pi).$$

Similarly,

$$0 = \pi_S(s; r_S^*) = Ls[r_S^*(1 - \pi) - c - k] + sVk - (F + F')$$

which yields r_S^* .

Q.E.D.

Lemma 1 also allows us to express α_N and α_S formally.

Lemma 3:

$$\alpha_N = F/L[h_N(1 - \pi) - c - k]$$

$$\alpha_S = (F + F')/\{L[h_S(1 - \pi) - c - k] + Vk\}.$$

Proof: By definition α_N and α_S are break-even demands for monopolists offering loans without and with security interests, respectively.

Hence

$$0 = \pi_N(\alpha_N; h_N) = L\alpha_N[h_N(1 - \pi) - c - k] - F,$$

and

$$0 = \pi_S(\alpha_S; h_S) = L\alpha_S[h_S(1 - \pi) - c - k] + \alpha_S Vk - (F + F').$$

Solving for α_N and α_S gives the lemma. Q.E.D.

A final lemma relating α_N to α_S will turn out to be of use later.

Lemma 4: $\alpha_N < \alpha_S$.

Proof: From Lemma 3 we have $\alpha_N < \alpha_S$ if and only if

$$\begin{aligned} & F/L[h_N(1 - \pi) - c - k] \\ & < (F + F')/\{L[h_S(1 - \pi) - c - k] + Vk\}. \end{aligned} \quad (3)$$

Simplifying (3), we have $\alpha_N < \alpha_S$ if and only if

$$\begin{aligned} & (h_N - h_S)(1 - \pi) > \\ & (Vk/L) - (F'/F)[h_N(1 - \pi) - c - k]. \end{aligned} \quad (4)$$

But Assumption 3 states $h_N - r_N^* > h_S - r_S^*$ which, using Lemma 2, implies

$$\begin{aligned} & h_N - [(F/Ls) + c + k]/(1 - \pi) > \\ & h_S - [(F + F')/Ls) + c + k] - (Vk/L)/(1 - \pi). \end{aligned} \quad (5)$$

Rearranging (5) gives

$$(h_N - h_S)(1 - \pi) > (Vk/L) - (F'/Ls). \quad (6)$$

Inequality (6) implies inequality (4) and hence the lemma, if

$$\begin{aligned} & (Vk/L) - (F'/sL) > \\ & (Vk/L) - (F'/F)[h_N(1 - \pi) - c - k]. \end{aligned} \quad (7)$$

Inequality (7), however, reduces to

$$sL[h_N(1 - \pi) - c - k] - F > 0.$$

But $sL[h_N(1 - \pi) - c - k] - F = \pi_N(s; h_N) > 0$ since $h_N > r_N^*$ by Assumption 3. Thus, (7) must hold, implying (4) holds, implying $\alpha_N < \alpha_S$. Q.E.D.

This completes our preliminary analysis. We are now ready to consider the possible equilibrium configurations in more detail. Equilibrium here is a consumer/firm ratio, $\sigma = A/N$, a distribution of firms between those offering loans with security interest, n_S , and those offering loans without security interest, n_N , and a distribution of interest rates in each market, $G_S(\cdot)$ and $G_N(\cdot)$, such that all firms earn zero profits and no firm can earn positive profits by

changing its interest rate. Here

$$\begin{aligned} N &= \text{total number of firms} \\ N_N &= \text{number of firms without security interest} \\ N_S &= \text{number of firms with security interest} \\ n_N &= N_N/N \\ n_S &= N_S/N. \end{aligned}$$

Theorems 1 through 8 all presume Assumptions 1 through 5 hold.

Theorem 1: A necessary and sufficient condition for $n_S = 0$ and the market for loans without security interests to be competitive is $a_1 s \leq \alpha_N$.

Proof: With $n_S = 0$ and the security interest market competitive, expected demand at r_N^* must equal s . Hence, $\sigma = A/N = s$. A firm entering this market above r_N^* should charge h_N because it gets non-shoppers only. Nonpositive profits thus requires

$$a_1 \sigma L[h_N(1 - \pi) - c - k] - F \leq 0$$

or, using Lemma 3, $a_1 \sigma \leq \alpha_N$. A firm entering the security interest market should analogously charge h_S . Nonpositive profits then requires

$$a_1 \sigma L[h_S(1 - \pi) - c - k] + a_1 \sigma V k - (F + F') \leq 0,$$

or $a_1 \sigma \leq \alpha_S$. But Lemma 4 shows $\alpha_N < \alpha_S$. Thus, $a_1 \sigma \leq \alpha_N$ implies $a_1 \sigma \leq \alpha_S$. Q.E.D.

Theorem 2: $n_N = 0$ and the market for loans with security interests to be competitive is impossible.

Proof: In this case $\sigma = A/N = s$ again, because capacity is insensitive to whether a security interest is taken or not. Now $h_N - r_N^* > h_S - r_S^*$ (Assumption 3) implies there exists an interest rate $\bar{r}_N > r_N^*$ such that $h_N - \bar{r}_N = h_S - r_S^*$. At this interest rate, consumers are indifferent to a loan with no security interest and one with a security interest at rate r_S^* . Hence, a firm entering the market for loans without security interests at \bar{r}_N will get expected demand equal to s . Profits are then $Ls[\bar{r}_N(1 - \pi) - c - k] - F$ which is strictly positive because $\bar{r}_N > r_N^*$ and $Ls[r_N^*(1 - \pi) - c - k] - F = 0$ by

definition of r_N^* (see proof of Lemma 2).

Q.E.D.

Theorem 3: It is impossible for both markets to be competitive.

Proof: The proof of this result is analogous to that of Theorem 2. A firm charging \bar{r}_N and not taking a security interest must necessarily earn strictly positive profits. Q.E.D.

Theorem 4: A necessary and sufficient condition for $n_s = 0$ and the market for loans *without security interests* to be *noncompetitive* is $\alpha_N < a_1s$.

Proof: When $n_s = 0$, the highest interest rate in the market for loans without security interests is h_N . Zero profits thus implies

$$\sigma a_1 L[h_N(1 - \pi) - c - k] - F = 0,$$

or $\sigma = \alpha_N/a_1$.

Now consider the distribution of interest rates in the no security interest market, $G_N(\cdot)$. Suppose it has a mass point at r_N^* denoted G_N^* . Expected demand at r_N^* is

$$\sigma \{a_1 + 2a_2[1 - (G_N^*/2)]\}.$$

Zero profits then implies

$$\sigma \{a_1 + 2a_2[1 - (G_N^*/2)]\} L[r_N^*(1 - \pi) - c - k] - F = 0,$$

or

$$G_N^* = [(a_1 + 2a_2) - (s/\sigma)]/a_2.$$

A noncompetitive distribution of interest rates in the no security interest market requires $G_N^* < 1$, or $(a_1 + 2a_2) - (s/\sigma) < a_2$. Because $\sigma = \alpha_N/a_1$, this reduces to $\alpha_N < a_1s$.

What about entry into the market for loans with security interests? To calculate expected profits at various interest rates in this market, we need to know the exact form of $G_N(\cdot)$. Expected demand at interest rate r is $\sigma \{a_1 + 2a_2[1 - G_N(r)]\}$. Hence, if we let $\pi_N(x;r)$ when x equals expected demand at r be denoted $\pi_N^e(r)$,

$$\pi_N^e(r) = \sigma \{a_1 + 2a_2[1 - G_N(r)]\} L[r(1 - \pi) - c - k] - F. (8)$$

Zero profits requires $\pi_N^e(r) = 0$ (for those r actually offered). Hence, (8) yields

$$G_N(r) = 1 - \frac{F - a_1\sigma L[r(1 - \pi) - c - k]}{2a_2\sigma L[r(1 - \pi) - c - k]} \tag{9}$$

If a firm enters the market for loans with security interests at rate q_s , it loses some shoppers to firms offering loans without security interests. In fact, at rate q_N , where $h_N - q_N = h_s - q_s$, consumers are indifferent and, for any $r < q_N$, they prefer to take a loan without a security interest at rate r rather than take one with a security interest at rate q_s . Thus, defining $\pi_s^e(\cdot)$ analogously to $\pi_N^e(\cdot)$,

$$\pi_s^e(q_s) = \frac{\sigma\{a_1 + 2a_2[1 - G_N(h_N - h_s + q_s)]\}}{L[q_s(1 - \pi) - c - k] + Vk} - (F + F') \tag{10}$$

Using (9) in (10) we get

$$\pi_s^e(q_s) = \frac{F\{L[q_s(1 - \pi) - c - k] + Vk\}}{L[(h_N - h_s + q_s)(1 - \pi) - c - k]} - (F + F') \tag{11}$$

Differentiating (11) with respect to q_s gives

$$d\pi_s^e(q_s)/dq_s = \frac{FL(1 - \pi)[L(h_N - h_s)(1 - \pi) - Vk]}{L^2[(h_N - h_s + q_s)(1 - \pi) - c - k]^2}$$

The sign of $d\pi_s^e(q_s)/dq_s$ equals the sign of

$$L(h_N - h_s)(1 - \pi) - Vk.$$

But by Assumption 5, this is positive. Hence, $d\pi_s^e(q_s)/dq_s > 0$ and $\pi_s^e(q_s) \leq 0$ for all $q_s \in [r_s^*, h_s]$ if and only if $\pi_s^e(h_s) \leq 0$. But from (11) this reduces to $\alpha_N \leq \alpha_s$, which necessarily holds given Lemma 4. Q.E.D.

Theorem 5: $n_N = 0$, and the market for loans with security interests to be noncompetitive is impossible.

Proof: If $n_N = 0$, then the highest interest rate in the market for loans with security interests is h_s . Zero profits then implies $\sigma = \alpha_s/a_1$. A firm entering the no security interest market at h_N

will attract $a_1\sigma$ customers. Profits are then

$$a_1\sigma L[h_N(1 - \pi) - c - k] - F,$$

which are nonpositive if and only if $\alpha_s < \alpha_N$, a condition which contradicts Lemma 4. Q.E.D.

Theorem 6: It is impossible for the market for loans both *with security interests* to be *competitive* and *without security interests* to be *noncompetitive*.

Proof: The logic here is the same as in the proofs of Theorems 2 and 3—expected demand at r_s^* is s . A firm offering $\bar{r}_N \equiv h_N - h_s + r_s^*$ will also attract s consumers and must therefore earn strictly positive profits. Q.E.D.

Theorem 7: It is impossible for the market for loans both *without security interests* to be *competitive* and *with security interest* to be *noncompetitive*.

Proof: This proof follows as that of Theorem 5—zero profits at h_s implies $\sigma = \alpha_s/a_1$, and this consumer/firm ratio necessarily allows strictly positive profits at h_N , unless $\alpha_N > \alpha_s$, a condition which violates Lemma 4. Q.E.D.

Theorem 8: It is impossible for *both markets* to be *noncompetitive*.

Proof: To prove this theorem we need first to show there cannot exist two interest rates in the market for security interests, say p_s and q_s , such that $q_N \equiv h_N - h_s + q_s$ and $p_N = h_N - h_s + p_s$ are both offered in the no security interest market. Suppose there were two such interest rates. Expected demand at p_s will equal expected demand at p_N , and expected demand at q_s will equal expected demand at q_N . Define these values by $D_s(p_s)$, $D_N(p_N)$, $D_s(q_s)$ and $D_N(q_N)$, respectively. Then zero profits gives

$$\begin{aligned} LD_s(p_s)[p_s(1 - \pi) - c - k] + D_s(p_s)Vk - (F + F') \\ = LD_N(p_N)[p_N(1 - \pi) - c - k] - F \end{aligned} \quad (12)$$

and

$$\begin{aligned} LD_s(q_s)[p_s(1 - \pi) - c - k] + D_s(q_s)Vk - (F + F') \\ = LD_N(q_N)[q_N(1 - \pi) - c - k] - F. \end{aligned} \quad (13)$$

But $p_N = h_N - h_s + p_s$ and $D_s(p_s) = D_N(p_N)$. Hence, (12) is

equivalent to

$$\begin{aligned} LD_s(p_s)[p_s(1 - \pi) - c - k] + D_s(p_s)Vk - (F + F') \\ = LD_s(p_s)[h_N - h_s + p_s](1 - \pi) - c - k] - F, \end{aligned}$$

or,

$$D_s(p_s)Vk - F' = LD_s(p_s)(h_N - h_s). \quad (14)$$

Solving (14) for $D_s(p_s)$ gives

$$D_s(p_s) = F' / [Vk - L(h_N - h_s)(1 - \pi)], \quad (15)$$

which is independent of p_s and thus must hold for q_s as well. Hence, p_s equals q_s and only one such point can exist. But such a point *must* exist if both markets are noncompetitive. Furthermore, $D_s(p_s) > 0$ if and only if $Vk > (h_N - h_s)(1 - \pi)$, which contradicts Assumption 5. Thus, no such point can exist because expected demand there will be negative. Q.E.D.

This completes our analysis of the case in which consumers prefer loans without security interests, given competitive pricing. It can be summarized nicely in the following corollary.

Corollary 1: Under Assumptions 1 through 5, the market for loans with a security interest can never exist. The market for loans without a security interest is competitive if and only if $a_{1s} \leq \alpha_N$. It is noncompetitive if and only if $a_{1s} > \alpha_N$.

If Assumption 5 does not hold, the necessary and sufficient conditions for $n_s = 0$ and the no security interest market to be noncompetitive are more restrictive (Theorem 4), and the possibility of both markets being noncompetitive arises (Theorem 8).

The Case in Which Consumers Prefer Loans With Security Interests if Priced Competitively

We now want to consider a situation in which consumers prefer to have loans made with security interests if they are priced competitively; i.e., the reduction in price from r_N^* to r_s^* is more than enough to compensate consumers for the presence of the security interest. Some new notation will be needed. In this case, we let l_N be the limit rate for loans without a security interest and l_s be the limit rate for loans with a security interest. We also let β_N and β_s be the break-even demands for monopolists charging l_N for loans without a security interest and l_s for loans with a security interest,

respectively. The relevant assumptions for this case are:

Assumption 2': $l_N > l_S$

Assumption 3': $0 < l_N - r_N^* < l_S - r_S^*$.

Assumptions 1 and 4 remain unchanged and the analogue to Assumption 5 can be stated as a lemma.

Lemma 5: $l_N - l_S < Vk/(1 - \pi)L$.

Proof: We know from Assumption 3' that $l_N - l_S < r_N^* - r_S^*$. But

$$r_N^* - r_S^* = [Vk/L(1 - \pi)] - [F'/sL(1 - \pi)].$$

Hence, $l_N - l_S < Vk/(1 - \pi)$ if

$$[Vk/L(1 - \pi)] - [F'/sL(1 - \pi)] < Vk/(1 - \pi)L,$$

which obviously holds because $0 < \pi < 1$.

Q.E.D.

Lemma 6:

$$\beta_N = F/L[l_N(1 - \pi) - c - k]$$

$$\beta_S = (F + F')/\{L[l_S(1 - \pi) - c - k] + Vk\}.$$

Proof: This result follows as Lemma 3.

Q.E.D.

Lemmas 1 and 2 are still valid. The analogue to Lemma 4, however, now fails; that is, β_N and β_S bear no particular relation to each other.

Theorems 9 through 16 are analogous to Theorems 1 through 8. All presume Assumption 1, 2', 3' and 4 hold.

Theorem 9: It is impossible for $n_S = 0$ and the market for loans without security interests to be competitive.

Proof: With $n_S = 0$ and all loans with no security interest priced at r_N^* , $\sigma = A/N = s$. A firm offering loans with security interests at \bar{r}_S , where \bar{r}_S is defined by $l_S - \bar{r}_S = l_N - r_N^*$, will also attract s consumers. Profits are then:

$$\pi_S(s; \bar{r}_S) = Ls[\bar{r}_S(1 - \pi) - c - k] + sVk - (F + F'),$$

which are strictly positive because $\pi_S(s; r_S^*) = 0$ by definition and $\bar{r}_S > r_S^*$.

Q.E.D.

Theorem 10: A necessary and sufficient condition for $n_N = 0$ and the market for loans with security interests to be competitive is $a_{1S} \leq \min \{\beta_N, \beta_S\}$.

Proof: The proof of this result is similar to that of Theorem 1. With $n_N = 0$ and all loans with security interests priced at r_s^* , $\sigma = A/N = s$. Nonpositive profits at l_s reduces to $a_1 s \leq \beta_s$ and nonpositive profits at l_N reduces to $a_1 s \leq \beta_N$. Because β_N and β_s bear no special relation to each other, both constraints are relevant. Q.E.D.

Theorem 11: It is impossible for both markets to be competitive.

Proof: This proof is analogous to that of Theorem 9—a firm charging \bar{r}_s and taking a security interest must necessarily earn strictly positive profits. Q.E.D.

Theorem 12: A necessary and sufficient condition for $n_s = 0$ and the market for loans without security interests to be noncompetitive is:

$$Vk - L(l_N - l_s)(1 - \pi) \leq a_1 F' / \beta_N (a_1 + 2a_2).$$

Proof: With $n_s = 0$ and the no security interest market noncompetitive, the highest price in the latter must be l_N . Hence, $\sigma = A/N = \beta_N/a_1$ by zero profits. Furthermore, $G_N(r_N^*) = 0$; there can be no mass at r_N^* because, if there were, firms could enter at \bar{r}_s and earn strictly positive profits (see the proof of Theorem 9). Let t_N be the lowest price in the no security interest market actually offered and define $\pi_N^e(r)$ to be equal to $\pi_N(x;r)$ when x is the expected demand at r . Then

$$\pi_N^e(t_N) = \sigma(a_1 + 2a_2)L[t_N(1 - \pi) - c - k] - F.$$

Zero profits then gives

$$t_N = \{[F/\sigma L(a_1 + 2a_2)] + c + k\} / (1 - \pi). \tag{16}$$

It must be that $t_N > r_N^*$. Using (16) and Lemma 2, this reduces to $a_1 s > \beta_N(a_1 + 2a_2)$. But this is implied by Assumption 3'.

What about entry into the market for loans with security interests? As in the proof of Theorem 4, we have for any $r \in [t_N, l_N]$,

$$\pi_N^e(r) = \sigma\{a_1 + 2a_2[1 - G_N(r)]\}L[r(1 - \pi) - c - k] - F.$$

Using $\pi_N^e(r) = 0$, this gives

$$G_N(r) = 1 - \frac{F - a_1 \sigma L[r(1 - \pi) - c - k]}{2a_2 \sigma L[r(1 - \pi) - c - k]}. \tag{17}$$

Let t_s be defined by $l_s - t_s = l_N - t_N$. Then for any $q_s \in [t_s, l_s]$,

$$\pi_s^e(q_s) = \frac{\sigma \{ a_1 + 2a_2[1 - G_N(l_N - l_s + q_s)] \}}{L[q_s(1 - \pi) - c - k] + Vk} - (F + F'), \quad (18)$$

where $\pi_s^e(\cdot)$ is defined analogously to $\pi_N^e(\cdot)$. Using (17) in (18), we get

$$\pi_s^e(q_s) = \frac{F\{L[q_s(1 - \pi) - c - k] + Vk\}}{L[(l_N - l_s + q_s)(1 - \pi) - c - k]} - (F + F'),$$

and differentiating,

$$d\pi_s^e(q_s)/dq_s = \frac{FL(1 - \pi)[L(l_N - l_s)(1 - \pi) - Vk]}{L^2[(l_N - l_s + q_s)(1 - \pi) - c - k]^2}.$$

Now Lemma 5 implies that the bracketed term in the numerator is negative. Hence, we need only guarantee $\pi_s^e(t_s) \leq 0$ to prevent entry into the no security interest market. But $t_s = l_s - l_N + t_N$. Hence,

$$\pi_s^e(t_s) = \frac{F\{L[(l_s - l_N + t_N)(1 - \pi) - c - k] + Vk\}}{L[t_N(1 - \pi) - c - k]} - (F + F').$$

Using (16), this reduces to

$$\pi_s^e(t_s) = \sigma(a_1 + 2a_2)[Vk - L(l_N - l_s)(1 - \pi)] - F'.$$

Because $\sigma = \beta_N/a_1$, $\pi_s^e(t_s) \leq 0$ can be stated in the form given in the Theorem. Note that because Lemma 5 implies $Vk - L(l_N - l_s)(1 - \pi) > 0$, this constraint is nontrivial when $F' > 0$. Q. E. D.

Theorem 13: Necessary and sufficient conditions for $n_N = 0$ and the market for loans with security interests to be noncompetitive are:

- (i) $\beta_s < a_1 s$,
- (ii) $\beta_s \leq \beta_N$.

Proof: With $n_N = 0$, the highest rate in the securities market must be l_s . Zero profits then implies $\sigma = \beta_s/a_1$. To guarantee that $G_s(\cdot)$ is nondegenerate, we follow the usual procedure (see the proof of

Theorem 4 for example): assume a mass point exists at r_s^* , use zero profits to calculate its size, and then require it to be strictly less than 1. This yields $\beta_s < a_1s$, condition (i).

Condition (ii) is also given by standard arguments regarding nonentry in the no security interest market. Using zero profits, we show for $r > r_s^*$,

$$1 - G_s(r) = \{ [(F + F')/\sigma L(r(1 - \pi) - c - k)] - a_1 \} / 2a_2.$$

Hence, for $q_N \in [r_N^*, l_N]$,

$$\pi_N^e(q_N) = \frac{(F + F')L[q_N(1 - \pi) - c - k]}{L\{[(l_s - l_N + q_N)(1 - \pi) - c - k] + Vk\}} - F,$$

and

$$d\pi_N^e(q_N)/dq_N = \frac{(F + F')L(1 - \pi)[L(l_s - l_N)(1 - \pi) + Vk]}{L^2\{[(l_s - l_N + q_N)(1 - \pi) - c - k] + Vk\}^2}.$$

Thus, Lemma 5 implies $d\pi_N^e(q_N)/dq_N > 0$, and we need only guarantee that $\pi_N^e(l_N) \leq 0$. This, however, reduces to $\beta_N \geq \beta_s$, condition (ii). Q.E.D.

Theorem 14: Necessary and sufficient conditions for the market for loans with security interests to be competitive and that for loans without security interests to be noncompetitive are:

(i) $\beta_N < a_1s$

(ii) $Vk - L(l_N - l_s)(1 - \pi) < a_1F' / [2a_1s - (a_1 + 2a_2)\beta_N]$.

Proof: With the no security interest market noncompetitive and the security interest market competitive, the highest rate charged in the former must be l_N . Zero profits then gives $\sigma = \beta_N/a_1$.

As usual, $G_N(\cdot)$ cannot have a mass point at r_N^* (see Theorems 9, 11, and 12). Furthermore, expected demand at r_s^* must equal s . Hence

$$\sigma\{a_1 + 2a_2[n_N + (n_s/2)]\} = s,$$

or, using $n_N + n_s = 1$ and $\sigma = \beta_N/a_1$,

$$n_N = [(a_1s/\beta_N) - 1]/a_2.$$

Hence, $n_N > 0$ yields $a_1s > \beta_N$ and $n_N < 1$ yields $a_1s < \beta_N(a_1 + 2a_2)$. The latter, however, is implied by Assumption 3'.

Hence, we have (i).

Let t_N be the minimum rate charged in the no security interest market. Then, zero profits implies

$$\sigma(a_1 + 2a_2n_N)L[t_N(1 - \pi) - c - k] - F = 0,$$

or

$$t_N = \{ [F/(2s - (a_1 + 2a_2)\sigma L) + c + k] / (1 - \pi) \}.$$

Hence, $t_N > r_N^*$ if and only if $\beta_N(a_1 + 2a_2) > a_1s$, the same constraint associated with $n_N < 1$.

Consider, finally, entry into the security interest market above r_s^* . Following the standard procedure, we have

$$1 - G_N(r) = \{ [F/\sigma L(r(1 - \pi) - c - k)] - a_1 \} / 2a_2n_N$$

and

$$\pi_s^e(q_s) = \frac{F\{L[q_s(1 - \pi) - c - k] - Vk\}}{L[(l_N - l_s + q_s)(1 - \pi) - c - k]} - (F + F').$$

Thus

$$d\pi_s^e(q_s)/dq_s = \frac{FL(1 - \pi)[L(l_N - l_s)(1 - \pi) - Vk]}{L^2\{[(l_N - l_s + q_s)(1 - \pi) - c - k]\}^2}$$

Lemma 5 then implies $d\pi_s^e(q_s)/dq_s \leq 0$. Thus, we need $\pi_s^e(t_s) \leq 0$ or, after some algebra,

$$Vk - L(l_N - l_s)(1 - \pi) < a_1F' / [2a_1s - (a_1 + 2a_2)\beta_N],$$

condition (ii).

Q.E.D.

Theorem 15: It is impossible for the market for loans without security interests to be competitive and the market for loans with security interests to be noncompetitive.

Proof: Firms could always enter the securities market at \bar{r}_s and earn strictly positive profits (see Theorems 9 and 11). Q.E.D.

Theorem 16: Necessary and sufficient conditions for both markets to be noncompetitive are

(i) $(a_1 + 2a_2)\beta_N[Vk - (l_N - l_s)(1 - \pi)L] > a_1F'$

(ii) $F' > \beta_N[Vk - (l_N - l_s)(1 - \pi)L]$

$$(iii) a_1 F' < [Vk - (l_N - l_S)(1 - \pi)L][2a_1 s - (a_1 + 2a_2) \beta_N]$$

Proof: The first step in this proof is to show that the maximum price in the no security interest market is l_N and the maximum price in the security interest market is strictly less than l_S . Suppose the opposite is the case (both l_N and l_S cannot be offered). As in Theorem 8, there can exist only one rate, say p_N , such that both p_N and p_S are offered, where p_S is defined by $l_N - p_N = l_S - p_S$. At p_N , expected demand is $\sigma(a_1 + 2a_2 n_S)$ because p_N is the highest rate in the no security interest market (and by assumption $p_N < l_N$). But expected demand at p_S is also $\sigma(a_1 + 2a_2 n_S)$. Hence, zero profits yields

$$\begin{aligned} & \sigma(a_1 + 2a_2 n_S)L[p_N(1 - \pi) - c - k] - F \\ & = \sigma(a_1 + 2a_2 n_S)\{L[p_S(1 - \pi) - c - k] - Vk\} - \\ & \quad (F + F'). \end{aligned}$$

or

$$\sigma(a_1 + 2a_2 n_S) = F'/[Vk - L(l_N - l_S)(1 - \pi)].$$

Solving for n_S ,

$$n_S = [(F'/Z\sigma) - a_1]/2a_2$$

where $Z = [Vk - L(l_N - l_S)(1 - \pi)]$.

We need $0 < n_S < 1$, or

$$(a_1 + 2a_2)\sigma Z > F' > a_1\sigma Z. \quad (19)$$

Next, let q_N be the minimum rate in the no security interest market. It must be that $q_N > r_N^*$ or entry at \bar{r}_S would yield strictly positive profits. But consider entry in the security interest market at q_S , where q_S is defined by $l_N - q_N = l_S - q_S$. Zero profits at q_N implies

$$\sigma(a_1 + 2a_2)L[q_N(1 - \pi) - c - k] - F = 0,$$

or

$$q_N = \{[F/\sigma(a_1 + 2a_2)L] + c + k\}/(1 - \pi).$$

Thus,

$$\begin{aligned} \pi_S^e(q_S) & = \sigma(a_1 + 2a_2)\{L[q_S(1 - \pi) - c - k] + Vk\} - \\ & \quad (F + F') \\ & = \sigma(a_1 + 2a_2)\{L[l_S - l_N + q_N](1 - \pi) - c - k\} + Vk \\ & \quad - (F + F'). \end{aligned}$$

Substituting for q_N and requiring $\pi_s^e(q_s) \leq 0$ gives

$$L(l_s - l_N)(1 - \pi) + Vk \leq F' / \sigma(a_1 + 2a_2)$$

or

$$\sigma(a_1 + 2a_2)Z \leq F'$$

which contradicts the left-hand inequality in (19); $n_s < 1$.

Thus, it must be that the maximum rate in the no security interest market is l_N and in the security interest market it is p_s , where p_s is defined as above. The minimum price in the no security interest market is p_N , where p_N and p_s satisfy $l_s - p_s = l_N - p_N$.

As before, we can solve for expected demand at p_N and p_s . Here we have that it equals $\sigma(a_1 + 2a_2 n_N)$ and thus

$$\sigma(a_1 + 2a_2 n_N) = F'/Z.$$

Thus $0 < n_N < 1$ implies

$$(a_1 + 2a_2)\sigma Z > F' > a_1\sigma Z \quad (20)$$

as in (19). It must also be that $p_N > r_N^*$. But p_N is given by

$$L\sigma(a_1 + 2a_2 n_N)[p_N(1 - \pi) - c - k] - F = 0,$$

or

$$p_N = [(FZ/F'L) + c + k]/(1 - \pi).$$

Thus, $l_N > p_N > r_N^*$ if and only if

$$\beta_N Z < F' < sZ, \quad (21)$$

the first of these being equivalent to $n_N > 0$ and the second to Assumption 3'.

Two considerations remain: nondegeneracy of $G_s(\cdot)$ and entry above p_s or below p_N . Concerning the former, suppose $G_s(\cdot)$ has a mass point at r_s^* . Then, zero profits implies

$$\sigma\{a_1 + 2a_2[n_N + n_s(1 - G_s(r_s^*))/2]\} = s,$$

or

$$G_s(r_s^*) = [2(a_1 + 2a_2) - (s/\sigma)]/[(a_1 + 2a_2) - (F'/\sigma Z)].$$

Thus, $G_s(r_s^*) < 1$ if and only if

$$a_1F' < Z[2a_1s - (a_1 + 2a_2)\beta_N]. \tag{22}$$

Concerning entry above p_s , $d\pi_s^e(r)/dr < 0$ for $r \in [p_s, l_s]$ (as in Theorem 12). For entry below p_N , $d\pi_N^e(r)/dr > 0$ for $r \in [r_N^*, p_N]$ (as in Theorem 13). Hence, zero profits at p_s and p_N covers these two cases. Substituting $\sigma = \beta_N/a_1$ into (20), (21), and (22), and using $Z = Vk - (l_N - l_s)/(1 - \pi)L$ gives the theorem. Q.E.D.

These result can be summarized in the following Corollary.

Corollary 2:

(i) A competitive equilibrium in the market for loans with security interests with $n_N = 0$ exists if and only if $a_1s \leq \min\{\beta_N, \beta_s\}$.

(ii) A noncompetitive equilibrium in the market for loans without security interests with $n_N = 0$ exists if and only if $\beta_s \leq \beta_N$ and $\beta_s < a_1s$.

(iii) $n_N > 0$ if and only if $\beta_N < \min\{a_1s, \beta_s\}$. Furthermore, $n_s = 0$ if and only if $[Vk - L(l_N - l_s)(1 - \pi)]\beta_N(a_1 + 2a_2) \leq a_1F'$.

These conditions are exhaustive and mutually exclusive.

Proof: Parts (i) and (ii) follow from Theorems 10 and 13. The negative of these cases is equivalent to $\beta_N < \min\{a_1s, \beta_s\}$. The necessary and sufficient conditions for each of these cases reduce to:

Theorem 12: $Z\beta_N(a_1 + 2a_2) \leq a_1F'$

Theorem 14: $Z[2a_1s - (a_1 + 2a_2)\beta_N] < a_1F'$

Theorem 16: $Z\beta_N(a_1 + 2a_2) > a_1F'$

$$F' > \beta_N Z$$

$$a_1F' \leq Z[2a_1s - (a_1 + 2a_2\beta_N)],$$

where $Z = Vk - L(l_N - l_s)(1 - \pi)$. But $F' > \beta_N Z$ is equivalent to $\beta_N < \beta_s$ and this is implied by $\beta_N < \min\{a_1s, \beta_s\}$. Furthermore, the necessary and sufficient conditions for Theorem 16 which remain

are the negation of those for Theorems 12 and 14. Thus, when $\beta_N < \min\{a_1s, \beta_S\}$, one of the three cases must hold. Q.E.D.