perimental Studies of Markets with Buyers of Quality Before Purchase: When Do "Lemons" Drive Out High Quality Products?

A REPORT TO THE FEDERAL TRADE COMMISSION BY

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CHAPTER I

INTRODUCTION AND OVERVIEW

This study reports on the behavior of experimental markets in which the buyers were ignorant (unless truthfully informed by sellers) of the true quality of the good purchased until after the sale. The experimental design ensured that buyers would be willing to pay more than the extra cost of high quality, so an efficient market would contain no low quality "lemons". In this first section, we explain, in a nontechnical way, why we studied "lemons" markets, why we chose to use experiments and designed them as we did, what the results were and what we believe we have learned.

In recent years, economists have intensively studied the question of how markets function when buyers and sellers have different degrees of ignorance. A well known theoretical model (Akerlof, 1970) demonstrates that when buyers are ignorant of quality before purchase, "bad" quality will drive out "good". This can happen even when buyers are willing to pay the extra cost of higher quality. Such markets will ultimately consist only of low quality products or "lemons". This is an example of an "informational market failure," since the inefficiency arises from the sellers' inability or unwillingness to effectively communicate their information about product quality to the buyers.

Other economic models focus on the incentive sellers have to develop a "reputation" for high quality (Nelson, 1970, 1974; Klein and Leffler, 1981; Shapiro, 1982a-c) or to use devices such as warranties (Grossman, 1981) to reduce inefficiencies in markets where buyers are ignorant of quality until after the sale. These theories predict that, under certain conditions, the lemons problem can be overcome by seller incentives to develop reputations or to offer warranties that can serve an as effective signal of quality.

Another approach (not necessarily an alternative one) to dealing with informational market failure problems is through consumer protection regulations of the type enforced by the FTC. The government can penalize "unfair and deceptive"

advertisements, require that certain types of disclosures be made (health warnings for cigarettes, truth-in-lending requirements or care labeling) or require that certain post-purchase rights be given to all buyers (a 3 day "cooling-off" period or a minimum warranty). Such regulations are not free. Compliance costs may be significant; regulation may have negative unintended consequences; enforcement may be expensive for firms and taxpayers alike. At least one economist with considerable expertise (Nelson, 1974) has asserted that laws against deceptive advertising are unnecessary and probably lead to an increase in deceptive advertising. A noted legal scholar (then professor, now Judge), Richard Posner, wrote that although under certain conditions an "intellectual" case could be made for FTC advertising regulations

> ...the commission has never developed a theory defining the circumstances under which serious advertising abuses are likely to occur and where resources should therefore be concentrated. Without such a theory it cannot hope to improve, on average, the functioning of the markets that it regulates. [1973, pp. 31-32]

While students of regulation disagree on the extent to which consumer protection is needed to overcome what would otherwise be market inefficiencies, all would agree that little is known about how the nebulous notion of "reputation" might or might not help to correct potential inefficiencies.

It is therefore useful to discover conditions in which market incentives to provide reputations and warranties are highly likely or highly unlikely to eliminate inefficiencies caused by lack of information. The purpose of the experiments reported here is to add to the rather small stock of knowledge on this difficult question.

Asymmetric Information and FTC Consumer Protection Policy

Much economic research dealing with informational problems does so under the label of markets with "asymmetric information." The term is deliberately neutral as to whether it is buyer or seller, consumer or producer, who is relatively ignorant concerning the transaction. Consumer protection policy, however, is often premised on the belief that it is the consumer who lacks relevant information and is therefore at a disadvantage relative to the professionals they have to deal with. Of course, almost everyone is both a consumer and a producer. Thus, the premise applies to everyone, but only in their role as consumers. It may be worthwhile to review some basic arguments advanced to show why it is useful to distinguish between "consumer" and "producer" and why the consumer will often have less information than the producer.[1]

Is there any fundamental reason to think that the same people who are sophisticated in their money-making activities are "backward in the art of spending money?" Wesley Clair Mitchell, one of the twentieth century's most distinguished economists, provided an insightful answer long before the term "consumer protection" was in common use. Mitchell contrasted the consumer to the merchant in the following terms:

> "Ignorance of qualities, uncertainty of taste, lack of accounting, carelessness about prices--faults that would ruin a merchant--prevail in our housekeeping."
> [Mitchell, 1912, p.3]

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[1] There are, of course, numerous cases where the "consumer" will have more information than the "producer". For example, an individual seeking insurance coverage will generally have more information about his own risk characteristics than the insurer; an applicant for credit will have more information about his past credit history than the lender.

Why? Mitchell's basic explanation for the asymmetry was that while the family had been replaced by the "vastly more efficient business enterprise" as the basic unit of production, it remained the basic unit of consumption or of spending money.

> "So long as the family remains the most important unit for spending money, so long will the art of spending money lag the art of making money." [ibid.,p.6]

Because of the great variety of items an individual or family buys, expert knowledge cannot be attained in more than a few of these markets; because of the small scale of purchases of individual items, little testing of any item can be done; limited storage and limited time to plan mean that items often must be bought in haste. Families are too small to achieve either economies of specialization or scale in consumption. In addition, Mitchell argued that the forces of competition do not operate between families in the way they operate between business enterprises.

> "...the masterful housewife cannot win away the husbands of slack managers as the masterful merchant can win away the customers of the less able. What ability in spending money is developed among scattered individuals, we dam up within the walls of a single household".
> [ibid., p. 10]

Mitchell goes on to give several other reasons for the relative backwardness of spending (e.g. scientific progress has been greatest in areas related to production, intra-family decisions involve tradeoffs that are difficult to reduce to dollar magnitudes so no effective accounting system exists for family decisions), and concludes that while there are some prospects for improvement in the art of spending money, they are modest.

Types of Goods and Consumer Ignorance

The upshot of all this is that "informational asymmetry" will be common in markets for consumer products and that it will often be the consumer who is relatively ignorant. The practical significance of this asymmetry depends partly on the nature of the product. Some product characteristics are immediately apparent, like the color of a blouse. These are often called "search" (Nelson, 1970) or external characteristics. They will generally be known to the buyer before purchase and so there is no asymmetry at the time of sale.

Other aspects of a good or service are usually learned about by using or "experiencing" the product, perhaps over an extended period of time. These are called "experience" or internal characteristics. Examples are the taste of a particular brand of coffee, the durability and reliability of a car, the rate of return on a money market fund.

Clearly, some characteristics are neither search nor experience. In the normal course of smoking, one would not uncover a connection between smoking and cancer. Without doing controlled experiments, it is difficult to determine whether a particular brand of aspirin is effective in reducing headache pains; whether a relatively more expensive brand is more effective than a "store" brand; whether a gasoline additive really increases mileage, etc. Such aspects (where an additional specific cost must be incurred to assess quality) are referred to as "hidden" or "credence" characteristics. Clearly, all of these distinctions: "search", "experience" and "hidden", are based on special cases of what Charles Babbage (1832) called the cost of verifying the fact that the article you wish to purchase has the "degree of goodness" you expect. Verification of quality usually takes time, effort and money. Search and experience characteristics are special because verification of their quality is a by-product of either examining or using articles, and thus involve no special effort or expense to "test" their qualities. "Hidden" characteristics cover the very broad area left over; they take some special effort to verify quality.

Whether the almost inevitable asymmetry in product knowledge between consumer and producer will lead to significant ineffiency thus depends on the characteristics of the product. There is a "commonsense" belief among some legal scholars and economists that serious market information problems are unlikely to occur with search products or with experience products that are purchased relatively frequently. Thus, informational market failures, if they are ever significant, would be expected to occur in products with "hidden" characteristics or in products with experience characteristics that are purchased infrequently. Since the experimental results reported here suggest that information problems can arise even in markets for frequently purchased experience goods, it may be useful to develop the various views held on these markets in more detail.

Experience Goods and Reputation

The views of two leading legal scholars were presented in a 1979 debate concerning the desirability of mandatory disclosure programs. Robert Pitofsky, a former Director of the FTC's Bureau of Consumer Protection, later an FTC Commissioner, and now a professor at the Georgetown University School of Law, argued that some such programs were desirable and successful. He began, however, by saying that, "market incentives are generally adequate to produce most key product information through advertising, . . . " and that the question worth addressing is whether "situations would ever occur" wherein a seller with a superior product would not have incentives to use the advertising media to inform the public of his superiority.

Pitofsky identified several such situations among which were: when a serious hidden hazard exists equally in all products (e.g., cholesterol content of eggs, cancer risk with smoking for cigarettes with approximately equal tar/nicotine/carbon monoxide content) and (2) where fraud

can pay because the item is generally a once-in-a-lifetime purchase (encyclopedias, hearing aids).[2]

On the other side was Richard Posner, the author of the dissenting statement to the influential ABA Commission to Study the FTC, who was then a professor at the University of Chicago Law School and is now a federal judge. Posner pointed to two situations where the danger of misrepresentation is substantial. First, the case of a "costly or infrequently purchased product" that has "an important characteristic that is not apparent on casual inspection" (i.e., an expensive or infrequently purchased non-search good); second, the case of a "product, whether cheap or expensive, whether frequently or infrequently purchased, which has an important characteristic which may remain hidden to the consumer throughout a long period of use." The latter he refers to as a "well hidden characteristic."

There is substantial agreement; both men point to hidden characteristics[3] and the lack of seller incentive to encourage repeat sales as key elements that might justify mandatory disclosure. By inference, neither believes there would be any significant market failure in experience good markets, so long as there is relatively frequent repurchase.

Neither Posner, nor Pitofsky provide an analysis of why firms would find it in their interest to develop "good" reputations in repeat purchase experience good markets. Their arguments seem to rest on a "commonsense" basis that

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[2] Pitofsky mentions two other situations, where firms can use labeling to confuse comparison shopping and where a firm has considerable market power, but does not discuss either one further.

[3] Although both cited "hidden characteristics" as a source of potential problems, they did not agree on specific examples of them. Posner rejected all of Pitofsky's examples cited in the text above.

sellers can be successful only if they achieve repeat sales and they can win repeat sales only by providing good value. Casual observation also suggests that fewer problems and complaints arise concerning experience characteristics of frequently purchased goods than for the other types of goods.

Economists have also emphasized the importance of repeat sales in providing firms with appropriate incentives to behave efficiently, and, in addition, they have tried to build explicit analytical models of experience good markets. In the process, however, they have uncovered certain difficulties that suggest that reputation development is not quite as simple as the common sense notion would suggest.

Nelson (1970, 1974) coined the term "experience good" in what was perhaps the first attempt to analytically model a market for such goods. His stress was on the important role that advertising could play in reducing the costs of consumers in identifying high quality sellers without the necessity of experimenting with different sellers to locate those who were supplying the best quality for a given price. He argued that since sellers who provide high quality relative to price in an experience good market will have higher repeat sales than low quality firms, they will place a higher value on convincing a consumer to "try" their product. Because higher quality firms value new customers more than lower quality firms, they will advertise more. Consumers will then use advertising as a "signal" for quality, since the fact that one firm advertises more than another indicates that the first values customers more than the second. The content of the advertising message itself is almost irrelevant. The real information being conveyed to the Nelson consumer is that the owners of the brand name are willing and able to spend a lot of money advertising.

In Nelson's model, then, no inefficiency is caused by buyer ignorance of quality before purchase. Experience goods markets will work in the commonsense way sketched above, and furthermore, the cost of experimenting to discover

quality will be reduced or eliminated by the role of advertising as a signal of quality. Prices will reflect the cost of advertising but will be just high enough to allow sellers of any quality a normal profit. [4]

Later writers found a fundamental problem in combining the common sense notion of reputation with the economist's model of competition as Nelson tried to do. Even though providing higher quality leads to greater repeat sales, a seller may find it more profitable to "cheat" by supplying low quality at a high price. If selling low quality items is just as profitable as selling high quality items and if one does not need a good reputation to sell low quality items, then cheating will pay. Selling one or more low quality units at a high quality price yields an extra profit which is not in any way offset by being "reduced" to selling at low quality prices forever after. To maximize profits, all sellers would try to cheat, but buyers would quickly be unwilling to pay any price above that for the lowest quality. The result would be a "lemons" market.

Thus, there is a contradiction between a competitive model that implies that price will be equal to marginal cost for all sellers regardless of quality and a reputation model that requires that there be a price premium for quality and that this premium increase with increasing quality. More generally, there is a potential conflict between competitive

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[4] Nelson's model, like many innovations, was incomplete. He did not "solve" the model for optimal prices, qualities and advertising messages. He did, however, assume that competition would ensure that, on average, total profits for equally efficient firms and profits per customer would be the same for both high and low quality sellers (1974, p.753). But if the seller's profit is the same on high quality as low, then the seller can do better by cheating, so long as higher quality entails higher costs. It appears that a seller of a high quality experience good will require a premium over the normal competitive price. See the next paragraph in the text and the references cited there.

forces that act to eliminate any gap between price and marginal cost and competitive forces that lead producers to provide any and all qualities, so long as buyers are willing to pay for their additional costs.

Common observation suggests that reputation usually works well in natural markets for frequently purchased experience goods. It seems likely that the potential conflicts sketched above are somehow overcome. Work by Klein & Leffler (1981) and Shapiro (1982a,b, 1983) showed how profit-maximizing sellers could have incentives to provide a range of quality in experience good markets. Two conditions are required: a higher margin of profit on higher quality items,[5] and an unwillingness on the part of buyers to trust a seller with whom they have had no prior experience unless the seller binds himself to lose money if he cheats. The first is necessary to ensure that the cheater has something to lose; the second to prevent the continual selling of low quality items at high prices by "new" firms.

The first condition can be achieved through a price premium. There is a price "premium" for a high quality item, such that a seller would make as much profit by supplying the high quality item in the indefinite future than he would by cheating once and being forced to sell low quality items thereafter. A price reflecting such a premium is known as a "quality assuring" price. The premium will be larger, the larger the difference in the costs of supplying high and low

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[5] This does not necesarily imply that sellers' of high quality items earn higher rates of return on their investment than other sellers. The former may have to may have to invest more than the latter to build their reputations. Their higher margin of profit per unit sold is thus a return for their higher initial investment. For further discussion, see below.

qualities, the lower the repurchase rate and the more "forgiving" buyers are.[6]

A perfectly unforgiving buyer is one who will never again be willing to pay a seller a high price if the seller has ever delivered a low quality item at a high price. A forgiving buyer is one who is sometimes willing to gamble on paying a high price, even though that seller has in the past provided low quality at high prices, in the hopes that this time the seller will deliver high quality. The more forgiving buyers are, the more profitable a cheating strategy becomes and therefore the larger the premium required to assure high quality. Competition may force this premium to the minimum point, where sellers are just indifferent between cheating and continuing to provide high quality, but it cannot completely eliminate it.

The second condition can be met if buyers will only trust sellers who invest in assets that will be rendered worthless if they cheat. Firms can do this either by providing high quality units at low "introductory" prices (Shapiro), or by "bonding" themselves by investing in highly firm or brand name specific assets[7] that will become worthless if they ruin their reputation (Klein and Leffler).

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[6] We use the term "forgiveness" in the sense used by Axelrod (1984, 36).

[7] Klein & Leffler (p. 626) refer to these as "non-salvageable" assets and cite investments in the "design of a firm logo or an expensive sign promoting the firm's name" as examples. In their formal model, they assume that buyers know both the production costs of different qualities and the value of non-salvageable assets. Later (629-633), they discuss the possible role of conspicuous expenditures on advertising as a signal to buyers who do not know the precise underlying costs. In the experiments, buyers knew nothing about sellers costs and advertising was not costly. Only Shapiro's mode of satisfying the second condition was available in the experiments. Shapiro's model does not require buyers to know seller's costs.

In both models, buyer ignorance of quality before purchase results in some inefficiency relative to the perfect information case, that is, buyer ignorance entails real costs. In Shapiro's (1982) model, sellers will choose to produce lower quality than they would if buyers were fully informed. In Klein and Leffler's model, not only is price above marginal cost, entailing some loss of efficiency, but the "bonding" assets themselves must be (at least in part) nonproductive because they must have no resale value if the firm ruins its reputation. Thus, the use of reputation to assure quality in experience goods markets is not costless. Public policies designed to increase consumer information may therefore increase the efficiency with which such markets operate, even though such public policies entail real costs of their own.

In the experiments described here, we examined a pure "experience" good purchased frequently. We did this because experience goods are simpler to model and they have been more intensively studied than goods with hidden characteristics and yet, as we have seen, the process of reputation development in such markets could be quite complex. The more general class of goods with "hidden" characteristics is almost surely more important for consumer protection policy, but behavior in experiments with hidden characteristics is likely to be difficult to interpret. People often appear to use (possibly different) "heuristic" rules to assess the liklihood of an uncertain event (Kahneman, Slovic, Tversky, 1982).[8] Little is presently known as to how people formulate such rules and consequently little formal modeling of markets for products with hidden characteristics has been done. It seemed best to begin with the simpler and better

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[8] There have been several experiments which investigate how markets perform when the goods traded have hidden characteristics. There are briefly reviewed in Appendix III.

formulated case of experience goods subject to frequent repurchase.

Why Lemons?

Why investigate the "lemons" problem? Two reasons. First the "lemons" problem, bad quality drives out good, and the related problem of the lack of close correlation between price and quality, is of direct interest to the FTC. Second, in virtually all the instances in which it has arisen, the debate has centered on whether the "lemons" problem is real and, if so, what evidence would be required to show it. Third, the "lemons" problem is perhaps the simplest case of informational market failure that has been extensively analyzed by economists.

The "lemons" problem, even in its most literal form, is of direct interest to the FTC. Part of the controversy concerning the FTC's recently issued Used Car Rule was a debate over whether there was evidence of a substantial lemons problem in this market.[9] Those who thought there was little or no evidence of a problem pointed to the incentives dealers have to maintain their reputations and to their ability to provide warranties to effectively signal high quality. Those on the other side suggested that neither reputations nor warranties were sufficient to produce an efficient market and so mandated disclosure would improve market performance.

Another recent FTC case involving a homebuilder (Ward Homes) led to an explicit debate over whether housing quality is adequately signaled to the market by the builder's reputation and by the warranty offered or whether the market exhibits a "lemons" problem because builders cannot effectively "commit" themselves to high quality performance.

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[9] See the original staff report of 1978 and the industry response to it. For a better appreciation of the difficulty of assessing the evidence, see the careful empirical study by Lacko (1986).

Both the (1979) FTC Staff Report on Life Insurance Cost Disclosure and the (1985) FTC Staff Report On Life Insurance Products and Consumer Information made extensive use of an analogy to the "lemons" model in an attempt to understand how the the life insurance industry operates. One of the arguments made was that since consumers could not evaluate the "price" of different policies (even after the sale), a lower price did not make it easier to sell a policy. Sales depend more on the selling talent of the salesman than on the objective qualities of the product. Companies compete for good salesmen by offering high sales commissions. High cost policies may, therefore, drive out low, and this would explain the market success of some policies that appeared to provide less than competitive rates of return on life insurance savings. There was, however, disagreement (even among Commission staff)[10] as to whether any "lemons" problem existed in this market. Critics of the reports pointed to the large number of life insurance companies and agents and the ease with which new companies enter the business, and suggested it is very unlikely that firms could successfully offer policyholders less than going market rates of return. They argued that the low measured rates of return must therefore fail to reflect some benefits attainable through certain types of life insurance contracts (e.g., certain options) that are not available through other savings alternatives.

Thus, "lemons" problems are of direct relevance to the FTC. Moreover, Akerlof's original paper (1970) was followed by a substantial amount of discussion and work on similar problems both by economists and policymakers.

It is important to establish that a lemons problem can really occur before examining alternative institutions that might correct it. What are the general conditions under which lemons problems arise? Akerlof's and later work

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[10] See the introduction and chapters VII and VIII in the 1985 Report.

suggests two aspects are important: first, that consumers cannot easily and cheaply learn the quality of the product prior to sale and second, that future sales depend little on past performance. Thus the root cause of failure in Akerlof's model is the combination of an experience good with a zero repurchase rate in the future, regardless of customer satisfaction.

In the experiments, we captured the lack of an incentive to build a reputation by making it impossible for buyers to learn the identity of sellers, that is, sellers had no brand names. Sellers thus had no economic reason to try to develop reputations. In the experiments, the condition "no brand names" ought to lead to an all lemons equilibrium whether or not sellers can make claims.

If it does occur, what cures are available for Akerlof's disease? External regulations might cure the lemons problem; in fact, any of the general types enforced by the FTC might work. A rule against deceptive advertising might work, if higher than average quality sellers make claims and if buyers assume that those sellers who make no claims are low quality. If sellers avoid making any claims, mandatory disclosure could cure the problem. Post-purchase remedies, such as a voluntary warranty with terms enforced by the FTC or a required warranty specifying a minimum level of quality, could also solve the problem. But, as discussed above, regulations themselves are costly, quality and the truthfulness of claims may be very difficult to specify precisely and regulatory resources are limited. So it is sensible to ask, "Under what conditions will normal market forces themselves be sufficient to overcome a lemons problem?"

Why Experiments?

Experimental markets have several advantages compared to naturally occurring markets. Natural markets are so complex that it is extremely difficult to determine if there is a lemons or adverse selection problem in a particular market. An experiment can be designed so there is no doubt that every buyer values a high quality item more than a low one

and, in similar circumstances, by exactly the same amount; that all high quality units are exactly alike as are all low quality units; that every buyer values the extra quality more than the extra cost and that there are no subtle "transactions" costs (for example, a particular buyer may be more costly to deal with, a particular seller may charge a higher price but provide better credit terms or faster delivery, etc.). In short, the experimental setting allows us to eliminate much of complex diversity in natural markets that lead to seemingly endless arguments over whether or not there is any substantial evidence of market failure. If reasonable people cannot even agree on whether a given market exhibits massive inefficiency or no inefficiency, there seems little chance of gathering persuasive evidence of the causes of market failure. By contrast, experimental controls allow us to precisely measure actual market efficiency and so make it possible to study the effects of different regimes or rules on overall market performance. We can focus on the important, but difficult questions of when, how and why sellers dealing with uninformed buyers seek to develop "good" reputations.

While the ability to control many features of the experimental environment has great and obvious advantages, the main disadvantage is that in any single experiment you can no longer be sure that you have actually captured the most important features of the natural markets of interest.

The Experiments

We will now provide a brief account of how the experiments were conducted.

Buyer and seller values for both low quality items (called "regulars") and high quality items (called "supers") were "induced" by the experimenter. For example, a buyer might be told that the experimenter would pay $3.30 for the first "super" purchased, but only $1.80 for the first "regular"

purchased. [11] Sellers might be told that they could purchase "supers" at $1.65 per unit and "regulars" at $.65 per unit. If a buyer and seller agreed to an exchange at, say, $3 and the unit supplied was a "super", then the buyer would sell the unit to the experimenter for $3.30 and so net 30 cents "profit" on the transaction. The seller would keep the difference between what the buyer paid ($3) and the "cost" of the unit ($1.65) for a net profit of $1.35. The experimenter would pay out a total of $1.65 to buyer and seller.

Note that if the seller provided a "regular" at a price of $3, his profit would increase by $1 to $2.35. The buyer, however, would lose $1.50, or 50 cents more than the seller gains, since he could only resell his $3 regular for $1.80. The experimenter would pay $1.80 to the buyer and would collect $.65 from the seller for a net cost of $1.15. The sale of a regular is "inefficient" in this case, because the buyer and seller jointly could have made more money from the experiment if a super had been exchanged. The experimental design ensured that it would always be more efficient, in this sense, to exchange supers.

In all the experiments, buyers and sellers were kept in separate rooms. Bids and offers were communicated by CB radio and recorded on a blackboard visible to all in a given room. In some experiments sellers were not identified in any way. We refer to this condition as "brand names prohibited."

In other experiments, seller offers were accompanied by the seller's identity number. In this way, buyers could return to the same seller, if they desired. We refer to this condition as "brand names permitted."

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[11] Not the actual values used. In the experiments, prices were quoted in an artificial currency called "francs". Buyers and sellers were usually subject to different (but known before the experiment began) conversion rates from "francs" into dollars. Subjects were paid in dollars, however, at the end of each experiment.

During some experiments, sellers were permitted to make a claim about the quality of the item they were offering at a given price. For example, the message might be "seller number 5 offers a super at $3." We refer to this condition as "advertising allowed."

In some experiments, sellers were allowed to make false claims and in others, claims, if made, had to be truthful.

In general, buyers learned the actual quality delivered only after the sale. In some cases, the actual quality delivered by each seller was made "public" by posting it on the blackboard. In other cases, only the purchaser knew the true quality delivered.

Results

A crude but simple summary of the complex results of 21 experiments is shown in the array on the following page. (Warning: The actual experiments involved many more variations than displayed here. A full account of the conditions is given in Table I, section II. The results are summarized fully in Tables II-IV, section IV.) A "dictionary" is provided to show briefly how an aspect of interest occurring in natural markets was translated into operational terms in the experimental markets.

SUMMARY OF EXPERIMENTAL RESULTS

	Advertising Prohibited	Advertising Allowed But Can Be False	Advertising Allowed But Must Be True
No Brand Names	Lemons	Not Tested	Efficient
Brand Names Allowed (Reputation possible)	Mixed:Lemons in Two Subject Pools But Fairly Efficient In CIT Pool	Lemons But CIT Subjects Not Tested	Efficient

DICTIONARY

Natural Market	Experimental Market
"Brand Name"	Seller Identity is Known
"Advertising"	Seller May Specify That He Will Deliver a "Super" or a "Regular"

Note: "labeling" and offering a warranty are equivalent to "advertising" in these experiments. Advertising was costless to sellers. CIT refers to the California Institute of Technology.

Without brand names or advertising, our experimental markets produce virtually all lemons. Neither altruism nor any strategic complexity prevent the lemons model from accurately predicting the price and quality distributions observed in the experiments. This is the first clear demonstration of the existence of the lemons phenomenon that we know of.

In all cases, requiring that any claims made be truthful, quickly produces markets that behave almost perfectly efficiently.

The opportunity and incentive to build a reputation is not sufficient to cure the lemons problem in the simple experience goods market we set up. The commonsense notion that reputation will work well if sellers depend on repeat sales was not supported.

It was possible to build reputation in the experimental markets when "brand names" or the identity of the seller was known to the buyers. With "advertising" or labeling prohibited, results were mixed. In two of the subject pools (students from Boston University & Pasadena City College) market performance did not significantly differ from that observed when reputation was impossible to build, that is, these were essentially "lemons" markets. In the third subject pool (students from the California Institute of Technology or "CIT"), market performance was substantially more efficient when brand names were allowed, but still fell short of the efficiencies obtained when only truthful claims were allowed.

When possibly false advertising or labeling was permitted along with brand names, all the observed markets were essentially "lemons", but the CIT subjects were not tested under this condition. Hence the addition of advertising or labeling to brand name made no apparent difference. Since the "advertising" was not costly, economic theory predicts that it could not be effectively used as a "signal" of high quality. Therefore the results should not be

significantly different from the brand names but no advertising condition just discussed and they were not.

Why did the common sense notion and some of the explicit economic models of reputation prove to be poor predictors of the behavior observed in the experimental markets? There are two broad possibilities: the implicit or explicit assumptions concerning buyer and seller behavior used in the models were violated by the subjects in the experimental markets and/or the experimental design failed to capture some elements of natural markets and theoretical models that are crucial to determining the way buyers and sellers behave in natural markets.

In the experimental markets, buyers did not behave in the simple "unforgiving" or "rewarding" way the theoretical models presuppose. Buyers did not always punish sellers for delivering low quality at a high price by refusing ever to pay a high price again, nor did they always reward a delivery of high quality at a low price by a willingness to deal again with the same seller at a higher price. Thus far, buyer behavior in these experiments resists any simple description.

The development of seller reputation in the experimental markets is also sometimes subject to "spill-overs," which are not taken into account in the models. In some of the experiments, if one seller cheated (provided low quality at a high price), he seemed to adversely affect the reputations of all sellers. Observing "one bad apple" led some buyers to conclude that all sellers were rotten. The second "spill-over" observed in some experiments was that sellers could, to some extent, "free ride" on the good reputation built by another seller. This free riding can be a source of inefficiency, because anticipatory price cutting by the late-comers may make it appear unprofitable for anyone to invest in developing a reputation in the first place.

The design of the experimental markets reported here omitted several aspects of natural markets that might have a substantial effect on reputation development and that also precluded a sharp test of the "quality assuring" price prediction.

Each seller was limited to the sale of at most two units in each period. This implies that sellers cannot greatly increase their market shares by developing good reputations, and so buyers can not use market shares as a signal of quality. In conjunction with the way buyers' incentives were structured, it also means that sellers earn "rents." The full information perfectly competitive price will be above the cost at which the sellers obtain the units. Hence it is difficult to detect whether the offer of a "premium" over cost for high quality would in fact lead to the provision of more high quality units. Note also that since buyers are ignorant of the extra cost of high quality, it is difficult for them to assess how large a premium they may have to pay for assurance of high quality.

Some later experiments were run (see Miller and Plott, 1985) with the quantity limitation on sellers removed. For the same subject pools, this resulted in more efficient market performance than that reported here. Markets were not perfectly efficient, but developed into two segments. The low price segment provided low quality at the competitive price, while the high price segment generally provided high quality items at prices that exceeded the difference in the cost of providing the two qualities. Thus the ability to increase market share in an experience good market is associated with greater efficiency and price "premia" do seem to result in a greater frequency of high quality deliveries. Reputation alone, however, even when market shares can increase, does not completely eliminate "lemons".

A second aspect of natural markets not present in the experimental markets is the fact that advertising is costly. Thus the theory that costly advertising may act as signal of high quality could not be tested in these experiments. This remains an important question for further research.

A third discrepency between the experimental and natural markets that may account for the failure of reputation to eliminate inefficiency is the short business

horizon of the sellers. While the subjects were unaware of the exact time at which the experiment would end, they were told that the experiments would run for about 3 hours. Thus sellers in the experimental markets had very short "horizons" compared to sellers in natural markets, since the latter have the possbility of selling their brand name (and its reputation) to someone else. Not only would such sellers have more incentive to cheat, but according to some theorists, a finite horizon implies that rational sellers will always cheat, that buyers will anticipate this cheating and so a lemons market will result.[12] The findings for the CIT subjects are inconsistent with this theory, but the theory is consistent with the results for the other subject pools. In any case, the short horizon may well have had an effect on the observed results. Additional experiments are needed to determine just how important that effect might be.

We should also note that some of the features of the experimental market were designed to be extreme rather than representative of natural markets. For example, the cost of the high quality item was fives times higher than the cost of the low quality in most of our markets. This high ratio was expressly chosen to provide sellers with ample incentive to cheat. Lower ratios do result in more efficient markets (see conclusion 13, chapter IV). Our experimental markets were not designed to emulate any particular natural market, but to study reputation formation under simple and sometimes extreme conditions. Therefore, the results should not be taken as representative of those that would obtain in natural markets.

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[12] See Luce and Raiffa (1957) for a thorough discussion of a closely related situation that occurs in repeated plays of a "prisoner's dilemma" game. Selten's "chain store paradox" is also similar; recent attempts to resolve it include Kreps and Wilson (1982) and Milgrom and Roberts (1982). Axelrod (1984) provides a very interesting discussion of repeated prisoner dilemma games, as played by computer programs, animals and politicians. He thoroughly explores the sometimes surprising success of the simple strategy of "ti for tat."

In short, we have demonstrated that "lemons" markets occur under precisely those conditions specified by economic theory and that truthful advertising imposed by a third party produces or restores efficiency. The "common sense" notion that the incentive sellers have to make future sales is sufficient, by itself, to force sellers to develop good reputations and thereby overcome any "lemons" problem was not supported by the simple experiments. Successful reputation development may require longer horizons than were possible in the experiments, or some way of "bonding" performance such as through costly advertising. In any case, our experiments suggest that frequent repurchase alone is not sufficient. The development and functioning of reputation as a means of assuring efficency in markets with imperfect information, in spite of its obvious importance, is still poorly understood.

CHAPTER II

THE MARKET AND REGULATORY ENVIRONMENTS, EXPERIMENTAL DESIGN, AND PROCEDURES

Parameters

A total of twenty-one markets were conducted plus some pilot experiments. Participants were students at Boston University (BU), California Institute of Technology (Caltech), and Pasadena City College (PCC). Some of these participants were involved in several markets as a control for experience.

All markets proceeded as a series of market days or trading periods. The number of periods was unknown to participants, but, because they knew roughly the maximum time of the experiment (three hours), they had some idea of when the last periods were approaching. Sellers remained sellers throughout an experiment and buyers remained buyers.

Sellers could supply units of grade Super or Regular. Each seller was limited to a total supply of two units per period. The units could be any combination of grades possible as long as each seller supplied a total of two or less units. Thus, the seller could sell two Rs, two Ss, one of each, one unit of some type, or nothing. The fact that Supers were more costly to sellers than were Regulars was public information. Both Supers and Regulars were supplied at constant marginal cost up to the limit of two units in total. For "high cost" experiments, which are all but selected periods of experiments 19 and 21, the (constant) marginal cost of Supers was 100 francs (one dollar) more than the (constant) marginal cost of Regulars. In the low-cost experiments, this difference in marginal cost was reduced to either 20 or 25 francs.

Buyers' redemption value of Supers was more than Regulars and this was public information. The redemption value for buyers is in Figure 1. As can be seen, the marginal valuation of a Super always dominates the marginal valuation of a Regular. Thus, given a choice of a Super or Regular, a buyer would always prefer a Super until a limit of three Supers is attained and the marginal valuation falls to zero. All buyers had identical redemption schedules.

For a typical experiment with eight buyers and six sellers the market demand and supply are presented in Figure 1. The values are in an experimental currency called "francs" that have a dollar conversion factor. As can be seen, the market supply is horizontal for twelve units and then becomes vertical.

BUYER REDEMPTION VALUES IN FRANCS

Unit Number	Regular	Super
1	180	330
2	165	300
3	150	270
4	0	0

one franc = $.02

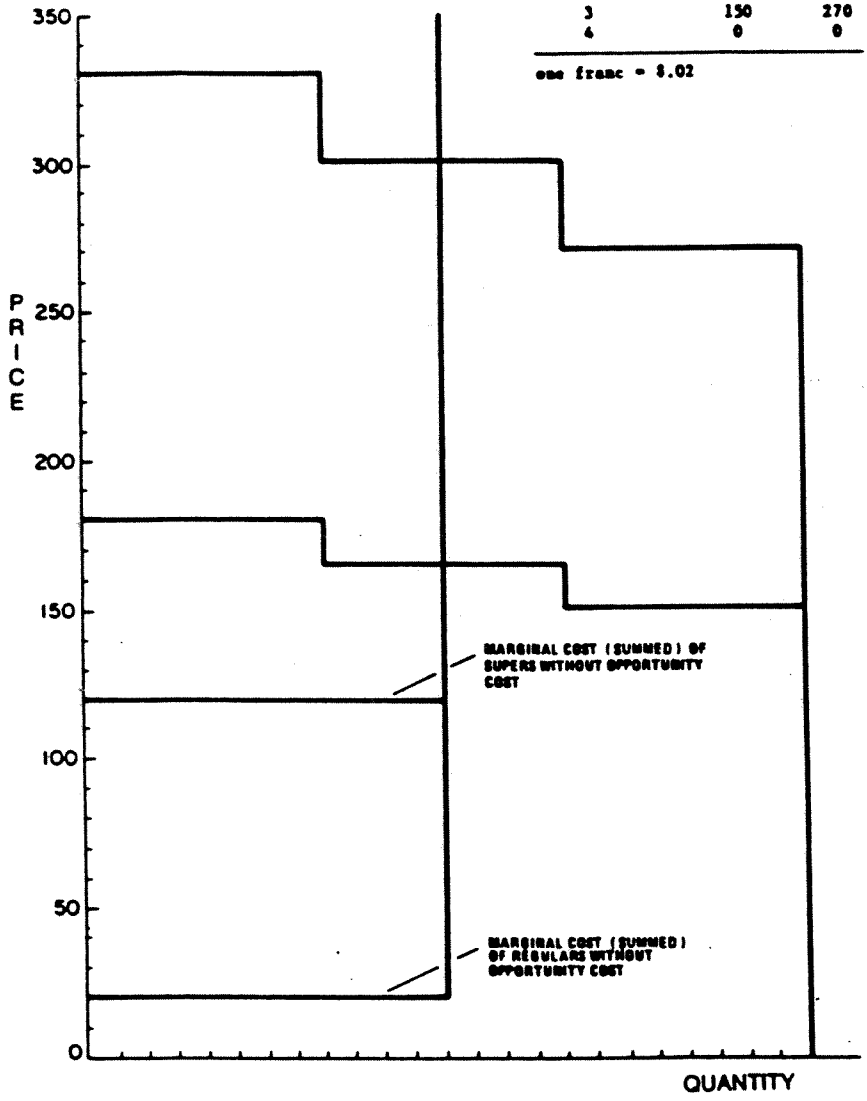

Figure 1

All transactions were in an experimental medium of exchange called francs. Francs could be converted to dollars at a predetermined rate known only to each individual. Prior to some markets, subjects were told that the dollar per franc conversion rate might be scaled upward after the experiment. In early experiments in which little was known about behavior and parameters, the value of francs was increased so that on average participants earned about $5 to $7 per hour. This was thought necessary in order that the experienced subjects would be willing to participate again.

In addition to profits earned from purchases and sales, buyers were given a bonus of 50 francs each period and an unexpected one-time endowment of 200 francs at the end of the first period. Early pilot experiments demonstrated a potential problem of credibility and control, which the bonus helped to eliminate. During the first period inexperienced buyers would pay high prices for units on the expectation that sellers would deliver Supers. When Regulars were actually delivered, the buyers suffered substantial losses. Once operating at a loss, they seemed to suspect that the experimenter would not collect money from the subjects, so they had little to lose from further losses. With perceived downside risk gone, control over incentives was lost. The surprise bonus was sufficient to bring all buyers back to a profitable position. When the surprise bonus was given to buyers, they were told to expect no more bonuses. Of course we had no real control over expectations, so we were potentially trading one problem for another.

Market and Regulatory Variables

Institutional variables were those that deal with market organization, information, and the rights and guarantees afforded to participants. The institutional variables are the treatment variables. When and how did the grade of a unit become known to a buyer? What guarantees were available to buyers of Regulars who thought they were buying Supers? When and how did the sales record of individual sellers become known? Answers to these questions define the institutional structure of the markets. These institutional features will be discussed after the features common to all markets are outlined.

1. The Basic Market Organization

The basic market organization was the same for all markets. Buyers and sellers were located in different rooms. Communication between rooms was accomplished by citizen band (CB) radios. Each room had an experimenter in front of the room equipped with a large chalkboard and a CB radio. A long horizontal line scaled from zero to infinity francs was displayed on the chalkboard. Buyers submitted bids that were transmitted to the seller room over the CB by the experimenter. At the same time the experimenter in the buyer room entered the bid under the horizontal line at the franc value equal to the bid. When the bid transmission was received in the seller room, the experimenter repeated the bid and entered it under the horizontal line at the appropriate value. Similarly, when sellers tendered offers, the offer was entered above the line at the appropriate value and transmitted to the buyer room where it was verbally repeated and entered on the chalkboard. If two bids (offers) were tendered at the same price, the second one was listed below (above) the first one. Thus the time of tender is partially ordinally indexed by distance from the line.

Bids and offers remained open until accepted or canceled. Buyers or sellers accepted offers/bids verbally by indicating to the experimenter the one they wanted from

those on the chalkboard. Traders were free to indicate the particular bid or offer they wanted independent of the temporal order of tender. An acceptance was immediately radioed to the other side of the market over the CB. Of course, since the CB transmitter and receiver were located in the room with agents, all transmissions over the radio were public. Once a trade was made the bid/offer was circled on the chalkboards and numbered. Aside from bids, offers, acceptances, and other necessary communications with experimenters, the participants were not allowed to say anything. No talking was permitted.

2. Regulatory Environment

The major treatment variables were warranties, warranty enforcement, identification of the seller of units, and the timing and public or private nature of grade revelation. These variables are discussed in order.

Warranties, when they existed, were express warranties generated by a claim or grade advertisement by the seller prior to the buyer's purchase.[13] In some cases sellers and buyers could do nothing other than make bids and offers with no reference at all to the grade of the unit. This condition is designated as "N" because no warranties of any sort existed or could exist. Under a different condition, condition "O," sellers had the option of advertising a unit as a Regular or Super at the time an offer was tendered to the market. The offer was then tagged on the chalkboard as an S or R according to the seller advertisement. Likewise,

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[13] Section 2-313 of the uniform commercial code requires: (a) Any affirmation of fact or promise made by the seller to the buyer which relates to the goods and becomes part of the basis of the bargain creates an express warranty that the goods shall conform to the affirmation or promise. (b) Any description of the goods which is made part of the basis of the bargain creates an express warranty that the goods shall conform to the description.

under the "O" condition buyers had the option of indicating along with a bid the grade of the unit desired. A third condition, "R," required sellers to advertise or disclose units as either a Regular or a Super at the time of an offer and required buyers to indicate with all bids, the grade of the unit desired. Thus, the regulatory environment governing warranties could be any of the conditions (N,O,R).

Warranties could be unenforceable (condition U) or enforceable (condition E). If warranties were unenforceable, no regulations existed governing the cases in which sellers failed to deliver the grade that was promised in the advertisement or requested by the buyer. That is, sellers could advertise a unit as a Super but deliver a Regular and the buyer could do nothing about it. In essence, false advertising was permitted. If warranties were enforceable (condition E) buyers were granted "specific performance."[14] That is, the seller was required to deliver a Super to the buyer if the unit had been so advertised. Thus, the enforcement condition could take two values (U,E).

In some markets sellers' identification numbers accompanied all offers and bids transmitted over the CB. Furthermore, under such conditions buyers were able to direct bids to individual sellers and such tagged bids could

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[14] Consistency of this regulation with the uniform commercial code is covered in Section 2-716. (1) Specific performance may be decreed where the goods are unique or in other proper circumstances. (2) The decree for specific performance may include such terms and conditions as to payment of the price, damages, or other relief as the court may deem just. (3) The buyer has a right of replevin for goods identified to the contract if after reasonable effort he is unable to effect cover for such goods or the circumstances reasonably indicate that such effort will be unavailing or if the goods have been shipped under reservation and satisfaction of the security interest in them has been made or tendered.

only be accepted by the requested sellers. This condition is designated as K to indicate that sellers' (but not buyers') identifications were known at the time of a contract. In the alternative condition U, neither buyer nor seller ever knew the identity of a trading partner. Thus, the identification variable took two values (U,K).

Unless grades were covered by an enforced express warranty, buyers became aware of grade either immediately after the purchase (condition A) or at the end of a period (condition E). Under condition A the seller held up a card immediately after the sale with letter S or R indicating the unit as Super or Regular. The information was then transmitted by the experimenter to the buyer. Under condition E the seller would submit a slip of paper indicating the grade for each trade in which the seller was involved. Trades were numbered on the chalkboard and sellers and buyers would record the number attached to each trade along with the price, etc.

The case in which the enforced warranty is provided is a little hard to describe notationally. If a grade was advertised, which need not be the case under condition "O," the buyer was aware of the grade prior to purchase. Thus the notation B is used. The actual announcement, however, could have been "A" or "E."

Some interpretations are in order. An enforced warranty can be interpreted as a case in which all characteristics of the product can be fully identified and evaluated by the customer prior to purchase. If the grade becomes known immediately after the sale, the customer has no recourse from unfulfilled expectations except alterations in future purchase patterns. Since the information becomes available immediately after a purchase, the consumer can react through modifications of purchasing behavior for the remainder of the period as can other buyers if the information is public. If the information becomes available only at the end of a period, the consumer is faced with a type of "credence" problem. During a period the consumers

are unable to evaluate purchases. The information that permits evaluation becomes available only after a delay.

Information about grade was either publicly revealed (condition Pub.) or privately revealed (condition Pvt.). In the case of public revelation the information regarding grade communicated to the experimenter was then announced over the CB for all to hear including the buyer. If the information was privately revealed, the slip indicating grade was passed along to the buyer or a cipher was used to privately transmit the grade over the CB. The latter procedure was useful if the rooms were so far apart that physical delivery of slips slowed the process excessively.

Experimental Design

A total of twenty-one markets was studied. The treatment variables included experience on the part of buyers and sellers, the relative cost of Supers, and the regulatory variables listed above. Obviously, with the large number of potential treatment variables not all possible experiments could be conducted. The strategy was to follow the sequential process outlined in the introductory statements. The choice of a particular experiment depended in part upon the availability of subjects and the pattern of previous results.

The treatments chosen for each of the twenty-one markets are listed in Table 1. The conditions of an experiment are indicated by an 8-tuple.

1	2	3	4
Warranty Offered (N,R,O)	Warranty Enforcement (U,E)	Trader I.D.'s (U,K)	Time of Grade Revelation (B,A,E)
5	**6**	**7**	**8**
Method of Grade Revelation (Pub,Pvt)	Experience (N,E,VE)	Relative Super Cost (L,H)	Location (BU,CIT,PCC)

For example, the index (O,E,U,B,Pub,VE,H,PCC) is a market in which warranties were optional but enforced if provided; trader I.D.'s were unknown; grades were known before purchase because warranties were enforced; the grades were publicly announced; traders were very experienced; the cost of Supers was in the relatively high condition; and the experiment was conducted at Pasadena City College.

Subjects with no experience (N) had participated in no experiments of the type under examination here, but some subjects from Caltech had participated in market experiments of a different type and were thus somewhat familiar with a market experimental environment. Experienced (E), subjects had participated in at least one previous experiment in this series. In almost all cases of new subjects the first market experience involved at least two different treatment variables that resulted in different patterns of market price so that afterwards subjects were all somewhat familiar with aspects of the parameters. Very experienced subjects (VE) had participated in at least two previous experiments.

Table 1

A List of Conditions, Subject Pools and Parameters Used in all Experiments

Key to Abbreviations

Column 3	Column 4	Column 5
N = no	E = yes	U = unknown
R = required	U = no	K = known
O = optional		

1	2	3	4	5	6	7	8
					Information about Grade		
Exp. No.	Location	Grade Warranty Requirement	Grade Warranty Enforcement	Seller* Identification	Time	Method	Subject Experience
1	BU	N	-	U 1-6 K 7,8	E	pvt	N
2	BU	N	-	U	E	pvt	N
3	BU	R 1-6 N 7-9	E -	U U	B E	pub pvt	N
4	BU	R 9-8 N 9.11	E -	U U	B E	pub pvt	N
5	BU	N	-	K	E	pub	N
6	BU	N	-	K	E	pub	E
7	BU	N	-	K	E	pub	E
8	CIT	N 1-6,9,10 R 7,8	- E	U U	E B	pvt pub	N
9	PCC	N 1-8 R 9-11	-	U U	E B	pvt pub	N
10	PCC	N 1-6 O 7,8	- E	K K	E B	pub pub	N
11	CIT	N	-	K 1-8 U 9-10	E	pub 1-8 pvt 9,10	8-E 6-N
12	PCC	N 1-6 O 7	- E	K	A	pub	N
13	PCC	N 1-6 O 7	- E	K	A A	pub pub	N
14	PCC	N 1-7 O 8,9	- U	K K	A	pub	N
15	CIT	N	-	K	E	pvt	5-VE 6-E 3-N
16	PCC	N 1-7 O 8,9	- E	K	A	pub	E
17	PCC	N 1-8 R 9	- E	K	A	pub	3-VE 8-E 2-N
18	PCC	N 1-6 O 7,8,9 R 10,11	- U E	K	A	pub	5-VE 9-E
19	PCC	N 1-3 O 4-14	- U	K	A	pub	2-VE 5-E
20	CIT	N	-	K	E	pvt	N
21	PCC	N	-	K	A	pub	VE

* Buyer identifications were always unknown except periods 7 and 8 of experiment 1.

Key to Abbreviations

Column 6	Column 7	Column 8
B = before purchase	pub = public	N = none
A = after purchase	pvt = private	E = experienced
E = period end		VE = very experienced

1	9	10	11	12	13	14	15
	Cost		Number		Full Information Competitive Equilibrium Price**		
Exp. No.	Supers	Regulars	Buyers	Sellers	Supers	Regulars	Total Number Periods
1	120	20	7	6	300	165	8
2	120	20	7	6	300	165	7
3	120	20	5	4	300	165	9
4	120	20	8	6	300	165	11
5	120	20	8	6	300	165	7
6	125	25	8	6	305	170	12
7	125	25	8	6	305	170	12
8	120	20	6	6	300	165	10
9	120	20	7	6	300	165	11
10	120	20	8	6	300	165	8
11	120	20	8	6	300	165	10
12	120	20	8	6	300	165	7
13	120	20	8	6	300	165	7
14	120	20	8	6	300	165	9
15	120	20	8	6	305	170	10
16	120	20	8	6	305	170	9
17	120	20	7	6	305	170	9
18	120	20	8	6	305	170	11
19	120 (7-14)40	20 20	5	1(6)***	300	165	14
20	120	20	8	6	300	165	9
21	125 (5-14)45	25 20	8	6	305	170	14

** $/F was .02 for buyers and .01 for sellers. Buyers received 50F per period endowment plus a one-time unexpected payment of 200F after period 1.

*** The monopolist has the capacity of eight sellers.

The description of the other variables must proceed with the discussion in the section above. The easiest way to understand the variables is to notice that advertising and the warranty are tied together in interpretation. If a grade is specified along with a bid or offer, it is viewed as both advertising and a warranty. The two are equivalent, because if a grade specification is available to any buyer, it is available to all. The interesting additional variable is whether or not the warranty is enforced or, equivalently, whether or not the advertising must necessarily be truthful. A "defective unit" backed by an unenforceable warranty is equivalent in these markets to an advertisement about grade that is false. As will be discussed in the parameter section below, the cost to sellers of delivering Supers was always higher than Regulars. If the difference was 100 francs ($1) per unit, the cost was in the high (H) condition. If the cost difference was 20 francs ($.20) or 25 francs ($.25) per unit, the condition was low (L).

Experimental Procedures

Subjects were recruited from BU undergraduate business and PCC undergraduate economics classes and from Caltech dorms. The "sales pitch" included with the instructions in Appendix A contains the essence of the information given subjects when they were recruited. All were told that the experiment would take approximately three hours. They were told that we could not guarantee an amount, but that they would have an opportunity to make "more than they would likely make in a comparable hourly period," that "we have never had a dissatisfied customer," and that "we were interested in studying situations in which people make decisions that matter, so we provided incentives accordingly." Such statements were intended as assurances that the stakes could at least cover their opportunity cost. Of those that signed up at PCC, approximately 65 percent actually showed up. The rates were higher at BU and Caltech.

At the assigned time and location the number of subjects present were counted and a decision was made about

the number of buyers and sellers.[15] Subjects were randomly assigned instruction sheets as buyers or sellers. Buyers were on one side of the room and sellers were on the other side. Forms in the instructions were reproduced on the chalkboard. Instructions were then read, questions were answered. The market process was explained, including the bids and offers process, the chalkboard, and the determination of Supers and Regulars. If warranties or advertising were involved, special instructions regarding these were included.[16] After all questions were answered, sellers were then accompanied to another room.

When buyers and sellers were in separate rooms, questions were again answered. Buyers completed a period zero.[17] They were also warned that they must keep accurate records and note the transaction numbers. If we found anyone who "mistakenly" recorded Regulars as Supers, we would need to terminate the experiment.[18] The market opened for period one and it remained open for seven minutes as opposed to the usual five. After period one the extra bonus of 200 francs was given to buyers in addition to the 50 franc per period endowment. Buyer and seller record sheets were checked after the first, second, and third periods and occasionally after that.

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[15] We preferred to have two more buyers than sellers. This would assure unique price predictions by certain models.

[16] See appendix I.

[17] See instructions. Each buyer was required to list the redemption values in the practice record sheet assuming a sequence of purchases SRRS in period 1 and RSR in period 2. This exercise removed certain confusions about the redemption values.

[18] Fortunately the only cheating problems we detected were in the pilot experiments that caused us to add this statement.

CHAPTER III

MODELS AND IDEAS

Ideas and models are outlined in five different categories. We have applied the models to generate a prediction, but the reader should notice that with all of the ideas outlined in this section some latitude exists regarding how a model might best be applied to the markets we created. For example, some models found in the literature are supported by analysis that involves the reasoning process that agents undertake, what they observe, and how they process these observations. Since we did not have access to such data, theories that rest on such ideas remain untested. Instead we applied the models using those operational concepts and measurements that were available and seemed reasonable.

The Full Information Model

This idea rests on the hypothesis that the markets will behave as if all information about the underlying state of nature available to any agent will be revealed to all through the market process. A natural assumption would be that this model could only be applicable in cases where the buyer knows the seller, or some form of direct communication is possible. However, it is conceivable that the predictions of the model would be borne out even when such special conveniences are absent. Sequences of bids, special prices, special offers, etc. could all serve as some sort of signal. Any market is filled with such possibilities, so the model could generate good predications even in cases where buyers and sellers have far less than full information.

The idea is as follows. Each seller presumably knows the quality of a unit to be sold at the time an offer is

tendered.[19] The state of nature is thus the pattern of Supers and Regulars offered on the market. The hypothesis is that buyers will behave as if they can distinguish between offers of Supers and Regulars. Sellers will develop a profit maximizing response to buyer decisions. Application of the laws of supply and demand yield a prediction that only Supers will be sold at a price of P_S (see Table 1).

Null Expectations Model

This idea rests on the hypothesis that buyers without prior instruction on the likelihood of Supers and Regulars will treat them as equally likely. The rational expectations postulate is not applied and neither is a substitute learning axiom. So expectations are postulated to be unchanging. Sellers will adopt a profit maximizing response to this behavior. If Supers and Regulars are expected to be equally likely, application of the laws of supply yields a prediction that all Regulars will be sold at a price equal to the average of P_S and P_R (see Table 1).

Clearly a null expectations model could involve any probability at all. The choice of 50:50 is arbitrary. The model is used primarily as a point of reference.

Lemons Model

Sellers, faced by buyers who behave as if they cannot distinguish Regulars from Supers, will adopt a short-term maximizing strategy and sell only Regulars. Buyers seeing only Regulars delivered will develop rational expectations and behave as if they expect only Regulars. Application of the laws of supply and demand yields predictions of all Regulars at a price P_R (see Table 1).

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[19] In most markets the seller need not commit to a grade until after a sale. We assume, however, that the decision about gradeis made before an offer is tendered.

Signaling Models

If firms have a means of adding some distinguishable feature to units, that feature can sometimes be used as a signal that distinguishes offers of Supers from offers of Regulars. If the cost of adding this feature is sufficiently lower for Super units as opposed to the cost of adding the feature to Regular units, then signaling models predict a signaling equilibrium. The feature will be added to Supers only, and its presence will serve as a signal that lets buyers differentiate the underlying grades of units. See Spence (1977), Rothschild and Stiglitz (1976), Miller and Plott (1985).

Signaling models have an obvious application when warranty instruments exist. If warranties exist and are costlessly enforced, the cost of adding a warranty of Super to a Super unit is zero and the cost of adding a warranty of Super to Regular units is the difference between the cost of providing a Super and the cost of providing a Regular. The warranty guarantees specific performance, so a seller advertising a Super must deliver one and therefore loses the cost advantage of delivering a Regular. If warranties are required or are optional, then the signaling model becomes the full information model and therefore has the same predictions. The results will be volume that is all Super units sold with a warranty[20] and the price will be P_S (see Table 1).

A model developed by Grossman (1981) leads to the same conclusions (Leland, 1981), but the Grossman model is based on different principles. Grossman applies a perfect

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[20] Grossman (1981) develops the notion that the warranty will be added. His model differs from the signaling model, but in this narrow case the predictions are the same.

equilibria principle from game theory[21] and a rational expectations principle.[22]

If warranties are not enforced, then the cost differential between adding the special feature to Supers and to Regulars disappears. Regulars can be advertised as Supers. The signaling model then predicts that no separation will occur because Super units and Regular units will both add the special feature. Regular units will be offered along with an unenforceable warranty that the unit is a Super. Buyers will adopt expectations accordingly and anticipate that all units are regulars. The final result will be all Regulars at a price of P_R (see Table 1).

The lemons model can also be interpreted as a degenerate case of the signaling model. In Akerlof's (1970) model, price serves the dual role of equilibrating supply and demand and signaling the quality of the product sold. Because of the one shot nature of trades and the absence of any cost associated with signaling high quality with high price, price cannot effectively signal quality and therefore only lemons are traded.

Reputation Models

Models of reputation formation tend to be motivated by the theory of dynamic games. Buyers behave as if they are aware of seller identities and adopt dynamic strategies of rewarding and punishing sellers. Sellers who perform as the buyer desires are rewarded with future business, and sellers who do not perform are avoided. Sellers recognize buyer behavior in developing their own dynamic strategies.

A model developed by Klein and Leffler (1981) postulated a quality guaranteeing price (weak version).

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[21] The principle is imbedded in equations (A4) and (a5) on page 481, Grossman (1981).

[22] Statement (A6) on page 481, Grossman (1981).

Buyers who observe a Regular delivered on terms that buyers would ordinarily expect a Super act as if that seller will always deliver Regulars in the future. A seller who has once "fooled" buyers will sell only Regulars at P_R (see Table 1). If sellers anticipate this buyer reaction and if sellers expect one full period more in the market, then, given the parameters in these markets, sellers have an incentive to deliver Supers at any price above P_S - 10. Rational expectations and the law of supply and demand yield a model that predicts only Supers will be sold in the market and these will be delivered at a price of P_S. As the end of the experiment approaches, sellers will sell Regulars at P_S and thereafter sell Regulars at P_R.

A natural extension of the theory to a quality guaranteeing price (strong version) can be applied even when buyers do not know seller identities. Buyers, once seeing a regular delivered to the market in the "high" price range, will anticipate that all future deliveries will be regulars. The resulting demand function will be that for Regulars. Price will immediately fall to the regular competitive equilibrium. Sellers know that a single regular sale will "spoil" the market for all. Thus, if the price is high enough, sellers will sell only supers.

Other reputation models can be found in the literature (Rogerson 1982; Shapiro 1982a,c; Nelson 1974; Schmalensee 1978). The thrust of these models is that sellers who feel that buyers can tailor their reactions to individual sellers by refusing to buy from them or by paying a premium to certain sellers will in turn modify their behavior in anticipation. According to the model, buyers will patronize sellers who have a history of offering good grades and sellers will respond by offering good grades. The result in the parameters of our experimental markets will be that only Supers will be sold. Premiums, prices above P_S, might be paid to sellers who consistently sell Supers.

CHAPTER IV

RESULTS

The time series of all markets are in Figures 2 through 22. Each contract is shown according to price and the ordinal time at which it occurred. Market efficiencies, summary statistics for each period, and the regime of treatment variables is also shown. Tables 2, 3 and 4 show average efficiencies for various periods under each regime.[23] Comparisons of efficiency between different periods or regimes should be made cautiously because the periods may have occurred at different stages in a given market, there may be a different number of periods in the intervals compared, etc. In spite of these difficulties, the reader may find the tables useful in gaining an overview of our results.

Conclusion 1. When disclosures (if made) must be truthful, the full information model works well.

Argument. The relevant markets (periods) are shown in Table 3. The full information model predicts all Super units, 100 percent efficiency and prices equal to P_S in Table 1. Of the 308 units sold during the relevant periods, 275 (89 percent) were Supers. On eight occasions an enforced warranty was imposed after the market had previously been operating under an alternative regulation and in all eight cases efficiency increased immediately. In three cases truthful disclosure was removed and in all three cases efficiency fell immediately.

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[23] We are indebted to Richard Craswell for suggesting the classification scheme embodied in Tables 2-4. Market efficiency as developed by Plott and Smith (1978) refers to actual earnings as a percentage of the maximum possible earnings.

Figure 2: Experiment 1

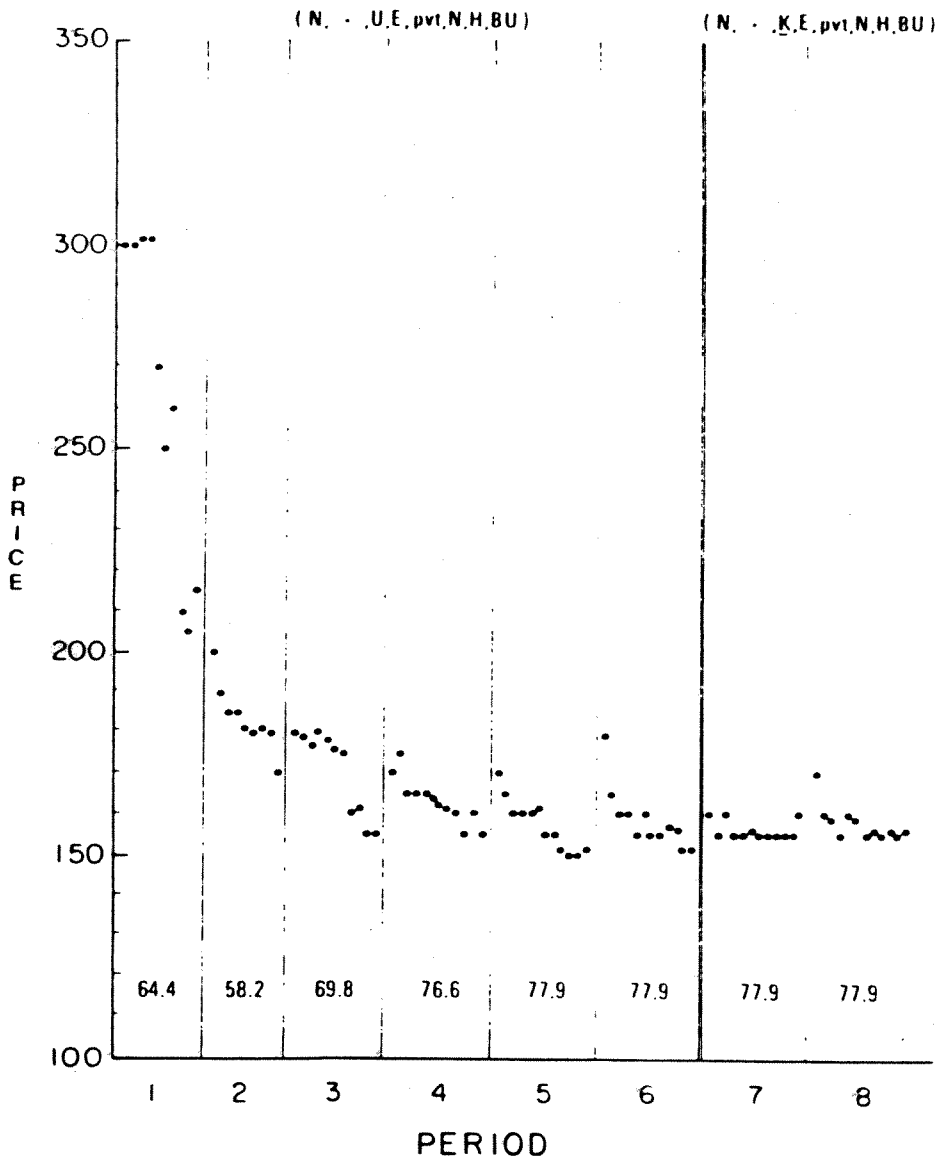

Figure 3: Experiment 2

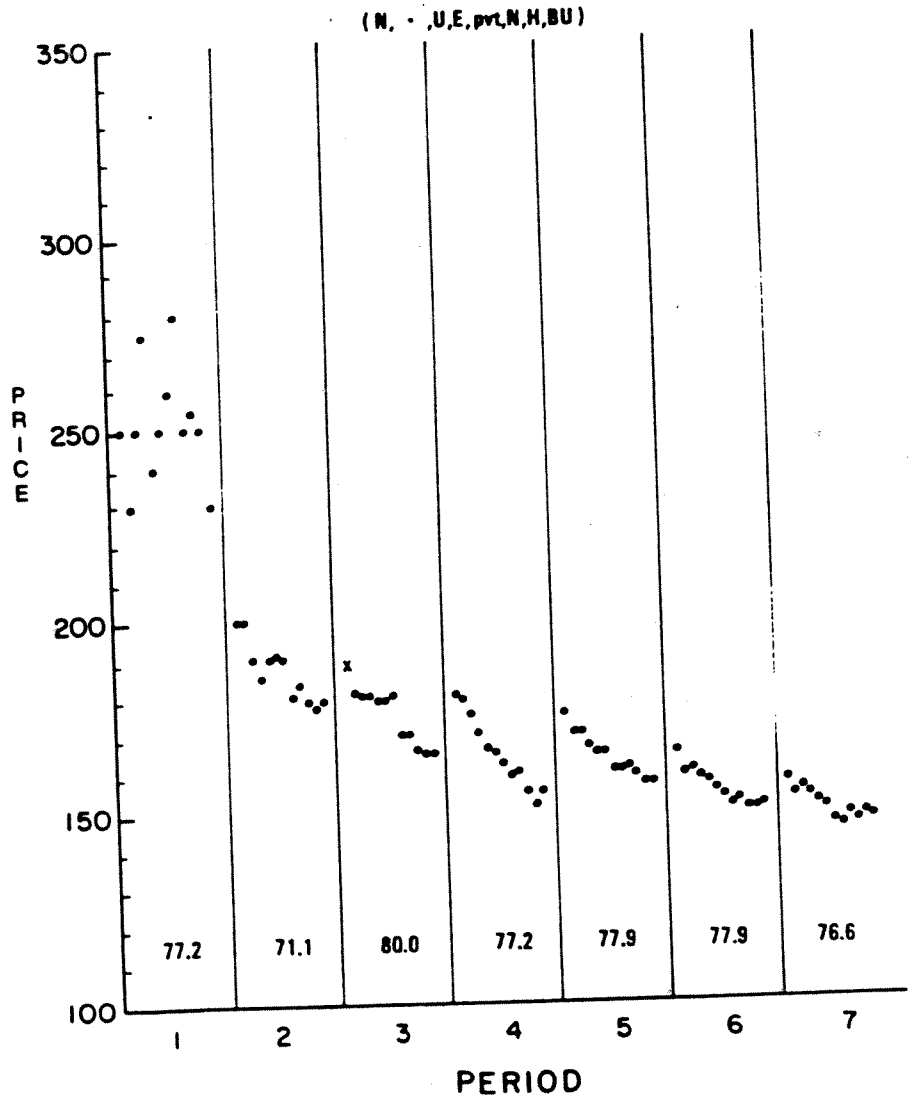

Figure 4: Experiment 3

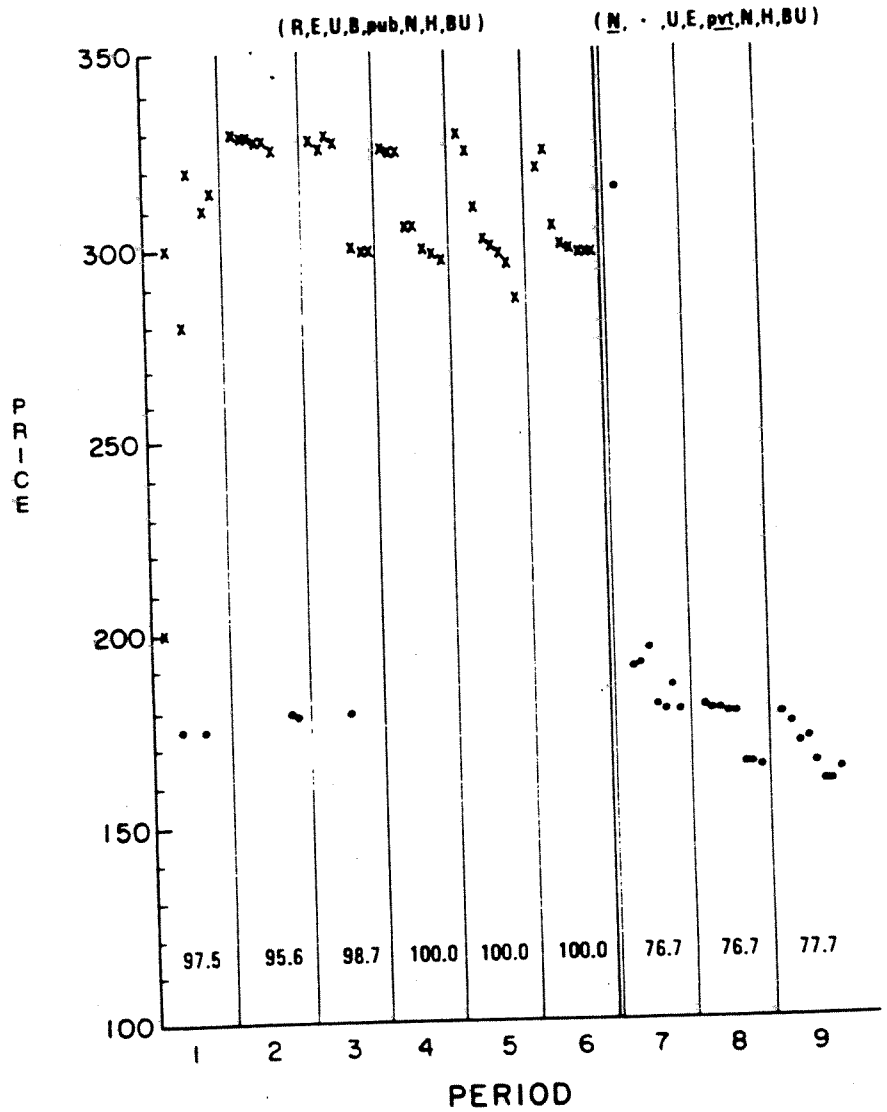

Figure 5: Experiment 4

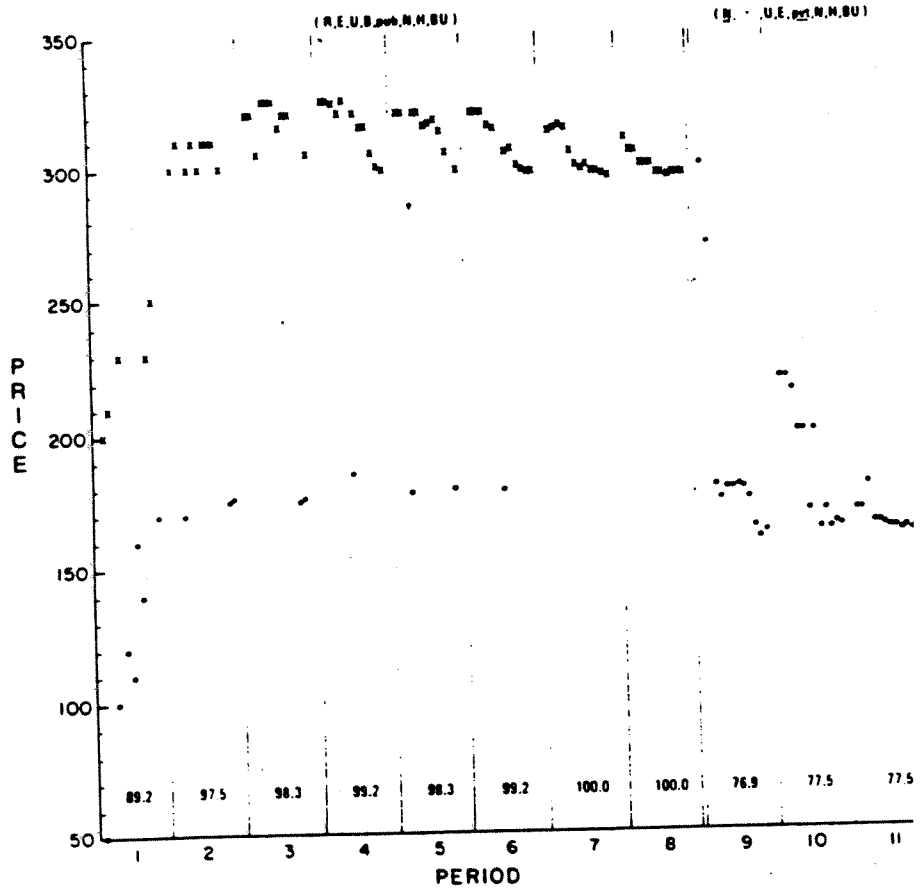

Figure 6: Experiment 5

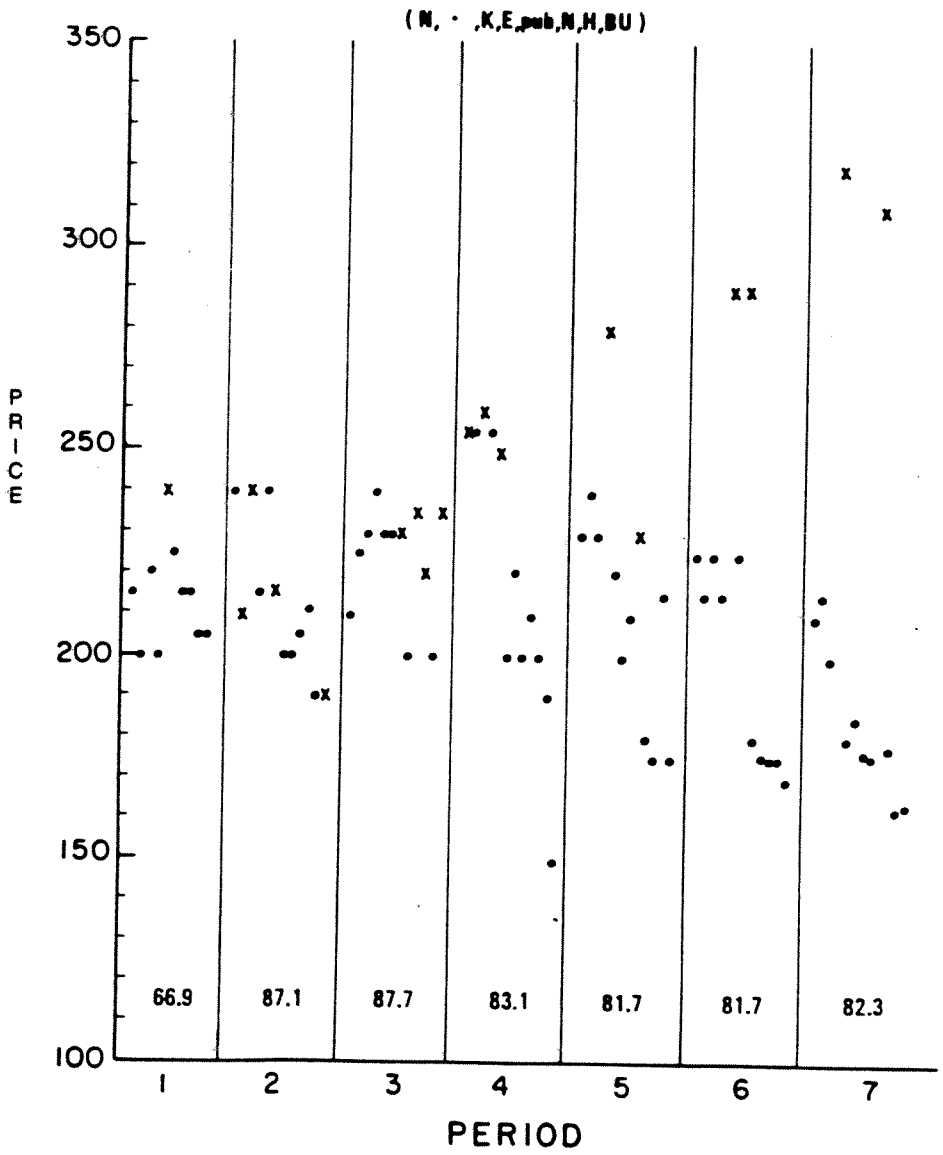

Figure 7: Experiment 6

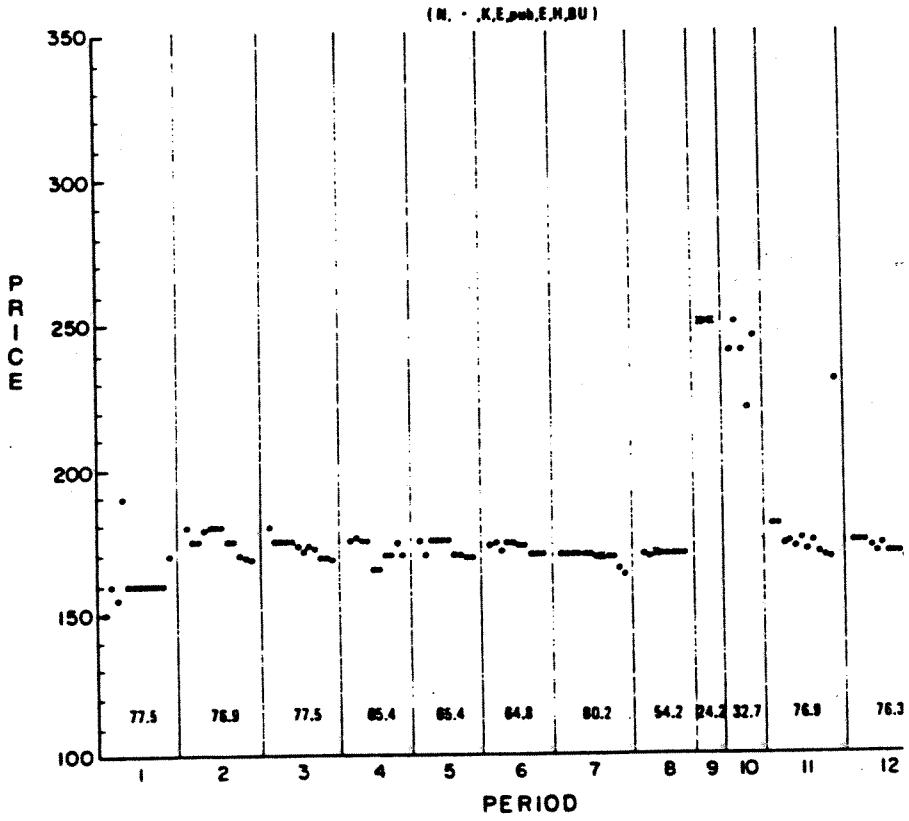

Figure 8: Experiment 7

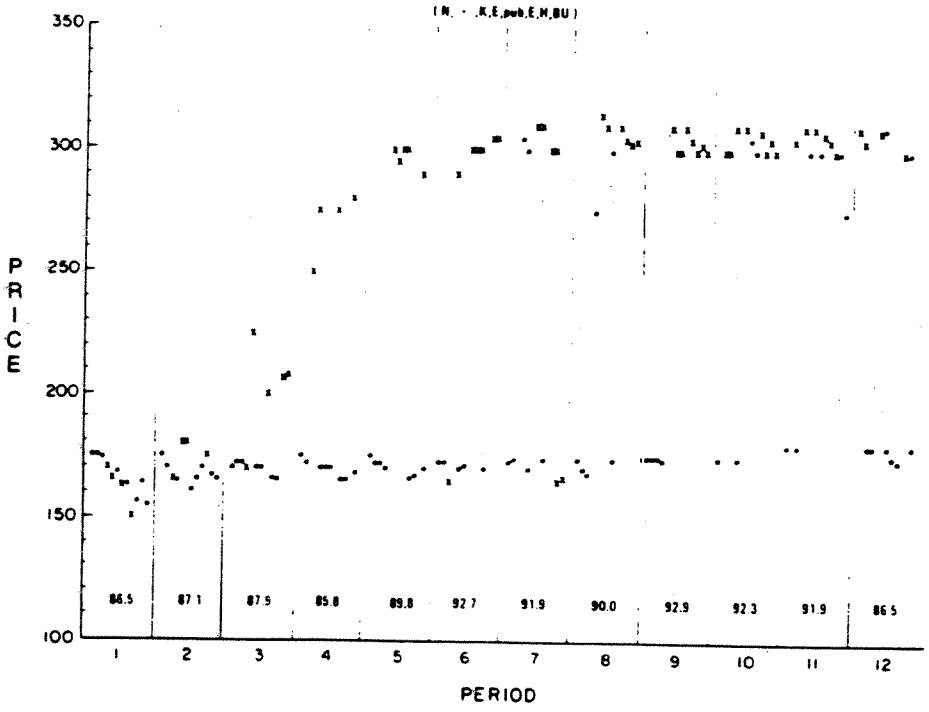

Figure 9: Experiment 8

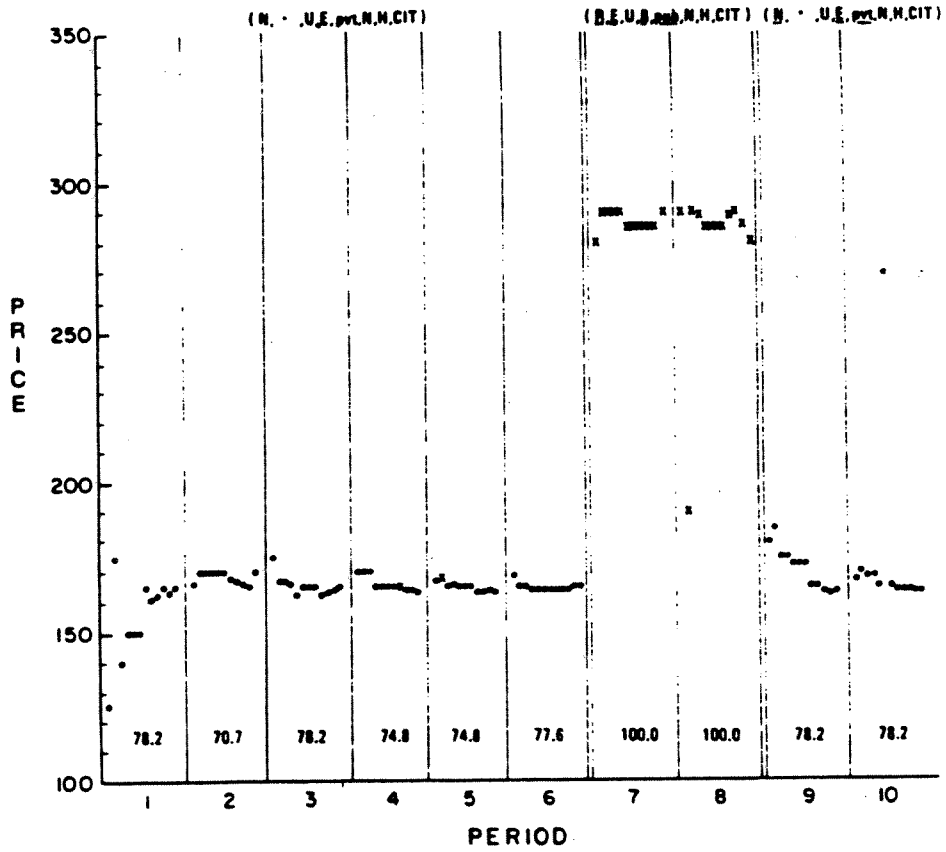

Figure 10: Experiment 9

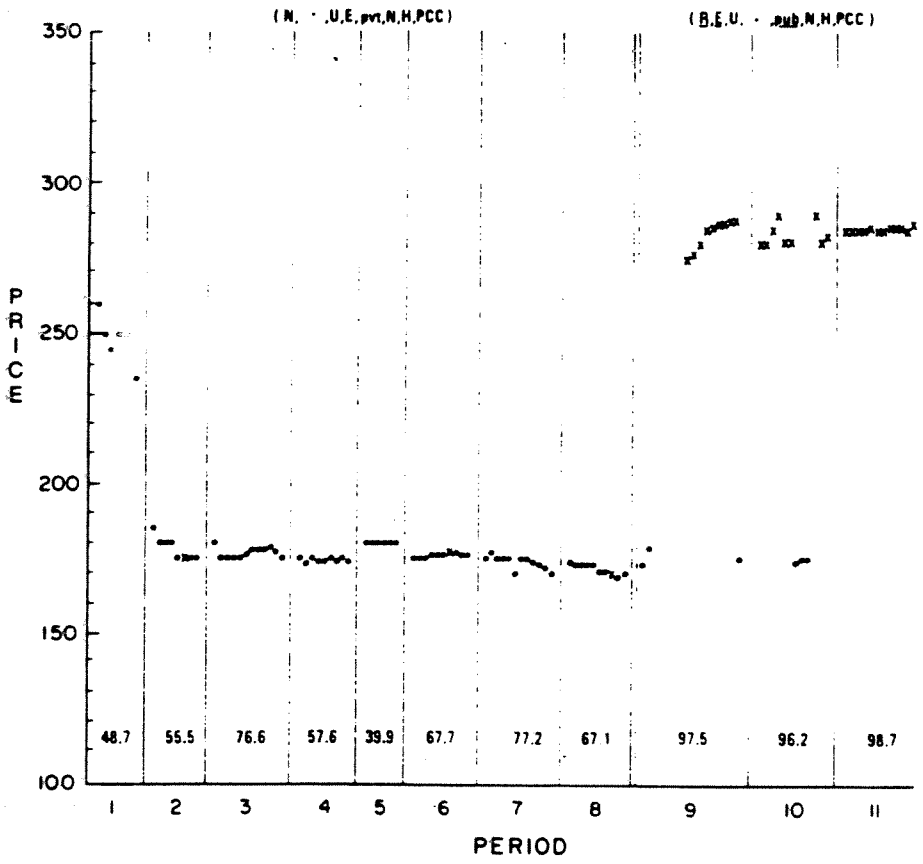

Figure 11: Experiment 10

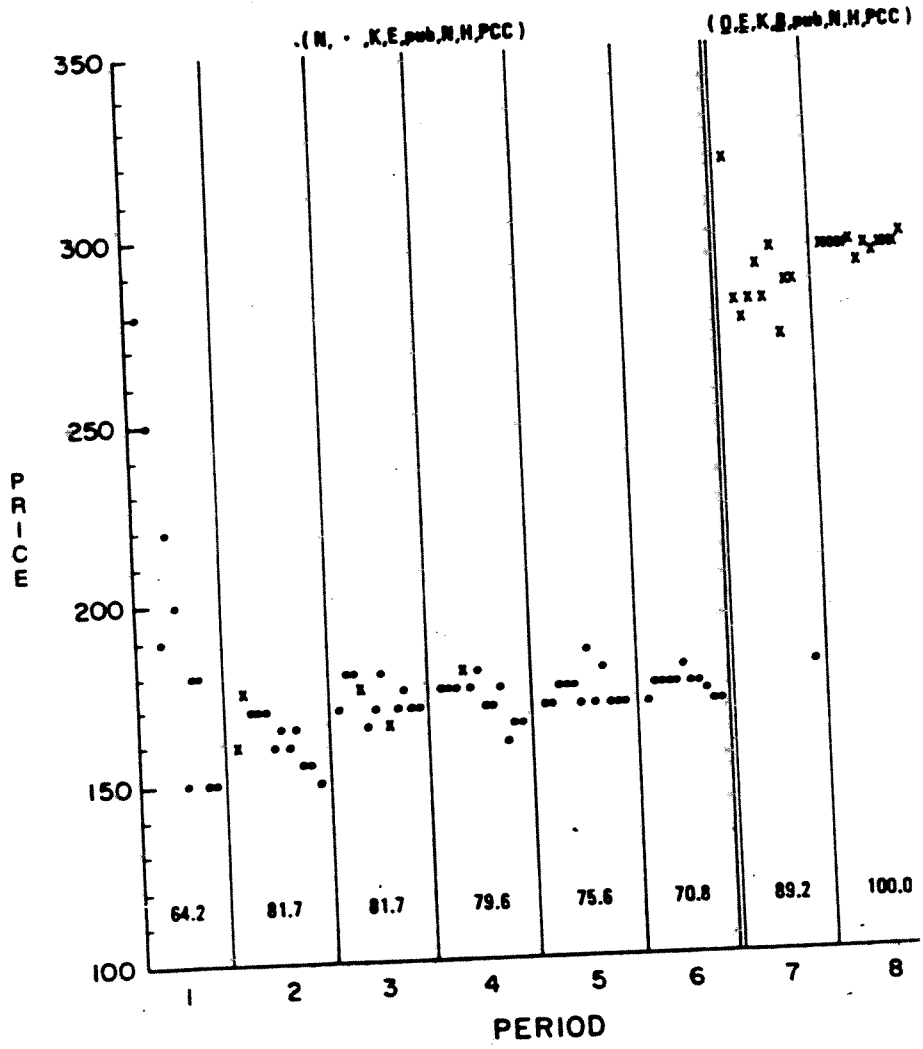

Figure 12: Experiment 11

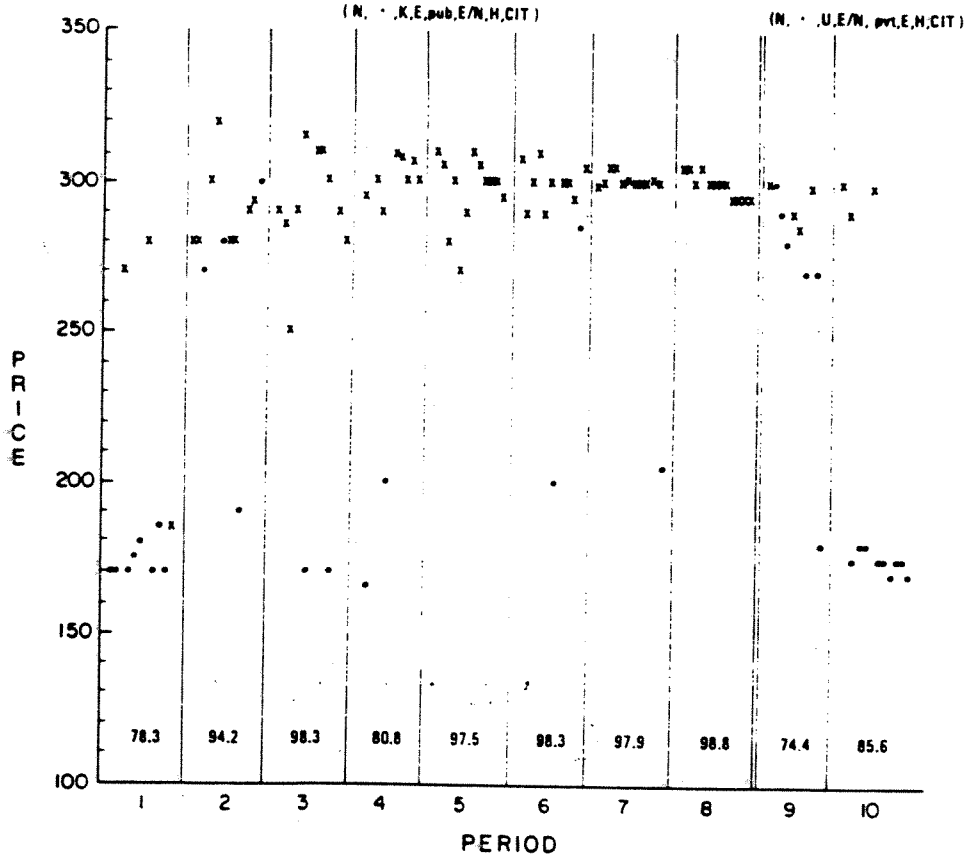

Figure 13: Experiment 12

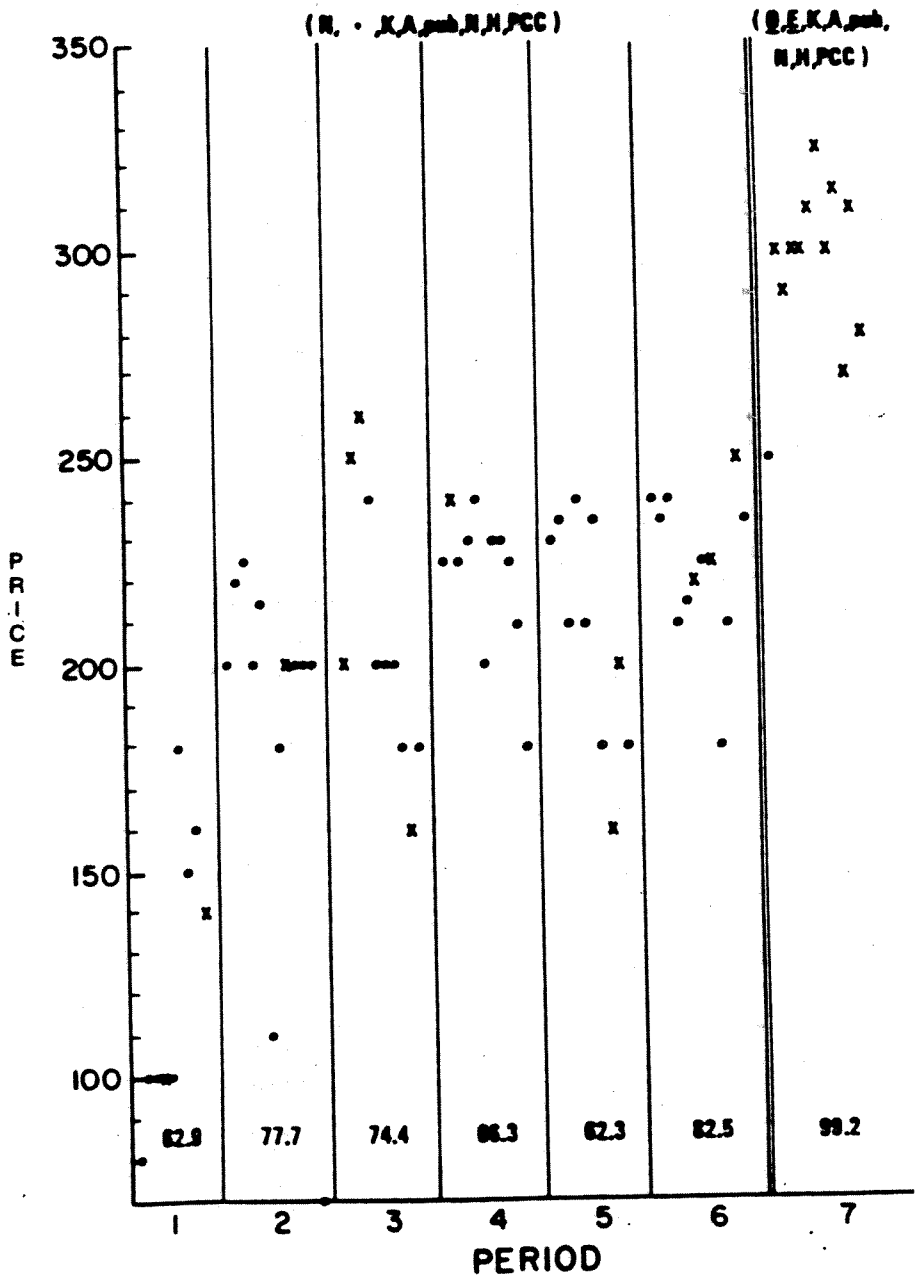

Figure 14: Experiment 13

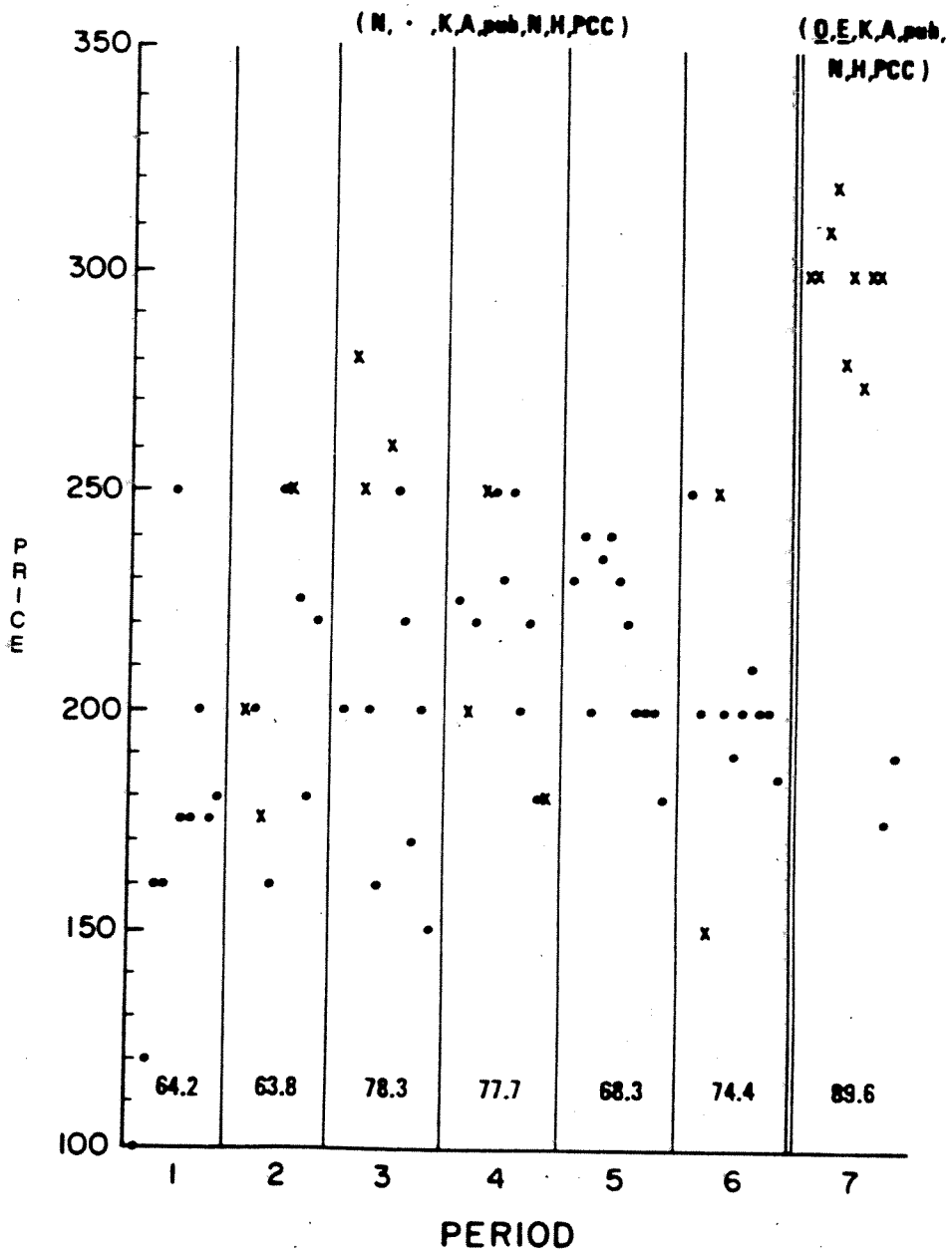

Figure 15: Experiment 14

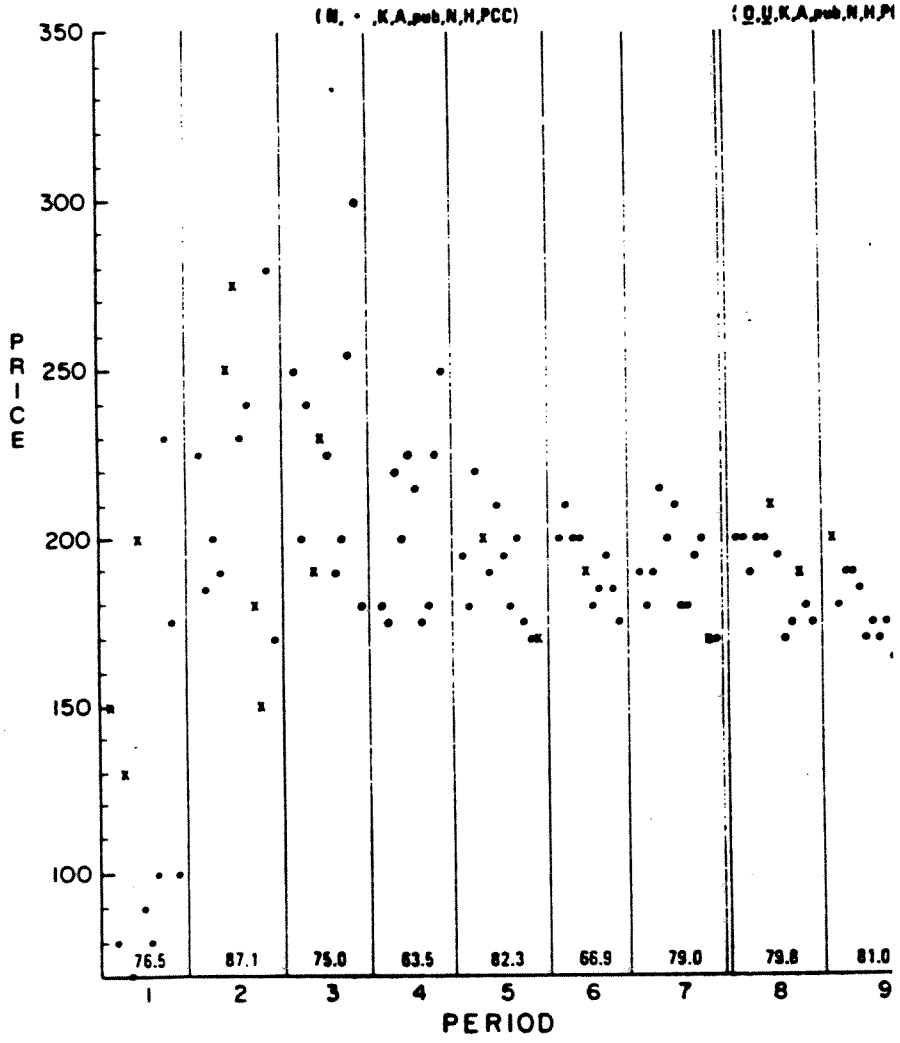

Figure 16: Experiment 15

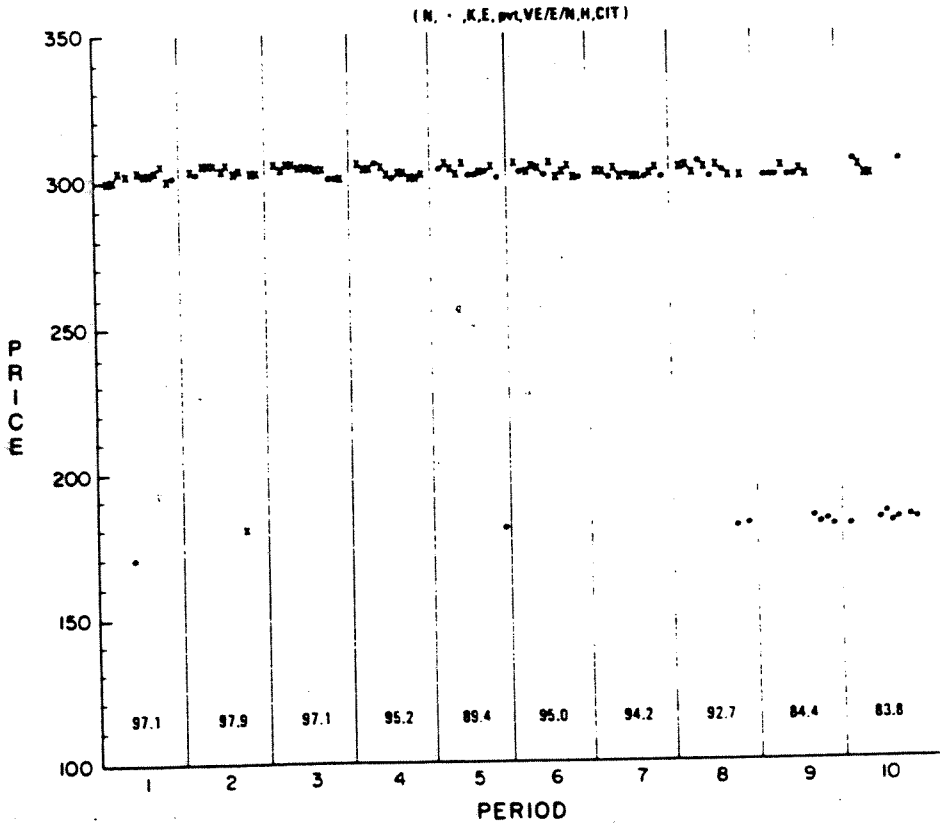

Figure 17: Experiment 16

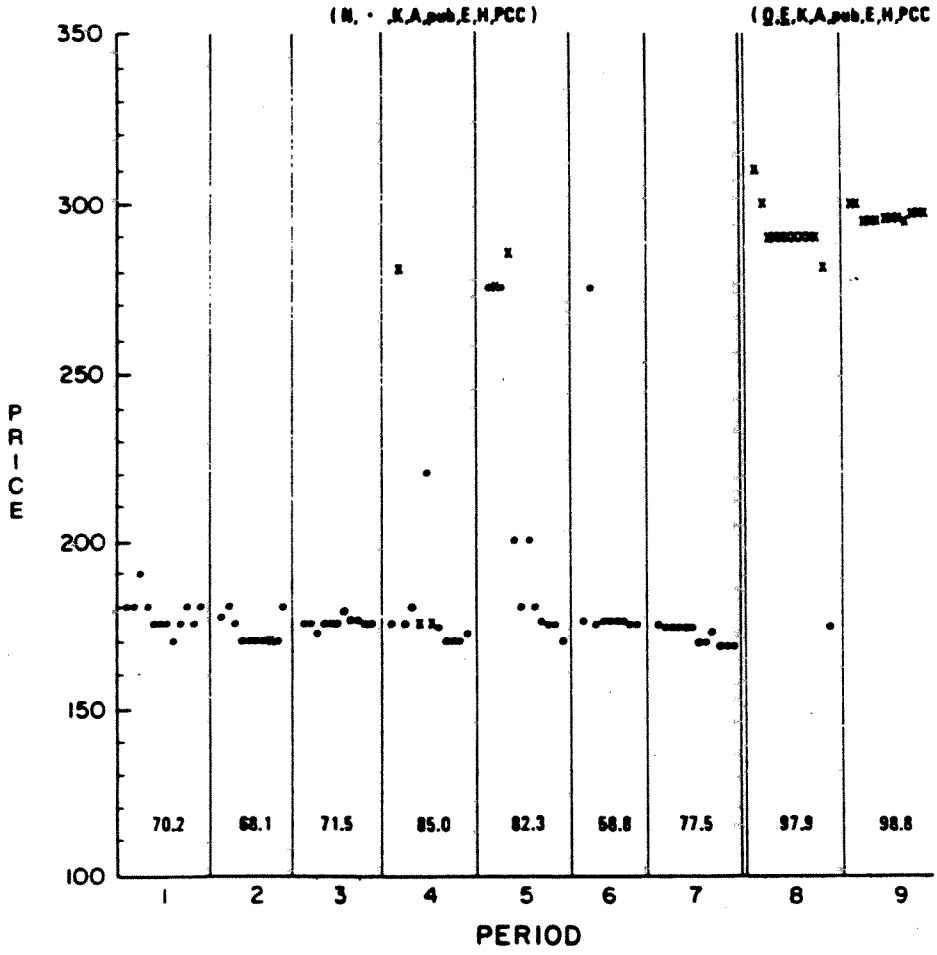

Figure 18: Experiment 17

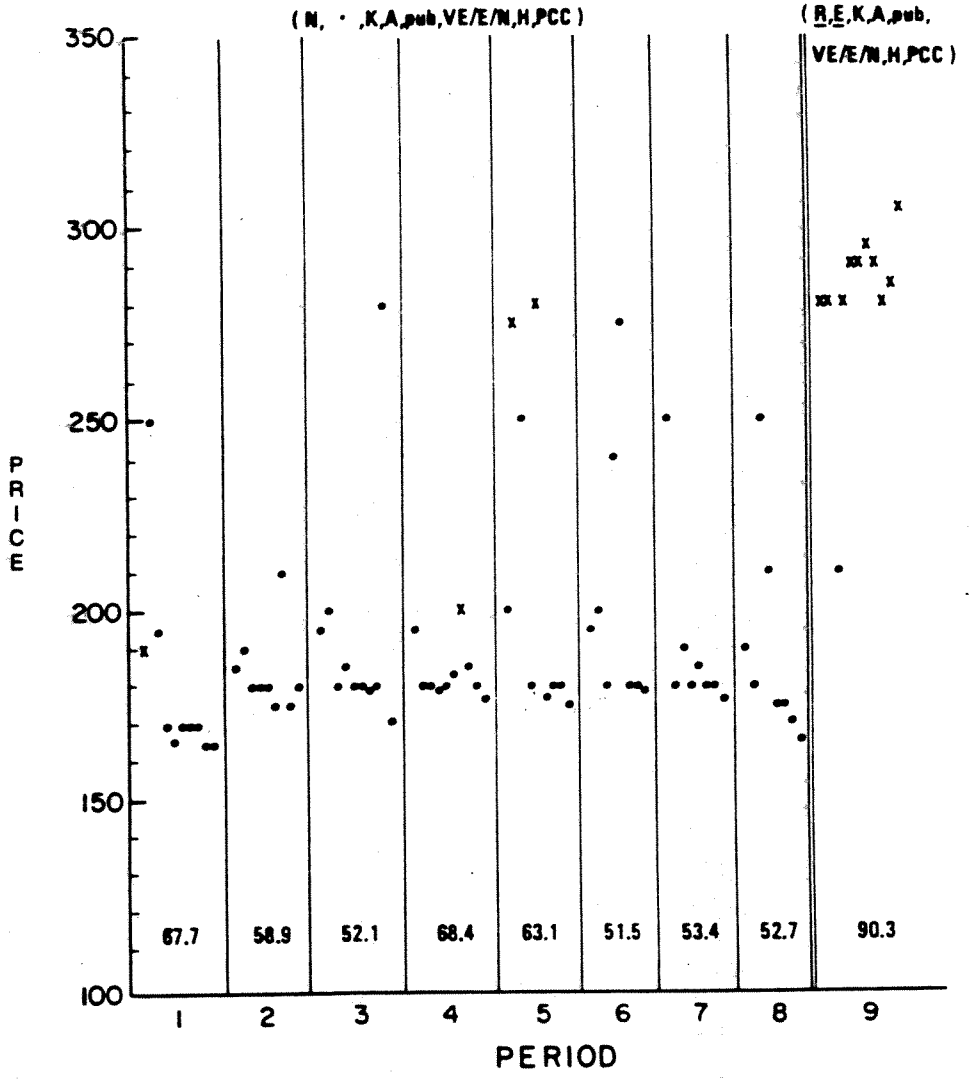

Figure 19: Experiment 18

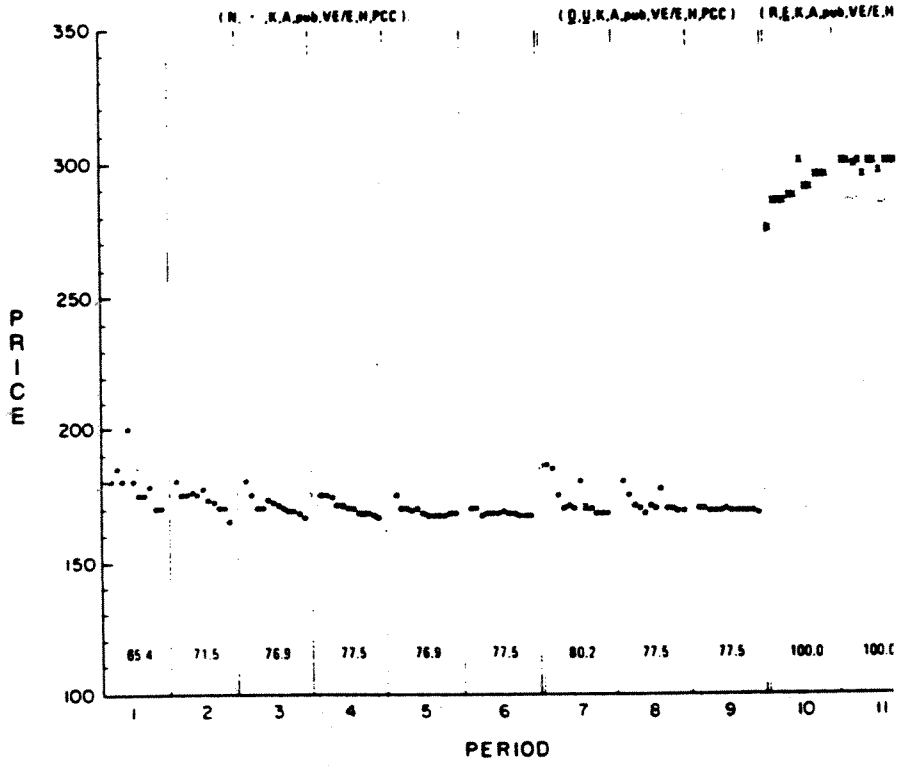

Figure 20: Experiment 19

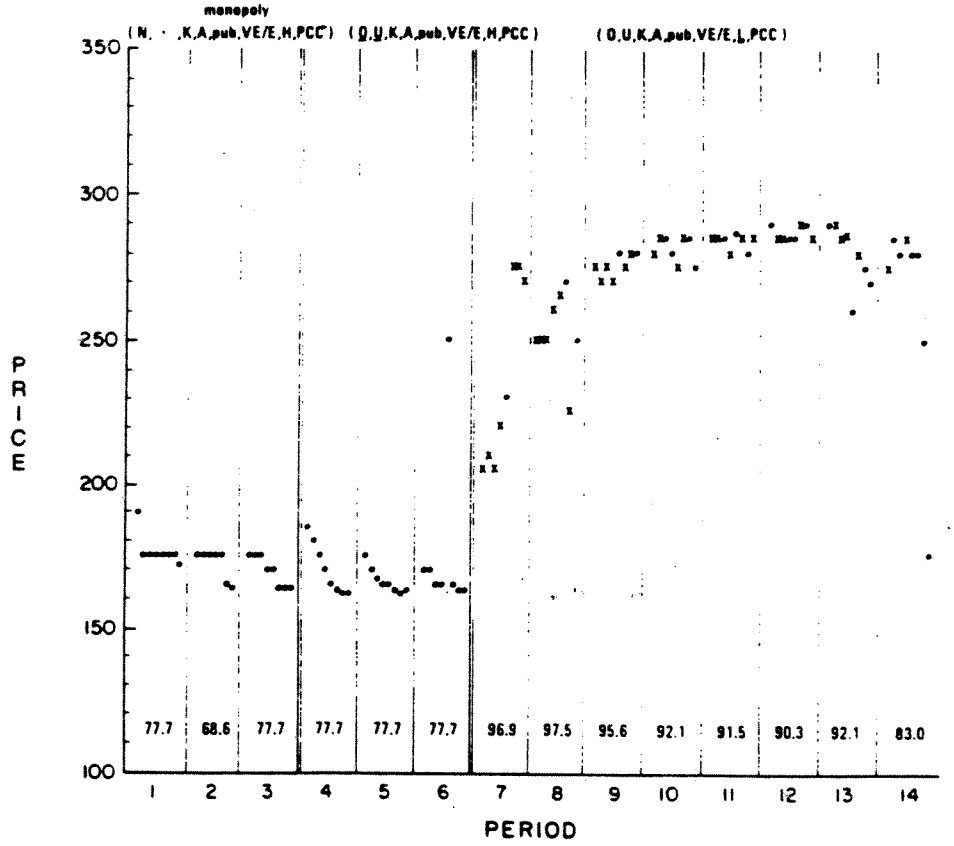

Figure 21: Experiment 20

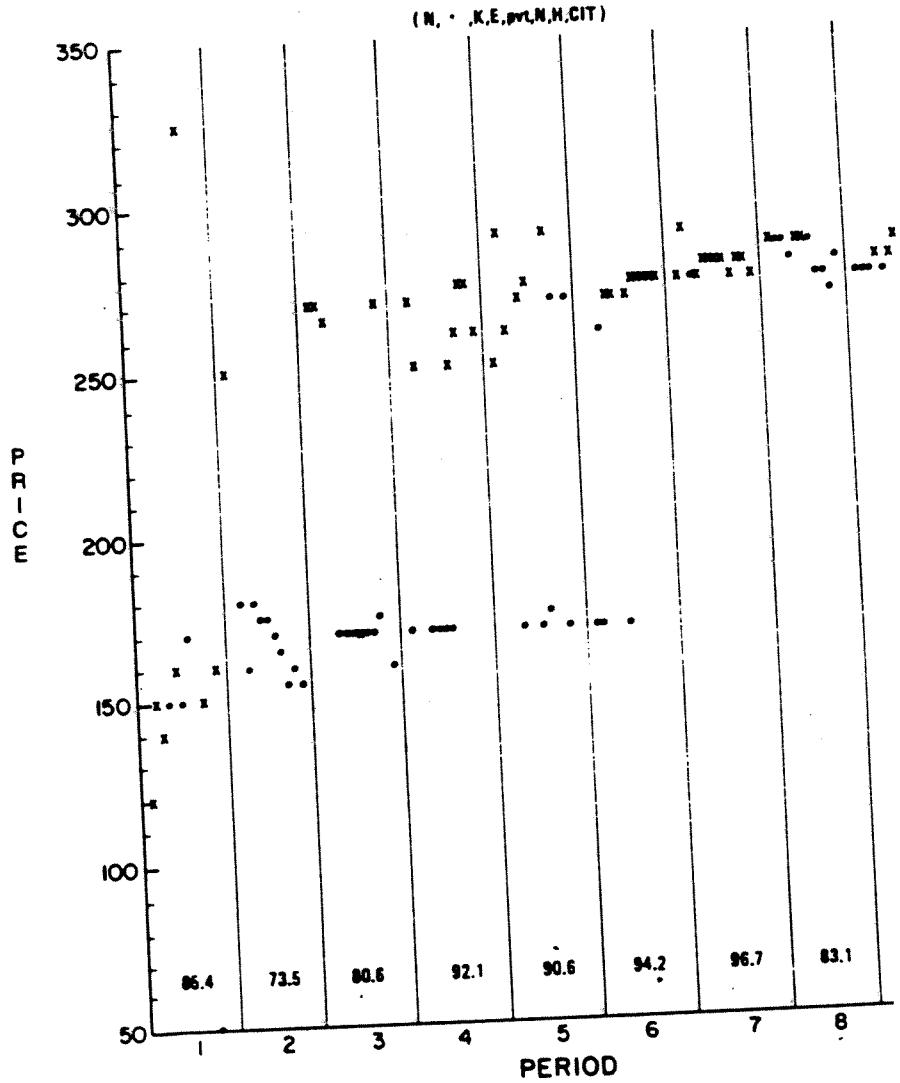

Figure 22: Experiment 21

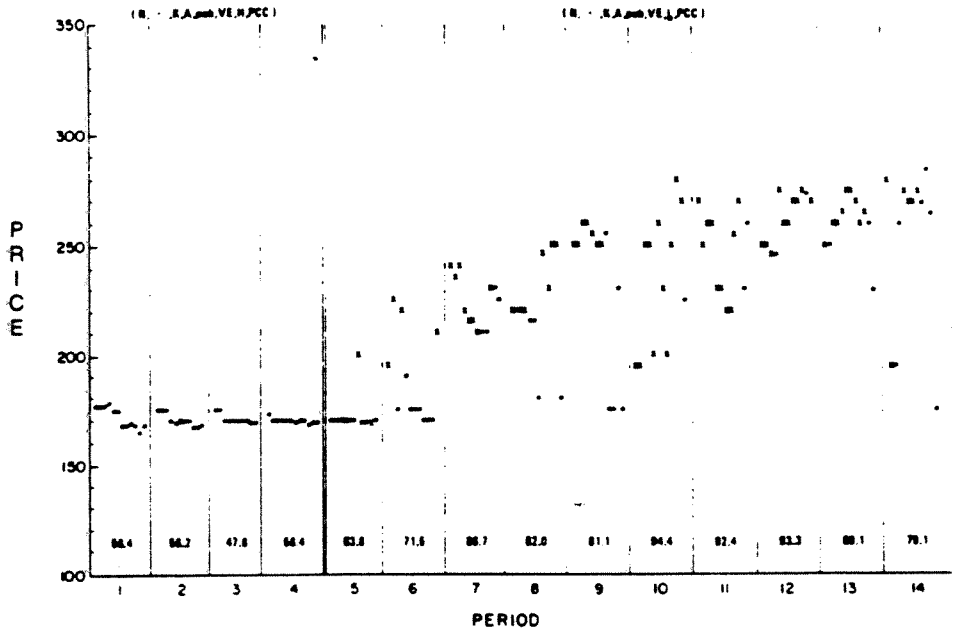

Table 2

EFFICIENCY IN MARKETS WHERE DISCLOSURES ARE PROHIBITED

	Seller ID Known			Seller ID Unknown		
	Experiment &Periods	School	Efficiency	Experiment &Periods	School	Efficiency
Buyers Have:						
Private Information Only	1:(7,8)	BU	78%	1:(1-6)	BU	71%
	15:(1-10)	CIT	93%	2:(1-7)	BU	77%
	20:(1-9)	CIT	87%	3:(7-9)	BU	77%
	Average	CIT	90%	4:(9-11)	BU	77%
	Average	All	89%	8:(1-6,9,10)	CIT	76%
				9:(1-8)	PCC	61%
				11:(9,10)	CIT	80%
				Average	BU	75%
				Average	CIT	77%
				Average	PCC	61%
					All	72%
Public Information	5:(1-7)	BU	82%	NOTE: An all Regulars "Lemons' Equilibrium is 78% of the Maximum Possible Surplus		
	6:(1-12)	BU	64%			
	7:(1-12)	BU	90%			
	10:(1-6)	PCC	76%			
	11:(1-8)	CIT	93%			
	12:(1-6)	PCC	71%			
	13:(1-6)	PCC	71%			
	14:(1-7)	PCC	76%			
	16:(1-7)	PCC	73%			
	17:(1-8)	PCC	58%			
	18:(1-6)	PCC	74%			
	19:(1-3)	PCC	75%			
	21:(1-4)	PCC	73%			
	21:(5-14)	PCC	83%			
	Average	BU	78%			
	Average	CIT	93%			
	Average*	PCC	71%			
	Average*	All	75%			

*Excludes 21:(5-14). periods with low cost supers. For these periods a "lemons equilibrium is only 56% of maximum surplus.

Table 3

EFFICIENCIES IN MARKETS WHERE TRUTHFUL DISCLOSURES ARE PERMITTED

Advertising (or Labeling or Warranty Provision)

Advertising (Labeling, or Warranty Provision)	Must Be Truthful					
	Seller Known			Seller Unknown		
	Experiments & Periods	School	Efficiency	Experiments & Periods	School	Efficiency
Is Required	17:(9)	PCC	90%	3(1-6)	BU	99%
	18:(10-11)	PCC	100%	4:(1-8)	BU	98%
				8:(7,8)	CIT	100%
				9:(9-11)	PCC	97%
	Average	All	97%		All	98%
Is Optional	10:(7,8)	PCC	95%	NOTE: An all Regulars "Lemons" Equilibrium is 78% efficient		
	12:(7)	PCC	99%			
	13:(7)	PCC	90%			
	16:(8,9)	PCC	98%			
	Average	All	96%	NOTE: Public Information in all periods.		

Table 4

EFFICIENCIES IN MARKETS WHERE DISCLOSURES ARE PERMITTED AND MAY BE FALSE

Advertising (or Labeling. Warranty Provision	Seller Known			Seller Unknown	
	Experiment & Periods	School	Efficiency	Experiment & Periods	School
Is Required	None			None	
Is OPTIONAL	14:(8,9)	PCC	80%	NONE	
	18:(7-9)	PCC	78%		
	19:(4-6)	PCC	78%		
	19:(7-14)	PCC	83%		
	Average*	All	79%		

*Average excludes 19:(7-14), *i.e.*, those periods where the cost of supers was reduced. For these periods the all regulars "lemons" equilibrium is only 56% of the maximum surplus.

The absolute levels of efficiency are "near" the predicted 100 percent by the second period of enforced warranties. More precisely, the levels are above 90 percent in seven of seven second periods and at 100 percent in three of the seven. By the second period of enforced warranties prices in all cases are within 10 francs of the price predicted by the full information model. Average efficiency for all periods was above 95%.

Conclusion 2. The lemons model works well when seller identification is unknown and disclosures are prohibited.

Argument. The relevant markets (periods) are shown in the right hand columns of Table 2. The lemons model predicts that only regular units will be sold. Of the 399 units sold in the periods in which seller identification was unknown and warranties were unenforced 384 (96 percent) were regulars. Efficiency predicted by the lemons model is approximately 78 percent in all markets. In the next to last periods of the sequences listed above, the efficiencies are within 1 percent (relative to full efficiency) of the lemons equilibrium efficiency. Average actual prices are within 5 francs of the prices predicted by the lemons model by the fourth period of all markets except market 9 where they are from 10-15 francs too high and only slowly converging. Average efficiency for all relevant periods was actually less than the lemons equilibrium at 72%.

Conclusion 3. The Grossman/signaling hypothesis that enforceable warranties will be voluntarily added to units (or that if disclosures must be truthful sellers will voluntarily make them) is supported in the data.

Argument. The relevant periods are shown in the lower left hand corner of Table 3. [24] Of the 72 offers in the relevant

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[24] Some ambiguity exists about whether or not warranties were optimal or were required in 17(9) and 18(10,11). Of the 43 offers in these periods, 37 indicated a Super, and of the 39 bids 36 requested a Super. All of the 34

periods, 53 indicated a Super, and of the 83 bids, 74 requested a Super. Of the 65 Supers sold, 64 were supported by an express warranty. Average efficiency is 96%, about the same as when disclosures are mandatory and truthful.

Conclusion 4. Sellers will nontruthfully advertise when it is possible. The "pooling" of regulars posing as supers phenomena predicted by the signaling models are observable when advertising need not be truthful (express warranties are not enforced).

Argument. The relevant periods are shown in the lower half of Table 4 in which advertising was optional but the implied express warranty was not enforceable. A total of 147 trades were made during these periods of which 105 were regulars and 42 were supers. A total of 61 of the regulars sold were falsely advertised as Supers (58 percent) with the other 44 advertised as Regulars or unadvertised. These misrepresentations are not random mistakes, because all of the 42 supers sold were also advertised as Supers. There were no "mistakes" at all.

Conclusion 5. Knowledge of seller indentification in the absence of truthful but voluntary disclosure:

i) does not guarantee efficiency improvements over the lemons' equilibrium, but in some markets such knowledge increased efficiency.

ii) can continue to have an influence if grade is only privately disclosed.

Argument. The relevant markets (periods) for part i are given in the left half of Table 2 and the lower left half of Table 4. The relevant periods of experiments 1, 6, 10, 12, 13, 14, 16, 17, 18, 19(1-6), 21(1-4) have efficiency level insignificantly above that of the lemons equilibrium. For th

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Super sales were supported by a warranty.

most part these efficiencies are close to the lemons model predictions, even though the price data suggest that buyers (especially inexperienced PCC buyers) are more optimistic than the lemons model suggests they would be. Experiment 5 is on the borderline but the relevant periods of 7, 11, 15, 19(7-14), 21(5-14) have efficiencies substantially above the lemons model values. In addition, these markets show evidence of improved efficiency over time. The data in parts of 15, 20, and 21 compare favorably with truthful disclosure markets.

Controlling for possible subject pool differences by comparing only experiments drawing from the same subject pool and in which seller identifications are known (for more than three periods) versus those in which they are unknown, the conclusion still emerges. Efficiencies in all but one of the nineteen periods of 5 and 7 are higher than the comparable experiments in the BU subject pool of 1 and 2. In the CIT pool, of the twenty-five periods of 11, 15, and 20 all but two are higher than the relevant periods of 8. Finally, in 11 efficiency goes down when seller I.D.'s are removed. The data in the PCC experiments are less clear unless the cost of Supers is lowered.

The relevant data for part ii come from the CIT markets 15 and 20 in comparison with 8 (upper half of Table 2). In all of these markets grade was only privately revealed. Efficiencies in all but two periods of 15 and 20 are higher than in all periods of 8. Average efficiency is about 90% for 15 and 20, compared to 76% for 8.

Conclusion 6. The signaling model works except where seller identification is known. Where seller identifications were known, the predictions of the model were less reliable and in some cases inaccurate relative to the full information model.

Argument. The signaling model predictions coincide with the full information model when warranties are enforceable and with the lemons model when warranties are not enforceable. Both predictions are supported. When warranties are optional

but enforced, the signaling model predicts they will be used.

The predictions of the signaling model remain the same when seller identifications are known. In fact, the signaling model is basically a static model and, unless it is reinterpreted to designate "reputation" as a "signal," predicts that the market will be insensitive to the revelation of seller identification. Conclusion 4 demonstrates that the model fails at this point.

Conclusion 7. Buyer reaction to "ripoffs" is not that postulated by either the strong or weak versions of the quality guaranteeing price model.

Argument. The reaction postulated by the model has buyers boycotting sellers who deliver Regulars at a price that is unprofitable for buyers. Buyers necessarily lose money on any purchase of a regular at a price of 180 or more. Consider all experiments where unenforceable warranties existed, seller identifications were known, and there was public revelation of grade. On 25 occasions sellers delivered a Regular at a price above 180 and were then able to make the very next sale at a price above 180. In 10 instances a seller sold a Regular to a buyer at a price above 180 and then sold to the same buyer within the next period at a price above 180 and without delivering a Super during the intervening time. The models predict that this will never occur.

Conclusion 8. A seller's demand depends not only upon his/her own "reputation" for delivering Supers, but also upon the market "reputation." The Shapiro model (1982a), if it is to be generalized to multiple firms, must be changed to add a "market reputation" term.

Argument. The following model was estimated.

$$P_{i,T} = C_1 + C_2 \cdot \sum_{t=1}^{T-1} (S_{.,T-t} \cdot A^{t-1}) + C_3 \sum_{t=1}^{T-1} (S_{.,T-t} \cdot B^{t-1})$$

$$S_{.,T-t} = \sum_{i=1}^{N} Si,t\text{-}t$$

$P_{i,T}$ = price received by seller i in period T

N = number of sellers

C_k, A, B = constants to be estimated

$S_{i,T-t}$ = number of Supers sold by seller i in period T - t so

$\sum_{t=1}^{T-1} (S_{i,T-t} \cdot A^{t-1})$ is *own reputation* = a weighted sum of all past Super sales by i.

$S_{.,T-t}$ = number of Supers sold in the entire market in the period T - t, so $\sum_{t=1}^{T-1} (S_{.,T-t} \cdot B^{t-1})$ is a *market reputation* = a weighted sum of all past Super sales.

The estimated coefficients are in Table 5. Data fro experiments 19 (monopoly) and 21 (low cost Supers) were n included. The conclusion stated above is supported by tl fact that six of the twelve experiments have a significant term.

Table 5

REGRESSION RESULTS

SELLER PRICE AS A FUNCTION OF OWN REPUTATION AND MARKET REPUTATION

EXP	C_1	C_2	A	C_3	B
5	215.16	13.16	0.958	-1.34	1.257
(N = 72)	(34.50)**	(4.62)**	(7.232)**	(1.45)	(4.503)**
6	170.15	5.44	0.101	26.01	0.220
(N = 106)	(109.23)*	(0.74)	(0.083)	(8.40)**	(2.955)
7	72.54	37.58	0.72	15.37	0.300
(N = 136)	(5.53)**	(6.22)**	(0.499)	(4.33)**	(2.278)
10	164.39	0.07	3.675	2.62	0.741
(N = 59)	(103.99)**	(0.13)	(0.383)	(3.42)**	(4.964)**
11	283.49	13.46	0.547	-3.75	-0.741
(N = 82)	(22.93)**	(2.46)**	(3.041)**	(1.78)	(0.173)
12	185.81	-1.85	1.314	3.34	1.093
(N = 55)	(13.66)**	(0.29)	(0.729)	(1.09)	(2.714)**
13	205.35	-7.48	-0.221	2.55	0.145
(N = 53)	(16.51)	(1.01)	(0.211)	(0.84)	(0.147)
14	186.97	-0.61	-1.318	5.37	0.205
(N = 67)	(13.74)**	(0.14)	(0.555)	(2.25)*	(0.482)
15	206.92	22.36	0.367	4.55	-0.200
(N = 108)	(11.71)**	(3.48)**	(2.190)*	(2.12)*	(-0.760)
16	177.87	23.17	-0.501	1.81	-0.023
(N = 66)	(28.57)**	(2.79)**	(1.185)	(0.75)	(0.012)
17	191.21	38.97	-0.200	-2.02	-0.600
(N = 62)	(47.70)**	(5.04)**	(0.955)	(0.63)	(0.501)
20	162.78	17.37	-0.054	3.79	0.728
(N = 94)	(10.82)**	(2.46)**	(0.132)	(1 65)	(3.346)**

Numbers in parentheses are t-statistics.

* significant at .95 level

** significant at .99 level

Conclusion 9. The markets where individual sellers prices are not influenced by either their own reputation for selling Supers or the market reputation for Super sales do not exhibit either lemons behavior or full information behavior. Furthermore, significant influence of individual seller's own reputation on own prices is not a sufficient condition for reputation-induced efficiency gains.

Argument. In markets 12 and 13 neither C_2 nor C_3 is significant. Market behavior is not captured well by either of the two models. Both experiments 16 and 17 exhibited sensitivity to individual reputations, but neither exhibited substantial efficiency gains.

The A and B parameters measure the "discount" rate over time -- whether past or most current Supers sales are most important. Those experiments for which A is small and C_2 significant suggest the importance is on the most recent individual behavior. Where B is small and C_3 is significant, the most recent market behavior seems to be the most important.

Conclusion 10. A reduction of buyer information about the grade deliveries of individual sellers from public information to private information decreases market efficiency.

Argument. Because of subject pool differences in market behavior, the only opportunity to reject the proposition occurred in the CIT experiments (left half of Table 2). Because efficiencies at both BU and PCC tended to be low, little opportunity existed for further efficiency losses. The public revelation of individual seller's decisions in market 11(1-8) at CIT produced efficiencies at near the 100 percent level. Efficiencies in experiment 11 (with public information and after period 4) dominate the efficiencies (after period 4) in both 15(1-10) and 20(1-9), where only private revelation of grade existed. The pattern of trades in the two private revelation markets is that suggested by the theory. Define a "ripoff" as a contract in which the price indicates that the (risk neutral) buyer was at least 90 percent confident tha

the unit would be a Super (270F), but a regular was delivered. In this case a Regular is delivered at a price of 270 francs or more. In market 11 a total of four ripoffs occurred while twenty-eight and fifteen ripoffs occurred in markets 15 and 20 respectively. While no tests are provided, both prices and efficiencies appear to be drifting downward in 15 and 20 and upward in 11.

Conclusion 11. A subject pool difference exists and subject experience makes a difference in market behavior.

Argument. The best example is between CIT 11 and PCC 16 and 17. These experiments had experienced participants, yet the market behavior of the PCC group is lemons, while the behavior of CIT is full information. Again an interesting comparison exists between the inexperienced PCC participants of 12, 13, and 14, which is difficult to describe in terms other than overly optimistic buyers, with the behavior of 20, which used inexperienced CIT participants. Notice, however, that with some institutional arrangements, such as markets with unknown sellers and markets in which express warranties were enforced, the differences between subject pools is almost nonexistent.

Experience seems to be important in the PCC subject pool when seller identifications are known, and enforced warranties are absent. Compare 12, 13, and 14 with 16, 17, 18, 21. The purchases that can be characterized as made by overly optimistic buyers substantially disappear with experience. In brief, the models seem to work better as participant experience increases.

Conclusion 12. The time of revelation, whether revelation was made at the end of the period or immediately after the sale, made no difference.

Argument. Markets 5(BU) and 10(PCC) had inexperienced subjects and the revelation came at the end of a period. Markets 12(PCC), 13(PCC), 14(PCC) had inexperienced subjects and the revelation was made immediately after a sale. Market efficiencies are indistinguishable.

Experienced participants in 6(BU), 7(BU) with revelation at the end of the period can be compared to participants in 16(PCC), 17(PCC), 18(PCC) and 21(PCC) when revelation was made immediately after sale. Market 7 with the credence property had the highest efficiencies. The others are indistinguishable.

Conclusion 13. A reduction in the relative cost of Supers switched market behavior from that of the lemons model to that of the full information model.

Argument. On two occasions the relative cost of Supers was lowered, markets 19(7-14) and 21(5-14). Prior to the lowering of cost the markets were essentially at a lemons equilibrium. After the cost was lowered the number of Supers delivered increased significantly as did efficiencies and prices.

Conclusion 14. Aside from a possible small increase in price at first, nontruthful advertising had no effect on average price.

Argument. Two of the three cases, in which warranties were optional but unenforced, experienced a slight upward movement in price at first, 18(7), 19(4), but prices then returned to previous levels. The third case, 14(8) experienced no upward movement at all.

CHAPTER V

SUMMARY AND INTERPRETATION OF RESULTS

The lemons phenomena can occur (conclusion 2). We are aware of no other clear documentation of its existence. Markets will not necessarily allocate information to the agent that values it most. Informational failure in a market can be observed. Of course this result alone says nothing at all about the likelihood of informational failure in naturally occurring markets. The result is important because it demonstrates that the tools and theories used to analyze naturally occurring markets were not rejected when put to an important test.

With the existence of the lemons problem documented, the analysis turns to an examination of the conditions that generate it. The lemons phenomena do not automatically go away when firms have an incentive and opportunity to establish a reputation for good quality (conclusion 5). Reputation and brand names are not sufficient devices to guarantee efficient market operation even in the case of experience goods and repeat purchases.

Several factors can operate to frustrate the competitive development of reputations. First, the cost of developing a reputation is evident in several markets. Supers must sell at regular prices in sufficient quantity to attract buyers' attention and develop their confidence in the seller's reliability. Of course, this can generate substantial temporary losses. The problem can occur because the market price response must be sufficiently rapid to reward sellers who adopt a strategy of delivering high-grade units, and this price response is not well understood. In fact, the positive responsiveness axiom that states that super deliveries will be rewarded by higher prices or increased demand is not always reliable. This axiom is at the heart of many models as in Klein and Leffler (1981), Nelson (1974), Peltzman (1981), Schmalensee (1978), Shapiro (1980, 1982a&b, 1983).

Buyers might not even respond positively to high-grade deliveries (conclusion 9). Instead of understanding seller motivations or believing that sellers have an interest in reputation development, buyers might regard sellers as being totally random or buyers might even avoid sellers who deliver Supers on the belief that the sellers were attempting to trap the buyer or lure the buyer into paying a high price and then delivering a regular. While we cannot actually document the existence of such extreme buyer skepticism, some of the markets seemed to have that characteristic (i.e., markets 12, 13, 14), and in some cases it might even be justified. In summary, buyer reactions to poor quality deliveries are not as uniformly predictable or as punishing and rewarding as presupposed by some dynamic models such as the quality guaranteeing price model of Klein and Leffler (conclusion 7).

How a policy might alter belief and learning processes or even buyer reactions to seller strategies is an open question. Marketing programs or regulatory policies that "properly frame" the problem that buyers face might be important. Conceivably the very existence of some sort of regulation, even if unenforced, is a type of public information that might foster buyer confidence in seller intentions and also foster seller beliefs about buyer reactions to "ripoffs." With such changed beliefs the market would possibly provide the proper rewards for quality such that further regulation would be unnecessary. Because the participants have incomplete information, multiple equilibria might exist, and the existence of multiple equilibria might be the source of confirming results. A publicly stated regulation might serve as a focal point that coordinates actions toward one of the equilibria. At this point theory provides very few hints and the issue is appropriate for more experimentation.

Buyer confidence and learning is just part of the reputation cost problem. The confidence must be translated into price increases. Once buyers recognize a seller who reliably delivers Supers, the price of that seller's units must adjust sufficiently rapidly to reduce the reputation cost Data from experiments (Plott, 1982) leads one to suspect that

this price adjustment property is sensitive to market organizational features independent of any learning properties of buyers. The cost of reputation development depends upon the speed of price adjustment in response to changed buyer beliefs. Price adjustment speed appears to be related to market organization. Therefore reputation costs and the resulting evolution of quality products might be sensitive to market organization. Thus, empirical reasons exist for economists to have some interest in market organization, in addition to the theoretical propositions about the relationship between quality and market organization developed by Wilson (1980).

A second factor that can prevent reputation development from guaranteeing market efficiency is a type of externality that seems to exist in some markets. Individual seller success can be related to a market reputation for delivering Supers as well as to the individual seller's own reputation (conclusion 8). The externality can work negatively in two ways. First, individual sellers have an incentive to free ride on the reputations and markets developed by others. After one or two sellers have incurred the cost of reputation development and are successfully selling supers at a high price, an entrant can coat-tail on their reputations. Buyers will test units of entrants priced just below the price at which Supers are being sold (price is a signal) and if the entrant delivers Supers, its reputation is almost costlessly established. The free rider aspect can dampen the development of reputations and the resulting market efficiency.

The externality also can work negatively on a seller who has an established reputation. If other sellers decide to destroy their reputation by dumping regulars and thereby make a profit on the ripoffs, buyer reaction can be negative toward all firms. Even sellers that continue to deliver Supers can experience a drop in demand as buyers appear to become suspicious of all firms. This negative externality can depress the returns from reputation development. Whether or not alternative market organization, public announcements, or

regulations can effectively promote the development of quality by reducing such externalities awaits further study.

A third potential problem is structural and derives from the problems discussed above. If quality improvements can be achieved only by large and discrete increases in cost, markets might equilibrate at local equilibria that have the lemons property. The large discrete increases in cost mean that the cost of quality improvements can be covered only by large changes in price. Either the buyer must be willing to take a risk and pay a premium in hope that the seller will deliver a Super or the seller must incur large losses by selling Supers at regular prices in order to build buyer confidence. Risk aversion on both sides will make reputation development and the resulting high quality difficult. In markets in which the relative cost of Supers is lowered, the instances of super sales and resulting reputation-like behavior in the market becomes much more pronounced (conclusion 13).

A final problem also derives from the fact that multiple markets are involved. If buyers are optimistic and bid prices high even in the face of many regular deliveries, sellers have no incentive to develop a reputation for delivering Supers. The difference between the going prices of units that are being delivered as Regulars and the maximum value that one might get from a Super is not enough to cover the cost differential (see markets 12, 13). Before a reputation is worthwhile, buyer optimism must be dampened and the prices must fall to a point that makes reputation development profitable. Complete market quality deterioration, all lemons, might be a necessary condition for automatic market recovery. Commentators with a taste for paradoxical statements could say that things cannot get better until they get worse; or regulation is needed least when market performance is at its worst.

Market reputation development may be difficult in some circumstances, but it is certainly not impossible. In some of the markets, knowledge of seller identification alone (brand names) was sufficient to guarantee behavior consistent

with the full information model (conclusions 5 and 13). This opens a possible role for third party actions that facilitate such reputation development. Reputation development is clearly a tool, but we do not know its exact limitations. Voluntary enforced warranties also will induce the market behavior that is captured by the full information model (conclusion 1). Markets that are otherwise behaving in a confusing and inefficient manner recover almost immediately when enforced warranties are introduced. The power of the instrument in fostering market efficiency is remarkable.

Legal instruments or practices that have the effect of a costlessly enforced warranty will be voluntarily offered by sellers. Such warranties, if they exist, will also be voluntarily demanded by buyers (conclusion 3). Such instruments require that any disclosures made are truthful. Competition, in turn, forces disclosures. The data in these experiments suggest that the Grossman/signaling models that predict the voluntary use of such instruments (when their availability is publicly known) are reliable in this respect as models of warranty-like instruments. We are thus not too far from an understanding of the process through which the warranty-like instruments have an effect on markets. Further support for this type of theory has substantial ramifications for regulatory policy because a direct implication of the theory, when applied to experience goods as opposed to credence goods, is that mandatory disclosure is unnecessary.

Markets need not be characterized by either the full information model or the lemons model. The reasons for such confusing behavior are not understood. Of course one can speculate that it reflects a lack of sophistication on the part of market participants or a lack of experience, or a number of things idiosyncratic to the population (conclusion 11). The problem could be due to the existence of multiple Bayes equilibria as was mentioned above. These are just speculations that call for more detailed investigation. Precisely because the behavior of such markets is not understood, it is necessary for policy analysts to know when standard principles can only be applied with substantial

precautions. Markets that behave in understood patterns ar characterized by either private reputation formation o market reputation formation or both (conclusion 9).

Our final observation is related to advertising. Fals advertising exists in our markets (conclusion 4) even whe buyers quickly and easily detect the deception. Thus polic analyses (Posner 1973, 1979) or models (Nelson 1970, 1974 that imply that false advertising cannot be sustained or wil be beneficial are not supported by our results. We hasten t add that conditions relied upon by Nelson were not presen in our markets and invites further experimentation.[2] Though false advertising occurred and the effects were nc beneficial, the effects (for experience goods) are not a deleterious as presupposed by some advocates of advertisin regulations. People are not misled. They simply dismiss al sellers' claims so that advertising fails to provide effectiv information which could enhance efficiency. This last findin may provide some insight into the advertising industry strongly voiced support for the FTC's advertisin substantiation program. [26]

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[25] The conditions are that advertising is costly a sellers can increase market share.

[26] See Advertising Age, November 1, 1980, p. Television/Radio Age, November 29, 1982, p. 35.

APPENDIX I

EXPERIMENT INSTRUCTIONS

GENERAL

This is an experiment in the economics of market decision making. Various research foundations have provided funds for this research. The instructions are simple and if you follow them carefully and make good decisions you might earn a considerable amount of money, which will be paid to you in cash at the end of the experiment.

In this experiment we are going to conduct a market in which some of you will be buyers and some of you will be sellers in a sequence of market days or trading periods. Attached to the instructions you will find some sheets, labeled Buyer of Seller, which describe the value to you of any decisions you might make. You are not to reveal this information to anyone. It is your own private information.

The type of currency used in this market is francs. All trading and earnings will be in terms of francs. Each franc is worth_____dollars to you. Do not reveal this number to anyone. At the end of the experiment your francs will be converted to dollars at this rate, and you will be paid in dollars. Notice that the more francs you earn, the more dollars you earn.

SPECIFIC INSTRUCTIONS TO BUYERS

During each market period you are free to purchase from any seller or sellers an many units as you might want. The value of a unit depends upon its grade. There are two grades (Regular and Super) and the value of a Super is much greater than the value of a Regular. At the time you buy a unit you will not know the grade but (at the end of a

trading period) (after the purchase) you will be told the grade of each unit you bought.

The attached information and record sheet will help you determine the value to you of any decision you make. Page_____ of your information and record sheets contains two schedules. The schedule in the left column identifies the redemption values of Regulars and the schedule in the right hand column contains the redemption values for the Supers. The redemption value of the first Regular you purchase is in the row marked First Units and the column marked Regular. The redemption value of the first Super you purchase is found on the same row only, under the column marked Supers. The redemption value of second units are found in the second row, etc. The profits from each purchase (which are yours to keep) are computed by taking the difference between the redemption value and the purchase price of the unit bought. That is,

your earnings = (redemption value) - purchase price.

In addition to these earnings you will receive a capital payment of _____francs each period.

Suppose, for example, the redemption value for your first Regular is 1000 and the redemption value for your first Super is 4000. If you buy two units at 1200 and one is a Regular and one is a Super your profits are

1000 - 1200 = -200
4000 - 1200 = 2800

TOTAL 2600

Turn now to the second page of the information and record sheet. The purchase price of the first unit you purchase should be listed in row two for the first unit purchased. The purchase price of the second unit should be listed in row 2 of the second unit, etc. When the grades of units become known you should enter the redemption values in rows 1 for each unit. If, for example, your first unit purchased is a Super and if your second purchase is a

Regular, you record the redemption value for the first Regular because even though the unit is the second purchase it is only your first Regular. Profits at the end of the period should be recorded at the bottom of the page.

SPECIFIC INSTRUCTIONS TO SELLERS

During each market period you may sell to any buyer or buyers as many as_____units. There are two types of units, Supers and Regulars. Each Super will cost you_____and each Regular will cost_____. Notice that the cost of Supers is more than the cost of Regulars. The profits or losses on each sale (which are yours to keep) are computed by taking the difference between the price at which you sold the unit and its cost.

Your total profits for a market period are computer by adding the profits or losses on each sale during the period. The attached record sheet will help you keep track of your profits or losses. Enter the price of the first unit you sell in the appropriate column (Super or Regular) in row 1 at the time of sale. Then record the profit or loss as directed in row 3. The sale price of the second unit should be listed in the appropriate Super or Regular column in row 4. Profits should be similarly calculated and the total for the period recorded in row 16. All profits over_____are yours to keep.

MARKET ORGANIZATION

The market for this commodity is organized as follows. The market will be conducted in a series of trading periods. Each period lasts for at most_____minutes. Any buyer is free at any time during the period to make a bid to buy the commodity at a specified price, and any seller with units to sell is free to accept or not accept the bid. Likewise, anyone wishing to sell a unit is free to make an offer to sell one unit at a specific price. All bids and offers are entered on the blackboard and remain there until accepted or

canceled. If a bid or offer is accepted, a binding contract has been closed for a single unit at the specified price and the contracting parties will record the contract price. Any ties in bids or acceptances will be resolved by random choice. Except for the bids and their acceptance or cancellation you are not to speak to any other subject. There are likely to be many bids that are not accepted, but you are free to keep trying. You are free to make as much profit as you can.

Trading period 0 will be a trial period to familiarize you with the procedure, and will not count toward your cash earnings.

FINAL OBSERVATIONS

1. (At the end of the period) (After each sale) sellers indicate to the experimenter those trades that involved Regulars and those that involved Supers. This information will be transmitted to the buyers who participated in those transactions. Buyers can then calculate their profits.

2. Each individual has a large folder. All papers instructions, records, etc, should be put into this folder Leave the folder with us before leaving. Take nothing home with you.

3. We are able to advise you a little on making money. First, you should remember that pennies add up Over many trades and a long period of time very small amounts earned on individual trades can add up to a great deal of money. Secondly, you should not expect your earnings to be steady. you will have some good periods and some bad periods. During bad times try not to become frustrate. Just stay in there and keep trying to earn what you can. It all adds up in the end.

Some people rush to trade. Other find it advantageous to "shop" or spread their trading over the period. We are

unaware of any particular "best" strategies and suggest that you adapt accordingly.

4. Under no circumstances may you mention anything about activities which might involve you and other participants after the experiment (i.e., no physical threats, deals to split up afterwards, or leading questions).

5. Each individual will be paid in private. Your earnings are strictly your own business.

6. Buyers tender bids verbally by indicating in sequence "(buyer number) BIDS (amount)."

7. Seller tender offers verbally by indicating in sequence "(seller number) OFFERS (amount)."

8. Each trade in a period will be numbered. (At the end of the period) (After each sale) each seller will (submit a slip of paper) (hold up a card) for each trade specifying a Super or a Regular. The seller is free to determine the grade of the units he sells and may mix grades within or between periods.

Trader No._____

R S

Buyer_____ Seller_____

INFORMATION AND RECORD SHEET

RECORD SHEET FOR SELLER NO.____

Unit Sold			Market Period 1 Super	1 Regular	2 Super	2 Regular	...	10 Super	10 Regular
1st	1	sales price							
	2	cost							
	3	profit/loss (row 1-row 2)							
2nd	4	sales price							
	5	cost							
	6	profit/loss (row 4-row 5)							
		. . .							
	13	total profit/ loss per item							
	14	total profit/ loss							
	15	deduction per period							
	16	net profit							

INFORMATION AND RECORD SHEET

RECORD SHEET FOR BUYER NO._____

Unit Purchased			Market Period							
			1	2	3	4	5		17	18
1st	1	redemption value								
	2	purchase price								
	3	profit/loss (row 1 - row 2)								
2nd	1	redemption value								
	2	purchase price								
	3	profit/loss (row 1 - row 2)								
5th	1	redemption value								
	2	purchase price								
	3	profit/loss (row 1 - row 2)								
	1	period profit								
	2	capital payment								
	3	total								

Name_____ Soc. Sec. No._____ Total Payment_____

Address_____

INFORMATION AND RECORD SHEET

	Regular	Super
1st units redemption value		
2nd units redemption value		
3rd units redemption value		
. . .	.	.
8th units redemption value		
Capital payment per period_____		

APPENDIX II

Transactions Data for 21 Experiments

EXPERIMENT 1

Subject Pool: Boston University
Brand Names: Yes 1-6. No 7,8
Advertising: Prohibited

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1				PERIOD 4		
5	0	300	14	4	0	170	12
3	0	300	13	1	0	175	16
6	0	301	16	5	0	165	13
6	0	301	15	3	0	165	15
1	0	270	13	1	0	165	16
1	0	250	14	3	0	164	15
5	0	260	15	2	0	162	13
7	0	210	11	2	0	161	11
6	0	205	16	5	0	160	14
2	0	215	11	4	0	155	12
				4	0	160	14
				6	0	155	11
	PERIOD 2				PERIOD 5		
4	0	200	15	4	0	170	12
6	0	190	13	5	0	165	13
3	0	185	15	1	0	160	16
6	0	185	14	4	0	160	15
5	0	181	13	3	0	160	16
4	0	180	16	2	0	161	14
1	0	181	16	5	0	155	13
3	0	180	11	1	0	155	15
1	0	170	14	6	0	151	14
				3	0	150	11
				6	0	150	11
				7	0	151	12
	PERIOD 3				PERIOD 6		
5	0	180	11	3	0	180	15
1	0	179	15	4	0	165	13
3	0	177	16	5	0	160	11
3	0	180	13	3	0	160	16
1	0	178	16	1	0	155	13
5	0	176	15	6	0	160	15
4	0	175	14	4	0	155	16
4	0	160	13	1	0	155	14
6	0	161	14	5	0	157	14
5	0	155	11	2	0	156	11
6	0	155	12	7	0	151	12
				6	0	151	12

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
		PERIOD 7					
4	0	160	13				
1	0	155	16				
6	0	160	15				
1	0	155	13				
7	0	155	15				
2	0	156	16				
5	0	155	12				
3	0	155	11				
7	0	155	11				
4	0	155	14				
3	0	155	14				
6	0	160	12				
		PERIOD 8					
3	0	170	13				
4	0	160	16				
5	0	159	16				
1	0	155	15				
6	0	160	15				
5	0	159	13				
1	0	155	11				
2	0	156	11				
4	0	155	14				
6	0	156	14				
3	0	155	12				
7	0	156	12				

EXPERIMENT 2

Subject Pool: Boston University
Brand Names: No
Advertising: Prohibited

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1				PERIOD 4		
7	0	250	11	2	0	180	11
2	0	230	13	5	0	179	15
5	0	250	12	8	0	175	12
7	0	275	15	3	0	170	13
8	0	240	13	4	0	166	12
5	0	250	14	6	0	165	14
6	0	260	11	2	0	162	15
3	0	280	14	5	0	159	11
6	0	250	12	6	0	160	16
8	0	255	16	8	0	155	16
4	0	250	15	4	0	151	13
6	0	230	16	3	0	155	14
	PERIOD 2				PERIOD 5		
5	0	200	15	2	0	175	11
2	0	200	12	5	0	170	15
5	0	190	13	8	0	170	11
5	0	185	16	7	0	166	14
7	0	190	15	6	0	165	13
8	0	191	12	4	0	165	15
3	0	190	11	2	0	160	16
2	0	180	13	5	0	160	12
5	0	183	11	3	0	161	14
6	0	179	14	8	0	159	13
8	0	177	14	7	0	157	16
4	0	179	16	6	0	157	12
	PERIOD 3				PERIOD 6		
7	1	188	13	8	0	165	15
7	0	181	11	4	0	159	11
2	0	180	12	6	0	160	14
5	0	180	12	5	0	158	12
6	0	179	15	2	0	157	15
4	0	179	15	8	0	155	14
3	0	180	11	5	0	153	11
8	0	170	16	4	0	151	12
8	0	170	13	6	0	152	13
5	0	166	14	3	0	150	16
2	0	165	16	2	0	150	13
8	0	165	14	7	0	151	16

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 7						
5	0	157	12				
2	0	153	12				
8	0	155	15				
3	0	153	16				
4	0	151	13				
6	0	150	15				
6	0	146	13				
8	0	145	16				
7	0	148	14				
4	0	146	14				
6	0	148	11				
4	0	147	11				

EXPERIMENT 3

Subject Pool: Boston University
Brand Names: No
Advertising: Required, periods 1-6
Prohibited, periods 7-9

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1				PERIOD 4		
3	1	200	11	5	1	326	12
4	1	300	12	4	1	325	13
5	0	175	14	2	1	325	11
5	1	280	11	1	1	305	13
2	1	320	12	3	1	305	11
3	0	175	13	3	1	299	12
2	1	310	14	4	1	298	14
1	1	315	13	5	1	297	14
	PERIOD 2				PERIOD 5		
4	1	330	11	4	1	329	12
4	1	329	14	5	1	325	11
2	1	329	12	2	1	310	11
3	1	328	13	3	1	302	12
5	1	328	14	1	1	300	14
5	1	325	11	4	1	298	13
5	0	179	13	2	1	295	14
3	0	178	12	1	1	286	13
	PERIOD 3				PERIOD 6		
2	1	328	12	4	1	320	11
5	1	326	11	5	1	325	14
4	1	329	12	2	1	305	11
3	1	327	11	1	1	300	12
4	0	179	13	4	1	299	12
1	1	300	14	3	1	298	13
4	1	299	14	5	1	298	13
5	1	299	13	3	1	298	14

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
		PERIOD 7					
4	0	315	14				
3	0	190	12				
1	0	191	11				
5	0	195	14				
1	0	180	11				
1	0	179	12				
2	0	185	13				
4	0	179	13				
		PERIOD 8					
1	0	180	12				
4	0	179	11				
5	0	179	12				
3	0	178	13				
2	0	178	13				
1	0	165	14				
1	0	165	14				
2	0	164	11				
		PERIOD 9					
4	0	178	12				
1	0	175	11				
2	0	170	12				
5	0	171	11				
3	0	165	14				
4	0	160	13				
2	0	160	13				
1	0	163	14				

EXPERIMENT 4

Subject Pool: Boston University
Brand Names: No
Advertising: Required, periods 1-8
Prohibited, periods 9,11

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1				PERIOD 4		
2	0	50	14	8	1	325	16
5	1	200	13	1	1	325	15
7	1	210	14	3	1	324	11
4	0	100	15	7	1	320	16
5	1	230	15	6	1	325	14
6	0	120	12	8	0	185	14
1	0	110	11	5	1	320	12
8	0	160	13	5	1	315	13
3	0	140	16	2	1	315	15
1	1	230	16	6	1	305	13
6	1	250	11	1	1	300	12
5	0	170	12	4	1	299	11
	PERIOD 2				PERIOD 5		
5	1	300	15	6	1	320	12
6	1	310	14	4	1	320	15
5	0	170	16	5	0	178	16
1	1	300	13	1	1	320	13
8	1	310	14	3	1	320	12
3	1	300	16	2	1	315	16
4	1	310	12	2	1	316	14
7	1	310	11	8	1	317	15
2	1	310	13	5	1	313	11
2	1	300	15	7	1	305	13
8	0	175	11	8	01	79.	14
6	0	176	12	4	1	299	11
	PERIOD 3				PERIOD 6		
5	1	320	11	3	1	320	14
4	1	320	15	4	1	320	12
6	1	305	16	6	1	320	11
8	1	325	13	1	1	315	16
1	1	325	13	8	1	314	15
3	1	325	14	4	0	179	16
2	1	315	16	2	1	305	11
1	1	320	11	7	1	306	14
7	1	320	15	5	1	300	13
1	0	175	12	6	1	299	13
6	0	176	14	4	1	298	15
7	1	305	12	1	1	298	12

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 7				PERIOD 10		
8	1	313	11	8	0	220	12
6	1	314	15	2	0	220	13
3	1	315	16	5	0	215	14
4	1	314	12	6	0	200	12
1	1	305	15	5	0	200	15
2	1	300	16	3	0	170	16
5	1	299	11	4	0	200	15
7	1	300	12	7	0	163	16
7	1	298	14	1	0	170	13
6	1	298	13	6	0	163	11
8	1	297	14	4	0	165	14
2	1	296	13	7	0	164	11
	PERIOD 8				PERIOD 11		
3	1	310	11	3	0	170	16
6	1	305	12	2	0	170	16
8	1	305	16	4	0	180	15
2	1	300	15	6	0	165	13
1	1	300	11	7	0	165	15
7	1	300	12	8	0	164	12
5	1	297	16	3	0	163	13
5	1	297	15	6	0	163	11
2	1	296	14	1	0	162	14
1	1	297	13	1	0	163	14
3	1	297	14	7	0	162	12
4	1	297	13	5	0	163	11
	PERIOD 9						
8	0	300	16				
8	0	270	16				
3	0	180	15				
5	0	175	14				
3	0	179	11				
7	0	179	13				
1	0	180	13				
6	0	179	11				
2	0	175	12				
1	0	164	12				
5	0	160	14				
2	0	162	15				

EXPERIMENT 5

Subject Pool: Boston University
Brand Names: Yes
Advertising: Prohibited

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1				PERIOD 4		
7	0	215	14	3	1	255	15
1	0	200	16	4	0	255	12
6	0	220	11	1	1	260	15
5	0	200	11	4	0	255	12
3	1	240	16	6	1	250	14
8	0	225	12	2	0	200	16
1	0	215	15	5	0	220	11
6	0	215	15	8	0	200	11
4	0	205	13	7	0	210	13
4	0	205	12	2	0	200	14
				4	0	190	16
				7	0	150	13
	PERIOD 2				PERIOD 5		
3	0	240	16	6	0	230	13
6	1	210	15	3	0	240	14
1	1	240	15	6	0	230	16
2	0	215	11	1	1	280	15
4	0	240	13	5	0	220	12
8	1	215	12	7	0	200	16
8	0	200	16	8	0	210	13
5	0	200	14	4	1	230	15
6	0	205	11	7	0	180	11
3	0	211	13	6	0	175	11
5	0	190	14	1	0	215	12
7	1	190	12	4	0	175	14
	PERIOD 3				PERIOD 6		
2	0	210	14	6	0	225	13
4	0	225	13	8	0	215	11
1	0	230	12	3	0	225	12
6	0	240	13	8	0	215	12
4	0	230	16	4	1	290	15
3	0	230	14	2	0	225	16
5	1	230	12	4	1	290	15
5	0	200	16	2	0	180	14
1	1	235	15	7	0	176	11
6	1	220	15	4	0	175	16
7	0	200	11	1	0	175	13
2	1	235	11	5	0	170	14

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
		PERIOD 7					
8	0	210	13				
3	0	215	11				
2	0	200	16				
1	1	320	15				
5	0	180	12				
8	0	185	16				
4	0	177	11				
7	0	176	13				
4	1	310	15				
6	0	178	12				
6	0	163	14				
7	0	164	14				

EXPERIMENT 6

Subject Pool: Boston Universitv
Brand Names: Yes
Advertising: Prohibited

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1				PERIOD 4		
2	0	150	14	6	0	175	16
4	0	160	16	2	0	176	11
7	0	155	14	7	0	175	11
8	0	190	13	8	0	175	16
6	0	160	16	6	0	165	15
8	0	160	11	3	0	165	15
4	0	160	12	1	0	170	12
3	0	160	15	5	0	170	13
7	0	160	12	4	0	174	13
5	0	160	11	5	0	170	12
5	0	160	15				
1	0	170	13				
	PERIOD 2				PERIOD 5		
6	0	180	16	7	0	175	16
3	0	175	16	2	0	170	16
1	0	175	12	6	0	175	12
7	0	179	12	3	0	175	12
8	0	180	13	4	0	175	15
4	0	180	11	8	0	175	15
5	0	180	15	1	0	170	11
1	0	175	15	5	0	170	11
5	0	175	11	4	0	169	14
3	0	170	13	7	0	169	14
4	0	169	14				
8	0	168	14				
	PERIOD 3				PERIOD 6		
6	0	180	16	7	0	173	16
2	0	175	11	2	0	174	12
3	0	175	15	2	0	171	11
1	0	175	16	6	0	174	15
8	0	175	12	8	0	174	15
7	0	173	13	3	0	173	16
5	0	171	11	4	0	173	12
5	0	173	13	2	0	170	13
4	0	172	15	1	0	170	11
7	0	169	14	5	0	170	13
1	0	169	14				
2	0	168	12				

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 7				PERIOD 10		
7	0	170	13	4	0	240	15
3	0	170	16	7	0	250	11
1	0	170	16	4	0	240	11
6	0	170	11	8	0	220	15
2	0	170	11	6	0	245	13
5	0	170	12				
4	0	169	13				
4	1	169	12				
3	0	169	15				
8	0	169	15				
6	0	165	14				
8	0	163	14				
	PERIOD 8				PERIOD 11		
6	0	170	12	4	0	180	16
4	0	169	11	3	0	180	12
3	1	170	12	7	0	173	16
2	0	170	15	6	0	174	15
5	0	170	16	8	0	172	11
5	0	170	16	5	0	175	11
1	0	170	15	5	0	171	13
1	0	170	11	2	0	174	14
				3	0	170	12
				7	0	169	15
				6	0	168	14
				4	0	230	13
	PERIOD 9				PERIOD 12		
4	1	250	11	3	0	174	11
1	0	250	11	4	0	174	11
6	1	250	12	2	0	174	15
				8	0	172	16
				6	0	170	14
				7	0	173	12
				5	0	170	15
				3	0	170	12
				5	0	170	13
				2	0	168	14
				8	0	168	16
				5	0	166	13

EXPERIMENT 7

Subject Pool: Boston University
Brand Names: Yes
Advertising: Prohibited

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1				PERIOD 4		
8	0	175	15	8	0	175	15
5	0	175	13	2	0	172	11
1	0	174	13	7	1	250	14
2	1	170	14	7	1	275	16
5	1	165	16	5	0	170	15
2	0	168	15	3	0	170	11
6	1	163	14	3	0	170	13
7	0	163	12	2	1	275	14
5	1	150	16	1	0	165	12
4	0	156	11	4	0	165	12
7	0	164	11	4	1	280	16
6	0	155	12	5	0	168	13
	PERIOD 2				PERIOD 5		
2	0	175	15	8	0	175	15
5	0	170	15	2	0	172	11
5	1	166	14	3	0	172	13
1	0	165	13	2	0	170	12
8	1	180	16	3	1	300	14
4	1	180	14	2	1	295	16
7	0	161	11	4	1	300	14
1	0	165	11	7	1	300	16
2	0	170	13	6	0	166	15
3	1	175	16	5	0	167	11
3	0	167	12	6	1	290	12
4	0	165	12	1	0	170	13
	PERIOD 3				PERIOD 6		
2	0	170	11	2	0	173	11
3	0	172	13	3	0	173	13
1	0	172	13	1	1	165	16
6	1	170	15	6	1	290	13
2	1	225	14	8	0	170	15
8	0	170	15	4	0	171	11
3	0	170	11	4	1	300	14
5	1	200	14	2	1	300	12
6	0	166	12	1	1	300	12
1	0	165	12	2	0	170	15
4	1	207	16	7	1	305	16
5	1	208	16	3	1	305	14

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLE NUMBE
		PERIOD 7				PERIOD 10	
2	0	173	11	3	0	175	15
3	0	174	15	2	1	300	11
7	0	305	12	2	1	300	11
4	0	300	12	7	1	310	14
3	0	170	15	6	0	175	15
2	1	310	13	3	1	310	16
3	1	310	14	1	0	305	12
8	0	174	11	6	0	300	12
7	1	300	14	4	1	308	16
6	1	300	13	4	1	300	14
4	1	165	16	8	1	305	13
5	1	166	16	3	1	300	13
		PERIOD 8				PERIOD 11	
8	0	174	11	8	0	180	15
3	0	170	12	2	1	305	11
4	0	168	12	4	0	180	15
6	0	275	15	5	1	310	16
2	1	315	13	3	0	300	12
7	1	310	14	7	1	310	14
1	0	300	15	2	0	300	12
2	0	174	11	4	1	307	14
3	1	310	13	6	1	305	11
4	1	305	14	3	1	300	16
7	1	303	16	4	0	300	13
3	1	304	16	7	0	275	13
		PERIOD 9				PERIOD 12	
8	0	175	15	7	1	310	16
7	0	175	11	2	1	304	11
4	0	175	15	7	0	180	15
2	0	174	11	4	0	180	12
7	1	310	14	3	1	309	16
2	1	300	12	4	0	310	14
7	1	300	12	8	0	180	12
4	1	310	16	5	0	176	13
3	1	305	16	3	0	175	13
6	1	300	13	1	1	300	11
4	1	303	13	4	0	300	14
2	1	300	14	2	0	180	15

EXPERIMENT 8

Subject Pool: California Institute of Technology
Brand Names: Yes
Advertising: Prohibited, periods 1-6 & 9,10
Required, periods 7,8

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1				PERIOD 4		
4	0	125	9	8	0	170	
8	0	175	11	10	0	170	5
10	0	140	9	12	0	170	3
12	0	150	11	4	0	165	7
8	0	150	7	2	0	165	9
12	0	150	1	6	0	165	5
10	0	165	5	2	0	165	3
6	0	161	1	10	1	165	9
2	0	162	7	6	0	164	7
6	0	165	3	8	0	164	1
4	0	163	3	12	0	163	11
2	0	165	5				
	PERIOD 2				PERIOD 5		
10	0	166	11	8	0	167	11
8	0	170	9	10	1	168	9
2	0	170	1	12	0	165	1
12	0	170	7	10	0	166	11
2	0	170	9	4	0	165	3
10	0	170	3	2	0	165	9
10	0	168	1	6	0	165	5
12	0	167	3	6	0	163	7
4	0	166	11	2	0	163	7
12	0	165	7	4	0	164	3
6	0	170	5	12	0	163	1
	PERIOD 3				PERIOD 6		
10	0	175	11	10	0	169	7
8	0	167	9	8	0	165	3
12	0	167	9	10	0	165	9
4	0	166	3	12	0	164	1
2	0	162	1	4	0	164	9
2	0	165	3	10	0	164	5
6	0	165	5	6	0	164	3
10	0	165	7	8	0	164	11
8	0	162	1	6	0	164	1
12	0	163	7	4	0	164	7
4	0	164	11	2	0	165	5
6	0	165	5	2	0	165	11

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 7				PERIOD 10		
12	1	280	1	12	0	167	9
8	1	290	1	10	0	170	11
12	1	290	11	8	0	168	3
10	1	290	5	10	0	168	3
6	1	290	3	4	0	165	5
8	1	285	7	8	0	270	1
6	1	285	9	2	0	165	1
10	1	285	11	6	0	164	9
2	1	285	3	2	0	164	7
4	1	285	9	6	0	164	11
2	1	285	7	12	0	163	7
4	1	290	5	4	0	163	5
	PERIOD 8						
10	1	290	5				
8	1	190	1				
12	1	290	3				
10	1	289	11				
4	1	285	9				
8	1	285	1				
6	1	285	11				
4	1	285	9				
2	1	289	3				
2	1	29	5				
6	1	286	7				
12	1	280	7				
	PERIOD 9						
10	0	180	3				
10	0	185	1				
4	0	175	11				
2	0	175	5				
12	0	173	9				
8	0	173	3				
6	0	173	9				
6	0	165	7				
2	0	165	1				
4	0	164	5				
12	0	163	7				
8	0	164	11				

EXPERIMENT 9

Subject Pool: Pasadena City College
Brand Names: No
Advertising: Prohibited, periods 1-8
Required, periods 9-11

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
PERIOD 1				PERIOD 4			
14	0	260	3	04	0	175	1
10	0	250	11	12	0	173	7
8	0	245	9	02	0	175	11
12	0	250	5	06	0	174	7
12	1	250	1	08	0	174	1
12	0	250	3	02	0	175	11
2	0	235	7	06	0	174	5
				12	0	175	3
				12	0	174	9
PERIOD 2				PERIOD 5			
14	0	185	11	14	0	180	5
10	0	180	1	10	0	180	3
04	0	180	1	12	0	180	7
06	0	180	5	10	0	180	1
08	0	175	11	08	0	180	11
12	1	175	7	02	0	180	11
12	0	175	9				
08	0	175	9				
PERIOD 3				PERIOD 6			
10	0	180	1	02	0	175	3
08	0	175	7	06	0	175	1
06	0	175	3	08	0	175	1
10	0	173	5	12	0	176	3
12	0	177	5	02	0	176	5
14	0	176	11	10	0	176	9
10	0	178	9	14	1	177	7
08	0	178	5	14	0	177	7
04	0	178	3	12	0	176	5
06	0	179	11	10	0	176	11
12	0	177	7				
04	0	175	1				

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 7		
14	0	175	7
02	0	177	5
08	0	175	3
14	0	175	1
10	0	175	1
10	0	170	7
04	0	175	5
10	0	175	3
06	0	174	9
12	0	173	9
12	0	172	11
06	0	170	11
	PERIOD 8		
02	0	174	5
12	0	173	11
08	0	173	11
10	0	173	1
14	0	173	1
12	0	000	0
10	0	000	0
06	1	000	0
08	0	169	7
14	0	170	3
	PERIOD 9		
14	0	173	7
10	0	179	11
06	1	275	3
04	1	277	5
02	1	280	3
14	1	285	7
06	1	286	1
08	1	287	9
10	1	287	9
12	1	288	5
02	1	288	11
06	0	175	1

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 10		
12	1	280	11
08	1	280	11
12	1	285	5
14	1	290	3
02	1	281	7
06	1	281	7
06	0	174	3
08	0	175	9
02	0	175	1
02	1	280	5
10	1	281	1
06	1	283	9
	PERIOD 11		
14	1	285	11
04	1	285	3
10	1	285	3
02	1	285	1
14	1	286	9
08	1	285	7
12	1	285	1
04	1	286	11
02	1	286	5
12	1	286	9
10	1	285	7
08	1	287	5

EXPERIMENT 10

Subject Pool: Pasadena City College
Brand Names: Yes
Advertising: Prohibited, periods 1-6
Allowed, periods 7,8

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1				PERIOD 4		
8	0	280	1	2	0	175	7
2	0	250	7	16	0	175	1
6	0	190	3	12	0	175	11
12	0	220	9	8	1	180	3
8	0	200	7	8	0	175	5
10	0	150	11	16	0	180	5
2	0	180	3	6	0	170	7
14	0	180	1	14	0	170	11
16	0	150	11	4	0	175	3
8	0	150	9	10	0	160	9
				12	0	165	1
				16	0	165	9
	PERIOD 2				PERIOD 5		
4	1	160	5	12	0	170	9
2	1	175	11	8	0	170	7
12	0	170	1	16	0	175	3
6	0	170	7	10	0	175	1
14	0	170	3	2	0	175	11
8	0	160	7	4	0	170	5
10	0	165	5	8	0	185	11
14	0	160	3	6	0	170	5
16	0	165	1	8	0	180	7
16	0	155	9	12	0	170	1
2	0	155	11	16	0	170	3
16	0	150	9	12	0	170	9
	PERIOD 3				PERIOD 6		
2	0	170	9	8	0	170	7
10	0	180	7	10	0	175	11
8	0	180	11	16	0	175	5
4	1	175	1	14	0	175	11
2	0	165	7	2	0	175	5
8	0	170	3	8	0	180	9
12	0	180	3	6	0	175	1
14	1	165	5	12	0	175	3
16	0	170	11	12	0	173	7
10	0	175	1	12	0	170	3
12	0	170	5	4	0	170	9
6	0	170	9				

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
		PERIOD 7					
2	1	320	11				
16	1	280	7				
8	1	275	1				
10	1	280	3				
12	1	290	7				
14	1	280	3				
10	1	295	5				
16	1	270	9				
12	1	285	5				
2	1	285	1				
8	0	180	11				
		PERIOD 8					
8	1	295	5				
12	1	295	7				
10	1	295	3				
14	1	295	3				
8	1	296	7				
16	1	290	1				
6	1	295	9				
2	1	293	11				
14	1	295	1				
2	1	295	5				
4	1	295	9				
10	1	298	11				

EXPERIMENT 11

Subject Pool: California Institute of Technology
Brand Names: Yes periods 1-8, No periods 9-10
Advertising: Prohibited

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1				PERIOD 4		
6	0	170	5	12	1	295	5
12	0	170	1	6	0	165	3
14	1	270	5	6	1	300	5
12	0	170	1	2	1	290	1
8	0	175	9	16	0	200	1
16	0	180	7	4	1	309	9
4	1	280	9	8	1	308	7
14	0	170	11	2	1	300	7
8	0	185	3	4	1	306	9
4	0	170	11	10	1	300	11
16	1	185	7				
	PERIOD 2				PERIOD 5		
14	1	280	5	8	1	310	3
6	1	280	5	4	1	305	5
14	0	270	1	14	1	280	1
12	1	300	3	6	1	300	5
8	1	320	9	14	1	270	3
4	0	280	1	12	1	290	1
6	1	280	11	8	1	310	9
12	1	280	11	8	1	305	11
6	0	190	9	2	1	300	7
2	1	290	7	10	1	300	11
4	1	293	3	10	1	300	9
10	0	300	7	2	1	295	7
	PERIOD 3				PERIOD 6		
12	1	290	5	6	1	308	5
6	1	285	5	6	1	290	1
16	1	250	3	12	1	300	1
10	1	290	3	8	1	310	11
8	1	315	9	12	1	290	3
2	0	170	1	4	1	300	3
4	1	310	9	16	0	200	11
4	1	310	7	10	1	300	5
14	1	300	11	14	1	300	9
10	0	170	1	2	1	295	7
2	1	290	7	4	0	285	7
12	1	280	11	16	1	305	9

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 7				PERIOD 10		
6	1	299	3	16	1	300	5
12	1	300	1	4	1	290	11
16	1	305	5	16	0	175	5
4	1	305	9	6	0	180	3
12	1	300	5	12	0	180	1
16	1	301	3	8	1	299	9
8	1	300	7	2	0	175	7
2	1	300	1	10	0	175	11
14	1	300	11	6	0	170	1
16	1	301	7	8	0	175	3
10	1	300	11	4	0	175	9
16	0	205	9	14	0	170	7
	PERIOD 8						
6	1	305	5				
8	1	305	7				
4	1	300	3				
12	1	305	11				
16	1	300	1				
14	1	300	1				
10	1	300	11				
2	1	300	5				
10	1	295	3				
14	1	295	9				
14	1	295	9				
4	1	295	7				
	PERIOD 9						
16	1	300	5				
12	0	300	1				
2	0	290	7				
16	0	280	7				
4	1	290	5				
12	1	285	11				
14	0	270	1				
8	1	299	9				
14	1	270	3				
8	1	180	3				

EXPERIMENT 12

Subject Pool: Pasadena City College
Brand Names: Yes
Advertising: Prohibited, periods 1-6
Allowed, period 7

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1				PERIOD 4		
2	0	80	1	6	0	225	11
10	0	100	3	14	1	240	3
12	0	100	5	6	0	225	5
14	1	100	3	4	0	230	11
8	0	100	7	10	0	240	1
12	0	180	7	2	0	200	7
8	0	150	5	4	0	230	3
4	0	160	11	6	0	230	9
10	1	140	1	14	0	225	9
				6	0	210	5
				16	0	180	7
	PERIOD 2				PERIOD 5		
10	0	200	5	2	0	230	11
14	0	220	5	6	0	235	5
10	0	225	9	2	0	210	7
4	0	200	7	2	0	240	9
14	0	215	11	16	0	210	7
10	0	110	9	2	0	235	5
2	0	180	1	10	0	180	3
4	1	200	1	12	1	160	1
16	0	200	11	14	1	200	9
4	0	200	3	4	0	180	3
8	0	200	7				
14	0	70	3				
	PERIOD 3				PERIOD 6		
2	1	200	3	2	0	240	11
10	1	250	9	4	0	235	5
14	1	260	11	4	0	240	1
8	0	240	3	12	0	210	7
2	0	200	7	8	0	215	11
16	0	200	9	2	1	220	1
4	0	200	1	14	0	225	5
12	0	180	5	16	1	225	9
12	1	160	1	10	0	180	3
2	0	180	7	14	0	210	7
				16	1	250	3
				14	0	235	9

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 7						
4	0	250	3				
2	1	300	5				
14	1	290	1				
12	1	300	11				
16	1	300	9				
10	1	310	7				
8	1	325	5				
10	1	300	3				
4	1	315	9				
16	1	270	11				
6	1	310	7				
12	1	280	1				

EXPERIMENT 13

Subject Pool: Pasadena City College
Brand Names: Yes
Advertising: Prohibited, periods 1-6
Allowed, period 7

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1				PERIOD 4		
2	0	100	3	2	0	225	5
6	0	120	9	6	1	200	3
2	0	160	5	4	0	220	7
6	0	160	9	14	1	250	9
4	0	250	5	10	0	250	11
12	0	175	11	14	0	230	5
2	0	175	3	4	0	250	1
8	0	200	11	4	0	200	11
14	0	175	1	8	0	220	9
16	0	180	1	6	0	180	3
				10	1	180	7
	PERIOD 2				PERIOD 5		
6	1	200	5	6	0	230	3
2	0	200	1	14	0	240	5
8	1	175	9	4	0	200	7
2	0	160	3	14	0	235	5
16	0	250	1	12	0	240	11
14	1	250	5	16	0	230	1
2	0	225	9	4	0	220	11
8	0	180	11	16	0	200	3
16	0	220	3	6	0	200	9
				4	0	200	1
				16	0	180	9
	PERIOD 3				PERIOD 6		
16	0	200	3	14	0	250	9
14	1	280	9	4	0	200	7
10	1	250	3	8	1	150	7
4	0	200	11	16	1	250	9
8	0	160	7	14	0	200	5
16	1	260	1	6	0	190	3
14	0	250	1	16	0	200	1
6	0	220	11	14	0	210	5
2	0	170	5	8	0	200	11
6	0	200	9	16	0	200	3
8	0	150	5	8	0	185	1

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLE NUMBE
	PERIOD 7						
4	1	300	5				
14	1	300	3				
16	1	310	9				
8	1	320	11				
6	1	280	7				
2	1	300	1				
6	1	275	9				
16	1	300	5				
12	1	300	11				
2	0	175	3				
10	0	190	1				

EXPERIMENT 14

Subject Pool: Pasadena City College
Brand Names: No
Advertising: Prohibited, periods 1-7
Allowed, periods 8,9

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1				PERIOD 4		
6	1	150	3	10	0	180	3
12	0	80	5	4	0	175	5
2	1	130	1	16	0	220	5
8	0	70	9	10	0	200	7
2	1	200	5	8	0	225	11
12	0	90	1	12	0	215	3
14	0	80	7	16	0	175	11
16	0	100	7	4	0	180	9
4	0	230	9	6	0	225	7
4	0	175	3	16	0	250	9
16	0	100	11				
	PERIOD 2				PERIOD 5		
2	0	225	5	10	0	195	3
12	0	185	3	4	0	180	11
10	0	200	7	4	0	220	5
6	0	190	5	6	1	200	3
14	1	250	3	16	0	190	1
2	1	275	7	12	0	210	11
6	0	230	1	10	0	195	5
16	0	240	11	2	0	180	7
4	1	180	11	16	0	200	7
16	1	150	1	14	0	175	9
2	0	280	9	6	0	170	9
14	0	170	9	2	1	170	1
	PERIOD 3				PERIOD 6		
6	0	250	1	12	0	200	1
16	0	200	3	6	0	210	3
2	0	240	11	10	0	200	5
10	1	190	1	12	0	200	11
12	1	230	3	6	1	190	1
12	0	225	5	16	0	180	9
4	0	190	7	4	0	185	7
16	0	200	5	16	0	195	7
6	0	255	7	6	0	185	11
8	0	300	9	2	0	175	5
6	0	180	9				

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLE NUMBE
	PERIOD 7						
12	0	190	1				
4	0	180	11				
10	0	190	3				
8	0	215	5				
6	0	200	5				
16	0	210	3				
10	0	180	7				
6	0	180	9				
4	0	195	7				
4	0	200	9				
2	1	170	1				
2	0	170	11				
	PERIOD 8						
10	0	200	1				
6	0	200	5				
4	0	190	9				
12	0	200	5				
16	0	200	11				
4	1	210	1				
6	0	195	3				
10	0	170	11				
12	0	175	7				
4	1	190	3				
10	0	180	9				
14	0	175	7				
	PERIOD 9						
10	1	200	3				
8	0	180	1				
4	0	190	9				
4	0	190	9				
6	0	185	3				
2	0	170	5				
16	0	175	7				
8	0	170	11				
14	0	175	5				
6	0	165	7				
10	0	150	11				
10	1	155	1				

EXPERIMENT 15

Subject Pool: California Institute of Technology
Brand Names: Yes
Advertising: Prohibited

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1				PERIOD 4		
4	1	300	9	8	1	305	1
14	1	300	1	16	1	303	5
16	1	303	5	12	1	303	11
14	1	302	7	14	0	305	1
4	0	170	9	16	1	304	5
8	1	303	3	10	1	301	7
12	1	302	11	14	0	300	11
10	1	302	11	4	1	302	3
16	1	303	5	2	1	302	7
8	1	305	1	4	1	300	9
6	1	300	7	12	1	300	9
12	0	301	3	2	1	301	3
	PERIOD 2				PERIOD 5		
16	1	303	5	12	0	303	7
10	0	302	11	8	1	305	1
12	1	305	11	16	1	303	5
2	1	305	7	8	1	301	11
8	1	305	1	14	1	305	7
16	1	303	5	10	0	301	1
14	1	305	1	2	0	301	3
6	1	302	7	4	1	302	9
4	1	303	9	2	0	302	11
16	1	180	9	16	1	304	5
10	1	302	3	4	0	300	3
12	1	302	3	6	0	180	9
	PERIOD 3				PERIOD 6		
14	1	305	1	8	1	305	1
16	1	303	5	12	0	302	7
8	1	305	7	2	1	302	11
10	1	305	9	14	1	304	7
12	1	304	11	16	1	303	5
2	1	304	3	14	0	301	1
16	1	304	5	12	1	305	11
2	1	303	7	4	1	300	9
4	1	303	9	2	1	302	3
4	0	300	11	16	1	304	5
8	0	300	3	4	1	300	9
12	1	300	1	10	0	300	3

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 7				PERIOD 10		
2	1	302	7	16	0	180	7
8	1	302	11	6	0	305	7
16	0	300	5	10	1	303	5
16	1	303	5	4	1	300	9
8	1	300	1	4	1	300	9
14	0	301	7	4	0	182	3
4	1	300	9	14	0	184	1
4	1	300	9	6	0	181	11
12	0	300	1	2	0	182	11
14	1	301	3	12	0	305	5
12	1	303	11	12	0	183	3
2	0	300	3	8	0	182	1
	PERIOD 8						
16	1	303	5				
12	1	304	11				
8	1	301	1				
14	0	305	3				
2	1	303	9				
4	0	300	1				
16	1	304	5				
12	0	302	11				
14	1	300	7				
4	0	180	7				
4	1	300	9				
2	0	181	3				
	PERIOD 9						
6	0	300	5				
6	0	300	7				
8	0	300	1				
16	1	303	5				
14	0	300	7				
8	0	300	1				
2	1	302	9				
4	1	300	9				
16	0	183	11				
2	0	181	11				
14	0	182	3				
4	0	180	3				

EXPERIMENT 16

Subject Pool: Pasadena City College
Brand Names: Yes
Advertising: Prohibited, periods 1-7
Allowed, periods 8,9

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1				PERIOD 4		
6	0	180	5	14	0	175	5
12	0	180	3	10	1	280	7
6	0	190	7	8	0	175	1
4	0	180	10	2	0	180	1
2	0	175	1	12	1	175	3
16	0	175	9	16	0	220	7
14	0	175	3	4	1	175	5
6	0	170	11	10	0	174	11
16	0	175	1	16	0	170	9
6	0	180	5	12	0	170	3
12	0	175	9	2	0	170	11
8	0	180	7	4	0	172	9
	PERIOD 2				PERIOD 5		
14	0	177	1	8	0	275	3
6	0	180	5	14	1	275	5
2	0	175	1	10	0	275	11
10	0	170	11	10	1	285	7
16	0	170	9	16	0	200	3
12	0	170	5	12	0	180	1
8	0	170	11	4	0	200	5
4	1	170	3	2	0	180	7
4	0	170	9	16	0	176	11
2	0	180	3	10	0	175	9
				14	0	175	1
				4	0	170	9
	PERIOD 3				PERIOD 6		
10	0	175	11	10	0	176	5
16	0	175	3	14	0	275	5
4	0	172	9	16	0	175	9
4	0	175	1	6	0	176	1
12	0	175	5	8	0	176	9
16	0	175	7	12	0	176	11
6	0	179	1	2	0	176	3
14	0	176	5	12	0	175	7
8	0	176	11	8	0	175	1
8	0	175	9				
2	0	175	7				

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
		PERIOD 7					
4	0	175	5				
10	0	174	3				
14	0	174	11				
8	0	174	9				
6	0	174	1				
16	0	174	3				
2	0	170	11				
14	0	170	9				
12	0	173	1				
6	0	169	5				
12	0	169	7				
10	0	169	7				
		PERIOD 8					
14	1	310	7				
16	1	300	1				
14	1	290	3				
10	1	290	5				
8	1	290	5				
16	1	290	11				
12	1	290	11				
2	1	290	7				
4	1	290	9				
10	1	290	1				
12	1	281	9				
10	0	175	3				
		PERIOD 9					
16	1	300	5				
2	1	300	3				
4	1	295	7				
14	1	295	11				
2	1	295	9				
12	1	296	7				
6	1	296	1				
4	1	296	3				
8	1	295	1				
6	1	297	11				
12	1	297	5				
14	1	297	9				

EXPERIMENT 17

Subject Pool: Pasadena City College
Brand Names: Yes
Advertising: Prohibited, periods 1-8
Required, period 9

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1				PERIOD 4		
12	1	190	9	12	0	195	11
4	0	250	1	14	0	180	1
12	0	195	11	6	0	180	3
6	0	170	5	10	0	179	9
8	0	166	3	4	0	180	5
2	0	170	3	2	0	183	11
10	0	170	11	4	1	200	3
12	0	170	5	12	0	185	7
2	0	165	1	8	0	180	9
10	0	165	7	10	0	176	1
	PERIOD 2				PERIOD 5		
12	0	185	5	12	0	200	9
12	0	190	11	12	1	275	3
6	0	180	7	12	0	250	1
14	0	180	3	6	0	180	11
4	0	180	11	12	1	280	3
8	0	175	1	4	0	177	5
12	0	210	5	2	0	180	1
2	0	175	3	10	0	180	11
10	0	180	1	8	0	175	5
	PERIOD 3				PERIOD 6		
12	0	195	5	10	0	195	11
12	0	200	1	4	0	200	3
12	0	180	3	10	0	180	5
12	0	185	9	12	0	240	7
4	0	180	3	12	0	275	3
10	0	180	1	2	0	180	7
2	0	179	9	6	0	180	9
6	0	180	11	10	0	179	5
12	0	280	11				
8	0	171	5				

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 7						
12	0	250	1				
10	0	180	11				
10	0	190	5				
14	0	180	3				
2	0	185	5				
6	0	180	1				
4	0	180	11				
8	0	176	3				
	PERIOD 8						
4	0	190	1				
12	0	180	5				
12	0	250	1				
2	0	210	9				
10	0	175	3				
6	0	175	11				
8	0	171	5				
10	0	166	3				
	PERIOD 9						
4	1	280	3				
6	1	280	1				
12	0	210	5				
4	1	280	11				
10	1	290	1				
12	1	290	3				
12	1	295	5				
2	1	290	11				
10	1	280	7				
6	1	285	7				
8	1	305	9				

EXPERIMENT 18

Subject Pool: Pasadena City College
Brand Names: Yes
Advertising: Allowed, periods 7, 8, 9
Required, periods 10,11

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1				PERIOD 4		
12	0	180	3	2	0	175	1
2	0	185	7	12	0	175	7
10	0	180	11	16	0	174	3
4	0	200	3	4	0	171	5
16	0	180	9	14	0	171	9
14	0	175	5	6	0	170	11
6	0	175	1	10	0	170	11
8	0	178	11	16	0	168	5
14	0	170	1	10	0	168	9
4	0	170	9	8	0	168	3
				4	0	167	7
				12	0	166	1
	PERIOD 2				PERIOD 5		
2	0	180	11	2	0	175	5
16	0	175	7	6	0	170	7
6	0	175	11	14	0	170	11
12	0	176	9	12	0	169	3
10	0	175	3	16	0	170	7
14	0	177	5	10	0	168	5
8	0	173	1	14	0	167	9
12	0	172	9	4	0	167	1
4	0	170	7	10	0	167	1
2	0	170	1	6	0	167	11
6	0	165	3	16	0	168	3
				12	0	168	9
	PERIOD 3				PERIOD 6		
2	0	180	5	2	0	170	1
16	0	175	7	16	0	170	3
10	0	170	11	14	0	167	11
4	0	170	11	12	0	168	5
14	0	173	5	4	0	168	5
6	0	172	3	6	0	168	9
12	0	171	9	16	0	169	3
14	0	170	7	14	0	168	7
14	0	169	1	8	0	168	7
8	0	169	1	10	0	167	11
10	0	168	9	8	0	167	9
6	0	166	3	10	0	167	1

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R? (1)	PRICE	SELLER NUMBER
OD 4		
	175	1
	175	7
	174	3
	171	5
	171	9
	170	11
	170	11
	168	5
	168	9
	168	3
	167	7
	166	1
'OD 5		
	175	5
	170	7
	170	11
	169	3
	170	7
	168	5
	167	9
	167	1
	167	1
	167	11
	168	3
	168	9
OD 6		
	170	1
	170	3
	167	11
	168	5
	168	5
	168	9
	169	3
	168	7
	168	7
	167	11
	167	9
	167	1

EXPERIMEN1

Subject Pool: Pasade
Brand Names: Yes
Advertising: Prohit
Allowe

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1		
2	0	190	1
6	0	175	1
6	0	175	1
8	0	175	1
10	0	175	1
2	0	175	1
4	0	175	1
10	0	172	1
	PERIOD 2		
4	0	175	1
6	0	175	1
10	0	175	1
2	0	175	1
8	0	175	1
2	0	165	1
10	0	164	1
	PERIOD 3		
10	0	175	1
6	0	175	1
4	0	175	1
2	0	170	1
8	0	170	1
4	0	164	1
6	0	164	1
10	0	164	1

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 7				PERIOD 10		
2	1	205	1	2	1	280	1
10	1	210	1	6	1	285	1
8	1	205	1	8	0	285	1
10	1	220	1	10	0	280	1
6	0	230	1	8	1	275	1
6	1	275	1	10	1	285	1
6	1	275	1	2	0	285	1
2	1	270	1	10	0	275	1
	PERIOD 8				PERIOD 11		
8	1	250	1	2	1	285	1
10	1	250	1	10	1	285	1
2	1	250	1	8	0	285	1
6	1	260	1	2	1	280	1
2	1	265	1	8	0	287	1
2	0	270	1	4	1	285	1
4	1	225	1	10	0	280	1
6	0	250	1	10	1	285	1
	PERIOD 9				PERIOD 12		
6	1	275	1	6	0	290	1
10	1	270	1	2	1	285	1
6	1	275	1	6	1	285	1
10	1	270	1	10	0	285	1
4	0	280	1	10	0	285	1
8	1	275	1	8	1	290	1
2	1	280	1	2	0	290	1
2	0	280	1	6	1	285	1

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 13						
2	0	290	1				
2	1	290	1				
6	1	285	1				
8	1	286	1				
2	0	260	1				
10	1	280	1				
8	0	275	1				
10	0	270	1				
	PERIOD 14						
8	1	275	1				
10	0	285	1				
2	0	280	1				
6	1	285	1				
10	0	280	1				
2	0	280	1				
2	0	250	1				
6	0	176	1				

EXPERIMENT 20

Subject Pool: California Institute of Technology
Brand Names: Yes
Advertising: Prhoibited

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1				PERIOD 4		
8	1	120	7	6	0	170	3
6	1	150	7	16	1	270	11
16	1	140	3	6	1	250	5
8	0	150	1	16	0	170	9
16	1	160	9	12	0	170	1
4	0	150	11	4	0	170	3
2	0	170	5	2	0	170	7
8	1	325	1	10	1	250	5
4	1	150	3	8	1	260	11
10	0	50	9	10	1	275	7
12	1	160	11	8	1	275	1
				4	1	260	9
	PERIOD 2				PERIOD 5		
8	1	250	7	10	1	250	5
16	0	180	1	16	1	290	11
6	0	160	7	8	1	260	5
16	0	180	9	6	0	170	3
8	0	175	5	6	1	270	3
4	0	175	1	2	1	275	1
4	0	170	11	16	0	170	9
6	0	165	3	4	0	175	1
2	0	155	3	16	1	290	11
12	0	160	9	6	0	270	7
10	0	155	11	12	0	170	9
				8	0	270	7
	PERIOD 3				PERIOD 6		
10	1	270	7	6	0	170	7
8	1	270	9	16	0	170	7
16	1	265	11	12	0	260	3
12	0	170	1	6	1	270	5
2	0	170	3	8	1	270	5
4	0	170	3	4	0	170	9
6	1	170	5	2	1	270	3
12	0	170	7	16	1	275	1
16	0	170	11	8	1	275	9
12	0	175	5	16	1	275	11
8	1	270	1	10	1	275	1
12	0	160	9	4	1	275	11

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 7						
10	1	275	1				
16	1	290	11				
4	0	275	7				
6	1	275	5				
4	1	280	1				
8	1	280	9				
2	1	280	5				
10	1	280	3				
2	1	275	7				
16	1	280	11				
6	1	280	3				
8	1	275	9				
	PERIOD 8						
8	1	285	1				
4	0	285	11				
6	0	285	7				
10	0	280	7				
6	1	285	9				
2	1	285	1				
16	0	285	11				
2	0	275	9				
4	0	275	3				
4	0	270	3				
10	0	280	5				
	PERIOD 9						
2	0	275	7				
10	0	275	3				
6	0	275	3				
4	1	280	1				
2	0	275	7				
8	1	280	9				
10	1	285	1				
6	0	175	5				
12	1	230	11				
16	0	170	11				
12	0	170	5				
4	0	170	9				

EXPERIMENT 21

Subject Pool: Pasadena City College
Brand Names: Yes
Advertising: Prohibited

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 1				PERIOD 4		
10	0	177	5	2	0	173	11
8	0	177	11	10	0	170	1
14	0	177	3	16	0	170	1
2	0	178	5	8	0	170	7
6	0	175	9	12	0	170	11
16	0	175	11	4	0	170	5
12	0	168	1	6	0	169	5
8	0	168	1	14	0	170	3
4	0	169	9	2	0	170	7
10	0	168	7	10	0	168	9
12	0	165	7	4	0	169	3
4	0	168	3	16	0	169	9
	PERIOD 2				PERIOD 5		
10	0	175	11	10	0	170	9
14	0	175	7	16	0	170	1
2	0	175	11	14	0	170	1
8	0	170	5	12	1	170	3
4	0	169	5	2	0	170	7
12	1	170	3	2	0	170	11
16	0	170	1	14	1	200	3
6	0	170	7	12	0	169	5
12	0	167	9	16	0	169	5
8	0	167	9	4	1	169	11
6	0	168	3	6	0	170	7
	PERIOD 3				PERIOD 6		
2	0	175	11	2	1	195	11
10	0	175	3	10	1	225	3
14	0	170	5	2	0	175	7
8	0	170	11	10	1	220	11
12	0	170	7	2	0	190	5
6	0	170	5	14	0	175	1
16	0	170	3	10	0	175	1
4	0	170	7	4	0	175	9
16	0	169	9	8	0	170	5
4	0	169	9	4	0	170	9
				16	0	170	7
				14	1	210	3

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
	PERIOD 7				PERIOD 10		
12	1	240	3	8	1	195	9
10	1	235	11	2	1	195	9
8	1	240	3	10	1	250	7
14	1	220	9	12	1	250	7
6	1	215	7	14	1	200	1
16	1	215	7	10	1	260	11
14	1	210	5	14	1	230	5
12	0	210	1	6	1	200	1
10	0	210	1	10	1	250	3
8	1	230	11	6	1	280	3
8	0	230	9	8	1	270	11
14	0	225	5	2	0	225	5
	PERIOD 8				PERIOD 11		
12	1	220	9	12	1	270	11
16	0	220	9	14	1	250	5
10	1	220	7	10	1	260	7
8	1	220	7	2	1	260	7
6	0	215	5	8	1	230	1
2	0	215	5	12	1	230	1
14	0	180	1	8	1	220	9
4	1	245	11	14	1	220	9
8	1	230	11	10	1	255	3
12	1	250	3	6	1	270	11
4	1	250	3	10	0	230	5
10	0	180	1	6	0	260	3
	PERIOD 9				PERIOD 12		
14	1	250	3	14	1	250	5
10	1	250	3	12	1	250	5
4	1	260	11	8	1	245	9
10	1	260	11	6	0	245	9
8	1	255	9	10	1	275	11
8	1	250	7	10	1	260	7
10	1	250	7	12	1	260	7
4	0	255	9	16	1	270	3
10	0	175	1	8	1	270	1
12	0	175	1	4	1	275	11
8	0	230	5	8	0	274	3
6	0	175	5	6	1	270	1

BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER	BUYER NUMBER	SUPER? (YES=1)	PRICE	SELLER NUMBER
		PERIOD 13					
12	1	250	9				
14	0	250	9				
10	1	260	7				
10	1	260	7				
16	1	265	5				
12	1	275	11				
4	1	275	11				
8	1	270	1				
2	1	260	3				
8	1	265	1				
6	0	260	3				
14	0	230	5				
		PERIOD 14					
14	1	280	1				
2	1	195	9				
12	0	195	9				
16	0	260	3				
8	1	275	11				
10	1	270	5				
6	1	270	7				
8	1	275	7				
12	0	270	3				
10	0	285	11				
8	0	265	1				
8	0	175	5				

APPENDIX III

As noted in the text, we chose an experience characteristic to model for its simplicity, rather than for its potential policy importance. Indeed, there is every reason to believe that "hidden" or partially hidden characteristics are more important for information policy than experience characteristics. In spite of the difficulty of interpreting experiments modeling "credence" or hidden characteristics, several have been run. In this appendix, we briefly summarize the findings of these experiments.

Plott and Wilde (1982) explored the extreme "hidden characteristics" or "credence" case wherein buyers never learn the true quality of the items purchased, that is, where the cost of ascertaining quality is essentially infinite. In spite of the extreme conditions, "lemons" markets were not observed. The experiments were designed to model a "repair" problem where, for example, an individual knows his automobile won't start, but doesn't know whether the problem is trivial and cheaply solved or serious and costly to repair.

Buyers could ask sellers for a "diagnosis" of their problem. Sellers could provide a diagnosis based on a "clue" that was specific to the buyer but which could only be understood by sellers. Buyers received neither direct or indirect evidence on the true quality of the advice they received from the seller until the conclusion of the experiment. Sellers' had a monetary incentive to always recommend the "high cost" treatment. For the sake of comparison, they ran similar experiments where the buyers were able to diagnose themselves.

Although none of the markets behaved as if participants were fully informed, it did turn out, surprisingly, that the markets where the sellers performed the diagnosis were somewhat more efficient than those where the buyers performed their own diagnosis. This was true in spite of the incentive sellers had to try to "sell" the buyer on the more

expensive treatment. Sellers found themselves under competitive pressure to provide the same advice as other sellers would give. If a seller assumed that other sellers would provide unbiased advice, then competition would force them to be honest as well. While the advice from sellers was somewhat biased toward the high priced treatment, it turned out that buyers in making their own diagnosis, showed a similar "bias" in their purchases.

The bias in both cases could have been due to the subject's failure to understand how to use the "clues" provided; instead they may have used a "representativeness heuristic" of the type studied by the psychologists, Kahneman and Tversky (1982, 84-98).

DeJong, Forsythe, Lundholm and Uecker (1984) and DeJong, Forsythe and Lundholm (1985) ran a series of experiments wherein buyers were subject to a random loss, but the probability of the loss would depend on the "care level" provided by an agent of their choice. The buyers or "principals" would observe whether or not they sustained a loss, but not the actual care level chosen by the agents. In some of the experiments run by DeJong et al., buyers could, for a price, learn the true quality of the service performed by agents, and in some, agents were liable for a loss if it was discovered through a costly investigation that they had neglected to take "due care."

All of these experiments allowed for the possibility of developing reputations and, in all, some sellers seemed concerned with developing a "good" reputation. Reputation alone, however, was not sufficient to produce completely efficient markets. In the unregulated (no investigations, no liability rule) markets, for example, two major sub-markets developed. One was a low price, low care level market and the other was a high price, middle care level market. The latter, however, was further segmented between agents who falsely advertised that they were providing the highest level of care and consistently recieved higher prices than their honest rivals. In fact, all agents in this sub-market were supplying the middle (efficient) care level.

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