



## Consumer biases and mutual ownership

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### ARTICLE INFO

#### Article history:

Received 17 September 2012

Received in revised form 3 June 2013

Accepted 3 June 2013

Available online 26 June 2013

#### JEL classification:

D11

D18

G21

G32

K22

L22

#### Keywords:

Consumer biases

Mutual ownership

Nonprofits

Credit unions

### ABSTRACT

We show how ownership of the firm by its customers, as well as nonprofit status, can prevent firms from using contractual terms that take advantage of consumer biases. By eliminating an outside residual claimant with control over the firm, these alternatives to investor ownership reduce the incentive of the firm to offer such terms. However, customers who are unaware of their behavioral biases may fail to recognize this advantage of non-investor-owned firms. We present evidence from the consumer financial services market that supports our theory. Comparing contract terms, we find that mutually owned firms offer lower penalties, such as default interest rates, and higher up-front prices, such as introductory interest rates, than do investor-owned firms. However, consumers most vulnerable to these penalties are no more likely to use mutually owned firms.

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## 1. Introduction

Existing models in the behavioral industrial organization literature assume that all firms simply maximize profits (e.g., [DellaVigna and Malmendier, 2004](#); [Grubb, 2009](#)). This is the standard way to model investor-owned firms, the residual claimants of which hold control rights over the firm. If the firm contracts with consumers who suffer from biases in decision-making, this profit motive in turn provides investor-owned firm managers with incentives to use

contractual terms that generate greater payments from biased consumers. For example, a profit-seeking manager of a credit card issuer may have incentives to include a term in the fine print of the cardholder agreement that requires the cardholder to pay a fee every time he goes over the credit limit on his card. This term will generate more payments from boundedly rational customers who have trouble tracking their credit usage. We will refer to contractual terms that take advantage of consumer mistakes as *penalties*.

In some cases these mistakes by consumers result in social costs, particularly when consumers are not fully aware of their behavioral biases. Moreover, the social costs of these mistakes are magnified by the strategic reaction of firms—contracts designed to take advantage of consumer mistakes can further distort consumer decision making ([DellaVigna and Malmendier, 2004](#)). While regulating the terms of contracts could in principle abate these social costs, to get the regulations right puts a considerable informational burden on the government, resulting in the risk that regulations would do more harm than good. And less intrusive remedies, such as mandatory disclosure and market competition, may fail to cure these inefficiencies.

In this paper we show how mutual ownership and nonprofit status can prevent firms from using contractual terms that take advantage of consumer biases. In a mutually owned firm, the firm's customers hold both residual financial claims and control rights over the firm. In contrast, nonprofit firms have no owners; that is, those with control rights over the firm are by law denied residual financial claims ([Hansmann,](#)

<sup>☆</sup> Financial support for this research was generously provided by the John M. Olin Center for Law, Economics, and Business at Harvard Law School and the Project on Justice, Welfare & Economics at the Weatherhead Center for International Affairs. We thank Co-Editor Dan Silverman, two anonymous referees, Oren Bar-Gill, Christoph Engel, Xavier Gabaix, Josh Gallin, Ed Glaeser, Michael Grubb, Henry Hansmann, Oliver Hart, Paul Heidhues, Marcel Kahan, Louis Kaplow, Larry Katz, David Laibson, Adam Levitin, Sendhil Mullainathan, Paul Niehaus, Josh Schwartzstein, Steven Shavell, Andrei Shleifer, Kathy Spier, Noam Yuchtman, and participants in the Law, Economics, and Organizations Workshop at Harvard Law School, the Law and Economics Session of the NBER Summer Institute, and the Frontiers in the Economic Analysis of Contract Law Conference at the University of Bonn for valuable comments. We also thank Harry Medina of the Government Accountability Office for providing data on deposit account contracts. The analysis and conclusions contained in this paper are those of the authors and do not necessarily reflect the views of the Board of Governors of the Federal Reserve System, its members, or its staff.

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1980). In practice, mutuals may be governed much like nonprofits given the collective action problems facing customer-owners in meaningfully exercising their control rights. Both mutual ownership and nonprofit status lower the benefit of penalties to those who control the firm and can thereby reduce their use of penalties.

While in our model mutual and nonprofit firms charge lower penalties than investor-owned firms, in equilibrium they must charge higher up-front prices. Competition causes up-front prices to be subsidized by penalty revenue at both types of firms. Because non-investor-owned firms earn less revenue from penalties, in a competitive market they must charge higher up-front prices than investor-owned firms in order to break even.

Given the differences in contracts induced by ownership type, we show that mutual and nonprofit firms have a competitive advantage over investor-owned firms in serving a particular type of consumer. On the one hand, customers who believe they are relatively unbiased and therefore can avoid the penalties used by firms, including *naïve* customers who in fact are vulnerable to these penalties, will be attracted by the low up-front prices charged by investor-owned firms. But customers who are aware of their vulnerability to penalties, whom we refer to as *sophisticated*, will patronize mutual and nonprofit firms in order to avoid paying the penalties that subsidize the low up-front prices at investor-owned firms. In our model, mutual ownership and nonprofit status serve as commitment devices that limit the degree to which the firm behaves opportunistically vis-à-vis its customers and that allow such firms to enter the market and compete successfully for sophisticated consumers.

In support of our theory, we present evidence that consumer contracts offered by investor-owned firms differ from those offered by mutually owned firms in the consumer financial services market. We find that, controlling for the scale of the firm, mutuals charge lower penalties, such as default interest rates, and higher up-front prices, such as introductory interest rates, than do investor-owned firms. We provide further corroborating evidence by showing that mutual firms do indeed provide less compensation in the form of incentive pay than do investor-owned banks, by examining the sorting of consumers between ownership types, and by providing anecdotes of investor-owned and mutual firms' marketing materials.

Our theory suggests that mutual and nonprofit firms may thrive in markets in which consumer biases are important. Consumer financial services markets are perhaps the best application, since credit unions, mutual savings and loan associations, mutual savings banks, and mutual insurance companies have substantial market share and consumer biases play a large role in household financial decision-making. Other markets in which mutuals and nonprofits play major roles and in which consumer biases may be important include education and health care. Factors other than consumer vulnerability to mistakes, of course, also influence the prevalence of ownership types in different markets. For example, because mutual and nonprofit firms cannot raise outside equity capital, they may be less prevalent in capital-intensive industries.

Our work is the first to bring together two literatures: (1) work on the role of firm ownership in mitigating incentives for opportunism with respect to some class of firm patrons (i.e., providers of some input to the firm or purchasers of the firm's output); and (2) work on the implications of consumer biases for market contracts. Hansmann's (1980, 1996) seminal work on non-investor-owned firms, on which we build, argues that mutual ownership and nonprofit status are used to mitigate a contracting failure between the firm and some class of firm patrons. Hansmann puts particular emphasis on the role of market power and information asymmetries as rationales for ownership of the firm by that class of patrons. Our paper fits within this general "contracting failure" theory. We argue that the inability of investor-owned firms to commit to not take advantage of consumer biases is another important motivation for ownership of the firm by its customers and for nonprofit status.

Our model is also related to Glaeser and Shleifer (2001), who analyze an entrepreneur's decision to start a nonprofit business rather than a for-profit business. They model nonprofit status as a means of committing to deliver higher values of non-contractible product quality *ex post*, by lowering the payoff from shading on quality. We model mutual and nonprofit ownership in a similar way, but focus on its ability to mitigate commitment problems posed by consumer biases.

An alternative but not mutually exclusive explanation for the existence of nonprofits focuses on the intrinsic motivation of workers. This approach argues that there are circumstances in which the reduced financial incentives of managers of nonprofits enable them to more efficiently harness workers' intrinsic motivations (Francois, 2000, 2003; Ghatak and Mueller, 2011). While we also model nonprofits as producing lower-powered financial incentives for managers, we assume no variation in intrinsic motivation across managers or workers.

We contribute to the second literature, on the implications of consumer biases for market contracts, by showing that the standard assumption of only investor-owned firms is not an equilibrium outcome when firms with different ownership arrangements are allowed to enter the market. We thus identify and document a private ordering strategy of shaping the incentives of firm management through assignment of ownership of the firm, rather than a regulatory strategy of dictating contractual terms or processes, as a way to reduce social costs that may result from consumer biases.

The plan of the paper is as follows. In Section 2 we present a simple model of how firm ownership can serve as a commitment device for firms to avoid offering contracts that exploit consumer biases. In Section 3 we offer evidence on the differences between the contracts used by investor-owned and mutually owned firms in the consumer financial services market as well as additional corroborating evidence. Section 4 concludes.

## 2. The model

Though our theory is meant to apply to a variety of consumer biases and markets, for ease of exposition we have written the model using the example of consumers in the market for some type of financial service account (e.g., a deposit account, credit card, or mortgage) who are vulnerable to penalties due to a self-control problem.

### 2.1. Setup

Suppose that each of an infinite number of potential banks can provide the account at the same cost, normalized to 0. Each bank can choose contract offers composed of a *base price*,  $p$ , which is observed by potential customers, as well as a *penalty*,  $\hat{p}$ , which is not observed by potential customers. By base price, we refer to account features that are highly salient to customers, such as credit card introductory interest rates and rewards programs. The base price could be negative, in which case the bank is paying customers for opening and using accounts. By penalty, we refer to account charges that (1) are hard for consumers to observe and understand, because the services being contracted for and the contracts themselves are complex (there could be many penalties, the importance of which is difficult to evaluate, buried in the fine print); and (2) are more likely to be incurred if the customer is subject to some behavioral bias. Examples of penalties identified in the existing behavioral economics literature include late fees for missing a minimum payment, the default interest rate for credit cards, and fees for falling below a minimum balance for deposit accounts. For concreteness, we will focus on late fees. We will refer to a vector  $\mathbf{p} = (p, \hat{p}) \in \mathbb{R}^2$  as a *contract*.

#### 2.1.1. Consumer behavior

There is a continuum of consumers of unit mass. For simplicity we assume that each consumer values account services at some  $v \gg 0$  so

that all choose to consume in the competitive market structures that we consider.

Consumers are one of three types,  $\theta_i \in \{u, n, s\}$ . A fraction  $\alpha_u > 0$  of consumers are *unbiased* ( $\theta_i = u$ ) and can costlessly pay on time, avoiding the bank's penalties. All that matters to unbiased consumers is the base price  $p$ . Unbiased consumers' ex ante expected utility as a function of the base price and expected penalty is  $U_r(p, \hat{p}) = v - p$ . We say "expected penalty" since the penalty component of contracts is not observed at the time of contracting, but consumers have rational expectations about banks' penalties.

A fraction  $\alpha_n > 0$  of consumers suffer from a self-control problem and are *naive* about it ( $\theta_i = n$ ). Naive consumers incur the penalty under their contract with probability  $\lambda$  but believe incorrectly that they are not at risk of incurring the penalty. Naive consumers' ex ante expected utility is  $U_n(p, \hat{p}) = v - p$ . Because they have the same beliefs about their risk of incurring penalties, the unbiased and naives have the same preferences over contracts.

Finally, a fraction  $\alpha_s > 0$  of consumers suffer from a self-control problem and are *sophisticated* about their problem ( $\theta_i = s$ ). Sophisticated consumers trip the penalty with probability  $\lambda$  and are aware of this at the time of contracting. Sophisticated consumers' ex ante expected utility is  $U_s(p, \hat{p}) = v - p - \lambda \hat{p}$ .

We model consumers' difficulty in observing and understanding penalties simply as all consumers not knowing the  $\hat{p}$  offered by different banks.<sup>1</sup> However, in equilibrium consumers have rational expectations about each bank's  $\hat{p}$ . The assumption that some opportunistic behavior by the firm vis-à-vis its customers is noncontractible is essential for our results because it creates a commitment problem for investor-owned firms.<sup>2</sup> If the entire customer relationship was perfectly contractible, then investor-owned firms could offer to treat customers the same way that mutuals do. We model the opportunistic behavior as contractual in nature—the firms can bury penalties in the fine print of a long contract, and consumers are unable or unwilling to carefully read all of the fine print. The unobservable penalties are thus essentially "noncontractible" in the sense that the firm cannot credibly commit via the contract not to charge them.

Given some set of contract offers, consumers choose the contract that minimizes their perceived costs. In the case of unbiased and naive consumers, the lowest perceived cost contract is simply the one with the lowest base price. In the case of sophisticated consumers, they choose the contract with the lowest value of  $p + \lambda \hat{p}$  since they believe they will incur the penalty with probability  $\lambda$ .

### 2.1.2. Firm behavior

Bank managers choose what contracts to offer, and their incentives differ by ownership type of the firm. We consider two types of banks: investor-owned banks and customer-owned banks (*mutuals*). To model the difference between these two types of firms, we follow the approach of Glaeser and Shleifer (2001) by making two core assumptions: (1) that the managers of investor-owned banks are under higher-powered financial incentives than are the managers of mutuals;

and (2) that there are non-monetary costs to bank managers of using penalties in consumer contracts.<sup>3</sup>

In particular, we model investor-owned banks as perfectly controlled by their residual claimants so that they simply maximize expected profits net of the costs of charging penalties (described below). In practice, asymmetric information and collective action problems associated with dispersed ownership result in governance of investor-owned firms that falls short of the perfect control that we assume in our stylized model. But a range of institutions—from institutional investors who hold large stakes, to the prospect that a poorly-managed firm will be acquired—makes the simple assumption of profit maximization a reasonable modeling approach. The existing behavioral industrial organization literature models firm behavior in this way.

In contrast, mutual banks are (at least nominally) controlled by their customers. This means that there are no outside owners, such as large institutional investors, whose sole interest in the firm is a share of its profits. And because ownership interests are not tradable, there is no market for corporate control that puts mutuals that do not maximize profits at risk of acquisition. Instead, customers elect a board of directors who hire and incentivize professional managers to run the firm. Given the collective action problems faced by customer-owners of a mutual, who have small stakes and little incentive to actively assert their control rights, we think that the governance of mutuals is very similar to the governance of nonprofits with self-perpetuating boards. Hence we adopt the standard approach in the literature to modeling nonprofits (see, e.g., Glaeser and Shleifer, 2001; Francois, 2003; Ghatak and Mueller, 2011) and assume that hired managers of mutuals are not the full residual claimants of the firm but rather receive some small fraction  $d \in [0, 1]$  of the firm's revenues and therefore have muted incentives to maximize penalty revenue compared to investor-owned banks.<sup>4</sup>

In Section 3.5.1 we provide direct evidence that the managers of mutuals are indeed given lower-power incentives in their compensation contracts than are the managers of investor-owned banks, consistent with our modeling approach. In particular, on average 45% of the compensation of the managers of investor-owned banks comes in the form of incentive pay, compared to only 14% of the compensation of the managers of credit unions, which are mutually owned. Moreover, as we discuss below, the directors of federal credit unions, who hold ultimate legal authority to set firm policy, are prohibited by statute from receiving any compensation for their work as directors and hold fiduciary duties to manage the firm on behalf of its customers. In contrast, directors of investor-owned firms are typically given substantial equity-based incentive pay and hold fiduciary duties to shareholders, not to the firm's customers. We think our simple modeling approach captures well the difference in incentives produced by these very different institutional arrangements.

Our second core assumption is that, while managers can reap pecuniary benefits from charging penalties, they also face nonpecuniary costs from extracting penalty revenue. For each customer of the bank charged a penalty, bank management incurs a non-cash cost  $\psi(\hat{p})$

<sup>1</sup> Customer interviews suggest a great deal of confusion about key aspects of credit card contracts. For instance, Government Accountability Office (2006a) finds that consumers often fail to understand credit card default interest rates, other penalty rate increases, late payment fees, and grace periods, among other things.

<sup>2</sup> As long as some dimensions of the relationship are noncontractible, mutuals will behave differently than investor-owned firms, potentially even on contractible dimensions. The nicer behavior of mutuals on the noncontractible aspects of the relationship will result in sophisticates choosing to use mutuals. The naives and unbiased think they are not vulnerable to penalties and therefore patronize investor-owned firms. With sophisticates gone, investor-owned firms have no reason to charge low *observable* (or unobservable) penalties because their customers do not care about them at the time they choose their contract.

<sup>3</sup> Glaeser and Shleifer (2001) model an entrepreneur's decision to start a nonprofit rather than a for-profit firm. They model nonprofit status as lowering the fraction of the firm's cash flows that are enjoyed by the entrepreneur. Moreover, they allow the entrepreneur to shirk on "quality," which imposes a non-cash cost due to entrepreneurs' social preferences.

<sup>4</sup> A different approach to modeling mutual ownership would be to explicitly model the control rights of customers of mutuals. For example, we could model a majoritarian voting rule for election of mutual directors by supposing that mutuals choose the contract preferred by the median customer of the firm. However, while we think such a modeling approach would likely yield similar results, it would be unrealistic, given the severity of the collective action problem faced by customer-owners of mutuals. We believe the key difference between mutuals and investor-owned firms lies in taking control rights away from outside investors, not in giving those control rights to customers.

from choosing a penalty  $\hat{p}$ , with  $\psi'(\cdot) \geq 0$ ,  $\psi'(0) = 0$ , and  $\psi''(\cdot) > 0$ .<sup>5</sup> We assume the same cost function  $\psi(\cdot)$  applies to the managers of both mutuals and investor-owned firms. In particular, we assume a simple quadratic cost function,  $\psi(\hat{p}) = \frac{1}{2}\hat{p}^2$ .

$\psi(\cdot)$  is a reduced-form way to represent the psychic costs of extracting high penalties from customers (e.g., it is unpleasant for the manager because of social preferences) as well as costs due to regulatory and social constraints. There is now a large literature in economics documenting the importance of social preferences for behavior, including a taste for fairness (e.g., Fehr and Gächter (2000), Levitt and List (2007), and DellaVigna et al. (2012)). The use of non-salient fees in consumer contracts is commonly regarded as “unfair” to consumers.<sup>6</sup> Furthermore, the use of contractual terms perceived as unfair may create difficulties for managers due to the social preferences of others. For instance, managers may be criticized in the media or forced in front of congressional committees to answer for their firms’ pricing practices.<sup>7</sup>

As we show formally below, these two core assumptions (differences in the strength of monetary incentives, non-monetary costs of penalties) generate the intuitive result that those with larger monetary incentives use higher penalties. This theoretical result parallels experimental findings. For example, Slonim and Roth (1998) show that when experienced ultimatum game participants are given higher stakes, they exhibit less pro-social behavior. Similarly, in our model, managers offer higher penalties (i.e., engage in less pro-social behavior) when they are given higher-powered incentives to maximize profits in investor-owned firms (i.e., are given higher stakes) than when they face flatter incentives in mutuals.

These assumptions imply that the objective function of bank managers over contract terms and the probability of a customer incurring a penalty, denoted  $q$ , is given by,

$$U(\mathbf{p}, q, \delta) = \delta p + q \left( \delta \hat{p} - \frac{1}{2} \hat{p}^2 \right), \quad (1)$$

where  $\delta = 1$  for investor-owned banks and  $\delta = d < 1$  for mutuals.

A firm’s profits from a contract  $\mathbf{p}$  sold to a consumer with probability of incurring the penalty  $q$  is,

$$\pi(\mathbf{p}, q) = p + q \left( \hat{p} - \frac{1}{2} \hat{p}^2 \right). \quad (2)$$

In our definition of competitive equilibrium below, we impose the standard requirement that the firm makes non-negative profits. Note that the firm’s profit function includes the manager’s nonpecuniary costs from extracting penalty revenue. It is easy to see why this cost would be included for an owner-managed firm—it is a real, direct cost to the owner-manager. For investor-owned firms in the model, the firm’s profit function and the manager’s objective function are one and the same. But in the case of a mutual firm, the nonpecuniary cost is also ultimately borne by the firm indirectly through the manager’s wages.<sup>8</sup>

<sup>5</sup> To simplify, we assume  $\psi(\hat{p})$  is incurred per customer that incurs a penalty so that a firm’s optimal choice of  $\hat{p}$  is not a function of the scale of the firm.

<sup>6</sup> See, e.g., Christine Dugas, “Adding new fees, raising old ones sent credit card profits soaring,” *USA Today*, Jan 26, 2001 (quoting a consumer advocate saying “In my view, the industry profits are unfortunately tainted by unfair practices.”) and Paul Adams, “Agencies propose credit card reforms: New Regulations aimed at unfair, deceptive practices,” *McClatchy-Tribune Business News*, May 3, 2008.

<sup>7</sup> See, e.g., Senate Permanent Subcommittee on Investigations Hearing, “Credit Card Practices: Fees, Interest Charges, and Grace Periods,” 110th Cong., 1st sess. (2007).

<sup>8</sup> To see this more formally, suppose that the mutual firm must compensate the hired manager at some competitive level, normalized to zero. The manager’s compensation consists of a cash wage,  $w$ , plus perquisites, minus the nonpecuniary cost of extracting penalties. Thus we have  $d(p + q\hat{p}) + w - q\psi(\hat{p}) = 0$ , so  $w = q\psi(\hat{p}) - d(p + q\hat{p})$ . The firm’s profits are then  $\pi(\mathbf{p}, q) = (1-d)(p + q\hat{p}) - w = p + q(\hat{p} - \psi(\hat{p}))$ . And of course, a similar reasoning would apply for an investor-owned firm that hired a professional manager.

### 2.1.3. Timing of the model

Bank managers first choose their contract offers  $(p, \hat{p})$ . Each consumer then observes the base price,  $p$ , of the contract offers, and chooses the contract with the lowest perceived costs. After contracts are formed, each naive and sophisticated consumer pays late and incurs the penalty  $\hat{p}$  under their contract with probability  $\lambda$ .

### 2.2. Equilibrium concept

We first define a condition that contracts’ penalties must satisfy in equilibrium. Since the penalty  $\hat{p}$  charged under a contract is unobserved by the bank’s customers, sequential rationality requires that bank managers choose  $\hat{p}$  to maximize penalty revenue net of penalty costs per customer (with penalty revenue deflated by  $d$  if the bank is a mutual) without taking into account the effect of equilibrium penalties on demand. More formally, the bank’s contracts must satisfy the following *penalty optimality condition*.

**Definition 1.** A bank offering contract  $(p, \hat{p})$  satisfies *penalty optimality* if  $\hat{p}$  is a solution to the following problem:

$$\max_{\hat{p}'} \delta \hat{p}' - \frac{1}{2} \hat{p}'^2 \quad (3)$$

where  $\delta = 1$  for investor-owned banks and  $\delta = d < 1$  for mutuals.

The first order condition for the problem in Eq. (3) is

$$\hat{p}^* = \delta. \quad (4)$$

Penalty optimality thus requires that all mutual contracts have  $\hat{p} = d$  and all investor-owned contracts have  $\hat{p} = 1$ . We thus have the intuitive result that mutuals charge lower penalties than investor-owned banks. The intuition for why is straightforward: while mutual managers face the same non-cash cost function for using penalties,  $\psi(\cdot)$ , they keep only a fraction  $d < 1$  of the monetary benefits from penalties that would accrue to an investor-owner. Consequently, their optimal level of penalties is lower.

Following Rothschild and Stiglitz (1976), a long-run competitive equilibrium will be a set of contracts that make nonnegative profits and satisfy free entry, and also satisfy our penalty optimality condition.

**Definition 2.** A competitive equilibrium is a set of contracts  $P^* = \{\mathbf{p}^{un}, \mathbf{p}^s\}$  such that

- (1) Unbiased and naives prefer  $\mathbf{p}^{un}$  to  $\mathbf{p}^s$ , and sophisticates prefer  $\mathbf{p}^s$  to  $\mathbf{p}^{un}$ ;
- (2) All contracts satisfy penalty optimality;
- (3) All contracts make nonnegative profits; and
- (4) Free entry: There does not exist a contract  $\mathbf{p}'$  such that
  - (a) There exists a customer type  $\theta$  that strictly prefers  $\mathbf{p}'$  to all contracts in  $P^*$ ;
  - (b)  $\mathbf{p}'$  satisfies penalty optimality; and
  - (c)  $\mathbf{p}'$  would make nonnegative profits.

We will consider below the cases in which only investor-owned banks or only mutual banks can enter the market, and the case in which investor-owned and mutual firms compete. Equilibria can take two forms: a pooling equilibrium in which  $\mathbf{p}^{un} = \mathbf{p}^s$  and a separating equilibrium in which  $\mathbf{p}^{un} \neq \mathbf{p}^s$ .<sup>9</sup>

<sup>9</sup> We follow Heidhues and Koszegi (2010) and for simplicity impose the requirement that all unbiased and naives choose the same contract, and all sophisticates choose the same contract. A natural alternative approach is to assume that types that are indifferent between a set of equilibrium contracts divide evenly among that set of contracts. The basic results would be the same, but in the case with mutuals and investor-owned firms competing, for a knife-edge set of parameter values there is an equilibrium in which sophisticates go to the mutual contract and unbiased and naives divide evenly between the investor-owned contract and the mutuals contract. This would make our propositions more complicated without adding insight.

### 2.3. Equilibrium with only investor-owned banks

We begin with the relatively simple case in which only investor-owned banks can enter. The outcome for this case will serve as a baseline from which to evaluate the effects of mutuals on equilibrium outcomes. We have the following result:

**Proposition 1.** *With only investor-owned banks competing, there is a unique competitive equilibrium in which all consumers pool on  $(-\lambda(\alpha_n + \alpha_s)/2, 1)$ .*

All proofs are in *Appendix A*.

With only investor-owned banks competing, the equilibrium involves pooling on a single contract involving a high penalty and low (indeed, negative) base price.<sup>10</sup> Consumers who are subject to self-control problems (sophisticates and naives) thus subsidize banking services for the unbiased, who receive services at below cost.

The inability of investor-owned banks to sort customers into different contracts is due to a commitment problem: investor-owned banks cannot commit to offering lower penalties since customers have trouble observing penalties.

### 2.4. Equilibrium with only mutual banks

Suppose instead that only mutual banks can enter. For example, imagine that by law only mutually owned firms were allowed to offer the financial service. We now have:

**Proposition 2.** *With only mutual banks competing, there is a unique competitive equilibrium in which all consumers pool on  $(-\lambda(\alpha_n + \alpha_s)(d - \frac{d^2}{2}), d)$ .*

With only mutual banks competing, the equilibrium involves pooling on a contract with a lower penalty but higher base price than in the equilibrium with only investor-owned banks competing.

### 2.5. Equilibrium with investor-owned and mutual banks

Suppose now that both investor-owned banks and mutual banks can enter and compete. Further suppose that there are a substantial number of naives in the population. Specifically, we assume that  $\frac{\alpha_n}{\alpha_n + \alpha_s} \geq 2d - d^2$ .<sup>11</sup> We now have:

<sup>10</sup> One potential concern with this equilibrium is that with negative base prices, unbiased and naive consumers may want to sign up for multiple accounts (e.g., one at each bank) to receive the subsidy. For example, a consumer could take out multiple credit cards with 0% interest rate introductory periods, draw down the credit lines, and invest the funds in a risk free asset. Such opportunism by consumers may limit how negative the base price could be before triggering too many such arbitrageurs. However, while anecdotally some consumers do game contracts in this way, we think that in practice the transaction costs of such consumer behavior, combined with naive consumers who attempt the strategy but ultimately pay the penalty, prevent it from being a major issue, and hence we exclude it from the model. We could incorporate an assumed lower bound on the base price due to such consumer behavior (see, for example, Heidhues et al. (2012) and Miao (2010)) and our basic results would be unchanged so long as the lower bound was not binding on mutual firms.

<sup>11</sup> This is necessary for a separating equilibrium to exist. If there are too few naives, then the investor-owned firm serving only the unbiased and naives would not raise enough penalty revenue to subsidize the base price to the point that it is below that of mutual firms serving sophisticates. Interestingly, if there are sufficiently few naives, then the unique equilibrium is a pooling equilibrium in which all consumers go to mutuals. The intuition for this is easiest to see for the polar case in which there are no naives. In this case, the unbiased want to pool with the sophisticates to enjoy a subsidy from the penalties they incur. Sophisticates prefer to go to mutuals, since they charge lower penalties. In our model, then, investor-owned firms require naives to survive. Without naives, the inability of investor-owned firms to commit to lower penalties puts them at a competitive disadvantage to mutuals. Because in reality mutual firms do not dominate the market, hereafter we focus on the subset of the parameter space with enough naives that consumers separate into mutual and investor-owned contracts. Sandroni and Squintani (2007) also follow the equilibrium definition of Rothschild and Stiglitz (1976) in their model of an insurance market with overconfident consumers and adopt an analogous assumption for the number of overconfident consumers.

**Proposition 3.** *With investor-owned banks and mutuals competing, there is a unique competitive equilibrium in which naives and the unbiased patronize investor-owned firms, which offer the contract  $(-\lambda \frac{\alpha_n}{2(\alpha_n + \alpha_s)}, 1)$ , and sophisticates patronize mutual firms, which offer the contract  $(-\lambda(d - \frac{d^2}{2}), d)$ . The base price of the mutual contract is higher than the base price of the investor-owned contract.*

With both types of firms competing in the market, the naives and unbiased go to investor-owned firms and sophisticates go to mutuals. The investor-owned firms charge higher penalties than mutuals, and competition among firms forces them to use their penalty revenue to subsidize the base price of the contract. Because investor-owned firms have higher penalty revenues, their base price is lower than the base price at mutuals. Hence the unbiased and naive, who think they are not at risk of paying penalties, prefer the low base price contracts of investor-owned firms. However, the naive consumers are in fact at risk of incurring penalties. Thus, naive consumers subsidize unbiased consumers at investor-owned banks.

In contrast, consumers who know they are at risk of paying late (sophisticates) avoid investor-owned banks, since they fear being hit with large penalties. Sophisticated consumers get the financial service at lower total cost at mutuals since they avoid paying the high penalties that subsidize the unbiased at investor-owned firms. Our model shows how mutual ownership can serve as a commitment device that gives mutuals a competitive advantage over investor-owned firms in serving sophisticated consumers. Hence mutuals can be expected to endogenously arise in such markets. Indeed, the standard assumption of the existing behavioral industrial organization literature of only investor-owned firms is no longer an equilibrium outcome when mutuals are allowed to compete.

### 2.6. The effect of mutuals

In our model, the separating equilibrium with mutuals competing with investor-owned banks results in better outcomes for sophisticated consumers than the equilibrium with investor-owned banks only. Moreover, mutuals can result in an efficient expansion of utilization of financial services and less cross-subsidization of unbiased consumers by consumers with self control problems. They can also result in more efficient consumer behavior under the contracts. We also consider in this section the situation in which, contrary to our assumptions in the model, consumer biases result in consumption of services by consumers who value them at less than their cost and argue that mutuals offer a potential partial solution to this problem. Finally, we argue that mutuals have greater incentives than do investor-owned banks to educate consumers about their biases.

#### 2.6.1. Social costs of penalties

The entry of mutuals lowers the penalties charged to sophisticates, which lowers the direct social costs of penalties. First, charging penalty  $\hat{p}$  results in a social cost of  $\psi(\hat{p})$  to the manager without any compensating benefit. The lower penalties charged by mutuals reduce this inefficiency.

Second, lower penalties can reduce the distortions in consumer behavior caused by penalties. In the model we assume that consumers have no choice in paying late and are simply at some risk (a probability of either 0 or  $\lambda$ ) of paying late. But in many real-world examples, consumers will be able to assert some choice about their penalty-incurring behavior and will sometimes learn the size of the penalty before making the choice. In such cases, the lower penalties charged by mutuals are closer to the marginal cost of the penalty-incurring behavior than the high penalties charged by investor-owned firms. Mutuals can thus result in less distortion in consumer behavior under the contract.

For example, consider prepayment penalties in mortgage contracts, which charge a fee if the borrower pays off the loan within some specified period after taking out the loan. These may exploit borrowers' underestimation of their likelihood of selling their home or refinancing, and their presence in mortgage contracts may inefficiently deter borrowers from selling their homes. If mutuals charge lower prepayment penalties, as our theory predicts, then the presence of mutuals in the market would result in more efficient home sales behavior by borrowers.

### 2.6.2. Cross-subsidization

The entry of mutuals reduces cross-subsidization by sophisticates and lowers their ultimate cost of the financial service, but raises it to the unbiased and naives. With only investor-owned banks competing, the base price is  $-\lambda(\alpha_n + \alpha_s)/2$ , and sophisticates in expectation pay  $-\lambda(\alpha_n + \alpha_s)/2 + \lambda$ . When mutuals enter, sophisticates go to mutuals, which charge a base price of  $-\lambda(d - \frac{d^2}{2})$  and penalties of  $d$ , for a total expected cost to sophisticates of  $-\lambda(d - \frac{d^2}{2}) + \lambda d$ . It is easy to show that this cost is lower than the expected cost when only investor-owned firms compete. This is because the sophisticates are no longer cross-subsidizing the unbiased.

In contrast, the expected cost to the unbiased and naives goes up when mutuals enter. With mutuals competing, the base price at investor-owned firms is no longer being subsidized by penalty revenues from sophisticates and is therefore higher at  $-\lambda \frac{\alpha_n}{2(\alpha_n + \alpha_u)}$ . Penalties at investor-owned firms remain unchanged at  $\hat{p} = 1$ , so both naives and unbiased are made worse off.

### 2.6.3. Underutilization of financial services

The changes in prices in the market when mutuals enter can have an effect on utilization of the financial service. Recall that we assumed that all consumers value account services at much greater than their cost of production. While stylized, this assumption seems plausible as an approximation for many financial services, including credit cards and deposit accounts. Suppose instead that consumers valued the service at a more modest  $v > 0$  so that in the first-best all consumers receive the service, but some consumers will not if the service is priced too high. With only investor-owned banks competing, a consumer will only obtain an account if she values it at more than the price she perceives for it, including her expected costs from penalties. More formally, the unbiased and naive will open an account at the prices in the equilibrium from [Proposition 1](#) if and only if

$$v > -\lambda(\alpha_n + \alpha_s)/2. \quad (5)$$

The RHS is always negative, so all unbiased and naive consume the financial service.

But for sophisticated consumers, the condition is

$$v > -\lambda(\alpha_n + \alpha_s)/2 + \lambda. \quad (6)$$

Now the RHS is strictly positive, meaning that sophisticated consumers with low enough  $v$  do not receive the service at these prices.<sup>12</sup> These consumers stay out of the financial services market despite the subsidized base price because they expect to pay large penalties.

In contrast, with mutual banks competing with investor-owned banks, the unbiased and naive will continue to all consume the financial service, but the condition for sophisticates to consume at the prices in the equilibrium from [Proposition 3](#) is now

$$v > -\lambda \left( d - \frac{d^2}{2} \right) + \lambda d. \quad (7)$$

<sup>12</sup> With some fraction  $\epsilon$  of sophisticated consumers not consuming, and hence fewer penalties subsidizing the base price, the base price in equilibrium will be higher at  $\lambda \frac{\alpha_n + \alpha_u}{2(\alpha_n + \alpha_u + \epsilon\alpha_s)}$ , and only sophisticated consumers with  $v$  greater than this base price plus the  $\lambda$  expected cost of penalties will consume in equilibrium.

The RHS of Eq. (7) is strictly less than the RHS of Eq. (6), which means that more sophisticates are now consuming the financial service. Moreover, Eq. (7) is also the condition for a sophisticates' valuation of the service to be greater than the social nonpecuniary cost of the penalties charged by mutuals ( $\psi(d)$ ), so this expansion is efficient even including the costs of the attendant increase in the total number of penalties charged. To see the intuition, consider a consumer who is wary of being taken advantage of by an investor-owned bank and therefore stays out of the market when that is the only option. If a mutually owned bank enters the market, he may then be willing to open an account there because he trusts the mutual not to exploit him. The presence of mutuals can thus result in an efficient expansion of financial service utilization.

### 2.6.4. Overutilization of financial services

Suppose instead that there are some consumers who value the service at less than their social costs ( $v < 0$ ). For example, consider a consumer who should not take out a mortgage because she will likely default, which results in high social and private costs. Consumer biases can result in overconsumption of the service in such a situation. In terms of the model, we can have a naive or unbiased consumer with  $v > p$  so that the consumer values the service at greater than her perceived cost, but  $v < 0$  so that the consumer is inefficiently utilizing the service. The unbiased overconsume because of the cross-subsidy from naives. The naives overconsume because they do not perceive the full price they will in fact pay under the contract. In the consumer loan market, such lending to naive consumers is often referred to as "predatory lending."

Mutuals can help address this overutilization problem. When mutuals enter, the base price at investor-owned firms rises because sophisticates go to mutuals, resulting in less penalty revenue to subsidize the base price of investor-owned firms. This brings the perceived price of the service closer to marginal cost, resulting in less overconsumption by naives and the unbiased.

### 2.6.5. Education of consumers by firms

A natural question is whether firms can win customers by educating their competitors' customers about their biases and consequent vulnerability to penalties.<sup>13</sup> Suppose firms could educate consumers so that they understood the true extent of their behavioral biases. Formally, suppose firms could change naive consumers into sophisticated consumers.<sup>14</sup> Furthermore, suppose that firm managers of all types of firms *ceteris paribus* would like to serve more customers (for example, suppose the market is not perfectly competitive). The effect of being "sophisticated" in this way would be to move erstwhile naives from investor-owned banks to mutuals. This analysis suggests that mutuals would, and investor-owned banks would not, have an incentive to educate consumers about their likelihood of incurring fees. We analyze a recent episode in which credit unions worked to sophisticate the customers of investor-owned firms in [Section 3.4](#) below.

<sup>13</sup> [Gabaix and Laibson \(2006\)](#) consider this possibility by allowing firms to costlessly convert some fraction of naive consumers into unbiased consumers. However, they show that firms are subject to a "curse of debiasing": debiased customers prefer to continue to patronize firms with high penalties since debiased consumers can now avoid those penalties and enjoy a subsidy from the remaining naive customers at firms with high penalties. Consequently, competition may not provide an incentive for firms to educate consumers about (easily avoidable) hidden penalties. However, we think that many of the relevant consumer biases, such as self-control problems, are not so easily cured. [Agarwal et al. \(2008\)](#) show that in the month following being charged a fee on their credit card account, consumers are 40% less likely to incur another fee than their baseline probability. However, their likelihood of incurring a fee increases as the period since they last incurred a fee increases. This serves as evidence that it is difficult for many consumers to correct the biases that lead them to incur penalties. In contrast, consumers' knowledge of their self-control problem seems more plausibly changeable.

<sup>14</sup> We do not define education as an action that reveals  $\hat{p}$  because many contracts are inherently difficult to understand so that disclosure, though it might alert consumers to particular prices and contract features, cannot convincingly inform consumers that no other important prices or features lie buried in fine print.

### 3. Evidence

The consumer financial services market is an appealing context in which to test our theory because existing research argues that consumer biases play an important role in determining the form of consumer financial contracts, and both investor-owned and mutual firms compete in the market. We begin this section by providing a brief background on credit unions, which are the mutually owned financial institutions that form the basis of our quantitative evidence. We then present evidence that the contracts used by credit unions charge lower penalties and higher base prices than those of investor-owned firms. Section 3.2 examines credit cards while Section 3.3 examines deposit accounts. Section 3.4 exploits a shock to the salience of bank fees in order to investigate customer sorting between investor-owned firms and mutuals. In Section 3.5 we offer additional corroborating evidence for our theory from executive compensation, marketing materials, and the types of customers at credit unions and investor-owned banks. Finally, we consider alternative explanations for our empirical findings in Section 3.6.

#### 3.1. Background on credit unions

While investor-owned firms provide the bulk of consumer financial services today, non-investor-owned firms, including credit unions and mutual thrifths, remain significant financial service providers. As of December 2005, credit unions comprised 7.5% of federally-insured deposits in the United States.<sup>15</sup> Both state and federal law provide for the chartering of credit unions and give the customers of credit unions ownership rights (both control rights and residual financial claims). For example, federal law requires federal credit unions to be managed by a board of directors elected annually by members, and empowers federal credit unions generally to lend to, and receive deposits from, only members.<sup>16</sup> Members are also the residual claimants of the credit union, enjoying the right to dividends as well as interest on deposits. Moreover, the directors of federal credit unions, unlike those of investor-owned banks, are prohibited from receiving compensation.

While ownership is in our view the most important difference between credit unions and investor-owned financial service institutions, there are several other institutional differences. For one, credit unions must have a “common bond” among their members. However, this common bond requirement has been progressively loosened over time. Geography-based common bonds such as “lives in Los Angeles County” are now common, and in 1998 federal law was changed to allow a credit union to serve multiple groups.

Furthermore, unlike investor-owned firms, credit unions are exempt from corporate income taxation. And credit unions are subject to a few differences in regulatory treatment, most notably a cap of 18% on the interest rate that federal credit unions can charge members. Otherwise, they operate under regulations similar to investor-owned banks.<sup>17</sup> We consider in Section 3.6 whether the common bond requirement, tax treatment, or interest rate cap of credit unions, rather than customer ownership, can explain the differences we document.

#### 3.2. Credit cards

We begin by comparing credit card contracts offered by credit unions to those offered by investor-owned issuers. Existing research in behavioral industrial organization has identified ways in which credit card issuers fashion contracts that exploit the mistakes that

consumers make. Heidhues and Koszegi (2010) provide the leading formal behavioral model of a consumer credit market. They assume that some consumers have time-inconsistent preferences and are partially naive about their taste for immediate consumption. They show that “in competitive equilibrium... firms offer seemingly cheap credit to be repaid quickly, but introduce large penalties for falling behind this front-loaded repayment schedule.” Their analysis thus predicts that firms will offer low introductory interest rates and high borrowing-contingent fees such as the purchase APR that applies when the introductory period expires, the default APR, late fees that apply when a consumer fails to make his payments on time, and over-the-limit fees that apply if the consumer exceeds the credit limit. In our context, contract terms such as these are the penalties  $\hat{p}$ , and the introductory interest rates are the salient base prices  $p$ . We also analyze whether the credit card offers a rewards program, which is a salient part of the contract that issuers actively advertise and compete on, and hence also part of the base price.

Both investor-owned lenders and credit unions issue credit cards. Though investor-owned issuers make up the bulk of credit card lending by volume in the United States, credit unions constitute a large fraction of lenders in the market. According to *The Card Industry Directory* (2008), 40 of the top 100 credit card lenders in the United States by lending volume were credit unions. Our theory predicts that the credit cards issued by credit unions will exhibit fewer contract features that exploit consumer biases and will instead have a flatter profile of up-front and borrowing-contingent prices.

##### 3.2.1. Data

Our credit card contract data come from Bankrate.com, which surveys a sample of credit card issuers weekly about their contract offers. We obtained the Bankrate credit card survey data for the first week of July 2008. We eliminated duplicate observations as well as observations with missing contract terms.<sup>18</sup> We also eliminated one card for which we could not obtain the data we use as issuer-level controls, described below. In addition, we eliminated a small number of cards that appeared to be charge cards rather than credit cards.<sup>19</sup> We were left with 309 distinct cards, issued by 63 distinct lenders. Of those cards, 76 are issued by credit unions, and of the 63 lenders, 19 are credit unions. Table 1 contains information on the size and nature of the dataset after each round of elimination. Table 2 contains the name of every credit card issuer in the analysis sample.

Most of the within-issuer variation in credit card contracts stems from card branding (i.e., “gold card” vs. “platinum card”), rewards programs, and the purchase interest rate, all of which commonly vary across each issuer’s menu of cards.<sup>20</sup> Much of the within-issuer variation in purchase interest rate is likely due to risk-based pricing. In contrast, fees vary little across cards offered by a single issuer. For instance, of the 63 issuers in our sample only 16 have any variation in their late fees, and only 13 have any variation in their over-the-limit fees.<sup>21</sup> We perform our analysis at the card level, but cluster standard errors at the issuer level.

##### 3.2.2. Analysis

We begin with a simple comparison of mean contract terms. Table 3 shows that the contracts of investor-owned issuers and mutuals are

<sup>18</sup> We eliminated all contracts that did not differ from any other contract by the name of the issuer or any features of the card.

<sup>19</sup> Charge cards do not allow customers to borrow beyond the one-month billing cycle and hence are not comparable to credit cards. Our criterion for identifying charge cards was a listed non-introductory purchase APR of 0%.

<sup>20</sup> Among issuers in our data with more than one card, only 3 do not vary the purchase interest rate across cards.

<sup>21</sup> Another way to approach this question is to decompose the total variance in fees into within-issuer and cross-issuer components. We find that 86.5% of the variance in late fees is cross-issuer, while only 13.5% of the variance is within-issuer. Similar results hold when other fees are considered.

<sup>15</sup> Government Accountability Office (2006b).

<sup>16</sup> The statute governing federal credit unions is codified at 12 U.S.C. §1751 *et seq.*

<sup>17</sup> U.S. Department of the Treasury (2001, p. 1) (“Despite their relatively small size and their restricted fields of membership, federally insured credit unions operate under banking statutes and rules virtually identical to those applicable to banks and thrifths”).

**Table 1**  
The Bankrate sample.

	Cards	Issuers
Full sample	438	73
Dropped due to missing data	112	9
Dropped because was a payment card	17	1
Analysis sample	309	63

quite different. Panel A compares the base prices that the existing literature predicts firms compete on and thus our theory predicts will be lower at investor-owned issuers. The results are largely consistent with this prediction. Investor-owned issuers are far more likely than credit unions to offer introductory APRs (annual percentage rate—a standardized measure of the interest rate) that are lower than their standard purchase APRs, and the mean introductory APR is significantly lower at investor-owned issuers.<sup>22</sup> Similarly, we find that 49% of all investor-owned issuer cards have rewards programs, compared with only 17% of credit union cards.

Panel B compares the penalty contract terms that the existing literature has identified as used to exploit consumer biases. Our theory predicts that investor-owned issuers will charge higher penalties in their credit card contracts. Again, the results line up well with this prediction. Credit unions on average have modestly lower purchase APRs, and far lower default APRs.<sup>23</sup> Credit unions also charge lower late and over-the-limit fees than do investor-owned issuers.

Fig. 1 depicts these contract differences graphically. Plotted from left to right are the mean introductory, purchase, and default APRs of the credit union and investor-owned subgroups. This profile of interest rates has a substantial slope for the investor-owned subgroup, beginning with low introductory APRs and ending with high default APRs. In contrast, the profile of credit union interest rates is much flatter, with higher introductory APRs and lower default APRs.

A potential concern with a simple comparison of means is that credit unions and investor-owned issuers may systematically differ on dimensions that affect contract terms but are not consequences of ownership type, resulting in omitted variables bias. We therefore perform a regression analysis using a set of controls. One potentially important control is firm size: credit unions have on average much lower lending volume than investor-owned issuers. We use the log of lending volume, taken from Payments Source,<sup>24</sup> as a control.

Credit unions may also serve a somewhat different pool of customers than investor-owned issuers because of their common bond membership requirements. These customer differences could in theory result in different equilibrium contracts. For example, if credit union members are on average much more risk averse than the customers of investor-owned credit card issuers, then they may demand lower penalties that add risk to the contract.<sup>25</sup> We thus include controls that proxy for customer composition. We use the delinquency rate of the issuer's credit cards from data provided by Payments Source to control

<sup>22</sup> All rates are calculated for the entire sample, unconditional on offering an introductory or default APR distinct from the standard purchase APR. Differences are also significant and in the same direction for rates calculated conditional on offering distinct introductory and default APRs (not reported).

<sup>23</sup> Default APRs are interest rates that are triggered following a late payment on the current card or, in the case of “universal default” provisions, on other debt of the borrower.

<sup>24</sup> See, <http://www.paymentssource.com>.

<sup>25</sup> Note that in the model, the differences in contract terms between mutuals and investor-owned firms induce sorting among customers according to bias type. Hence, the model predicts that patrons of investor-owned issuers and mutuals may look somewhat different on observables, but this sorting is a consequence, not a cause, of the difference in contracts.

**Table 2**  
Investor-owned issuers and credit unions in the Bankrate sample.

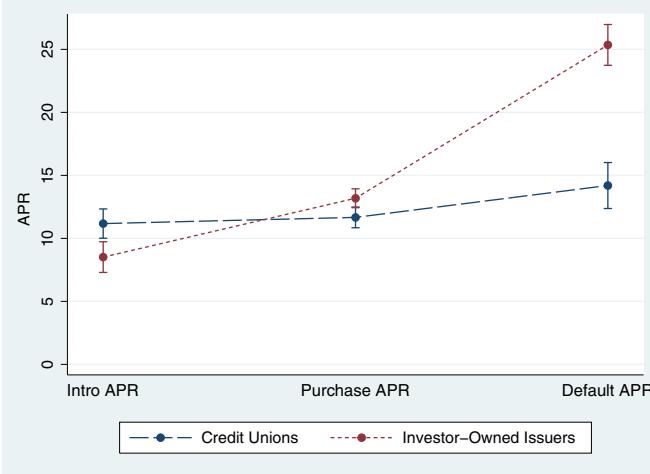
Investor-owned issuers	Credit unions
1st Hawaiian Bank	America First CU
5 Star Bank	Digital FCU
American Express	GTE FCU
Amalgamated Bank of Chicago	Golden One CU
BB&T	Michigan State University FCU
BancorpSouth	Municipal CU
Bank of America	Navy FCU
Barclays Bank	Orange County Teachers FCU
Bryn Mawr Trust Co.	Patelco CU
Capital One	Penn. State Employees FCU
Chase	Pentagon FCU
Citibank	Randolph Brooks FCU
Commerce Bank	Redstone FCU
Compass Bank	SEFCU
Delaware National Bank	San Diego CU
Discover	Suncoast FCU
Elan	United 1st FCU
First National Bank of Omaha	VyStar CU
Fifth Third Bank	Wescom CU
First Command Bank	
First Internet Bank of Indiana	
First Premier Bank	Zions First National Bank

for variation in the riskiness of each issuer's customer base. Many issuers offer different cards based on the riskiness of the customer. The Bankrate data include information on the card type (Gold, Platinum, Student, Business, and Secured), which is a coarse proxy for variation

**Table 3**  
Differences in contract terms.  
Source: Bankrate.com survey, first week of July 2008.

	Credit unions	Investor-owned	Δ
<i>Panel A: Base prices</i>			
Has special intro APR	0.053	0.399	−0.347*** (0.073)
Intro APR (%)	11.173	8.514	2.659*** (0.812)
Has special balance transfer	0.197	0.545	−0.348*** (0.114)
Intro APR	10.214	6.892	3.321*** (1.093)
Balance transfer intro APR (%)	0.171	0.494	−0.322*** (0.0817)
Has rewards program			
<i>Panel B: Penalty prices</i>			
Purchase APR (%)	11.667	13.184	−1.518*** (0.534)
Has special default APR	0.434	0.932	−0.497*** (0.121)
Default APR (%)	14.195	25.353	−11.158*** (1.170)
Late fee (\$)	18.539	35.841	−17.301*** (2.199)
Over-the-limit fee (\$)	15.500	32.188	−16.688*** (2.351)
N	76	233	309
Number of issuers	19	44	63

*Note:* All figures are calculated for the entire sample (i.e. unconditional on having an introductory APR or a default APR distinct from the standard purchase APR). By “Special intro APR” we refer to an introductory APR that is unequal to the standard purchase APR. The “Intro APR (%)” figure is not conditional on having a special intro APR, and includes cards with introductory rates equal to the purchase rate. The same approach is followed for the figures on balance transfer introductory rates and penalty rates. Standard errors in parentheses are clustered at the issuer level. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.



**Fig. 1.** Profile of APRs (95% confidence intervals).

in creditworthiness across cards offered by the same issuer. We also include indicators for these card types as controls.<sup>26</sup>

To measure the effect of mutual ownership we estimate the following equation:

$$Y_{cf} = \beta_0 + \beta_1 \mathbf{X}_{cf} + \beta_2 CU_f + \epsilon_{cf} \quad (8)$$

where  $Y_{cf}$  is a given term of the contract  $c$  offered by firm  $f$ ,  $\mathbf{X}_{cf}$  is a vector of controls,  $CU_f$  is an indicator for whether the firm is a credit union, and  $\epsilon_{cf}$  is the error term.

**Table 4** presents in column 2 results from regressions controlling for issuers' log lending volume, delinquency rate, and card type indicators, along with the raw differences again in column 1 for ease of comparison. Standard errors are clustered at the issuer level. We find that the coefficients on  $CU$  change only slightly with the inclusion of these controls. For most of the contract terms, the controls modestly reduce the size of the difference between credit unions and investor-owned issuers' contracts. For example, for default APR the coefficient on credit union changes from  $-11.158$  to  $-8.876$  when controls are added. In the case of purchase APR, adding controls causes the coefficient on credit unions to lose its statistical significance. But in the case of introductory APR, the controls actually increase the size of the difference between credit unions and investor-owned issuers, with the coefficient on credit union changing from  $2.659$  to  $2.998$ . Overall, column 2 continues to show robust differences in contract structure between credit unions and investor-owned issuers, suggesting that while differences in customer pools or firm size may play a role, it is unlikely that they alone can explain the results.

A concern about these estimates with controls is that there are several investor-owned issuers that are orders of magnitude larger than any credit union in our sample. This can be seen in the histograms of the credit cards' issuers' size for the two subgroups, provided in **Fig. 2**. Because of this lack of covariate overlap, our results may be dependent on our parametric assumptions about the functional form of the relationship between firm size and contract terms. The regressions in **Table 4** revealed a significantly positive partial correlation between log lending volume and many fees (coefficients unreported for brevity).<sup>27</sup>

<sup>26</sup> Though the credit card industry has no fixed definition of Gold and Platinum cards, the terms are generally used to denote cards aimed at high-FICO borrowers. Conversely, Secured cards are marketed towards credit-compromised individuals looking to rebuild their credit scores. The definitions of Student and Business cards are self-explanatory.

<sup>27</sup> For instance the coefficients on log lending volume imply that, with every doubling, late fees increase by \$0.65 and default APRs increase by 66 basis points, all else equal.

**Table 4**

Regression analysis of differences in contract terms.  
Source: Bankrate.com survey, first week of July 2008.

	(1) OLS, no controls	(2) OLS with controls	(3) OLS with controls, truncated sample
<i>Panel A: Base prices</i>			
Has special intro APR	$-0.347^{***}$ (0.073)	$-0.358^{***}$ (0.079)	$-0.385^{***}$ (0.096)
Intro APR (%)	$2.659^{***}$ (0.812)	$2.998^{***}$ (0.793)	$3.649^{***}$ (1.002)
Has special bal. trans. intro APR	$-0.348^{***}$ (0.114)	$-0.235^{**}$ (0.117)	$-0.291^{***}$ (0.119)
Bal. trans. intro APR (%)	$3.321^{***}$ (1.093)	$2.178^*$ (1.118)	$3.253^{***}$ (1.070)
Has rewards program	$-0.322^{***}$ (0.0817)	$-0.113^{**}$ (0.046)	$-0.054$ (0.050)
<i>Panel B: Penalty prices</i>			
Purchase APR (%)	$-1.518^{***}$ (0.534)	$-0.862$ (0.521)	$-0.589$ (0.575)
Has special default APR	$-0.497^{***}$ (0.121)	$-0.476^{***}$ (0.125)	$-0.456^{***}$ (0.124)
Default APR (%)	$-11.158^{***}$ (1.170)	$-8.876^{***}$ (1.255)	$-8.121^{***}$ (1.377)
Late fee (\$)	$-17.301^{***}$ (2.199)	$-14.811^{***}$ (2.304)	$-14.666^{***}$ (2.292)
Over-the-limit fee (\$)	$-16.688^{***}$ (2.351)	$-15.289^{***}$ (2.424)	$-15.764^{***}$ (2.504)
N	309	309	183
Number of issuers	63	63	52

Note: Each cell contains an estimate of the effect of being a credit union on a contract term. Controls included in column (2) are card type indicators, and issuer's log lending volume and delinquency rate from the Card Industry Directory. Column (3) reports estimates using a truncated sample where all issuers with lending volume greater than the largest credit union are dropped from the sample to achieve better covariate overlap between credit unions and investor owned issuers. Standard errors in parentheses are clustered at the issuer level. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

To verify that our results are not an artifact of such functional form assumptions, we drop any issuer that is larger than the largest credit union and present estimates based on this truncated sample in column 3 of **Table 4**.<sup>28</sup> The estimates are similar to our estimates using the full sample. The only notable difference is that the estimated effect of mutual ownership on rewards programs is now insignificant.

Yet another concern may be that our lending volume numbers are by bank, not by card, so the averages are not weighted by usage. It might be that while the unweighted average of fees across cards is higher at investor-owned issuers than at credit unions, if one were instead to weight each card by the lending volume under that card, then the weighted average of fees is actually higher at credit unions. We investigate this possibility using a very stringent test: for each investor-owned issuer we select the issuer's card with the lowest fee, and for each credit union we select the card with the highest fee, and then we analyze that restricted sample. Even with the cards stacked against our hypothesis in this way, we find that credit unions continue to have significantly lower fees than investor-owned issuers. For instance, in the full sample data the average late fee for credit unions is \$17.30 lower than for investor-owned issuers; using this method the average late fee among credit unions is \$10.82 lower than for investor-owned issuers. Similar results hold for every other penalty term in **Table 3** except for purchase interest rate, the average of which is significantly higher at credit unions in the restricted sample (full results unreported for brevity). The reason is that there is

<sup>28</sup> The largest credit union in the sample is the Navy Federal Credit Union, which had \$4 billion in credit card loans in 2008. The next largest issuer is Barclays Bank at \$11 billion. The issuers dropped to form the truncated sample are Barclays Bank, Elan, U.S. Bank, Capital One, Wells Fargo, American Express, HSBC, Discover, Citibank, Bank of America, and Chase.

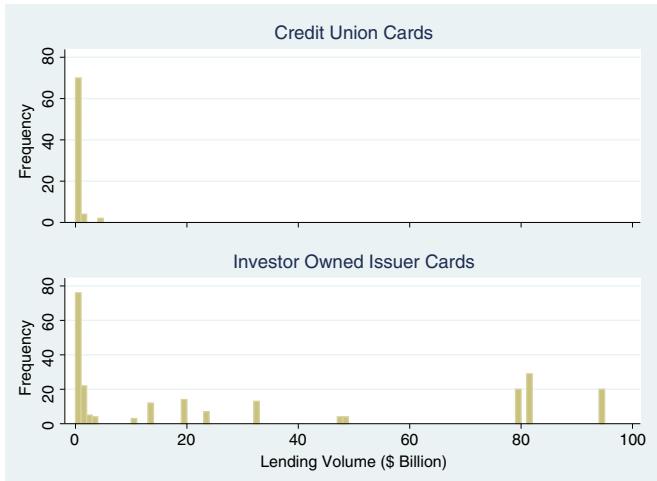


Fig. 2. Histograms of credit card issuers' lending volume.

considerable within-issuer variation in purchase interest rate due to risk-based pricing.

### 3.3. Deposit accounts

We next examine deposit account contracts. Gabaix and Laibson (2006) argue that banks shroud many of the fees they charge on deposit accounts, such as bounced check fees and minimum balance fees, and set those fees above marginal cost to exploit myopic consumers. Our theory predicts that such fees at mutually owned banks should be lower than at investor-owned banks. We investigate whether this is true using data on account fees at credit unions and investor-owned banks.

#### 3.3.1. Data

Our figures on deposit account contracts were provided by the United States Government Accountability Office (GAO), which conducted a study examining fees charged by depository institutions on savings and checking accounts, as well as disclosure of such fees, using data collected by Moebs Services and Informa Research Services (Government Accountability Office, 2008). The Moebs figures are constructed from 37,080 observations of investor-owned banks and credit unions collected via telephone surveys over the years 2000 to 2007. Informa figures are constructed from 5925 observations collected over the years 2001 to 2006.

The GAO was contractually obligated not to share the underlying data, but it did provide us with variable means for the credit union subgroup and the bank and savings and loan association (S&L) subgroup. S&Ls include some mutually owned S&Ls, but the vast majority are stock-owned. Despite this contamination by mutuals, we consider the bank and S&L subgroup to be our investor-owned subgroup; the presence of mutuals in the bank and S&L subgroup will bias our results towards no difference. Because we do not have access to the underlying data we cannot provide standard errors. However, the very large sample sizes suggest that the differences we present are statistically significant.

#### 3.3.2. Analysis

Table 5 shows that for a wide variety of deposit account fees, investor-owned banks and S&Ls charge more than credit unions.<sup>29</sup> Shrouded prices that likely take advantage of consumer myopia, such as Non-Sufficient Funds Fees, Overdraft Fees, and monthly fees

Table 5  
Fees for deposit accounts.

	Moebs Services			Informa Research Services		
	CUs	Banks and S&Ls	Δ	CUs	Banks and S&Ls	Δ
Monthly fee (\$)				3.85	8.74	-4.91
Non-sufficient funds fee (\$)	20.51	23.19	-2.68	21.61	25.96	-4.35
Overdraft fee (\$)	19.75	22.93	-3.18	21.82	26.70	-4.87
OD trans from deposit (\$)	2.61	2.84	-0.22			
OD trans from credit (\$)	1.13	1.59	-0.46			
Stop payment (\$)	14.49	19.93	-5.44	16.35	24.81	-8.46
ATM (\$)	0.93	1.33	-0.36	1.04	1.57	-0.52
Foreign ATM (\$)	0.65	0.82	-0.17	0.90	1.21	-0.31
Return of deposited item (\$)	12.11	6.59	5.52	8.58	5.89	2.69

Note: No standard errors provided because we do not have access to the original data. Monthly fee is for interest checking. CUs stands for credit unions. Sources: Moebs Services (2000–2007) and Informa Research Services (2001–2006), provided by the United States Government Accountability Office. The Moebs sample had 37,080 observations, and the Informa sample had 5925 observations, though not all observations were non-missing for every variable.

assessed when the account balance falls below a minimum threshold, show a clear pattern of being higher at investor-owned banks than credit unions. The only fee for which credit unions consistently charge more is the "Return of Deposited Item" fee, which is charged when a customer attempts to deposit a bad check written by someone else.

However, it is not clear what the components of the base price are for deposit accounts, and none of the account features in the GAO data are good candidates. Given that investor-owned firms successfully compete with credit unions to attract customers, it is likely that they offer superior terms or features on at least some component of their deposit accounts, for instance the availability of ATMs. However, we lack data on those account features.

Finally, it is noteworthy that credit unions provide lower penalties for both credit cards and deposit accounts. If we had only analyzed the credit card data, for example, then one potential concern would be that credit unions are using credit cards as loss leaders and making their real money through fees on bundled deposit accounts. Our analysis of the deposit account data suggests that this cannot explain our results. Moreover, credit union deposit accounts are available to customers without a credit card at the credit union.

### 3.4. Consumer sorting after a shock to the salience of fees

Our theory predicts that differences in the contracts offered by mutually owned and investor-owned firms should induce a particular type of customer sorting: those who perceive that they are vulnerable to penalties (sophisticates) should be attracted to mutuals. We investigate our sorting hypothesis using a recent shock to the salience of penalty fees. If the fear of being hit with penalties leads some customers to choose credit unions over investor-owned firms, then an event that increases the salience of such penalties and consumers' vulnerability to them—effectively causing some naives to become sophisticates—will cause customers near the margin to move from investor-owned firms to mutuals.

On September 29, 2011, Bank of America announced a new \$5 monthly fee for debit cards. This seemingly modest price change prompted a consumer backlash, directed not just at Bank of America's debit card fee but at bank fees more generally. One public interest advocate explained: "What you're seeing is banks are doing what they always do, which is to find an excuse to maximize fee income. ... Customers should be voting with their feet here and switching to avoid these fees."<sup>30</sup> In response, on October 9th one consumer set up

<sup>29</sup> The Moebs and Informa data had different sampling strategies (Moebs was designed to be nationally representative, while Informa was not) which may explain the differences in the point estimates.

<sup>30</sup> Phil Rosenthal, "Bank of America debit card fee a reminder to shop around," Chicago Tribune, Oct. 1, 2011.

a Facebook page for “Bank Transfer Day,” encouraging consumers to close their accounts at investor-owned banks and move their funds en masse to credit unions. The date was marked for Nov. 5, 2011. A credit union spokesperson explained, “Each time the banks make a change like this, it shines the spotlight on what a tremendous value and how consumer-focused credit unions are.”<sup>31</sup>

We interpret this episode as a general shock to the salience of penalty fees and the lower propensity of credit unions to charge such fees. We document this shock to salience using Google Trends data, which tracks the popularity of search terms over time and can serve as a rough proxy for consumer awareness and experience (Da et al., 2011). Fig. 3(a) shows U.S. search volumes for the phrase “bank fees.” There is a dramatic spike in searches just after the Bank of America announcement. The Google Trends data indicate that bank fees became much more salient to consumers after this event.

In response to this shock to the salience of bank fees, consumer interest in credit unions surged. Fig. 3(b) shows U.S. search volumes for the phrase “credit unions.” There is a spike at the time of the announcement, followed by a larger spike a month later at the time of “Bank Transfer Day.”<sup>32</sup> Searches for the phrase “credit union vs bank” (not shown) reveal similar spikes between September 29th and November 5th, suggesting that customers were actively searching and comparing. The jump in interest in credit unions shown in the data is consistent with our sorting theory. Bank of America's fee announcement, and the subsequent public discourse about bank fees that it sparked, made some naive consumers aware of their vulnerability to fees, effectively converting them to sophisticated consumers. In response these consumers sought out credit unions.

We further document consumers' response to this shock to salience by showing that many consumers indeed switched from investor-owned banks to credit unions after Bank of America's fee announcement. Fig. 4(a) presents data from credit union call reports on seasonally-adjusted changes in total membership. We see an unusually large net increase in credit union membership in 2011:Q4, after Bank of America announced its fee increase. These data suggest that the “Bank Transfer Day” movement created in response to the shock did indeed result in a shift of consumers to credit unions, as predicted by our sorting theory.

One potential alternative interpretation of this shift to credit unions following Bank of America's fee announcement is that this is a simple price effect rather than a price salience effect: Bank of America customers left Bank of America and went to credit unions because Bank of America raised its prices. We investigate this by examining changes in the number of deposit accounts at investor-owned banks *other* than Bank of America. We use the change in the total number of deposit accounts of size less than \$250,000 reported by commercial banks in their call reports. Due to data limitations, we cannot seasonally adjust the investor-owned bank deposits time series.<sup>33</sup>

Fig. 4(b) presents this time series and shows an unusually large drop in the number of deposit accounts at other investor-owned banks in 2011:Q4, after Bank of America announced the fee increase. These data suggest that the increase in credit union membership in the quarter after the announcement was due to a broader price salience effect, not just a simple price effect. One caveat, however, is that the credit union membership data has a negative Q4 seasonal factor, and

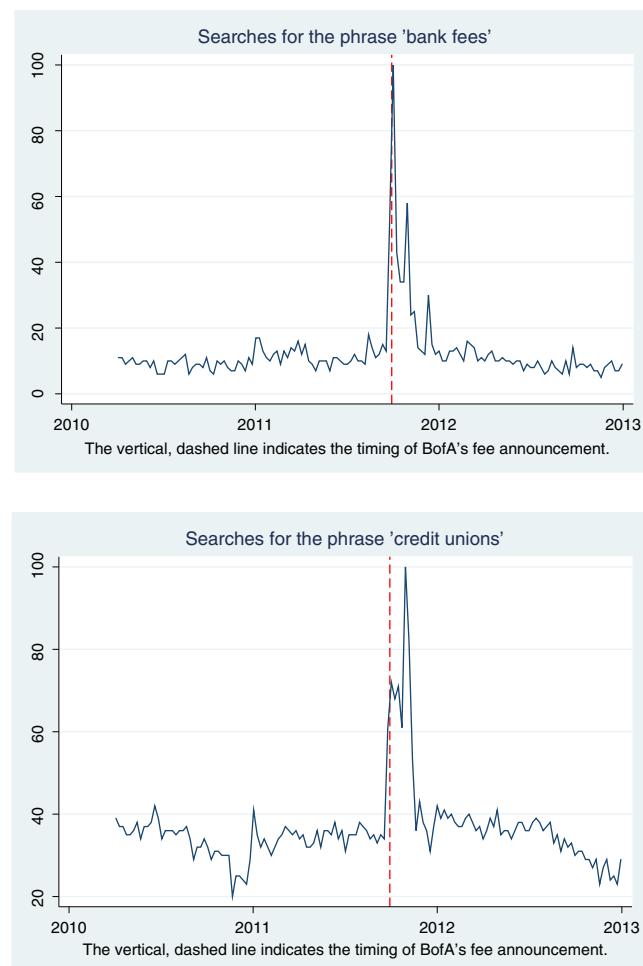


Fig. 3. Google Trends data.

our 12 quarters of bank deposit account data appear to have a similar seasonal pattern. If it were possible to seasonally adjust the bank deposit account data, the large drop seen for 2011:Q4 would likely moderate to some extent.

### 3.5. Additional evidence

Additional corroborating evidence for our theory can be found in differences in the executive compensation and marketing materials of customer-owned and investor-owned banks. We also provide some suggestive evidence from the Survey of Consumer Finances that customers sort between firm types according to their perceptions of their biases, as our theory predicts.

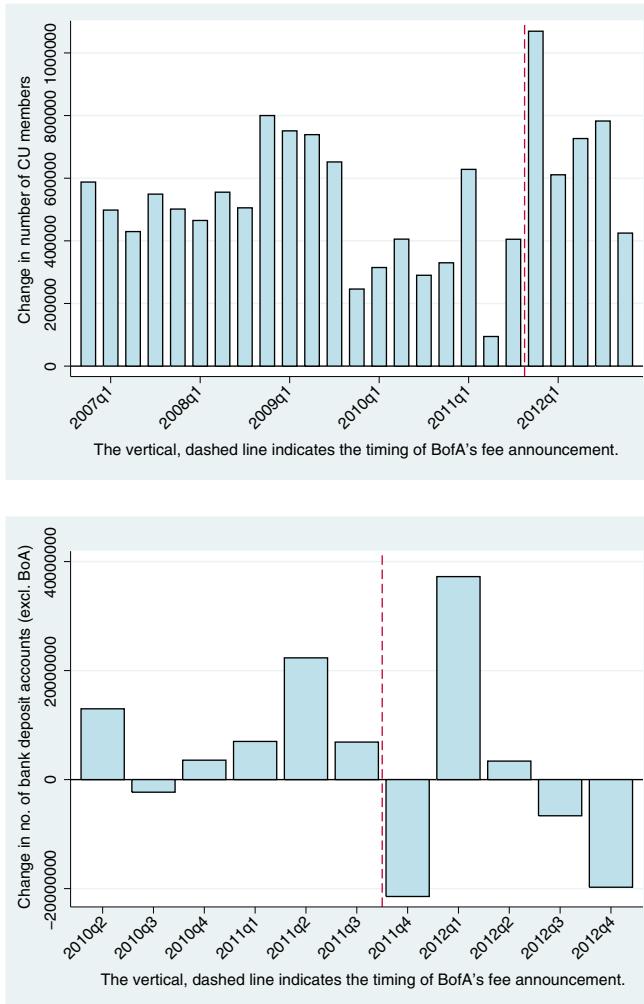
#### 3.5.1. Executive compensation

Our theory focuses on the incentives that investor-owners have to use contracts that exploit consumers' mistakes. However, investor-owners typically elect directors who hire managers to set firm policy, and they provide incentive contracts for those managers in addition to explicit directives. In practice, one proximate cause of the differences in behavior between ownership types may be differences in these compensation contracts of firm managers, with investor-owners providing their hired managers with higher-powered incentives than the directors of mutual firms give to their managers. Confirming these

<sup>31</sup> Vanessa Ho, “Debit card fees irk customers, prompt flight to credit unions,” Seattle Post Intelligencer, September 30, 2011.

<sup>32</sup> The Google Trends data show that interest in credit unions initially surged on September 30th, nine days prior to the establishment of the Bank Transfer Day movement on October 9th.

<sup>33</sup> Prior to 2010 the question about the number of deposit accounts of investor-owned banks was only asked annually. Therefore we only have 12 quarters of data, which is too few to perform a seasonal adjustment.



**Fig. 4.** Changes in numbers of customers at credit unions and investor-owned banks. Source: Call Reports.

hypothesized differences in executive compensation thus provides supporting evidence for our theory.<sup>34</sup>

Examining the 2005 America's Community Bankers Compensation Survey, Mazur (2005) finds that the highest-paid employee of investor-owned banks was paid on average \$237,102, 45% of which was in bonus and profit-sharing payments. In contrast, among mutual savings banks, the highest-paid employee was paid on average \$178,726, only 24% of which was in bonus and profit-sharing payments. Moreover, while 35% of investor-owned banks had an employee stock ownership plan, only 10% of mutual banks had a phantom stock program or similar scheme designed to produce incentives similar to stock-based compensation. Similarly, the Credit Union National Association 2004–2005 CEO Total Compensation Survey found that the average credit union CEO cash compensation was \$189,432, of which only 14.5% was in bonus and incentive payments (Molvig, 2005). It thus

appears that investor-owned issuers do indeed use higher-powered incentive contracts to compensate their top executives than do mutuals.

We can use these data on managers' compensation contracts, together with data on consumer contracts, to do a simple calibration exercise to see whether the data are consistent with our modeling approach. In particular, let  $d^{IO}$  and  $d^{CU}$  be the fraction of penalty revenue that goes to managers of investor-owned issuers and credit unions, respectively. Also, parameterize the non-monetary cost of penalties function as  $\psi(\hat{p}) = \frac{1}{2}\hat{p}^2$ . The first order condition for the problem in Eq. (3) then becomes:

$$d^{IO} = A\hat{p}^{IO} \quad (9)$$

and

$$d^{CU} = A\hat{p}^{CU} \quad (10)$$

for investor-owned issuers and credit unions, respectively. Interpreting our model literally, then, implies that

$$\frac{d^{IO}}{d^{CU}} = \frac{\hat{p}^{IO}}{\hat{p}^{CU}}. \quad (11)$$

As a rough approximation, suppose that the fraction of penalty revenue that goes to a manager is proportional to the fraction of the manager's pay that is incentive-based. The compensation data then implies that  $\frac{d^{IO}}{d^{CU}} \approx \frac{45\%}{14.5\%} = 3.1$  is the ratio of incentive strength between investor-owned banks and credit unions. (Comparing investor-owned banks and mutual savings banks, the analogous ratio is  $\frac{45\%}{24\%} = 1.9$ .) The question then becomes whether this ratio is large enough to explain the observed differences in contracts. The data on credit card contracts presented above shows that the ratios of penalties used by investor-owned card issuers and credit unions are all of the same order of magnitude as this ratio of  $d$ s. In particular, they are 1.13 for the purchase APR, 1.79 for the default APR, 1.93 for the late fee, and 2.07 for the over-the-limit fee. The model and the data thus hang together reasonably well.

### 3.5.2. Marketing materials

The marketing materials used by customer-owned and investor-owned credit card issuers provide anecdotal evidence of the differences in behavior between the two types of firms. Promotional credit card brochures collected from branches of Bank of America and the Harvard University Employee Credit Union (HUECU) in Cambridge, MA, in May 2008 (Figs. 5 and 6) illustrate the difference. The Bank of America brochure focuses exclusively on the rewards program of the credit card, with no mention of account fees or interest rates. In contrast, the less colorful HUECU brochure emphasizes that it has "No hidden fees" and "No default rates," and details the contract terms with no mention of a rewards program. Interpreting these in light of our theory, the Bank of America pamphlet appeals to naives and the unbiased, as they do not expect to incur penalties and are attracted by the low base price represented by the rewards program, while the HUECU pamphlet is pitched at sophisticated consumers who are aware of their vulnerability to penalties.

Some mutuals go further and explicitly market themselves as being free of the profit motive induced by outside investor ownership. For instance Nationwide Insurance, a large mutually owned insurer, ran a TV ad in 2012 trumpeting that "Nationwide Insurance doesn't have shareholders so we can protect what's most important: our members."<sup>35</sup> Such marketing draws a direct connection between ownership structure and the incentives of the firm to exploit its customers.

<sup>34</sup> Our theory does not predict that firm ownership causes differences in firm behavior only through the incentive pay contracts of managers. Incentive pay contracts are in theory used to align the interests of managers and owners with respect to the *unobservable* actions of managers. For observable actions, owners (or their representatives) can directly dictate the choices of managers. For example, a board of directors may mandate that the CEO adopt a rewards program for the firm's credit card products. Firm ownership can affect these choices too.

<sup>35</sup> Nationwide Insurance, "Your Invitation to Join The Nation," July 27, 2012. <http://www.youtube.com/watch?v=3xi3BCqmqSw>.

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Choose from hundreds of merchandise items from the best names in electronics, housewares, fashion, and sporting goods like:

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- Sony®
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- Braun®
- Coleman®
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- Dooney & Bourke®
- Radio Flyer®
- Skagen®
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Redeem your Points for gift cards, and choose the merchandise you want from a top retailer or enjoy a meal at a favorite restaurant. Here are just a few of the gift card or certificate options you have:

**\$50 Gift Card/Certificate**  
6,000 Points



**\$100 Gift Card/Certificate**  
12,000 Points



**Cash Rewards**



Sometimes the best reward is cash.

Cash Reward	Points
\$12.50	2,500
\$25	5,000
\$37.50	7,500
\$80	10,000
\$120	15,000
\$160	20,000
\$250	25,000
\$350	35,000
\$500	50,000

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Fig. 5. Brochure for the Bank of America credit card products, collected at branch in Cambridge, MA, in May 2008.

### 3.5.3. Customer sorting according to perceptions of bias

We further test our sorting predictions using data from the Survey of Consumer Finances, pooled from 1989–2004. Our theory predicts that perceived vulnerability, which is not necessarily the same as actual vulnerability, influences whether consumers patronize investor-owned firms or credit unions. We proxy for consumers' perception of the probability of incurring penalties using the response to the following question: "What is the most important reason your family living here chose the institution that you did for your main checking account?"  $WantLowFee_i$  is an indicator for whether the respondent chose "low fees or service charges" as the most important reason for choosing their checking account institution. Low fees is the third most popular reason given for account choice (after location and all-in-one service) with 15.4% of respondents citing it. We consider this response a proxy for consumers' perceived vulnerability to penalties because penalties are unimportant unless the account holder believes there is a positive probability of incurring them. This is an admittedly crude proxy, given that some fees are not penalties that exploit consumer biases.

We proxy for consumers' actual vulnerability to penalties using outstanding credit card balances, collapsed to a binary variable.  $CarryBal_i$  is an indicator for whether the credit card holder failed to pay their full balance in the month prior to the survey. 54.3% of cardholders in the data carried a non-zero balance.

We first estimate a probit model of the form

$$CUCheck_i^* = \alpha_0 + \alpha_1 WantLowFee_i + \alpha_3 \mathbf{X}_i + \epsilon_i \quad (12)$$

where  $CUCheck_i^*$  is the underlying latent variable determining  $CUCheck_i$ , which is an indicator for whether the household has a checking account at a credit union, and  $\mathbf{X}_i$  is a vector of controls including sex, age, age<sup>2</sup>, race, education, income, industry, occupation, and year of survey.

The results, reported in column (1) of Table 6, confirm that people concerned about fees are indeed more likely to hold a checking account at a credit union than those who do not. We take this as evidence supporting our basic sorting hypothesis: consumers who are worried about their vulnerability to penalties are more likely to use mutuals.

We next check whether concern about fees and service charges and carrying a credit card balance are correlated with credit union credit card use. While  $WantLowFee_i$  is a response to a question about checking accounts, it seems likely that consumer concern about fees in checking accounts carries over to concern about fees in other types of accounts. Column (2) estimates a probit model of the form

$$CUCC_i = \alpha_0 + \alpha_1 WantLowFee_i + \alpha_2 CarryBal_i + \alpha_3 \mathbf{X}_i + \epsilon_i \quad (13)$$

where  $CUCC_i$  is an indicator for whether the household has a credit card at a credit union.

We find that consumers with  $WantLowFee_i = 1$  are significantly more likely to use a credit union credit card. In contrast, the coefficient on  $CarryBal_i$  is not significant. We take these results as further suggestive evidence for the type of sorting predicted by our theory. Sophisticated consumers, proxied for by their expressed concern over fees, are more likely to use a credit union credit card. In contrast actual vulnerability to high borrowing-contingent fees, proxied by carrying a credit card balance, does not make one more likely to use a credit union credit card.

One potential concern with this analysis is that the correlation between  $CUCC_i$  and  $WantLowFee_i$  may be mediated by having a credit union checking account. Perhaps people who want low fees are more likely to choose credit union checking accounts, and once they have those accounts they become more likely to get credit union credit cards. The regression in column (3) is identical to column (2), but



**Fig. 6.** Brochure for the Harvard University Employees Credit Union credit card products, collected at branch in Cambridge, MA, in May 2008.

**Table 6**  
Correlation of bias and perceptions of bias with credit union use.  
Source: Survey of Consumer Finances 1989–2004.

Outcome	(1)	(2)	(3)
	<i>CUcheck</i>	<i>CUCC</i>	<i>CUCC</i>
<i>WantLowFee</i>	0.111*** (0.009)	0.055** (0.010)	0.030 (0.024)
<i>CarryBal</i>		0.005 (0.007)	–0.025 (0.023)
Controls	Y	Y	Y
Sample	All	All	<i>CUcheck</i> = 1
Observations	21,930	17,879	2845

*Note:* Marginal effects from probit regressions. *CUcheck* is an indicator for whether the household has a checking account at a credit union. *CUCC* is an indicator for whether the household has a credit card at a credit union. *WantLowFee* is an indicator for whether the respondent chose "Low fees or service charges" as the most important reason for choosing their checking account institution. *CarryBal* is an indicator for whether the household carried a non-zero credit card balance in the month prior to the survey. Controls include sex, age, age<sup>2</sup>, race dummies, education dummies, income dummies, industry dummies, occupation dummies, and year of survey dummies. Regressions are weighted using SCF sampling weights. Standard errors in parentheses. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.

restricts the sample to only those with credit union checking accounts.<sup>36</sup> This regression removes all variation due to use of credit union checking accounts, and asks whether credit union customers who say they want low fees are more likely to use credit union credit cards than credit union customers who give a different reason. Unfortunately restricting the sample in this way substantially reduces the sample size, and although the coefficient on *WantLowFee*<sub>i</sub> remains positive, it is no longer significant ( $p = 0.215$ ).

### 3.6. Alternative explanations

We now consider several alternative explanations for the stark differences in contracts offered by customer-owned and investor-owned firms in the consumer financial services market.

<sup>36</sup> We restrict the sample in this way rather than simply control for *CUcheck* because the group of consumers who do not have a credit union checking account but do have a credit union credit card is an odd (and small) sample. We thank an anonymous referee for pointing this out.

### 3.6.1. Customer selection

Perhaps the biggest concern with our findings on contract differences is that they may be driven by the different customer selection processes of credit unions. Credit unions are required to establish membership requirements, and those membership requirements might result in different customer pools, affecting the contracts they offer.

As a preliminary matter, it is instructive to examine the membership requirements of the 19 credit unions in our credit card contracts sample. We list their common bond requirements in Table 7. The requirements are extremely loose, typically including anyone who lives or works in a large set of communities. For instance, Westcom CU is open to anyone living in Los Angeles, Orange, Riverside, San Bernardino, Santa Barbara, or Ventura counties in California, while Digital FCU is open to anyone willing to make a \$10 donation to a charity. GTE FCU is open to literally anyone. Though the common conception of a credit union may be a local entity serving a narrow clientele, the particular credit unions in our credit card sample are among the largest in the

country, and all have very broad membership. Indeed, the members of the credit unions in our sample may be more demographically similar to the clientele of investor-owned banks than the credit union members in the SCF data, which includes credit unions of all sizes.

To further investigate customer selection, we examine whether people who use credit cards issued by investor-owned firms are observably different from those who use credit union credit cards. In order for customer selection to be the driving force for the large differences in contracts we observe, we would expect to see substantial differences in credit union and investor-owned firm customers.

In Table 8 we compare households whose main credit card is from a credit union to those whose main credit card is from an investor-owned issuer using data from the Survey of Consumer Finances (SCF) merged from 1989 to 2004. We find little difference between the demographics of the two groups. Credit union card users are on average slightly younger, more likely to be male, and more likely to have graduated from high school. There are no significant differences between groups in their proportion white, black, or college graduate.

The only demographic characteristic in which there is an appreciable difference between the groups is income: households served by credit unions make, on average, \$11,134, or 16% less per year, than do households with investor-owned credit cards. Furthermore, we find that people who use credit union cards are more likely to be employed than users of investor-owned issuer cards and are specifically more likely to be employed in the public sector. Employment-based selection is only a concern if we believe selection between, say, public and private sector employment is correlated with demand for up-front prices versus penalties or with other characteristics of borrowers that result in different equilibrium contracts. We believe that most such employment- and criteria-based selection is largely orthogonal to consumers' demand for particular contract terms.

A type of consumer preference that might affect consumers' demand for different contract terms is risk preference. We investigate this possibility using data from the 1983 SCF, which contained a question about risk preferences: respondents were asked whether they were willing to take "substantial," "above average," "average," or no risk at all in their investments. Fig. 7 shows the histograms of responses

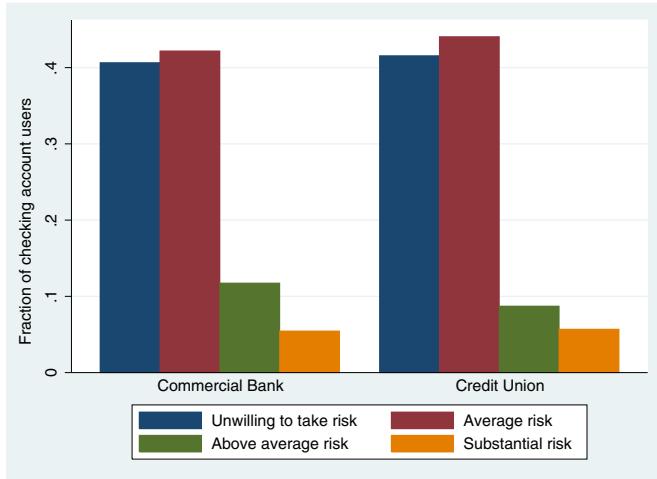
**Table 7**  
Membership requirements for credit unions in the credit card sample.

Name	Membership requirements
America First CU	Live, work (or regularly conduct business in), worship, volunteer, or attend school in Salt Lake County, Utah.
Digital FCU	Anyone can join by making a \$10 donation to a charity.
GTE FCU	Anyone can join.
Golden One CU	People who live in the following counties in CA: Alameda, Amador, Butte, Calaveras, Contra Costa, El Dorado, Fresno, Imperial, Kern, Kings, Lassen, Madera, Merced, Napa, Nevada, Placer, Sacramento, San Bernardino, San Joaquin, San Luis Obispo, Santa Barbara, Santa Clara, Shasta, Solano, Sonoma, Stanislaus, Sutter, Yolo, and Yuba.
Michigan State University FCU	Students and employees of Michigan State and Oakland Universities and 78 other businesses and associations.
Municipal CU	Work for City of New York or one of dozens of other employers in New York City.
Navy FCU	Work for the Department of Defense or have a family member who does.
Orange County Teachers FCU	Employees of: Schools; County Superintendents of Schools; and authorized Education Foundations, in the counties of: Imperial, Kern, Los Angeles, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara and Ventura.
Patelco CU	Live or work in the following CA counties: Alameda, Contra Costa, Marin, Napa, Sacramento, San Francisco, San Mateo, Santa Clara, Solano, or Sonoma. Live or work in one of about 100 CA cities.
Penn. State Employees FCU	State and local government employees; faculty, staff, students and alumni of the Universities within the State System of Higher Education and Harrisburg Area Community College; students, faculty and staff of Elizabethtown College; employees eligible for membership in the Public School Employees' Retirement System (PERS) or the State Employees' Retirement System (SERS); and members of approved associations and employee/occupational groups.
Pentagon FCU	Anyone is eligible to join by making a \$20 to a charity that supports military families.
Randolph Brooks FCU	Live or work in one of the eligible cities or counties in TX: Austin, San Antonio, Caldwell County, Wilson County, Gonzales County, City of San Marcos, and City of Seguin.
Redstone FCU	Serves 350,000 members from more than 1400 clubs, organizations, and employers in Alabama.
SEFCU	Live or work in one of 32 cities in NY, including Albany, Buffalo, and Syracuse.
San Diego CU	Live or work in San Diego, Riverside, or Orange County, CA.
Suncoast FCU	Have child in public schools in one of 15 counties in Florida, or employed by one of hundreds of participating employers.
United 1st FCU	Live in Dodge County, Pierce County, Ben Hill, Telfair, Wilcox and Wheeler Counties, Charlton and Ware County Georgia, or work at one of about a hundred participating employers.
VyStar CU	Anyone living in the NE Florida area.
Wescom CU	Anyone living in Los Angeles, Orange, Riverside, San Bernardino, Santa Barbara, and Ventura counties.

**Table 8**  
Comparison of users of investor-owned and credit union credit cards.  
Source: 1989–2004 Survey of Consumer Finances.

	Credit union users	Investor-owned users	Δ
Female (fraction)	0.200	0.223	-0.023* (.0125)
Age (years)	46.25	49.35	-3.10*** (0.477)
White (fraction)	0.849	0.832	0.017 (0.011)
Black (fraction)	0.082	0.080	0.002 (0.008)
HS grad (fraction)	0.933	0.894	0.039*** (0.008)
College grad (fraction)	0.371	0.378	-0.007 (0.015)
Income (\$)	57,635	68,769	-11,134*** (1651)
Employed (fraction)	0.844	0.702	0.142*** (0.009)
Public sector (fraction)	0.113	0.038	0.075*** (0.007)
Observations	1432	16,899	18,331

Note: Credit union users are respondents who hold a credit card issued by a credit union. Definition of "Public sector" includes public administrators and military personnel, but excludes teachers and police officers. This narrow definition was used because coarse occupational grouping in the public-use version of the SCF made it impossible to construct a broader group without including non-public sector employees as well. Weighted with SCF sampling weights. Standard errors are in parentheses. \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5%, and 10% levels, respectively.



**Fig. 7.** Consumers' willingness to take risk by checking account institution type.  
Source: Survey of Consumer Finances, 1983.

for credit union and investor-owned bank checking account holders.<sup>37</sup> The patterns of responses among credit union and investor-owned bank customers are similar. Ordered probits predicting risk aversion responses by institution type fail to reject the null of no effect of institution type with a *p*-value of 0.65.

Finally, note that our finding of differences in the credit card contracts used by investor-owned issuers and credit unions reported in Section 3.2 is robust to controlling for proxies for customer composition, including card type and the issuer's delinquency risk.

On the whole, we think it is implausible that these modest differences in customer composition reflected in the SCF explain even a small part of the large differences between investor-owned and credit union credit card contracts. Without a compelling mechanism by which criteria-based selection would be correlated with demand for different contract types, and without evidence that strong selection actually does take place, it is unlikely that the dramatic contract differences we find in the data are caused by differences in customer composition.

### 3.6.2. Tax treatment

As we noted above, credit unions are exempt from the corporate income tax. This exemption is meant to make it easier for credit unions to expand their capital stock by allowing them to retain more of their profits, thus partially compensating for their inability to raise equity capital. However, it seems unlikely that this is the cause of the differences in contracts. Smith et al. (1981) and Cook and D'Antonio (1984) argue that if credit unions were taxed they would likely lower interest rates, as corporate income tax would reduce the benefit of retaining earnings. There is no reason to expect that taxing credit unions would result in their using the low up-front prices and high penalties observed at investor-owned issuers. Indeed, our model would predict that taxes would lower the use of penalties at mutuals by lowering their pecuniary benefit to managers.

### 3.6.3. Interest rate caps

Federally chartered credit unions may not extend credit to members at rates exceeding 18% per year on the unpaid balance inclusive of all finance charges.<sup>38</sup> The National Credit Union Administration (NCUA) looks to the Federal Reserve's Regulation Z to determine whether a charge under the contract is considered a "finance charge" for purposes of this ceiling.<sup>39</sup> Regulation Z excludes "[c]harges for actual unanticipated late payment, for exceeding a credit limit, or for delinquency, default, or a similar occurrence" from the definition of finance charges.<sup>40</sup> This carveout means that most of the penalty prices we examine are not regulated by the 18% limit on federal credit unions' interest rates and hence the limit cannot explain our results.

The 18% limit does apply to purchase interest rates, which are slightly higher at investor-owned issuers than at credit unions. However, only 1 of the 76 credit union credit card contracts in our sample charges a purchase interest rate at or above 18% (compared to 12 of 233 cards issued by investor-owned firms).<sup>41</sup> If the interest rate cap was the driver of the difference, then one would expect the cap to be binding for a greater fraction of credit union credit cards.

### 3.6.4. Innovation

One explanation for our APR results is that raising revenue via introductory and default APRs that are different from the standard purchase APR is a fairly recent innovation in credit card contracting, and perhaps mutual firms are just slower to adopt innovations than are investor-owned issuers. A similar argument is that there is a fixed cost to introducing complex contract features such as introductory and default APRs, and credit unions, which are smaller on average than commercial banks, do not find it cost-effective to do so. To investigate this, we restrict the sample to banks with introductory and default APRs distinct from their purchase APRs and find that it is still the case that credit unions offer a flatter interest rate profile than do investor-owned issuers, albeit not quite as flat as in the entire sample (results unreported for brevity). In addition, Table 4 contains specifications with explicit size controls and with the largest investor-owned firms removed from the sample.

In sum, we think that a difference in management incentives caused by firm ownership, rather than any of these alternative explanations, is the best explanation for the observed differences in contracts between investor-owned issuers and credit unions.

## 4. Conclusion

Firm ownership can be a socially useful device for shaping incentives in domains in which alternative modes of social control, such as regulation and market competition, may be ineffective. These domains include markets in which consumer biases result in losses to social welfare. While the evidence we have presented for our theory is confined to financial services markets, we think it is likely that firm ownership plays a similar role in attenuating firms' incentives to exploit consumer biases in other markets, such as education and health care.

<sup>38</sup> 12 U.S.C. §1757(5) (A)(vi); 12 C.F.R. §701.21(c)(7)(i). The National Credit Union Administration (NCUA) has set the interest rate ceiling at 18% by lender letter. See, NCUA Letter to Federal Credit Unions, Letter No. 11-FCU-04 (2011).

<sup>39</sup> See, NCUA Letter to Federal Credit Unions, Letter No. 09-FCU-05 (2009).

<sup>40</sup> 12 C.F.R. §226.4(c) (2). The NCUA has specifically announced that it follows this part of Regulation Z in determining whether a charge is a "finance charge" for purposes of the interest rate ceiling. See, e.g., NCUA Legal Opinion 91-0412, April 30, 1991 (confirming that, per Regulation Z, late charges are not considered "finance charges" for purposes of the interest rate ceiling).

<sup>41</sup> Very few credit unions even charge default interest rates at or above the cap. Only 11 of the 76 credit union cards charged default interest rates greater than or equal to 18%, compared to 213 of 233 cards issued by investor-owned firms.

<sup>37</sup> We examine checking account ownership because it was a financial product used by the majority (96.3%) of respondents in 1983, much as credit cards are today. Relatively few people (18.5%) in the 1983 sample used credit cards, and of those a mere 16 respondents used credits card issued by mutuals, making inference difficult.

Our analysis suggests that a potential benefit of policies that expand the market share of mutual and nonprofit firms is a reduction in the costs that stem from consumer biases. For example, access to cooperatively owned credit unions was expanded by the Credit Union Membership Access Act of 1998, which allowed federal credit unions to serve multiple groups of consumers. In education, the federal Higher Education Act differentiates between for-profit and nonprofit or public educational institutions, requiring for-profit entities to derive at least 10% of their revenue from sources other than federal student aid. This rule was intended to curb the proliferation of “fly by night” for-profit schools that provide low-quality education to students whose expenses are paid by federal student aid. In healthcare, the 2010 Patient Protection and Affordable Care Act provides subsidies to fund the startup costs of nonprofit health insurance issuers. Of course, there are also costs to policies that expand the market share of mutuals and nonprofits. For instance, mutual firms may operate less efficiently than do investor-owned firms because, for example, they are sheltered from the market for corporate control. A comprehensive cost–benefit analysis of such policies is beyond the scope of the paper.

## Appendix A

**Proof of Proposition 1.** First pooling on  $(-\lambda(\alpha_n + \alpha_s)/2, 1)$  is an equilibrium. The equilibrium contract uses  $\hat{p} = 1$  and so satisfies penalty optimality for investor-owned firms. To see that it makes nonnegative profits, note that each naive and sophisticated consumer pays a penalty with probability  $\lambda$ . Hence, a fraction  $\lambda(\alpha_n + \alpha_s)$  pay a penalty in the equilibrium, and contract profits are thus:

$$\begin{aligned} \pi[(-\lambda(\alpha_n + \alpha_s)/2, 1), \lambda(\alpha_n + \alpha_s)] \\ = -\lambda(\alpha_n + \alpha_s)/2 + \lambda(\alpha_n + \alpha_s)\left(1 - \frac{1}{2}\right) = 0. \end{aligned} \quad (14)$$

Furthermore, it satisfies free entry since any alternative contract that also satisfies penalty optimality and makes some consumer type strictly better off must offer a  $p < -\lambda(\alpha_n + \alpha_s)/2$  and would therefore attract all consumers and make negative profits.

Third, this equilibrium is unique. To see this, note that all equilibrium contracts in any alternative equilibrium must have  $\hat{p} = 1$ . Now note that all consumer types will buy the equilibrium contract with the lowest  $p$ , so any equilibrium must have a single contract. Now note that any equilibrium contract with  $p < -\lambda(\alpha_n + \alpha_s)/2$  would make negative profits, while any with  $p > -\lambda(\alpha_n + \alpha_s)/2$  would violate free entry.  $\square$

**Proof of Proposition 2.** First, pooling on  $(-\lambda(\alpha_n + \alpha_s)(d - \frac{d^2}{2}), d)$  is an equilibrium. The equilibrium contract uses  $\hat{p} = d$  and so satisfies penalty optimality for mutual firms. It is easy to show that with all consumers pooling on this contract, the firm exactly breaks even, so the contract satisfies the nonnegative profits condition.

Furthermore, it satisfies free entry since any alternative contract that also satisfies penalty optimality and makes some consumer type strictly better off must offer a  $p < -\lambda(\alpha_n + \alpha_s)(d - \frac{d^2}{2})$  and would therefore attract all consumers and make negative profits.

Third, this equilibrium is unique. To see this, note that all equilibrium contracts in any alternative equilibrium must have  $\hat{p} = d$ . Now note that all consumer types will buy the equilibrium contract with the lowest  $p$ , so any equilibrium must have a single contract. Now note that any equilibrium contract with  $p < -\lambda(\alpha_n + \alpha_s)(d - \frac{d^2}{2})$  would make negative profits, while any with  $p > -\lambda(\alpha_n + \alpha_s)(d - \frac{d^2}{2})$  would violate free entry.  $\square$

**Proof of Proposition 3.** We first show that the proposed separating equilibrium is indeed an equilibrium.

Naives and unbiased prefer the investor-owned contract and sophisticates prefer the mutual contract. To see this, recall that naives and the unbiased only care about the base price. Hence, they prefer the investor-owned contract if and only if

$$-\lambda \frac{\alpha_n}{2(\alpha_n + \alpha_u)} \leq -\lambda \left(d - \frac{d^2}{2}\right). \quad (15)$$

This simplifies to

$$\frac{\alpha_n}{\alpha_n + \alpha_u} \geq 2d - d^2, \quad (16)$$

which we have assumed is true. This also establishes the claim in the proposition that the base price of the mutual contract is higher than the base price of the investor-owned contract.

For sophisticates to prefer the mutual contract, their total expected cost of using it must be less than for the investor-owned contract:

$$-\lambda \left(d - \frac{d^2}{2}\right) + \lambda d \leq -\lambda \frac{\alpha_n}{2(\alpha_n + \alpha_u)} + \lambda. \quad (17)$$

Rearranging and canceling terms, this reduces to:

$$d^2 \leq 2 - \frac{\alpha_n}{(\alpha_n + \alpha_u)}, \quad (18)$$

which is true since  $d^2 < 1$  and  $\frac{\alpha_n}{(\alpha_n + \alpha_u)} < 1$ .

The contracts in the proposed equilibrium obviously satisfy penalty optimality.

Consider now the profits banks earn under each contract. In the proposed equilibrium, all naive and unbiased consumers go to investor-owned firms, and so the firm earns a penalty on each contract with probability  $\lambda \frac{\alpha_n}{\alpha_n + \alpha_u}$ . The expected profit generated by the investor-owned contract  $(-\lambda \frac{\alpha_n}{2(\alpha_n + \alpha_u)}, 1)$  is thus equal to 0. Similarly, mutuals attract all (and only) sophisticates, who incur the penalty with probability  $\lambda$ . The expected profit generated by the mutual contract  $(-\lambda(d - \frac{d^2}{2}), d)$  is thus also equal to 0, so both contracts yield nonnegative profits.

Furthermore, the proposed equilibrium contract set satisfies free entry. Consider an alternative investor-owned contract with a lower base price. If it only attracted naives and unbiased it would make negative profits. In order to attract sophisticates, it must have a base price low enough so that sophisticates' perceived costs would be lower than at the mutual contract in the proposed equilibrium. Denoting the base price by  $p'$ , we must have:

$$p' + \lambda < -\lambda \left(d - \frac{d^2}{2}\right) + \lambda d \quad (19)$$

or

$$p' < \lambda \frac{d^2}{2} - \lambda. \quad (20)$$

Furthermore, if it attracted sophisticates, then it would also attract naives and unbiased. It would have to earn non-negative profits, which requires that:

$$\pi((p', 1), \lambda(\alpha_s + \alpha_n)) = p' + \lambda(\alpha_s + \alpha_n)/2 \geq 0, \quad (21)$$

which reduces to

$$p' \geq -\lambda(\alpha_s + \alpha_n)/2. \quad (22)$$

But Eqs. (20) and (22) are in contradiction. To show this, we need to show that:

$$-\lambda(\alpha_s + \alpha_n)/2 \geq \lambda \frac{d^2}{2} - \lambda. \quad (23)$$

Reducing yields

$$2 - (\alpha_n + \alpha_s) \geq d^2, \quad (24)$$

which is true since  $(\alpha_n + \alpha_s) < 1$  and  $d^2 < 1$ . So no investor-owned contract can enter.

Similarly, for a mutual contract to enter, it must offer a lower base price than the equilibrium mutual contract in order to make some type strictly better off. If it attracted only sophisticates then it would make negative profits. Similarly, if it attracted unbiased and naive it would make negative profits. To see this, note that to attract unbiased and natives, it would have to have a lower base price than the equilibrium investor-owned base price, which is lower than the equilibrium mutual base price. It would thus attract all consumers. But since the equilibrium mutual contract charges a higher base price and just breaks even with a larger fraction of penalty-paying consumers, this contract would make negative profits.

We now show that this equilibrium is unique. Equilibria are either separating (the sophisticates go to a different contract than the naives and unbiased) or pooling (all types use the same contract). First, in any separating equilibrium in which sophisticates go to mutuals and the unbiased and naive go to investor-owned firms, the only investor-owned contract possible is  $(-\lambda \frac{\alpha_n}{2(\alpha_n + \alpha_u)}, 1)$ . To see this, first note that all investor-owned firms must use  $\hat{p} = 1$  by penalty optimality. Then, suppose a contract is offered by an investor-owned firm in such an equilibrium with  $p < -\lambda \frac{\alpha_n}{2(\alpha_n + \alpha_u)}$ . Such a contract would make negative profits, so this is not an equilibrium. Suppose instead a contract is offered by an investor-owned bank with  $p > -\lambda \frac{\alpha_n}{2(\alpha_n + \alpha_u)}$ . Then the contract would violate free entry since sophisticates and naives would prefer the contract  $(-\lambda \frac{\alpha_n}{2(\alpha_n + \alpha_u)}, 1)$ . Analogous arguments establish that in any such equilibrium, the only mutual contract possible is  $(-\lambda(d - \frac{d^2}{2}), d)$ .

Second, there is no separating equilibrium in which sophisticates go to investor-owned firms and naives and the unbiased go to mutuals. To see this, first note that penalty optimality requires mutuals and investor-owned firms to charge penalties of  $d$  and 1, respectively, in such an equilibrium. Then observe that to survive free entry, the base price of the investor-owned contract would have to be below that of the mutual contract since they charge higher penalties and more of their customers incur them. But that would mean that unbiased and naives would prefer to go to the investor-owned contract, which contradicts our supposed equilibrium.

Third, there is no pooling equilibrium in which all consumers go to an investor-owned firm. In such an equilibrium, the contract would have to be  $(-\lambda(\alpha_n + \alpha_s)/2, 1)$  to satisfy penalty optimality, nonnegative profits, and free-entry. But this proposed equilibrium does not satisfy free-entry since there exists a mutual contract  $(p', d)$  that sophisticates strictly prefer (but unbiased and naives do not) and that would make non-negative profits. For unbiased and naives not to go the entrant, it must have a higher base price:

$$p' \geq -\lambda(\alpha_n + \alpha_s)/2. \quad (25)$$

For sophisticates to strictly prefer it, it must provide them lower perceived costs:

$$p' + \lambda d < -\lambda(\alpha_n + \alpha_s)/2 + \lambda, \quad (26)$$

or

$$p' < -\lambda(\alpha_n + \alpha_s)/2 + \lambda(1-d). \quad (27)$$

For it to make non-negative profits, we must have

$$p' + \lambda d \geq 0, \quad (28)$$

or

$$p' \geq -\lambda d. \quad (29)$$

Such a  $p'$  exists. The  $\lambda(1 - d)$  term provides a wedge between the bounds in Eqs. (25) and (27). For a  $p'$  to exist that satisfies Eqs. (27) and (29), we must have

$$-\lambda d < -\lambda(\alpha_n + \alpha_s)/2 + \lambda(1-d), \quad (30)$$

or

$$0 < 1 - (\alpha_n + \alpha_s)/2, \quad (31)$$

which is true.

Fourth, there is no pooling equilibrium in which all consumers go to a mutual firm. In such an equilibrium, the contract would have to be  $(-\lambda(\alpha_n + \alpha_s)(d - \frac{d^2}{2}), d)$  to satisfy penalty optimality, non-negative profits, and free-entry. But this proposed equilibrium does not satisfy free-entry since there exists an investor-owned contract  $(p', 1)$  that the unbiased and naive strictly prefer (but sophisticates do not) and that would make non-negative profits. For unbiased and naives to strictly prefer the entrant, it must have a lower base price:

$$p' < -\lambda(\alpha_n + \alpha_s) \left( d - \frac{d^2}{2} \right) \quad (32)$$

For sophisticates not to strictly prefer it, it must provide them higher perceived costs:

$$p' + \lambda \geq -\lambda(\alpha_n + \alpha_s) \left( d - \frac{d^2}{2} \right) + \lambda d, \quad (33)$$

or

$$p' \geq -\lambda(\alpha_n + \alpha_s) \left( d - \frac{d^2}{2} \right) - \lambda(1-d). \quad (34)$$

For it to make non-negative profits, we must have

$$p' + \lambda \frac{\alpha_n}{2(\alpha_n + \alpha_u)} \geq 0, \quad (35)$$

or

$$p' \geq -\lambda \frac{\alpha_n}{2(\alpha_n + \alpha_u)}. \quad (36)$$

Such a  $p'$  exists. The  $\lambda(1 - d)$  term provides a wedge between the bounds in Eqs. (32) and (34). For a  $p'$  to exist that satisfies Eqs. (34) and (36), we must have

$$-\lambda(\alpha_n + \alpha_s) \left( d - \frac{d^2}{2} \right) \geq -\lambda \frac{\alpha_n}{2(\alpha_n + \alpha_u)}, \quad (37)$$

which after rearranging becomes

$$\frac{\alpha_n}{\alpha_n + \alpha_u} \geq (\alpha_n + \alpha_s)(2d - d^2), \quad (38)$$

which is implied by our assumption that  $\frac{\alpha_n}{\alpha_n + \alpha_u} \geq 2d - d^2$ .  $\square$

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