How Much Irrationality Does the Market Permit?

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1. Introduction

1.1 Psychology and Economics

Persons make systematic errors in laboratory experiments when asked to perform tasks that require cognitive skill, such as deciding whether different representations of a policy choice describe the same problem or different problems. Persons act as if they are means/ends rational, however, when asked to perform tasks in laboratory experiments that test economic theories.\(^1\) The disjunction between the psychological experiments, in which persons exhibit irrationality, and the economics experiments, in which persons exhibit rationality, once led Vernon Smith to speculate that the market institution somehow enables persons to overcome their mistakes.\(^2\) This paper is an early entrant in a literature that pursues Smith’s speculation.\(^3\)

Gode and Sunder began this literature with two interesting papers arguing that market competition and budget constraints can overcome individual irrationality.\(^4\) These scholars created an

\(^{1}\)The disjunction between the psychological experiments, in which persons exhibit irrationality, and the economics experiments, in which persons exhibit rationality, once led Vernon Smith to speculate that the market institution somehow enables persons to overcome their mistakes. This paper is interested in the third potential explanation, so it supposes that bias can influence consumer choice.

\(^{2}\)Gode and Sunder (1997) and (1993).
experimental auction market. Their subject buyers could resell any experimental “goods” they purchased from the subject sellers to the experimenters at a preset price; the buyers thus had an incentive to minimize the prices they paid. The sellers had purchased the experimental goods from the experimenters at a lower preset price, and were then permitted to sell the goods in the experimental auction, keeping the difference between what they paid the experimenters and what the buyers bid. The sellers thus had an incentive to maximize the auction prices. These human subjects coordinated on the equilibrium that economic theory predicted would have been reached by profit maximizing traders facing the same costs and prices.

The experimental results thus were consistent with auction theory, but Gode and Sunder were interested in whether the outcome was driven primarily by the subjects’ rational choices or the market institution. To answer this question, they had computers play the same game. A computer “seller” could not agree to a sale below the price the experimenters charged the seller for the goods (the seller’s budget constraint); nor could a computer “buyer” pay more for goods than the sum the experimenters would pay to repurchase them (the buyer’s budget constraint). Between the sellers’ costs – the floor – and the buyer’s limit – the ceiling – the computers generated random bids and asks. A sale was concluded when a bid matched an ask. Gode and Sunder referred to their computer parties as “zero intelligence traders” because they bid randomly, had no memory and ignored market rules. The zero intelligence traders reached the equilibrium that the human subjects reached, however. Gode and Sunder concluded that competition and budget constraints (i.e., one can’t sell below cost) can
overcome the effects of irrational behavior completely.\textsuperscript{5}

This view should be taken more as a suggestion than a result for two reasons. First, Gode and Sunder studied simple transactions. Each party, computer or human, had only one unit to buy or sell, there was only one term in the relevant contract – the price – and exchange was immediate. The experiments do lend plausibility to Vernon Smith’s speculation, however. If markets can substitute for irrationality in simple contexts, perhaps markets will ameliorate irrationality in more complex contexts. Second, and however, the human subjects in these experiments had “rational preferences”; they sought to maximize profits. The computer players realized this goal as well as the human subjects did. These and other economics experiments thus can be taken to suggest that markets can (partly) substitute for a lack of means/ends rationality. It is a separate question whether markets can prevent persons from pursuing irrational ends.

1.2 Markets, Means/Ends Rationality and Consumer Heterogeneity

The main stream view among psychologists regarding cognitive error holds that persons process information with two systems:

A. “System I is viewed as encompassing primarily the processes of interactional intelligence. It is automatic, largely unconscious, and relatively undemanding of computational capacity .... [I]t conjoins properties of automaticity and heuristic processing .....”

B. “System 2 conjoins the various characteristics that have been viewed as typifying controlled processing. System 2 encompasses the processes of analytic intelligence that have traditionally

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been studied in psychometric work and that have been examined by information-processing
theorists trying to uncover the computational components underlying psychometric
intelligence.”

There is an implicit homogeneity assumption in much of the law review literature. Persons (all of them)
are victims of the availability heuristic or give different answers to the same question depending on how
the question is framed. The homogeneity assumption is too strong. . . Psychologists believe that a
successful experimental subject will make the choice that maximizes her overall well being. This choice
is defined as the “normative response”. It turns out that a nontrivial fraction of subjects in every
experiment give the normative response.

To understand why subjects may perform the same task differently, realize that cognitive theory
experiments are designed such that one information processing system will yield a particular response but
the other will yield a different response. The experimenter’s goal is to see which system governs how
subjects will perform the experimental task. For example, the scenarios used in framing problems
intuitively seem different to subjects – the System 1 response – but analysis would show that the
scenarios actually describe the same problem – the System 2 response. Subjects whose response is
controlled by System 2 give the normative response; they are not misled by how the question is posed.
Subjects whose responses are controlled by System 1 make errors. The data also show that
performance on one laboratory task correlates positively with performance on others. Thus, persons
who are not misled in framing experiments tend not to commit the sunk cost fallacy while subjects who

make mistakes in one context tend to make them in others.\footnote{Stanovitch’s extensive review summarizes the studies (at 66): “... the direction of all of the correlations displayed in Tables 2.1 and 2.2 is consistent with the standard normative models used by psychologists when interpreting tasks in the reasoning and decision-making literature. Individuals giving the normative response in one task tended to give it on another – even when the task requirements were quite different. Also, in every single case, cognitive ability was positively associated with giving the normative response – individuals of higher intelligence were relatively more likely to give the normative response. This was equally true for tasks where the normative response is the subject of great controversy as it was for the relatively uncontroversial tasks ....”}

The correlation in performance across experiments is plausible. Subjects who give the normative response in an experiment score higher in intelligence, as measured by SAT scores, than subjects who fail to give the normative response; and the former subjects also test higher on such personal traits as a tendency to intellectualize problems. Since intelligence and personality are relatively invariant to context, smart, intellectual people make fewer mistakes in general than other persons. Also, persons do not come to the experimenter wearing signs that identify themselves as analytic or intuitive. Rather, when a psychology investigator is interested in who is who, she tests subjects ex post.

The psychology results suggest that markets possess two features relevant to the questions pursued here. First, market participants also should be heterogenous: there will be “System 2 persons”, who are difficult to fool, and “System 1 persons”, who are more easily misled. Second, in mass transactions firms – sellers and lenders – cannot conveniently identify who is who before the firm offers contracts to consumers.

Firms thus face a complex problem. A firm would like to present a deal in such fashion as to cue the System 1 response if consumers exhibiting that response would pay higher prices or accept less favorable terms than would more analytical consumers. For example, persons are said to be overly

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optimistic about their future earnings prospects. Such persons may be willing to accept default terms, such as security, that their more rational selves would reject. On the other hand, a firm that offers contracts that these System 1 persons will take could lose the business of System 2 persons (they would be put off by the harsh default terms). Since firms compete for the marginal consumer, and do not know who that is, competition among firms for the sophisticated perhaps could cause them not to satisfy the preferences of the naïve.

It will be helpful, in pursuing this possibility, further to partition the consumers who make mistakes. Some of these consumers likely know their flaws while others do not. Consider, for example, a person who develops a financial plan that requires her to save a certain amount each period. Persons are said – this is becoming controversial – to discount the future hyperbolically rather than exponentially. A hyperbolic discounter has a higher discount rate between tomorrow and today than she has between six and five months from now. To be concrete, the person thinks she should save $200 each month for the next twelve months, but when March arrives an iPod looks great to her compared to banking the money so she under-saves in March. Thus, she is time inconsistent. In January, she would like to save $200 in March, but when March arrives she over consumes.

If this illustrative consumer is self-aware, she will attempt to pre-commit to her financial plan. The Government sometimes facilitates pre-commitment. Thus, Federal law helps persons to pre-commit both by using tax subsidies to encourage the creation of IRAs, and by creating penalties for early withdrawal from IRA accounts. The penalties reduce the attractiveness to consumers of departing from

\[^8\text{A good review is Frederick, et al (2002).}\]
A Coasian analysis would take a broader focus, to ask when cognitive error is best corrected within firms or on markets. Market analysis is so undeveloped that it seems productive at this stage to pursue a market inquiry separately.

1.3 This Paper

The literature suggests that markets may respond to cognitive error in two ways: by causing firms to offer the contracts that sophisticated consumers prefer to all consumers; and to offer contracts to self-aware error prone consumers that permit these consumers to avoid trouble. The question whether actual markets behave in either of these ways poses theoretical and empirical issues. Regarding theory, the analysis must be more concrete. How would competition work when some consumers are fully rational and others are not? Does competition work in the ways that theory suggests?

This paper takes a theoretical tack. Part 2 draws from a recently published paper to argue that firms with market power will offer contracts that maximize the utility of persons who do not make errors and persons who do but are self aware. Persons who make errors but are insufficiently self aware are exploited; they pay supracompetitive prices for bad contracts. Part 3 next adds competition to the story by creating a search equilibrium model of competition among firms for rational and irrational consumers. Part 4 uses the model to argue that, under plausible conditions, competitive markets can reduce the prices naive consumers pay for bad contracts and sometimes will drive bad contracts out.

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10 A search model analyzes competition for “search goods”, which are goods all of whose features the buyer can observe before purchase. Color thus is a search good while durability is an “experience good”. This paper uses a search model because it is interested in the contracts consumers sign, and a contract, at least in theory, can be read before the consumer commits to buy.
altogether. Part 5 is a Conclusion that summarizes the results, discusses their normative implications and briefly illustrates how decision makers could apply them.

It will be helpful, however, to state the important normative question at the outset. Cognitive error manifests itself in two ways: (a) the consumer cannot effectively implement her preferences; (b) the consumer has the wrong preferences (she wants to make contracts she should not make). The analysis below, consistently with the Gode and Sunder experiments, argues that markets sometimes will respond effectively to the first problem. There is a question whether markets should respond to the second problem. To see why this question is serious, let market competition drive out a bad contract. This would be an undesirable result if the normative goal were the maximization of persons’ actual preferences; for the preferences of the naive would have been frustrated. A full normative analysis of what markets should do is outside this paper’s scope, but the Conclusion will briefly argue that society should want markets to implement the consumer’s ideal preferences – the preferences she would have were she sophisticated – rather than her actual preferences. If this argument persuades, then markets that respond more to the sophisticated than to the naive are performing well. A significant implication of this view holds that while it now is common to ask how cognitive error can flaw market performance, the regulator also should ask how market performance can be helped to ameliorate cognitive error.

2. A Monopoly Contracting Model\textsuperscript{11}

2.1 The Model

Consumers face a monopolist who offers a good or a service that is priced with a two part tariff:

\textsuperscript{11}The analysis in Part 2 is drawn from DellaVigna and Malmender (2004).
a lump sum payment $P$ paid in period one (the period after making the contract) and a per use fee $p$ that is paid in period two. A buyer (or borrower) can consume in period 1 or not. If she does consume, she pays the price $p$ and incurs an immediate consumption cost of $t$. Consumption generates a benefit $b$ that is realized in period two. In this version of the story, consumption is costly now but provide benefits tomorrow (the consumption cost is exercising today at the health club; the future benefit is getting stronger). On the other hand, some products or services yield current – i.e., period one – benefits but generate future costs. Eating unhealthy food or maxing out on a credit card are examples. The model considers both of these product and service categories.

Consumers are partitioned into three types: (a) A consumer who discounts the future exponentially (she is time consistent); (b) A consumer who discounts the future hyperbolically, and so will be time inconsistent, but who knows that she is likely to deviate from her optimal consumption path; and (c) A consumer who discounts the future hyperbolically but is not fully aware of her weakness. Consumer types (a) and (b) are “sophisticated” while consumer type (c) is “naive”.

Consider first the case where consumption is currently costly but yields future benefits. At $t^0$, when a consumer signs a contract, she would like to choose consumption in period one (use the gym) if the consumption cost is less than the discounted period two benefit minus the period one user fee. A time consistent consumer thus consumes whenever $t \leq \delta b - p$. Here, $\delta$ is the exponential discount rate ($\delta = 1/(1+r)$). A self aware time inconsistent consumer, however, knows that she will choose less period one consumption than her time consistent self would prefer because this consumer discounts the future benefit too heavily. To be precise, she understands that she will choose consumption in period one whenever $t \leq \beta \delta b - p$ where $\beta$ represents the extent to which she over-weights the present ($0 \leq \beta < 1$).
In English, this consumer knows that later she will care more strongly about saving the current cost t and care less about realizing the future benefit b than she would had she been time consistent. The smaller is $\beta$ the more present oriented the consumer is.

A naive consumer believes that she is more able to resist current temptation than she actually is. This overconfident consumer thus discounts the future benefit b at the rate $\beta'$ where $\beta' > \beta$. More precisely, when she signs the contract, at $t^0$, she thinks she will consume in period one whenever $t \leq \beta' \delta b - p$ (she thinks she will go to the gym every other day).

The firm faces a start up cost of F and a per usage constant marginal cost of c. It thus earns $P - F$ when a consumer signs the contract and $p - c$ if the consumer engages in consumption. The firm will offer consumers a *menu* of contracts that maximize the firm’s expected profits subject to the constraint that consumers do at least as well signing contracts as they would do going without the good or service.

2.2 *Analysis*

The contract intended for the time consistent consumer sets the user fee $p^*$ equal to the firm’s marginal cost c of providing the good or service. Marginal cost pricing ensures that this consumer engages in consumption whenever that would generate positive surplus (whenever $t \leq \delta b - c$). The firm offers the surplus maximizing contract because, being a monopolist, it is able to recapture the surplus in advance through the down payment.

The consumer who is time inconsistent ($\beta < 1$) but who is aware of her weakness, would like to pre-commit to consume appropriately in period 1 (to use the health club as often as she should). The contract intended for this consumer sets the user fee $p$ *below* the firm’s marginal cost ($p^* < c$), making up for the resultant loss by raising the down payment P. The sophisticated, time inconsistent consumer
will make the higher down payment because she knows that the increment to the down payment buys
the pre-commitment that she prefers. The lower per use fee, that is, encourages the consumer to engage
in the appropriate amount of period one consumption (she will use the gym more as her optimal life plan
would dictate). The firm offers the pre-commitment contract because it earns the same (monopoly)
profit selling to the self aware consumer that the firm earns when selling to the time consistent consumer.

The naive consumer does poorly, however. The contract intended for her sets the lump sum fee
at its highest level and also prices use below marginal cost. This consumer believes, at $t^0$, that she will
consume more than she actually will and so she is willing to make the high down payment in order to
profit from the low usage fee on the many uses she (incorrectly) expects to make. Put another way, she
overpays up front but will not recover the overpayment through appropriate consumption later on.

A time consistent consumer will choose the optimal consumption path for goods and services
whose consumption generates benefits in period one but costs in period two. A self aware time
inconsistent consumer, who suffers from weakness of will, knows that she is likely to over consume in
period one (max out on a credit card or eat too much unhealthy food) relative to the consumption she
would choose were she time consistent. This consumer now wants to pre-commit not to consume
excessively. The contract intended for her requires a lower down payment than the time consistent
consumer pays, but sets the user fee above marginal cost. The high user fee reduces period one
consumption and thus satisfies the consumer’s desire to pre-commit not to over consume.\footnote{This consumer
would not later switch to a low marginal cost provider because the seller is a monopolist; there is no other provider.} Under the
same logic, the contract intended for the naive consumer, who underestimates how much she will consume later, also sets a user fee that is above marginal cost but is lower than the fee the self aware consumer pays. The naive consumer thus makes a down payment that is higher than it should be.

This analysis deals with two kinds of error: overconfidence and hyperbolic discounting (i.e., weakness of will). The results, however, likely generalize to some other forms of cognitive error. For example, consumers who know they are prey to the availability heuristic may pay firms to provide probability data; self aware boundedly rational consumers may pay for simple contracts.

To summarize, when consumers face a seller with market power, the seller will offer efficient contracts to the rational consumers and to the consumers who are aware that they may make cognitive mistakes. In contrast, the seller exploits the naive consumers in two dimensions: it extracts all of the surplus that a contract can generate, and the contracts themselves are inefficient. Can the market do better when firms are added to the selling side?

3. A Search Model

3.1 The Identification Problem and the Social Goal

There is an initial question what an “irrational contract” is. To understand the question, let the market offer two categories of product: safe and unsafe. A decision maker who can distinguish between them maker should ban the unsafe product. Similarly, if one contract type is always preferred by irrational consumers and never chosen by rational consumers, the decision maker should proscribe the irrational choice. There is no point to asking whether the market would eliminate an irrational contract because its existence alone answers the question.

The contracts that are this paper’s subject, in contrast, would be purchased in a free market by
every consumer type – rational, knowingly irrational, unknowingly irrational – if a contract is made attractive enough, but it would be a mistake for some consumers to buy particular versions of some contract types. As an example, consider a lending agreement with an interest rate, a late fee and a security interest. A consumer who underestimates the probability of default – she is over confident regarding her earning prospects – may borrow under the contract because she mistakenly believes that the late fee will never be assessed or the security interest will never be enforced. A rational consumer with the same default probability may reject the contract because she believes that the bad consequences she would encounter if she defaulted outweigh the contract’s seemingly favorable interest rate. On the other hand, there likely is an interest rate sufficiently low to induce the rational consumer to borrow under the contract despite those possible consequences. Similarly, there likely is an interest rate sufficiently high to discourage naive potential borrowers from buying the naive contract. For this paper’s purposes, then, an “irrational contract” is a contract that every consumer type could want but that some consumers should not want.

On this view, there is a deeper motivation for the inquiry here. Irrational contracts, as just defined, are common but difficult to regulate directly because an irrational contract differs from an unsafe product. An administrative agency sometimes can distinguish safe from unsafe products by testing. If a contract type can be both rationally and irrationally preferred, however, there is no convenient “contract test”: an agency cannot inquire into the circumstances of every consumer. A decision maker could respond to this difficulty by correcting the biases themselves, but this would be a hard task.13 The discussion of the

13Because biases can partially or completely offset, correcting one bias in isolation risks causing consumers to make worse choices. See Besharov, supra note 3. Thus, the task of bias correction may
monopoly model suggests that the decision maker should look at the market before attempting it. In that model, rational and self aware irrational consumers could distinguish good from bad deals. This makes salient the question how competition for these consumers affects the naive.

The analysis below uses a particular strategy in approaching this inquiry. Firms may specialize in consumer types. Consumer finance companies, for example, may be more likely than banks to offer contracts that to appeal to naive types. The tendency of firms to specialize is captured below by supposing that some firms offer “sophisticated contract packages” while other firms offer naive contract packages. Both consumer types in the model will purchase both contract types, depending on their relative prices. The questions pursued are whether competition can reduce the prices of these contracts to competitive levels, and whether naive contracts could be driven out altogether. A little more should be said about how these inquiries relate to each other.

Naive contracts sometimes are in a consumer’s ex ante self interest. To illustrate, a consumer who is led through excessive optimism to underestimate the probability that a product is defective will buy a less comprehensive warranty than she should buy. Claims under even limited warranties can be valuable, however. A market for warranties is competitive if the price of the warranty equals the firm’s cost of providing it. Because too narrow warranties – i.e., “wrong warranties” – are not useless, naive consumers are better off if competition causes wrong warranties to be priced at cost. Naive consumers may be worse off, however, if competition causes wrong warranties to disappear altogether. In this event, naive consumers either will buy less preferred warranties or not trade. Competition thus may have require the decision maker to make an all things considered analysis. This issue is revisited in the Conclusion.
ambiguous welfare effects if the goal is to optimize actual consumer preferences. This issue is best considered after an analysis of how competition could work.

3.2 A Search Model

A firm can sell a contract that is intended for sophisticated consumers, denoted $X_s$, or a contract that is intended for naive consumers, denoted $X_n$. A contract is a set of terms that define a loan or other consumer purchase. The monopoly model described above thus analyzed three categories of contract, each intended for a different consumer type, but it will be convenient here to put sophisticated and mistaken but self aware consumers in the same category; the $X_s$ contract is intended for these types.

Firms have a fixed cost $F_i$ ($i = s$ or $n$), produce at a constant marginal cost of $c_i$ over some range $[0, z_i]$ and produce at an infinite marginal cost thereafter ($z_i$ thus is the firm’s capacity constraint). A firm’s average cost for offering a package is $AC(X_i) = (F_i/q) + c_i$, where $q$ is output. The competitive price for a contract, which has each firm pricing contracts at average cost and selling up to capacity, thus is $p_i^* = AC_i(X_i)(z_i) = (F_i/z_i) + c_i$. It is assumed equally costly to sell both contract types ($c_n = c_s$), but that it is more costly for a firm to set up an exploitative system than an efficient system. The motivation for this fixed cost assumption is that it apparently is more complex for a firm to find the standard form contract that best exploits the numerous, possibly partially offsetting biases to which consumers are prone than it is for a firm to choose the terms that a utility maximizing consumer would accept.\(^{14}\) Because $F_n > F_s$ while all firms sell at the same marginal cost, the competitive price for the naive contract must exceed the competitive price for the sophisticated contract (i.e., $p_n^* > p_s^*$). There are $Y$ total firms in the market, where $Y_s$ sell

\(^{14}\)Firms also risk nonenforcement or liability if their contracts too obviously exploit.
the sophisticated contract \(X_s\) and \(Y_n\) sell the naive contract \(X_n\) (\(Y_s + Y_n = Y\), the total number of firms).

Consumers are partitioned in two ways. First, some consumers make cognitive errors without realizing they do so – they are “naive” – and some do not make errors or are self aware – they are “sophisticated”. Using notation, there are \(B_s\) sophisticated consumers in the market and \(B_n\) naive consumers, where \(B_s + B_n = B\), the total number of consumers. Persons also are partitioned according to their shopping behavior. Some consumers – \(B_1\) in number – visit \(n = 2\) firms and then purchase the most attractive contract they see. A sample size of two is chosen for convenience. The \(B_2\) consumers – the nonshoppers – visit only one firm before purchasing. Let \(Pr_s\) be the probability that a sophisticated consumer shops, and \(Pr_n\) be the probability that a naive consumer shops. Then \(B_1 = Pr_s B_s + Pr_n B_n\), with \(B_2\) defined similarly. There seems no reason to suppose, however, that naive consumers are less interested in low prices than sophisticated consumers are. On this view, it is assumed here that \(Pr_s = Pr_n = P\), the probability that any consumer engages in comparison shopping. For the reasons given in Part 1.2, firms cannot tell which consumers are naive and which not, nor can they tell which consumers shop or not.

A consumer is said to prefer the contract \(X_i\) if she would choose \(X_i\) after seeing both contracts selling at their competitive prices. To understand the basis for this definition, begin by assuming that a sophisticated consumer will purchase the contract \(X_s\) at any price up to a common limit price of \(l_s\). Next recall that consumers will purchase their less preferred contract if the price of their preferred contract is too high. A sophisticated consumer thus also will purchase the naive contract \(X_n\) at any price up to a common limit price of \(l_{sn}\). Similarly, a naive consumer will purchase \(X_n\) at any price up to a common limit price \(l_n\), and will purchase \(X_s\) at any price up to a common limit of \(l_{ns}\). These limit prices are referred to
as a consumer’s “willingness to pay” for a contract type. A sophisticated consumer who sees the contracts Xs and Xn priced competitively would purchase Xs if \( l_s - p_{s^*} > l_{sn} - p_{s^*} \), where the left hand side of this inequality is the expected surplus the consumer would get from purchasing Xs and the right hand side is the expected surplus she would get from purchasing Xn. Since \( p_{n^*} > p_{s^*} \), the sophisticated consumer would purchase Xs only if \( l_s > l_{sn} \); if, that is, she has a greater willingness to pay for the sophisticated contract than for the naive contract. This is a plausible condition. Similarly, the naive consumer will buy Xn if she has a greater willingness to pay for the naive contract than for the sophisticated contract. Because the naive consumer is partly deluded, however, it cannot be said a priori whether her limit price for her preferred contract, \( l_n \), exceeds the limit price of the sophisticated consumer for her preferred contract, \( l_s \). Part 4 considers both possibilities.

A little more should be said about when consumers will purchase their less preferred contract. It is convenient to explain switching between contracts by focusing on the behavior of the naive consumer. She will purchase the sophisticated contract Xs if its price is low enough and she visits only firms that sell Xs, or if she sees both contracts but the price for Xs is too high. The cutoff price for Xn, above which the naive consumer would purchase Xs, is referred to as the “switching price”. To derive this price, recall that the discussion of consumer preferences just above showed that \( l_n > l_{ns} \). A naive consumer who purchases Xs at its competitive price of \( p_{s^*} \) earns an expected surplus of \( l_{ns} - p_{s^*} \). She is assumed to reject Xn if she would earn at least as much surplus purchasing Xs at \( p_{s^*} \) than she would earn by purchasing Xn at the switching price. Letting this price be \( p_n(a) \), the naive consumer will switch to Xs when

\[
l_n - p_n(a) = l_{ns} - p_{s^*},
\]

where the left hand side of this equation is the surplus the consumer would
have realized had she purchased \( X_n \) at \( p_n(a) \). Rearranging terms, the switching price for \( X_n \) is \( p_n(a) = l_n - l_{ns} + p_s^* \). The price at which the sophisticated consumer switches to \( X_n \) is derived similarly.

This description of the model apparently implies that naivety is a generic quality: a consumer is naive or she is not. Naivety would be context dependent, however, if consumers are more sophisticated about some contracts or contract terms than others. For example, consumers may make fewer mistakes regarding the warranty term than the prepayment penalty term because over time consumers become familiar with the need for warranty protection.\(^{15}\) That consumer sophistication may vary with context could affect the results reached below in two ways. First, the less naive a consumer is the more she will pay for the sophisticated contract \( X_s \) because she will (partially) recognize its virtues. In the notation used here, the limit price of naive consumers for the sophisticated contract, \( l_{ns} \), increases as consumer sophistication increases. When \( l_{ns} \) goes up, the switching price \( p_n(a) \) that will induce the naive consumer to reject the contract intended for her – \( X_n \) -- goes down. The lower is the naive switching price, Part 4 shows, the more effective comparison shopping is at lowering the price that sellers can charge for \( X_n \). Second, the less naive a consumer is, the lower will be her willingness to pay for the naive contract. Part 4 will argue, in turn, that when sophisticated consumers have a greater willingness to pay for the sophisticated contract than naive consumers have for the naive contract, or the willingnesses to pay are close, the market for the naive contract is more likely to disappear.

Finally, a firm is said to have a “comparative advantage” at selling one of the two contract types

\(^{15}\)Some biases moderate with experience. For example, Van Den Steen (2004) states (at 1141) that “The [overconfidence] bias also increases in a mean-preserving spread of the distribution of prior beliefs, but it tends to disappear with sufficient experience with the particular choice problem.”
considered here if the firm needs fewer customers to break even – to recover its fixed cost – selling that contract type than selling the other type. The number of consumers a firm needs to break even is \( \frac{F_t}{l_t - c_t} \), where \( i = s \) or \( n \). Thus, a firm would have a comparative advantage, denoted \( \lambda_s \), at selling the contract \( X_s \) if

\[
\lambda_s = \frac{F_s}{l_s - c_s} < \lambda_n = \frac{F_n}{l_n - c_n}
\]

As will become apparent, when firms have a comparative advantage at selling one contract type, the market is less likely to offer the other contract type.

This model applies to many of the cognitive errors that are assumed to affect consumers commercially. For example, a naive consumer may be overconfident or optimistic about her ability to pay off a loan. Because her true odds of default are higher than her perceived odds of default, she will accept more draconian default terms in return for a low interest rate than a sophisticated consumer with her default profile would take. A contract with these harsh terms is denoted \( X_s \) here. On the other hand, if the interest rate on the loan becomes too high, this consumer would switch to a contract with an even higher interest rate but less onerous penalties for nonpayment. The contract with these softer terms is denoted \( X_n \).\(^{16}\)

4. Analysis

\(^{16}\)Though the interest rate for \( X_s \) in the illustration is higher than the interest rate for \( X_n \), the total cost of \( X_s \) to the consumer is lower because of the more favorable default terms.
4.1 Pricing Decisions

It is helpful to begin by assuming that firms are selling both contract types at their competitive prices. Would a firm selling the naive contract $X_n$ deviate from the competitive equilibrium? Two deviations are possible: in the price dimension, from $p_n^*$ to a higher price; and in the “quality” dimension, from $X_n$ to the sophisticated contract $X_s$. Beginning with price deviations, first consider a deviation to the limit price $l_n$. The firm would then sell only to naive nonshoppers. A sophisticated nonshopper would reject $X_n$ at its limit price. A naive shopper would either see the package $X_n$ selling elsewhere at its competitive price $p_n^*$ or the package $X_s$ selling at its competitive price $p_s^*$. Since the latter is below the switching price of $p_n(a)$, neither naive nor sophisticated shoppers would purchase $X_n$ at $l_n$.

The firm would not deviate from the competitive equilibrium if a deviation would earn it a non-positive profit. This equilibrium condition is expressed as

$$ (l_n - c_n) \frac{(1 - p)B_n}{Y} - F_n \leq 0 $$

The first term on the left hand side of this expression is the surplus the firm would earn from the deviation $(l_n - c_n)$; the second term is expected demand from the naive nonshoppers. The expression can be rewritten as

$$ (1) \quad \frac{(1 - p)B_n}{Y} \leq \frac{F_n}{l_n - c_n} $$

A deviation to the highest price for the naive contract thus would not occur if (a) Many naive consumers

\[\text{\footnotesize\textsuperscript{17}}\]

It is assumed here that the willingness to pay of the sophisticated consumer for the naive contract is less than the willingness to pay of the naive consumer for the naive contract (i.e., $l_n < l_s$). On this assumption, a firm that offers $X_n$ at its limit price of $l_n$ could not sell to a sophisticated nonshopper.
comparison shop (P is high); (b) Consumers have a low willingness to pay for the naive contract (l_n is low); or (c) The fixed costs of setting up an exploitative system are high (F_n is big). The intuition underlying condition (a) is obvious. The intuition underlying condition (b) is that the lower is the willingness to pay of naive consumers the less the firm gains from charging them the limit price. Regarding condition (c), the greater the fixed costs of creating the naive contract, the more naive nonshoppers the firm needs to recover these costs.

The presence of sophisticated consumers in the market also reduces the likelihood that firms will charge excessive prices for the naive contract. To see why, realize that when firms sell the sophisticated contract X_s at its competitive price, they restrict the ability of other firms to price X_n at its limit. This is because the limit price is less than the switching price of p_n(a) so a naive shopper will either buy X_n if she visits a firm that prices it competitively, or she will buy X_s if her other draw is from a firm offering it. Firms could not sell X_s, however, unless there were sophisticated consumers to buy it. Hence, the presence of sophisticated consumers helps to protect naive consumers from being maximally exploited in the price dimension.

The illustrative firm also could deviate to the lower switching price p_n(a). The firm would not sell to sophisticated shoppers. This consumer’s two draws will reveal at least one firm selling the contract X_s priced competitively, or one firm selling the contract X_n priced competitively. Whether this firm would sell to sophisticated nonshoppers depends on whether the most such consumers would pay for the naive package (l_{sn}) exceeds p_n(a), the switching price for naive consumers. The firm would not sell to a naive shopper whose other visit was to a firm selling the naive contract at its competitive price. On the other hand, the deviant firm would sell to naive nonshoppers and to naive shoppers whose other visit was to a
firm selling $X_s$. A firm selling $X_n$ would earn non-positive profits from a deviation to the switching price if it did not sell to sophisticated nonshoppers and if

$$\frac{(1-P)B_n}{Y} + (P \cdot B_n) \frac{Y_n}{2Y} \leq \frac{F_n}{p_n(a) - c_n}$$

The existence of a second term on the left hand side of Expression (2) apparently makes (2) harder to satisfy than (1): that is, a firm selling $X_n$ at $p_n^*$ is more likely to deviate to the switching price for $X_n$ than to the limit price. This result is strengthened if the firm also would sell to sophisticated nonshoppers. On the other hand, if the naive consumers’ willingness to pay for $X_s$, $l_{ns}$, is relatively high, then $p_n(a)$ will be small, making the right hand side of Expression (2) large. Then (2) will become easy to satisfy; the firm likely will do better pricing $X_n$ competitively than deviating to a higher price. The intuition for this result was introduced above: When the switching price for $X_n$ is low, the gain to the firm from charging it – $(p_n(a) - c_n)$ – is more likely to be below the cost – the loss of the naive shoppers who visit another firm selling $X_n$ competitively. Thus, as consumer naivety falls, comparison shopping is more effective at producing competitive prices.

This analysis of the seller’s pricing decision can be summarized in

Proposition One: The presence of sophisticated consumers in a market, and the penchant of both sophisticated and naive consumers to comparison shop, both increase the likelihood that firms will price naive contracts competitively.

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18 This possibility may be of theoretical interest only, as it is realized when few sophisticated consumers comparison shop and the sophisticated consumers have a high willingness to pay for the naive contract.
Remark 1: Competition is beneficial in two ways. First, competition will ameliorate or eliminate the redistribution of wealth from consumers to firms. When $X_n$ is competitively priced, naive consumers realize the full surplus from buying it ($l_n - p_n^*)$. Second, when firms earn rents from noncompetitive pricing, new firms will enter the market to compete those rents away. As a consequence, though all firms come to earn zero pure profits the market will have too many firms. This inefficiency is reduced as market pricing becomes more competitive because then fewer firms will enter. Finally, the model assumes for convenience that consumers engage in the minimum amount of search; shoppers visit only two firms. If consumers search more extensively, the beneficial effects of competition will be enhanced.

Remark 2: Proposition One nevertheless may appear to describe an inefficient outcome. To see why, suppose that naive consumers somehow became sophisticated. Then, the most they would pay for the naive contract would be $l_{sn}$ which was shown above to be less than $l_s$. Since the competitive price for the naive contract exceeds the competitive price for the sophisticated contract, every consumer who saw both contracts priced competitively would realize that the sophisticated contract generates greater expected surplus and buy it. Thus, that both contract types are sold appears inefficient. Remark 7 below questions this conclusion.

Remark 3: The contracting ideal, among scholars, is the “dickered term”: the portion of the agreement whose content is codetermined. Dickering may have less appeal in consumer markets if firms can use the bargaining process to learn whether consumers are mistake prone. Such firms would then exploit the naive while offering good terms to the sophisticated. In contrast, in the model here the selling side drafts every term but firms cannot identify particular consumers by type. Proposition One thus suggests that consumers can be better off with anonymity plus competition than with the opportunity to
bargain with firms over terms.

4.2 Contracting decisions

A second issue is whether the market for the naive contract could disappear altogether though naive consumers exist. A firm selling the contract $X_n$ at its competitive price could deviate to selling the contract $X_s$ at its limit price or at some lower price. A firm that deviated to $l_s$ would serve only sophisticated nonshoppers. The firm could not sell to naive shoppers, who would either see $X_s$ or $X_n$ priced competitively at another firm, both of which they would prefer. The firm also would not sell to naive nonshoppers because their willingness to pay for the sophisticated contract is assumed to be less than the willingness to pay of sophisticated consumers for that contract (i.e., $l_{ns} < l_s$). Finally, the firm would not sell to sophisticated shoppers because their other draw would be either to a firm selling $X_s$ priced competitively or $X_n$ priced competitively. The latter price is below the sophisticated consumer’s switching price.$^{19}$ Hence, a deviation from selling the naive contract at $p_n^*$ to selling the sophisticated contract at its limit price would earn non-positive profits if

$$\frac{(1 - P)B_s}{Y} \leq \frac{F_s}{l_s - c_s}$$

Expression (3) demonstrates the obvious result that firms are more likely to offer sophisticated contracts if there a lot of sophisticated consumers. A more interesting question is whether Expression (3)

$^{19}$Denote the price at which a sophisticated consumer would buy the naive contract as $p_s(a)$. Then, recalling the derivation of the naive consumer’s switching price, the switching price for the sophisticated consumer is $p_s(a) = l_i - l_{sn} + p_n^*$.
is harder to satisfy than Expression (1) (i.e., whether a firm is more likely to offer the sophisticated contract at its limit price than the naive contract at its limit price). The left hand side of (3) would be larger than the left hand side of (1) -- deviations to $X_s$ would be more likely -- if there were more sophisticated consumers than naive consumers. Also, the right hand side of Expression (1) is $\lambda_n$, a firm’s comparative advantage at selling the naive contract, and the right hand side of Expression (3) is $\lambda_s$, a firm’s comparative advantage at selling the sophisticated contract. Hence, if $\lambda_s < \lambda_n$, the right hand side of (3) would be smaller than the right hand side of (1). In this event, a firm originally offering the naive contract would be more likely to deviate in both the price dimension and the quality dimension: the firm, that is, would rather sell the sophisticated contract at its limit price than the naive contract at its limit price.

The marginal cost of selling both contract types is assumed to the same, but the fixed costs of selling the naive contract are higher than the fixed costs of selling the sophisticated contract. Thus, firms will have a comparative advantage at selling the sophisticated contract if sophisticated consumers have a higher willingness to pay for $X_s$ than naive consumers have a willingness to pay for $X_n$ (i.e., $l_s > l_n$); or if the two willingnesses to pay are sufficiently close.

Next consider a deviation from $X_n$ to $X_s$ at the switching price of $p_s(a)$. The analysis of this deviation is similar to the analysis for the naive switching price above. A firm that deviates to selling the sophisticated contract $X_s$ at its switching price would sell to sophisticated nonshoppers, to sophisticated shoppers whose other draw was at a firm selling the naive contract $X_n$ and to naive nonshoppers if their

\[\text{20 A firm selling the naive contract at its competitive price would not deviate to selling the sophisticated contract at its competitive price because the firm realizes no surplus in any competitive equilibrium.}\]
willingness to pay for the sophisticated contract \((l_s)\) exceeded the sophisticated switching price. The firm thus is more likely to deviate to selling the sophisticated contract at its switching price than at its limit price.

This analysis of contracting decisions is summarized in

Proposition Two: Competition may drive naive contracts from the market. This outcome is more likely to occur if there are many sophisticated consumers, if both naive and sophisticated consumers comparison shop, if sophisticated consumers have a relatively high willingness to pay for contracts intended for them and if naive consumers have a relatively low willingness to pay for contracts intended for them.

Remark 4: Firms selling \(X_n\) may deviate to \(X_s\) at its limit or switching price. Since firms in the original assumed equilibrium were pricing \(X_s\) competitively, the analysis here predicts the existence of price dispersion in the \(X_s\) market. Equilibria with price dispersion are common when search is costly.

Remark 5: A number of biases, such as over confidence and the endowment effect, dissipate with experience. This suggests that naivety is less common or weaker in markets in which consumers buy or borrow frequently. The less naive a consumer is, the lower is her willingness to pay for the naive contract and the higher is her willingness to pay for the sophisticated contract. Common transactions thus are more likely to be conducted under sophisticated contracts.

Remark 6: In the model, sophisticated consumers will buy contracts intended for the naive. A plausible alternate specification holds that sophisticated consumers never would purchase naive contracts because they would recognize the contracts’ exploitative nature. On this view, naive contracts are more likely to disappear than in the analysis here because firms offering naive contracts could not sell to sophisticated consumers at any price. A possibly more realistic assumption is that sophisticated consumers will purchase some naive contract types but not others. The rejected contracts may be the most
exploitative.

**Remark 7**: Eliminating naive contracts, however, would be undesirable if actual consumer preferences are the normative benchmark. When firms sell the sophisticated contract at its limit price, no naive consumers would purchase; and when firms sell the sophisticated contract at its switching price, naive consumers would buy it only if their limit price for that contract exceeds the switching price \((l_{ns} > p_s(a))\).

Recalling that naive consumers get surplus from the contract intended for them (this is \(l_n - p_{n}^\ast\)), competition that eliminates the naive contract creates welfare losses.

5. Conclusion

5.1 Summary and Normative Analysis

Consumers may be partitioned in three ways: some consumers do not make cognitive errors; some consumers are error prone, but know they are; and some consumers are error prone but think they are not. Theory shows that firms with market power will offer contracts that are optimal for the first two consumer types but which exploit the third. Naive consumers are offered naive – that is, wrong – contracts, and pay monopoly prices for them. The first result carries over when market competition is introduced on the selling side: firms will offer optimal contracts to rational and to self aware consumers. The second result may change, however. When naive consumers are offered the wrong contracts, those contracts are less likely to be priced supracompetitively. Also, sellers sometimes do better offering good contracts to every consumer type. The intuition underlying these results now is easy to state: If many firms exist, if some consumers are sophisticated while others are naive, if firms cannot tell into which class a consumer falls, and if all consumer types will shop for low prices and preferred contracts, then competition among firms for the marginal consumer will drive prices down for all contract types and, if there are enough sophisticated consumers, will
This last result may be thought morally problematic. If naive consumers do not lose their errors, they will experience welfare losses when competition drives their preferred contract from the market. Thus, Williams (1985), at 88, thus argued that government can reduce utility if it implements idealized preferences but persons never come to have those preferences.

There is an argument, briefly sketched here, that the consumer’s idealized preferences – those she would have were she sophisticated – should control. The argument is in a Rawlsian vien, and would go like this: Consider a person who knows that she will be a consumer during her adult life but does not know if she will turn out to be sophisticated or naive. She is told that, when she is to make market purchases, she may be naive regarding some transactions and sophisticated regarding others. When she is sophisticated, she knows that she would purchase the sophisticated contract, if given a choice, because the sophisticated contract would be better for her. Thus, she would prefer, before the market game began, to be sophisticated in every transaction; this would maximize her expected utility over all of the commercial contracts she later will make. This view implies that she would prefer the market to maximize the preferences she would later like to have – her idealized preferences – rather than to maximize the preferences she later turns out to have; for those preferences could lead her astray. It is customary in moral theory to give considerable weight to the choices that persons would make in some form of original position. If that is done here, then that market competition may drive out naive contracts is the normatively best result.

5.2 Applications

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This is a familiar problem in utilitarian theory. Williams (1985), at 88, thus argued that government can reduce utility if it implements idealized preferences but persons never come to have those preferences.
Current market responses to cognitive error will not always produce good results; bad contracts and high prices likely continue to exist. This raises difficult questions for decision makers because whether an actual contract is good or bad depends on context: the contract could be optimal for some consumers and suboptimal for others. The two related implications of this fact are that the existence of several contract types in a market cannot itself demonstrate that cognitive error is pervasive, and that banning particular contract types would usually be a mistake. A second policy response is to correct disadvantaging biases. Apart from consumer education in schools, this response is difficult to implement: that biases may offset implies that the task of bias correction makes great informational demands on the decision maker. As an example, people who are too present oriented may choose suboptimal effort levels in the pursuit of projects with long term payoffs. A person who is excessively confident in his ability to control outcomes, however, may overcome this bad incentive if his misplaced optimism causes him to overrate the probability of success.\footnote{As another example, pessimistic consumers who make overly high projections of future consumption needs may not under-save. Rabin (1999).} When offsetting errors are welfare enhancing, correcting one error must be welfare reducing. This suggests that the task of bias correction may best be conducted holistically.\footnote{A decision maker also may have to consider the efforts of persons to overcome biases through internal systems of control. Considerable evidence exists that a person forms her self image by inducting the kind of person she is from her past actions. Because persons have imperfect recall (they cannot fully evaluate the wisdom of past choices), they develop “personal rules” to guide behavior. It is easier to recall whether one violated a rule. The cost to a person of violating a rule thus may be large: missing a scheduled exercise day will reduce fitness only by a little but may contribute substantially to the person’s view that she really is slothful. That perception, in turn, may cause the person to miss a lot of exercise days. More relevant here, a person who fears that she suffers from weakness of will may develop a saving rule that she is quite reluctant to break. Benabou and Tirole (2004) formalize this behavioral theory in a model which shows, among other things, “that agents with hyperbolic discounting can actually behave as though they overweighed the future rather than the present.” (at 850; emphasis in original). That persons exhibit inconsistent discount rates in laboratory experiments thus should not,
and difficult questions as to which legal institution would be good at error reduction and how that institution should proceed.

That markets may help suggests a different mode of response, which is to improve market performance. There are two well known tools: to facilitate comparison shopping by requiring common terms in consumer contracts to be cast in standard forms; and to require the language in those forms to be accessible to the average reader. A possible third tool is to require firms to provide consumers with bias reducing information.

This paper briefly illustrates these possible policy responses by analyzing how the model applies to credit card contracts. Every extant credit card contract could be preferred by every consumer type, but not every consumer should prefer every contract. Some companies offer credit cards with high introductory charges, relatively low monthly interest rates and a variety of ancillary services. Other companies offer cards with no initial charges, low interest rates for an introductory period, high interest rates thereafter and few ancillary services. Letting income be a rough proxy for sophistication, sophisticated consumers could prefer the former card because they are likely to use the services (easier reservations at expensive restaurants and clubs, for example) and are relatively indifferent to the interest rate on an outstanding balance, which these consumers plausibly expect never to have. This credit card contract would be an $X_s$ contract.

A naive consumer could prefer the stripped down version with high later interest rates – the $X_n$ contract. This contract is attractive to many consumers because the contract is costless to make (there are
no initial charges), relatively less affluent consumers may have little interest in the ancillary services, and consumers may be attracted to the feature that later borrowing will be quick and easy. To see why this contract may be wrong for a naive consumer, let a person develop a financial plan at time zero ($t^0$). The plan requires her to save the fraction $6$ of her income in each period and to spend the fraction $(1 - 6)$ in that period. This consumer, however, is prone to two cognitive errors: she discounts the future hyperbolically (she suffers from weakness of will) and she is overconfident. As a consequence of the former error, in period $t^3$ she succumbs to temptation, and chooses to spend the fraction $\Gamma > 6$ of her period three income. As a consequence of the latter error, she uses her credit card conveniently to borrow a sum she mistakenly believes she will promptly repay. Firms offering the $X_n$ credit card contract specialize in selling to such naive types. This contract type is said to be unfair, however. The low initial rate lures the naive consumer into the arrangement and the later high rate exploits her.²⁴

A contract with these features, however, could be rationally preferred by consumers free from cognitive error, and also preferred by self aware error prone consumers. Nominal credit card interest rates are high relative to other credit sources, but the total cost of a credit card loan may be lower than the total cost of alternate financial sources because credit card borrowing has low transaction costs. The debtor gets the money without providing the lender with a credit history or income and employment data, or having an interview.²⁵ Hence, sophisticated consumers who are not interested in the ancillary services associated with $X_n$ may prefer to save the introductory fee and use the $X_n$ card. Also, a self aware error

²⁴See Bar Gill (2004).

²⁵Put more precisely, if $C(L)$ is the total cost of a loan, then $C(L) = r + tc$ where $r$ is the interest rate and $tc$ are transaction costs. Then $C(L)_{\text{card}}$ may be less than $C(L)_{\text{bank}}$ even if $r_{\text{card}} > r_{\text{bank}}$. 

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prone consumer may prefer this card because of the high later interest rate. This consumer wants to make future borrowing difficult because she knows she is likely otherwise to borrow too much. The high rate thus is a form of pre-commitment: the higher it is, the more difficult it is for the consumer to borrow in the course of deviating from an optimal financial plan. As just said, however, naive consumers perhaps should not prefer $X_n$: under it, they may make excessive purchases early in their consuming lives because they mistakenly overestimate their ability to pay credit card debt promptly.

To summarize, sophisticated consumers likely prefer the $X_s$ card, but some of these consumers also prefer borrowing under the $X_n$ card and more of them would have this preference if the introductory charge for $X_s$ was increased too much. Naive consumers likely prefer the $X_n$ card but they could come to prefer the $X_s$ card with its low monthly rate if the introductory charge fell sufficiently. Since all consumer types can prefer all card types, no type should be banned. This market would be performing poorly, however, if too many naive consumers borrowed under the $X_n$ card relative to these consumers’ circumstances and if the prices for both contract types were too high.

If good and bad contracts are partly person relative, there is a question how a decision maker would know when to intervene. The model suggests that problems may exist if particular contract types sold at widely disparate prices. Considerable price dispersion indicates that some consumers are paying supracompetitive prices. Also, considerable price dispersion suggests that too few consumers comparison shop. The less comparison shopping there is, the more likely it is that the naive contract is profitable to sell.

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The state could attempt to improve the functioning of a badly performing credit card market by requiring common terms in all credit card contracts, not only the annual percentage rate, to be quoted in standard, easy to understand language. This would facilitate comparison shopping by all consumers for both contract types and for low rates. Regarding the third possible market improving response, a credit card company could be required to present consumers with a short description of default rates together with a statement that not every borrower can be above average (that consumers are better advised to consider themselves average than good). Because some persons are better able to absorb narrative than to evaluate statistics, an alternative disclosure mode would have firms providing consumers with scenario information: stories about persons who got in over their heads. Either form of disclosure could reduce consumer naivety by moderating any overconfidence bias. When naivety falls, market performance improves.

None of these responses guarantees that only good contracts will be offered at competitive prices. But since it would be a mistake to ban any of these contract types, and since correcting the biases that may cause some consumers to borrow excessively under them would be extraordinarily difficult, focusing on the competitive process seems a promising policy option. Markets may be easier to improve than people.

References


Jolls and Sunstein (2004), at 40-46, discuss the need for and the potential efficacy of providing consumers with information of this type.


