Making firms liable for consumers' mistaken beliefs: theoretical model and empirical applications to the U.S. mortgage and credit card markets*

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Abstract

I show that an introduction of a liability on firms, proportional to the difference between consumers' beliefs and the effective terms of purchase/contract, can improve both social welfare and consumer surplus, depending on the relative magnitudes of: 1) decrease in the gap between the beliefs and the effective terms of the contract due to the introduction of the liability, 2) output decrease or price increase, and 3) efficiency of administering the liability (and the amount transferred). I do not find statistically significant evidence of (2) in two examples of instituting a similar liability: when several large U.S. credit card issuers dropped mandatory arbitration clauses (that effectively precluded class action lawsuits) and when U.S. residential mortgage creditors became liable for failing to consider a borrower's future ability to repay the mortgage, suggesting that these events improved consumer surplus and might have improved social welfare.

1 Introduction

In many markets consumers hold mistaken beliefs. While in some markets consumers are correct in their beliefs on average, this is not always the case. Sometimes mechanisms such as reputation, competition, or mandated disclosure, all discussed later, might nonetheless result in a well-functioning market. However, in many cases, consumers' mistaken beliefs lead to a market failure.[1]

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[1]DellaVigna and Malmendier (2004), Heidhues and Köszegi (2010), and Grubb (2015) all show that in particular settings with particular behavioral biases, perfect competition does not maximize social welfare, and thus an intervention might increase social welfare. Alexandrov (2015) shows that this is the case for virtually any behavioral bias,

In many such markets firms can either alter the effective terms of contract to better correspond to consumer beliefs or alter consumer beliefs to better correspond to the effective terms of the contract. I analyze a model of introducing legal liability on the firms, with the property that the liability depends on the gap between consumers' beliefs and the effective terms of the contract. Using a theoretical model, I show that this intervention, under certain conditions, increases both social welfare and consumer surplus in such markets, even in the ones where other mechanisms might not have succeeded. Empirically, I do not find statistically significant price increase (in the U.S. credit card market) or statistically significant quantity decrease (in the U.S. mortgage market) due to such interventions (with all standard caveats). To test for the magnitude or presence of positive effects, one would need data on deterrence that is unavailable, at least for these particular interventions.

In the theoretical model, introducing this liability results in (1) firms shrinking the gap between the effective terms of the contract and consumers' beliefs by shifting at least one of these two variables.[2] However, this (2) increases firms' cost and therefore lowers quantity produced, to the extent of the marginal cost increase adjusted by the cost pass-through rate. Also, there are (3) the liability transfer itself and the administrative costs of effecting this liability transfer, for example court costs and lawyers' fees.[3] The overall impact on both social welfare and consumer surplus depends on the interplay between these three effects.

Throughout the paper I focus on two real-world examples of this type of a legal liability: one connected to the U.S. credit card issuers' exposure to class action lawsuits that started in late 2009 due to the issuers agreeing to drop their mandatory arbitration clauses and the other connected to the ability to repay (ATR) regulation in the U.S. mortgage market that became effective in early 2014.[4] The available data only allows me to attempt to estimate causally the magnitude of effect (2), increased prices or decreased quality in these two markets. The estimates are not statistically significant: I cannot rule out that the introduction of such liability had no adverse impact on

and I adopt the model in that paper to allow for legal action. The model can also be viewed as addressing the lack of salience of form terms (and other attributes). Policy interventions, like the ones that I analyze, arguably move us towards the "reasonable expectations" doctrine discussed by Korobkin (2003). Such interventions are another way to influence sellers' ex-ante incentives, instead of (or, possibly, together with) Korobkin (2003)'s suggestion that the courts should consider leaving sellers with the worst ex-post default options to ensure that sellers have the correct ex-ante incentives. Note that, under some assumptions, market can ameliorate or fix behavioral biases completely, see for example **?**, see also **?** for a discussion on regulation when consumers might have behavioral biases. I discuss other related literature throughout the text and in the Appendix.

[2]This is, effectively, deterrence: see for example **?** and **?**.

[3]As discussed further, effect (3) has different implications for consumer surplus and for social welfare. From the point of view of social welfare, effect (3) in and of itself is weakly negative: this is a transfer, and at best it is perfectly efficient, but sometimes there will be administrative costs. From the point of view of consumer surplues, effect (3) in and of itself is weakly positive: even if there are significant administrative costs, consumers still receive at least a little of that monetary transfer.

[4]See the following sections and New York Times (2015) for the first article in a three-piece longform series on mandatory arbitration clauses. Also see, for example, **?** on the U.S. Consumer Financial Protection Bureau's notice of proposed rulemaking that would not allowing mandatory arbitration clauses to be used to block class action lawsuits in the consumer finance space in the U.S.

The ability to repay rule was the key part of a package of rules that the U.S. Congress instructed the Consumer Financial Protection Bureau to pass as a part of the Dodd-Frank Act, with the intention of preventing future mortgage crises, see New York Times (2013) and Slate (2013) for examples of popular press coverage when the rule was finalized.

prices or quantity. However, in the credit card application, the magnitude of the standard errors is, arguably, economically significant, and thus I cannot rule out an economically significant response.

Much of the behavioral literature's suggestions for addressing the market failure imposed by behavioral biases is ways of making consumers behave as if they are closer to rational: nudges, choice architecture, or taxes on products like cigarettes, fatty foods, and sugary beverages.[5] Another way of fixing the internality imposed by consumers' behavioral biases is making firms internalize consumers' internality.[6] The liability that I analyze is an example of alleviating the market failure by making the firms accountable for consumers' biases.

I show that introduction of this legal liability has three effects on social welfare. The first effect is that social welfare increases because the gap between the effective terms of the contract and consumer beliefs shrinks (less mistaken consumption that would not have occurred with correct beliefs). The second effect is that the equilibrium quantity consumed decreases. This effect could have ambiguous consequences on social welfare, but assuming that the market is sufficiently far from perfectly competitive implies that lower equilibrium quantity results in lower social welfare. The third effect is that the administrative cost of liability lowers social welfare to the extent that the transfer involves a social loss and is not a pure transfer from firms to consumers. Overall, the introduction of this legal liability improves social welfare when the first effect outweighs the second and the third effects. Note that in a close to a perfectly competitive market, my findings apply *a fortiori*: the second effect, decreased output/increased price, increases social welfare, see a discussion later in the paper relating this result to Dixit and Norman (1978).[7]

The effects on consumer surplus are similar, with a notable difference: consumer surplus increases by the amount that the firms' liability is distributed to consumers. This could amount to almost nothing if administering the liability costs as much as the liability itself (thus it is a pure waste in social welfare terms) or this could be close to the whole liability if the administrative costs are negligible and the liability is effectively a pure transfer from the firms to the consumers. Overall, the introduction of this legal liability increases consumer surplus when the first and the third effect outweigh the second effect. When the market is close to perfectly competitive, the second effect is positive as well (lower quantity increases consumer surplus), and thus consumer surplus weakly increases due to the introduction of this liability.

These three effects correspond to the qualitative effects frequently mentioned by practitioners and in the legal literature. The first effect of shrinking the gap is the deterrence effect of liability: the firm is aware of the potential liability in the future, and thus it has incentives to change its actions in a way to make the liability less likely. The second effect is the cost pass-through effect: the claim that consumers save money due to firms' decreased liability since firms have to spend less

[5]See, for example, Jolls, Sunstein, and Thaler (1998), Camerer, Issacharoff, Loewenstein, O'donoghue, and Rabin (2003), Sunstein and Thaler (2003), Jolls and Sunstein (2006), Johnson, Shu, Dellaert, Fox, Goldstein, Häubl, Larrick, Payne, Peters, Schkade, Wansink, and Weber (2012), Allcott, Mullainathan, and Taubinsky (2014), and Madrian (2014).

[6]See, for example, **?** discussing litereature on externalities.

[7]The broader point is that making an incomplete market closer to complete does not necessarily improve social welfare.

(both on transfers and on "quality"), and these savings get passed through to the consumers in terms of lower prices. In my theoretical model, this effect is also equivalent to an over-deterrence effect: firms producing less due to the expected liability. The third effect is the transfer effect: consumers benefit ex-post from the liability (money and other relief from class action settlements and ability-to-repay lawsuits, conditional on potentially higher prices), but this transfer is imperfect (at least a portion of this might be spent on unnecessary litigation).

The results of analyzing the model suggest that the main potentially adverse effect of introducing the liability (and the only potentially adverse effect for consumer surplus) is the potential decrease in equilibrium quantity. I do not find statistically significant evidence of an equilibrium price increase in one market or an equilibrium quantity decrease in another market in my two empirical applications, despite arguably causal settings (differences-in-differences and regression discontinuity) and reasonably low standard errors (particularly in the mortgage market).[8]

I model liability as a deterministic function. However, that is usually not the case in the real world. Many decisions that eventually lead to legal liability of the type discussed here fall in a gray area, where it is not known for sure whether something is indeed going to result in a liability, even conditional on getting sued. My model is fully equivalent to that setting: all I require is that a particular action has a higher likelihood of resulting in legal liability. In other words, my liability function in the model can be viewed as expected liability.[9] In the limit, if the firms cannot affect legal liability at all, then there is no deterrence effect.

The fact that there exists a gap between consumers' beliefs and reality suggests not fully rational consumers. I am agnostic regarding which bias in particular drives this gap: most likely it is a different bias or even a different collection of biases for a given market. I utilize a model that builds on the approaches employed by Mullainathan, Schwartzstein, and Congdon (2012) and Bar-Gill (2013). The model generalizes many of the biases previously discussed by the literature: hyperbolic discounting, inattention to non-salient prices, sparse maximization, and false beliefs, among others.[10] I am also agnostic on what consumers hold wrong beliefs about. For example, consumers' beliefs could be wrong either about a term of the contract or about some non-contractual state of the world. Arguably, the credit card example is closer to the former and the mortgage example is closer to the latter.

The manifestation of the gap is different depending on the application. For example, in the case of class action exposure, the gap is the difference between what is in the contract and what the firm

[8] In the application involving class action exposure, I show in my theoretical model that testing for an equilibrium quantity decrease is equivalent to testing for an equilibrium price increase, and given the data available I utilize the price test instead of the quantity test.

[9] This of course might not be a good approximation for risk averse management; however, without modeling this formally, I conjecture that management's risk aversion should be equivalent to changing the liability function. Note that the finance literature suggests that, from the perspective of the shareholders, firms' management should be risk-neutral except for some special cases, see for example Smith and Stulz (1985), however, same literatute often goes on to note that managers might not be. Moreover, strategy literature suggests that firms' management might find it profitable to be risk-loving in some cases.

[10] See Alexandrov (2015) for details. Moreover, the model also accounts for the possibility of heterogeneous consumers, in particular when heterogeneity is due to only some of the consumers susceptible to the particular bias. Thus, while I do not model consumer heterogeneity here, the results are similar with heterogeneous consumers.

can do without fearing class actions.[11] Exposure to class actions, almost tautologically, imposes an expected liability for firms that depart sufficiently far from what is in the contract.[12] In the case of ability to repay, the gap is the difference between consumers' beliefs (about, for example, the likelihood of foreclosure given their income and the terms of the mortgage) and the actual state of the world. The liability in the ability to repay case is not based on consumers' beliefs; instead, it is outcome driven: a consumer can countersue when they are foreclosed on.[13] The evidence of an eventual foreclosure might be indicative of the consumer not knowing the chances of default and of the consumer's inability to repay, barring an unfortunate scenario where consumer's circumstances changed in a dramatic and an unexpected fashion (in which case the firm would likely not face an ability to repay liability). Another way of framing it is that, conditional on observables, Creditor A's borrowers being more likely to default than Creditor B's borrowers might be an indication of Creditor A making less effort to ensure that borrowers fully understand the likelihood of being able to repay the loan without losing their house to foreclosure.

As noted above, the overall impact on social welfare and consumer surplus depends on the relative magnitude of three effects: (1) smaller gap between beliefs and effective contract/purchase terms, (2) decreased output, and (3) administrative costs of the liability. The first, positive, effect is difficult to measure for these relatively new market interventions. For example, in the mortgage context, an arguable measure of the outcome would be the incidence of foreclosures (that take years to materialize). I measure the second, potentially negative, effect in both of my applications. The third effect, the administrative costs, most often tends to be characterized as lawyers' fees.[14] Despite public perception, plaintiffs' lawyers' fees in the class action cases are on (weighted) average below 30% of the amount that consumers are winning, when that amount includes only cash already paid out (for example, neither coupons nor unclaimed checks are counted) and is net of all other payments.[15]

[11] For simplicity, I assume that consumers' beliefs coincide with the contract – consumers read the contract, they just don't realize that it's effectively non-enforceable if there is an arbitration clause present. If anything, consumers actually reading and understanding their contracts, but not realizing that the contracts are unlikely to be enforced, is an optimistic view of the extent to which consumers read and understand their contracts. Another way to frame this is that consumers have a general idea that firms are constrained by law. However, with arbitration clauses, this general belief might be mistaken.

[12] While this liability likely looks more like a step function of the magnitude of the gap, a weakly increasing continuous function seems like a decent approximation, especially in the context of the firm worrying about expected liability, potentially years away.

[13] There is not much literature on ability-to-pay regimes, but see Barr, Mullainathan, and Shafir (2009) making some of the similar arguments as in this paper qualitatively and Levitin, Pavlov, and Wachter (2012) discussing the role of qualified mortgages and qualified residential mortgages in the securitization market. See also Bhutta and Ringo (2015) analyzing the Home Mortgage Disclosure Act (HMDA) data from 2014 and showing that the distribution of a proxy for the front-end debt-to-income ratio in HMDA did not change significantly from 2013 to 2014, suggesting that there was no discernible effect of the ability-to-repay qualified mortgage rule.

[14] I assume that the liability either goes to consumers or is a social loss. In many cases, however not the empirical applications in this paper, some or all of the money would go to a government. In terms of the model, I am effectively assuming that some of that money is passed through to the consumers, either in terms of more public services or in terms of lower taxes.

[15] See Fitzpatrick (2010). In the consumer financial cases, Consumer Financial Protection Bureau (2015) shows that the amount is even smaller: around 17% on average; however, note that these numbers only account for plaintiffs' legal fees.

2 Theoretical model of a firm's exposure to liability and its implications for consumer surplus and social welfare

2.1 Formal Model Setup

Consumers in the market have an inverse demand function of $P(x, q)$, where x is a parameter describing consumer beliefs or the effective contract/purchase terms and q is the quantity consumed. The law of demand holds: $\frac{\partial P(x,q)}{\partial q} < 0$. More of x enhances consumers' utility from consumption $\frac{\partial P(x,q)}{\partial x} \geq 0$ and their marginal utility from consumption, $\frac{\partial^2 P(x,q)}{\partial q \partial x} \geq 0$. I also assume that all of the functions are smooth and that $x \geq 0$.

Suppose that consumers believe that the parameter in the utility function is x_p (perceived), while it is actually x_0. Thus, consumers behave as if their inverse demand is $P(x_p, q)$, and therefore the firm faces an inverse demand curve of $P(x_p, q)$. However, consumer surplus is based on the true value of the parameter: $P(x_0, q)$. Mistaken beliefs could also be potentially about the price of the product – this would not change the qualitative results, but would make the notation unnecessarily complicated. The model incorporates the case where the mistaken beliefs are not about the terms of the contract, but are about the state of the world – for example, consumers mistakenly perceiving that they have a higher ability to repay than they actually do.

The firm faces production costs of $C(x_0, q)$. The fixed and marginal costs of production are weakly increasing in the effective contract terms (x_0): producing better products costs more (weakly). In other words, $\frac{\partial C(x_0,q)}{\partial q} \geq 0$; $\frac{\partial C(x_0,q)}{\partial x_0} \geq 0$; and $\frac{\partial^2 C(x_0,q)}{\partial q \partial x_0} \geq 0$. The firm might also be able to affect consumer beliefs at a cost of $k(x_p)$, $k'(x_p) \geq 0$.[16] To rule out trivial cases, I assume that $\frac{\partial C(0,q)}{\partial x_0} = 0$ (it is almost free for the firm to marginally improve the effective contract terms from the minimum) and that $k'(0)$ is bounded (it is not prohibitively expensive for the firm to affect consumer beliefs at least negligibly from the minimum).

The firm also faces an expected liability cost of $\theta L(r, q)$, where $r \equiv x_p - x_0$, L is weakly increasing in both arguments and has a positive cross-partial: the liability is weakly larger, both lump-sum and per-unit, when the gap between the effective terms and consumers' beliefs is larger. Setting $\theta = 0$ implies that the firm faces no expected liability for consumers' mistakes about the contract terms. As θ increases, the liability increases as well. Consumers receive some of this liability as a transfer: $\gamma\theta L(q, r)$, with $\gamma \in [0, 1]$. If $\gamma = 0$, then the liability is a pure social waste. If $\gamma = 1$, then the liability is a lossless transfer from the firm to the consumers.[17]

[16] By affect I simply mean change x_p. Since consumers actually get the effective contract terms of x_0, x_p does not interact with the output produced, q in the cost function. This assumption could be relaxed and is made for convenience.

[17] The liability does not have to be proportional to the magnitude of the gap in the real world for this model to apply. An alternative version of this model would have the probability of the gap being detected proportional to the magnitude of the gap, with the same conclusions. Increased cost due to the introduction of liability encompasses any cost that makes the firm less efficient. I am not imposing a constraint of $\gamma = 1$, and this allows for the possibility that the social loss encompassed in the transfer is not simply the inefficiency of the lawsuit, but also the possibility that the firm does not operate as efficiently because of, for example, risk-averse management's concerns regarding potential lawsuits and the resulting overcautious product development.

The liability oftentimes goes to neither consumers, nor is it a pure waste: it goes to the government instead. This

Thus, the firm's profit is

$$\pi(q, x_0, x_p) = qP(x_p, q) - C(x_0, q) - k(x_p) - \theta L(r, q), \tag{1}$$

and consumer surplus is

$$CS(q, x_0, x_p) = \int_0^q P(x_0, v)dv - qP(x_p, q) + \gamma\theta L(r, q). \tag{2}$$

With small modifications, this model can be used for other applications. For example, Jackson (1985) argues that the reason to allow debtors to discharge their debts in bankruptcy is to mitigate the effects of impulsive behavior or flawed heuristics (both could be modeled by the same x_0 and x_p divergence). The liability cost L then becomes the inability of the creditor to collect on debt discharged in bankruptcy. See also Jolls (1998).

The model could be reframed with appropriate supermodular/submodular assumptions and get to roughly the same results without making assumptions on smoothness of functions. However, for readability, I employ the form more familiar to the majority of the readers.

The model's results are framed as comparative static with respect to an incremental addition of liability: starting with $\theta = 0$, and making it incrementally higher. First, this is arguably the case in my empirical applications: while consumers could sue before the policy treatment, the amount of such suits was negligible. Second, adding the assumption of $\frac{\partial^2 L(r,q)}{\partial q \partial r} \leq 0$ would ensure that the results presented apply throughout the parameter space. However, it is not clear whether such an assumption is close to reality, and thus I choose to focus on the more conservative, but more justifiable assumptions instead. In particular, a nontrivial jump in θ and a particular shape of L could certainly reverse some of the findings if it, for example, the changes are such that no firm finds it worthwhile to stay in the market.

Consumer beliefs, x_p, are typically not exogenous and not just driven by firms' choices. They are also rarely observed. However, I make these simplifying assumptions for tractability. Unobserved x_p, together with consumers choosing their beliefs (potentially x_p really high to force firms into a much higher x_0 if the liability is imposed) might change some of the results.

2.2 Firm's maximization and the comparative statics effects of liability

Conditional on θ, the firm could maximize its profit with respect to three variables: quantity produced/sold, consumer beliefs, and the effective contract terms:

possibility simply affects the interpretation of γ. I believe the majority of economists and legal scholars would consider the transfer to the government as somewhere in between a transfer to the consumers and a pure waste, however, I am sure not all economists and legal scholars would agree.

The model can be adjusted to include (non-strategic) competition. The firm's inverse demand could be $P(x, q+\tilde{q})$, where $\tilde{q}$ represents the exogenous quantity supplied by the competitors, see Weyl and Fabinger (2013) for an example. In my model, this addition does not change the derivations or the qualitative results in a meaningful way, but does complicate the notation, therefore I do not utilize it.

$$\frac{\partial \pi}{\partial q} = P(x_p, q) + q\frac{\partial P(x_p, q)}{\partial q} - \frac{\partial C(x_0, q)}{\partial q} - \theta\frac{\partial L(r, q)}{\partial q}, \tag{3a}$$

$$\frac{\partial \pi}{\partial x_p} = q\frac{\partial P(x_p, q)}{\partial x} - k'(x_p) - \theta\frac{\partial L(r, q)}{\partial r}, \tag{3b}$$

$$\frac{\partial \pi}{\partial x_0} = -\frac{\partial C(x_0, q)}{\partial x_0} + \theta\frac{\partial L(r, q)}{\partial r}. \tag{3c}$$

For simplicity, I assume that in the class action liability case the firm can control the effective contract terms x_0 (say, service levels after consumers sign their contracts). However, consumer beliefs x_p are exogenous (it might be too costly for the firm to explain to consumers that it might be difficult to sue the firm if the effective contract terms are different from the ones that consumers believe or such a disclosure might be hard to design).

In contrast, in the ability to repay liability case, I assume that the firm can control consumer beliefs x_p (explain to consumer that he is likely to default when taking out a mortgage loan for a larger amount than the consumer can realistically repay or simply decline to originate a loan for that amount). However, the effective contract terms x_0 are exogenous (say, the probability that the consumer defaults given consumer characteristics).

It is clear that the firm's profit decreases as the firm is exposed to the liability. The effect on other parameters is described below. All proofs are in the Appendix.

Proposition 1 *An incremental introduction of liability for consumers' mistaken beliefs weakly decreases the output and the difference between consumer beliefs and the contract terms. More formally, as* $\theta \to 0$, $\frac{\partial q^*}{\partial \theta} \leq 0$ *and* $\frac{\partial (x_p^* - x_0^*)}{\partial \theta} \leq 0$.

The effect on quantity is straight-forward to explain. The per-unit liability enters as an additional marginal cost and higher marginal cost results in lower output. Similarly, the liability imposes a cost on the firm that increases in the difference between consumer beliefs and the effective contract terms. Naturally, if the firm can control this difference, this difference decreases.[18]

2.3 Consumer surplus

Corollary 1 *At negligible level of liability, consumer surplus increases when the effective contract terms become better or when the liability increases. Consumer surplus decreases when consumers believe that contract terms are better (even though the actual terms stay the same). More formally, as* $\theta \to 0$, *at the profit-maximizing quantity, belief, and effective contract terms levels,* $\frac{\partial CS}{\partial x_0} \geq 0, \frac{\partial CS}{\partial x_p} \leq 0$, *and* $\frac{\partial CS}{\partial \theta} \geq 0$.

Somewhat surprisingly, consumer surplus does not necessarily increase as output increases. The

[18]The driving factor behind the deterrence (shrinking the gap) is $\frac{\partial L(r,q)}{\partial r}$. If this term is 0, or in other words the liability does not depend on the gap, then the deterrence benefits are, almost tautologically, lost.

derivative of consumer surplus w.r.t. output, after accounting for $\theta = 0$, is

$$\frac{\partial CS}{\partial q} = P(x_0, q) - P(x_p, q) - q\frac{\partial P(x_p, q)}{\partial q}. \tag{4}$$

The first term is the consumers' marginal utility from one more unit. The second term is the price that they have to pay for it. These two terms cancel out when consumers' beliefs are consistent with the effective contract terms ($x_p = x_0$). In that case, the law of demand ensures that the overall effect is that consumer surplus increases with output: the third term is simply inframarginal consumers enjoying lower prices.

The issue when consumers' beliefs do not coincide with the actual contract terms ($x_p > x_0$) is that the marginal utility from one more unit is lower than the price paid, thus the marginal consumer actually loses (first two terms combined), but the inframarginal consumers gain (the last term). The expression, given that $\theta = 0$, can be simplified further by utilizing the firm's FOC for the optimal output (equation 3a):

$$\frac{\partial CS}{\partial q} = P(x_0, q) - \frac{\partial C(x_0, q)}{\partial q}. \tag{5}$$

Assumption 1 (Not Too Competitive Assumption) *The market is not too competitive relative to consumer beliefs:*

$$\frac{\partial CS}{\partial q} = P(x_0, q) - \frac{\partial C(x_0, q)}{\partial q} \geq 0. \tag{6}$$

The assumption is that the marginal consumer enjoys his consumption more than it costs the firm to produce the unit, despite the consumer's bias. This assumption might not be reasonable in a very competitive market. If the demand curve is almost flat $\left(\frac{\partial P(x_p,q)}{\partial q} = 0\right)$, the firm is effectively pricing so that the marginal consumer only believes that he will enjoy the product more than the product's marginal cost.

Corollary 2 *Consumer surplus is affected in the following ways by introducing a negligible amount of liability (regardless of whether it's class action or ATR):*

1. *better effective contract terms or consumer beliefs closer to the effective contract terms (increasing consumer surplus),*

2. *lower output levels (decreasing consumer surplus if and only if the Not Too Competitive Assumption is satisfied), and*

3. *liability payments from the firms (increasing consumer surplus).*

The three effects in the Corollary are the three effects discussed at length in the introduction: (1) deterrence, (2) cost pass-through due to the expected liability, and (3) transfer from firms to consumers. Better effective contract terms are a direct consequence of imposing liability for

mistaken consumer beliefs. Of course this is counterbalanced by a decrease in output, since the liability is effectively an additional marginal cost to the firm.

Price does not necessarily increase in the case of ATR liability (when the firm can alter consumer beliefs). While the equilibrium quantity decreases, consumer beliefs decrease as well, resulting in an ambiguous effect on price, $P(x_p, q)$, that increases in x_p but decreases in q.

Finally, it is useful to analyze the model when the market is close to perfectly competitive (the Not Too Competitive Assumption does not hold).

Corollary 3 *Regardless of the type of liability introduced, if the market is close to perfectly competitive (the Not Too Competitive Assumption does not hold), then consumer surplus weakly increases due to the introduction of a negligible amount of class action liability.*

2.4 Social welfare

Social welfare can be expressed as

$$SW = CS + \pi = \int_0^q P(x_0, v)dv - C(x_0, q) - k(x_p) - (1-\gamma)\theta L(r, q). \tag{7}$$

Corollary 4 *Shrinking the gap between consumer beliefs and the effective contract terms weakly increases social welfare.*

The second effect on social welfare is due to the decreased output:

$$\frac{\partial SW}{\partial q} = P(x_0, q) - \frac{\partial C(x_0, q)}{\partial q} - (1-\gamma)\theta \frac{\partial L(r, q)}{\partial q}. \tag{8}$$

As above in the case of consumer surplus, social welfare does not necessarily increase in quantity produced/consumed. In particular, due to the distorted beliefs, particularly in a competitive market, there might have been overproduction. As Dixit and Norman (1978) observed, two distortions going the opposite directions sometimes make it right: underconsumption due to market power and overconsumption due to catering to consumers' beliefs might cancel each other out in just the right way. Therefore, increasing consumption has ambiguous effects on social welfare, and has an adverse effect on social welfare in a perfectly competitive market. However, using the Not Too Competitive Assumption above, $\frac{\partial SW}{\partial q} \geq 0$ – more consumption/production implies higher social welfare.

Corollary 5 *Social welfare is affected in the following ways by introducing a negligible amount of either class action or ability to repay liability:*

1. *smaller gap between the effective contract terms and consumer beliefs (increasing social welfare),*

2. *lower output levels (decreasing social welfare if and only if Not Too Competitive Assumption is satisfied), and*

3. the administrative costs of administering the liability (decreasing social welfare).

Again, the three effects in the Corollary are the three effects discussed at length in the introduction: (1) deterrence, (2) cost pass-through due to the expected liability, and (3) transfer from firms to consumers.

Finally, it is useful to analyze the model when the market is close to perfectly competitive (the Not Too Competitive Assumption does not hold). A corollary similar to the one for the consumer surplus also holds:

Corollary 6 *Regardless of the type of liability introduced, if the market is close to perfectly competitive (the Not Too Competitive Assumption does not hold) and if there are no administrative costs of liability ($\gamma = 0$), then social welfare weakly increases due to the introduction of a negligible amount of class action liability.*

The difference between the two corollaries is the following. If the market is not close to perfectly competitive, then it is possible that introduction of liability lowers social welfare, through a much lower output level. However, if the market is perfectly competitive or close to that, then a lower output level actually increases social welfare too, and thus in the perfectly competitive case introduction of liability always increases social welfare.

3 Empirical analysis of the effect of firms dropping mandatory arbitration clauses

In this and the following section, I analyze the magnitude (or the presence) of the second effect of liability: expected liability cost pass-through. In both sections, I cannot reject the hypothesis of no cost pass-through at the standard statistical significance levels. However, the standard errors are arguably economically significant in the setting of this section.

3.1 Background on mandatory arbitration clauses with no class action provisions

The first empirical application is (the lack of) mandatory arbitration clauses with no class action provisions in the U.S. credit card market. A mandatory arbitration clause is a clause in a contract that states that either of the two parties can unilaterally elect to move any dispute into a private arbitration system where the decision-maker is a privately-employed arbitrator, and there is no jury (I do not include arbitration imposed by statute in this definition). The decision that the parties receive in the arbitration system is generally final and is not subject to appeal in the court system except for very narrow grounds for vacating the decision, for example one of the parties bribing the arbitrator or the arbitrator failing to disclose a material conflict of interest. The decision is also often not published.[19]

[19]See Consumer Financial Protection Bureau (2015) for more on procedural differences. The U.S. Congress mandated in the Dodd-Frank Act that the Consumer Financial Protection Bureau (CFPB) studies pre-dispute arbitration

Despite the clauses' prevalence in contracts in the U.S., the existence of these clauses is largely ignored by the academic literature in economics. Thus, among other contributions, this is the first paper presenting a formal model of the consumer surplus and social welfare effect of these clauses and offering an arguably causal test of the effect of the clauses' existence on prices.

The arbitrators are often either retired judges or people with industry experience, and they tend to be perceived as unbiased.[20] The difference that the existence of the mandatory arbitration clauses brings that I focus on is that the vast majority of mandatory arbitration clauses in consumer settings contain a no class action provision. The procedures in the arbitration system are otherwise relatively similar to the procedures in courts, but there are a few other notable differences.[21]

The no class action provision in mandatory arbitration clauses effectively means that if a firm faces a class action lawsuit in court, it can choose to move the lawsuit to arbitration, and then the no class action provision kicks in, dispersing the class. In other words, the firm does not have to face class action lawsuits if it does not want to, either in court or in arbitration. These provisions are prevalent in, for example, consumer financial contracts where arguably, except for mortgages, the majority of contracts includes these clauses.[22] Employment contracts and a multitude of other industries include them too.[23] In fact, some legal scholars argue that it might soon become malpractice on behalf of a firm's counsel *not* to include such a clause into contracts and that most, if not all, contracts will include such clauses in the near future, at least for the firms that are at

clauses in the consumer financial space. The report pursuant to this mandate was released shortly before the release of the first draft of this paper. The report also includes a less technical description of the finding of no statistically significant results in an empirical exercise similar to and with the same identification strategy as the mandatory arbitration clause empirical application in this paper.

For the purposes of full disclosure, the author of this paper was involved in research work for the CFPB's Report to Congress and in drafting CFPB's Notice of Proposed Rulemaking on Arbitration Agreements. It is worth noting again that the views expressed in this paper are those of the author and not of the CFPB. While the empirical analysis of the credit card market in this paper and in the CFPB report involve the same identification strategy, some details and definitions differ for the purposes of better corresponding to definitions used in earlier academic papers. Similarly, given the specialist audience of this research paper, I choose to address some of the technical issues that were not addressed in the CFPB report.

[20]This was not always the case: see the case of the National Arbitration Forum, for example Public Citizen (2007).

[21]While it is hard to generalize, arguably, the main two other differences are appeals and discovery: there is only a very limited opportunity for appeals in the mandatory arbitration system (for example, one appeal to a three-arbitrator panel) and very limited rights to discovery (effectively up to the arbitrator's discretion). The law and economics literature provided several reasons for why both appeals and mandatory discovery might be beneficial, see Shavell (1995) and Daughety and Reinganum (2000) for appeals and Shavell (1989) for discovery. However, it is clear that both processes could be used as a leverage by one of the sides when that side does not necessarily have a legitimate claim, see Rosenberg and Shavell (1985) and Coffee (1986). See Posner (1998) on arbitration in the international trade context.

Finally, in an ideal setting, arbitrators would possess and could gain even more expertise in a particular field, and thus make better decisions, both in terms of procedure (for example, allowing discovery only when it is efficient to do so) and in terms of the final outcome. See, for example, Consumer Financial Protection Bureau (2015) and Drahozal and Zyontz (2010) on more distinctions between mandatory arbitration system and the courts.

[22]See Consumer Financial Protection Bureau (2015). In the residential mortgage market, Fannie Mae and Freddie Mac decided not to accept contracts with such clauses and thus these clauses were not prevalent. Later, the Congress explicitly outlawed these clauses in the residential mortgage market in the Dodd-Frank Act.

[23]See Fitzpatrick (2015), Sternlight (2012), and Sternlight (2015). In the standard consumer purchase context, a contract could be something that most consumers would not recognize as such: for example "Monopoly" game's official terms that consumers are directed to read. See James v. McDonald's Corp., 417 F.3d 672 (7th Circuit 2005) and, more generally, ProCD, Inc. v. Zeidenberg, 86 F. 3d 1447 (7th Circuit 1996).

risk to face a class action lawsuit.[24]

The existence of no class action provisions in these clauses lowers firms' incentives to adhere to the stated terms of the contract or to law in general. Barely any consumer is willing to sue the firm in an official proceeding for a relatively small amount of money even if the consumer knows for sure that they are correct.[25] However, more often these disputes are less than clear cut. Moreover, if a consumer does sue, then the firm can simply pay off that particular consumer, without reimbursing the remaining consumers who did not choose to sue. Thus, it is clear that even if consumers read the initial contract, there might be a significant gap between consumers' beliefs regarding the service that is to be provided and what the firms might actually be able to provide without suffering legal consequences from class actions.

In the Spring of 2016, CFPB released a notice of proposed rulemaking, proposing to effectively disallow providers of consumer financial products or services to invoke arbitration agreements in class actions. Several other government agencies have recently finalized or proposed similar interventions as well, for example the Department of Education and the Department of Labor.

The law and economics literature discussed general pros and cons of class action lawsuits at least since Coffee (1986). Rosenberg and Spier (2014) argue that class actions lawsuits allow numerous plaintiffs to pool their resources against a defendant that has much more at stake than an individual plaintiff, increasing social welfare by enabling both the combined plaintiff class and the defendant to make their best cases. Hylton (2015) argues that class action waivers present a, familiar from the industrial organization literature, problem of naked exclusion: the plaintiffs can only accomplish something by pooling their resources together; however, neither one of the class members is marginal, and thus does not have the right incentive to invest in pooling resources.[26] However, Hylton (2015) also makes the point that some class action waivers might be efficient if a sufficient number of consumers do not waive their rights, using the familiar arguments for individual litigation waivers.[27] Choi and Spier (2014) analyze product liability waivers in a model with moral hazard on the part of the producers and adverse selection on the part of the consumers. They find that it is optimal, from the social welfare perspective, to limit the right of the producers to introduce product liability waivers in order to entice the producers to make safer products, with the intuition similar to the seminal article in the economics of insurance, Rothschild and Stiglitz (1976).

[24] See Gilles (2005) and Fitzpatrick (2015). But see Consumer Financial Protection Bureau (2015) and Rutledge and Drahozal (2013) showing that the expected increase in clause prevalence is yet to materialize in the consumer finance space.

[25] See Consumer Financial Protection Bureau (2015). Also, as Judge Posner wrote in his opinion in *Carnegie v. Household International, Inc.*, "[t]he realistic alternative to a class action is not 17 million individual suits, but zero individual suits, as only a lunatic or a fanatic sues for $30." This sentence was also quoted by Justice Breyer in *Concepcion*.

[26] See Rasmusen, Ramseyer, and Wiley (1991) and Segal and Whinston (2000).

[27] See Consumer Financial Protection Bureau (2015) showing consumers' lack of understanding of mandatory arbitration clauses in credit card contracts.

3.2 Ross settlement and empirical analysis

While there is no need to explain why in general cross-sectional correlational studies are not a good substitute for causal analysis, the case is especially clear while studying the effect of arbitration clauses in the credit card market. Consumer Financial Protection Bureau (2015) finds that while less than 20% of the approximately 400 largest credit card issuers use arbitration clauses, 15 out of the top 20 do so. In other contexts, Ware (2006) and Sternlight and Jensen (2004) use cross-sectional evidence, arguing respectively that there are price savings due to clauses and that there are not.

At the end of 2009 four credit card issuers (Bank of America, Capital One, Chase, and HSBC) settled a lawsuit that alleged anti-competitive practices by these and several other issuers (the Ross case). The alleged anti-competitive practice, running from May 1999 to October 2003, was the use of mandatory arbitration provisions in credit card contracts. The settlement required these four issuers to stop including mandatory arbitration clauses in new contracts effective almost immediately and to mail existing customers new contracts without mandatory arbitration clauses within a few months. According to the settlement, these four issuers ("settlers" from now on) were barred from including mandatory arbitration clauses in their contracts for three and a half years after removing them pursuant to the settlement. None of the other issuers in the dataset voluntarily discontinued their arbitration clauses after the settlement. The settlement did not involve any payments. In contrast, the other three issuers that were sued simultaneously (American Express, Citigroup, and Discover) chose to proceed with litigation, and they ended up winning the case in 2014: the plaintiffs failed to show the existence of antitrust violations.

It is clear that this is not a natural experiment. There are many reasons for why certain issuers get sued and others do not and why certain issuers settle and others do not. However, in this particular case, none of the case documents suggested that either the decision of which issuers to sue or the issuers' decisions on settlement were correlated with the per-account profitability of having mandatory arbitration clauses, all the consumer characteristics held constant. A theory for why certain issuers got sued is simply that the largest issuers got sued since plaintiffs had limited resources and wanted to get the most bang for the buck. The decision to settle seemed to suggest the differences in appetite for risk of the different issuers or their legal advisors. That, of course, could potentially be correlated with the extent to which issuers incentives change due to arbitration clauses; however, given the dispersed firm structure of a large issuer, it is very doubtful that the correlation is actually there. Finally, unfortunately I do not have data necessary to estimate any impact of the settlement on the interchange fees. Note that this change did not directly affect consumers' demand or cost: virtually no consumers went to mandatory arbitration (or to court) individually either before or after and virtually no consumers are aware of whether their contract has a mandatory arbitration clause, see Consumer Financial Protection Bureau (2015).

While an economist would expect the law of one price holds in the credit card market conditional on consumer characteristics such as credit score (FICO) and income, **?** show that this is far from being the case. Despite online offerings, most consumers continue to choose their credit cards based

on mail solicitations from the issuers. **?** show that subprime consumers are considerably less likely to receive such solicitations, with a lower than 40% chance of receiving a solicitation in any given month for the subprime consumers close to the prime threshold, and significantly lower chance for even more subprime consumers. Thus, arguably, the appropriate model for the market, especially the subprime part of the market, is issuers mailing out solicitation envelopes with a good chance that the issuer is a de-facto monopolist that period for the consumers receiving the envelopes, see also **?**.

The setting of firms competing head-to-head, especially in the prime market, presents an identification challenge: a price increase by a set of firms might trigger a price increase by their competitors, rendering the differences-in-differences technique less powerful. However, the subprime market is notoriously less competitive, allaying these concerns in that case.

I am using data from the CFPB's Credit Card Database (CCDB), a 1% random sample. This dataset includes de-identified account-level data from over a dozen of large credit card issuers (whose identities must remain anonymous for reporting purposes), but at least one of the settlers is in the dataset. The statistics in this paper are aggregated to maintain the confidentiality of the underlying data, consistent with the CFPB's confidentiality rules. The dataset consists of monthly snapshots of each consumer account of each of the issuers in the dataset. From the CFPB's CARD Act report, Consumer Financial Protection Bureau (2013b):

"[The data is] de-identified loan-level information from a sample of large banks' credit card portfolios, which is compiled in the CFPB's Credit Card Database ("CCDB"). The data is updated monthly and covers the period from January 2008 [...] The database contains information on the full consumer and small business credit card portfolios, representing between 85% and 90% of credit card industry balances. Information in the database cannot be tied to any particular individual nor can multiple accounts in the database that may belong to a single individual be linked in any way. The database does include anonymous updating of accounts over time in order to discern changes in account information such as annual percentage rates ("APR"), balances, payments, interest charges, and fees."

Given the time period of the Ross case, it is reasonable to use data for accounts originated from November 2008 to November 2011. This period allows me to control for seasonality, at least to a certain extent, and includes over a year immediately before the settlement and over a year immediately after the settlement.[28]

I focus on new accounts as this is where one would expect to see changes due to the regime switch. Re-pricing old accounts is constrained by the CARD Act provisions becoming effective around the same time and the exact timing could also differ significantly based on the settlement that a given issuer signed. Thus, I limit my sample to new accounts.

[28]CCDB might or might not include the data from all four settlers: consistent with the Bureau's confidentiality rules, this paper does not identify which of or how many settlers are in the CCDB. For brevity, the rest of the analysis is written as if all four settlers' data is in CCDB. For the same confidentiality concerns, I am able to show just a few tables, with many coefficients suppressed (because, for example, some of them might not even be applicable given the data, such as an indicator variable of firms potentially not having a mandatory arbitration clause in their contracts).

Despite all the caveats, I believe that this empirical exercise – showing that plausible causal identification with the best data available produces a price increase not statistically different from zero – is still important to document, especially considering the policy significance.

3.3 Regression

The regression setup is differences-in-differences. I compare the difference in prices between what the four settlers and the rest of the issuers charged after the settlement with the difference in prices that the four settlers and the rest of the issuers charged before the settlement, controlling for a number of observables.

There are several fees, rates, and charges that one could focus on while performing an analysis of whether the prices changed after the settlement. As the Bureau's CARD Act Study and Agarwal, Chomsisengphet, Mahoney, and Stroebel (2015), I focus on the total cost of credit (TCC). From the CFPB's CARD Act Report,[29]:

"Although changes in component costs and the composition of pricing are therefore important to consider, the ultimate question posed to the Bureau concerns the "cost of credit." To measure all-in costs, we calculate, on a monthly basis, a metric that includes everything that consumers pay to possess and use their credit cards and state that total as a percentage of the average cycle ending balance on an annualized basis for those accounts. This "Total Cost of Credit" ("TCC") metric incorporates all fees and interest charges the consumer pays to the issuer. It excludes revenue generated though separate agreements between other businesses and the issuer, such as interchange fees paid by merchants and marketing fees or commissions paid by companies offering add-on products to an issuer's customer base. This TCC metric thus captures all of the component costs that consumers pay."

Settlements in the Ross case occurred in November and December of 2009. Pursuant to these settlements, settlers were required to remove their arbitration provisions at various points during the first half of 2010. Given the timing of the settlements, I analyzed TCC across issuers during the period November 2008 through October 2009 against the total cost of credit across issuers during the period January 2010 to November 2011. I selected these time periods to control for seasonality and to remove a two-month time period during which adjustments to pricing policy and availability of credit may have occurred.

It is not clear when exactly the settlers would have priced in anything related to the settlement, if at all. I choose to focus on November and December of 2009 as the dates of this process occurring. Thus, I throw the accounts originated during these two months out of the sample for all regressions. However, I also tried several different time windows, all producing similar results, in particular windows of: November 2009 to April 2010, November 2009 to November 2010, and April 2009 to April 2010, see Appendix. Thus, these different time windows are also an attempt to account for

[29]See Consumer Financial Protection Bureau (2013b). Argus Information & Advisory Services (the compiler of the dataset), in collaboration with nine large credit card issuers, also used a very similar aggregation measure in one of their presentations, referring to it as "gross effective asset yield." The main difference between that metric and TCC is that TCC (and the dataset that I am using) does not have the interchange revenue information.

the possibility that the issuers started adjusting prices before formally settling (for example, when they have decided to settle). Finally, it is theoretically possible that the issuers accounted for the possibility that they might be forced to take out the arbitration agreements at the moment when they have put them in. However, even in that case, as long as the case resolved some uncertainty, the issuers have an increased liability risk.

Given the controls, standard economic theory predicts that the price trends across the two groups of issuers would be similar. Either convergent or divergent trends would imply unidirectional changes either in relative costs of each issuer or in consumers' perception of the value of issuers' brand names. These unidirectional changes would also have to be stable over time. At least anecdotally, neither of the trends was operating in the market. Moreover, since I condition on many variables, a simple traditional figure of trends before and after the event is not particularly meaningful. I am effectively comparing differences in weighted averages across many different types of consumers, and the weights of the groups are changing as, for example, more subprime consumers came into the market in a given month, and some issuers target the subprime market more than others. Comparing these differences across different time windows and finding no differences in differences, as I do, is effectively an analogue to the traditional figure showing parallel trends before the event. Alternatively, I could show the traditional figure for several particular consumer types (say, FICO of 740-750, income of \$60,000-\$70,000, pre-approved for a credit card, without a previous banking relationship with the issuer). Unfortunately, especially given the few settlers, the presence or the absence of kinks in particular months in the trends over time could identify issuers in the dataset. Additionally, even if the data would have been public, it would be difficult to document parallel trends systematically without showing hundreds of graphs.[30]

The first difference is the difference between TCCs of accounts originated by settlers and other issuers during the same month, conditional on all the observables. The differences in differences is the comparison of the first differences before the settlement and after the settlement.

I run the following specification:

$$TCC = \beta_0 + \beta_1 Post \times Settler + \beta_2 Post + \beta_3 Settler + \overline{\beta} X. \tag{9}$$

Each observation is an account. TCC is computed over the first 25 months of the account in the main specification, but the results do not change for 13, 19, and 37 months.[31] Variable *Post* indicates whether the account was opened after the potential change in pricing of new accounts (January 1st, 2010 in the main specification). Variable *Settler* indicates whether the account is with one of the settlers. Coefficient β_1 is the standard dif-in-dif interaction coefficient of interest. I also include various controls in X: month, year, month-year interaction, issuer fixed effects,

[30] As a verbal description, even with caveats above, restricting the sample to prime consumers only ($FICO \geq 660$) produces pre-trends that are not just parallel, but virtually lie on top of each other. In contrast, there is a significant pre-trend level difference for subprime consumers ($FICO < 660$), that at least to some extent is attributable to the differences in FICO compositions across issuers even conditional on analyzing only subprime consumers. As mentioned above, I am limited in what I am able to release publicly from this dataset.

[31] The somewhat odd numbers of months are to account for a possibility of an introductory period expiring.

credit card origination channel, other banking relationship of the consumer with the issuer, and whether the consumer has other cards with the issuer.[32] I also include nonlinear controls for FICO and borrower's income (log, square, and the actual value) and whether a particular issuer had mandatory arbitration clauses in its contracts before the time of the settlement. I use the following formula to compute TCC:

$$TCC = 12\frac{Average\ Monthly\ Fees}{Average\ Daily\ Balance}, \tag{10}$$

where average monthly fees include virtually all fees that a consumer might pay: interest rate charges, late fees, annual fees, NSF fees, cash advance fees, and so on.[33]

3.4 Results

The differences-in-differences coefficient with TCC as the dependent variable is not statistically significant. This implies that I cannot rule out a hypothesis that TCC did not change as a result of the settlement, or in other words that there was no price/quantity change. See Table 1, column 1.

The fact that I did not find statistically significant effects on TCC does not imply that there was no evidence about individual components. In fact, in some of the regressions for different time windows and other specifications that I analyzed, there was a statistically significant increase in APR or a statistically significant decrease in annual fee.[34] However, as noted above, I focus on TCC as the metric to describe the cost of credit. Moreover, I did not apply the Bonferroni correction to standard errors, and given dozens of regression, some of them were likely to produce statistically significant results simply due to chance.

Note that the standard errors are, arguably economically significant, on the order of 2 TCC percentage points even for subprime consumers. Thus, while the estimates are not statistically significant, I cannot rule out an economically significant effect.

Despite a flexible functional form for including each consumer's FICO score (a linear, a logarithmic, and a square term), it is theoretically possible that there are discontinuous effects, for

[32] Credit card origination channel includes indicator variables for pre-approved, acquired from third-party, branch applications, and so on.

[33] I throw out some of the observations during the cleaning process. In particular, I do not use credit card accounts secured by a collateral, private label or small business credit cards, accounts with invalid credit scores (below 250 or over 850) or with invalid APR (99.99). Finally, I throw out a handful of outlier accounts in terms of TCC. The 99th percentile TCC is a little over 1. However, there are outliers with TCC of well over 100. Given the formula, it is not hard to see how such outliers might appear: for example, a person barely using their card that charges an annual fee. Not to influence my results, I throw out all accounts that have TCC over 2 *and* a daily average balance of under $200. These several accounts do not add much to issuers' profits and do not make a difference in the consumer surplus calculations. Several studies used analyzed TCC metric that includes taking a power of 12 of a fraction similar to the one that I am using, to account for compound interest. In this setup this could lead to more problematic outliers and thus I choose to employ the TCC formula above. The results are robust to using either version.

[34] For example, the interaction term in the 25th month APR regression is positive and statistically significant; however, the interaction term in the annual fee regression negative and statistically significant for consumers with $FICO < 660$. Statistical significance disappears and the coefficient on the PostXSettler interaction term changes signs (in the TCC regression as well) for measurement windows different from 25 months, for example 13 months, 19 months, or 37 months.

Table 1: Total Cost of Credit Regression

	(1) Whole sample	(2) $FICO < 660$	(3) $FICO \geq 660$
PostXSettler	0.0346	-0.00985	0.0363
	(0.0298)	(0.0226)	(0.0308)
Settler	0.0674	-0.288***	-0.00895
	(0.0322)	(0.0210)	(0.0308)
Post	-0.0560	-0.0215	-0.0567
	(0.0352)	(0.0207)	(0.0382)
FICO Controls (linear, square, and log)	X	X	X
Income Controls (linear, square, and log)	X	X	X
Issuer Fixed Effects	X	X	X
Mandatory arbitration clause	X	X	X
Month/Year Dummies	X	X	X
Loan Channel Dummies	X	X	X
Banking Relationship Dummies	X	X	X
N	307415	72946	234469

Standard errors in parentheses, clustered at the issuer level

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

example a discontinuous delineation into a subprime and a prime market. To address this possibility, I analyzed only consumers with FICO scores below 660, the standard industry subprime vs. prime cutoff. I do not find any statistically significant effects on TCC for that population either. See Table 1, column 2.

While the bounds are not especially tight on the whole sample, the bounds for the subsample of subprime consumers (those with FICO score of less than 660) are tighter and the point estimate is negative (firms decrease prices due to exposure to class action), further pointing to a precise zero result. The subprime consumer segment is significant on two dimensions: first, this is the segment where a price increase would be especially worrying from the policy perspective, and second, this is the less competitive segment resulting in, arguably, a cleaner differences-in-differences estimation from the identification perspective.[35] Thus, the subprime market regression is my preferred specification, with similar results from the prime market showing that the pattern holds even despite stronger identification concerns.

3.5 Other explanations for not finding statistically significant results

There is a possibility that there was a specific selection into which issuers signed the settlement in the Ross case. For example, it is possible that the only issuers who agreed to the settlement

[35]See, for example, Drahozal and Rutledge (2012) among legal commentators concerned about the subprime market space.

were the ones for whom the lack of mandatory arbitration clauses did not represent a sizable cost increase. Although, as noted before, no documents indicated that this is indeed the case.

A highly competitive market would not limit the ability of issuers to pass the costs through to the consumers. In a highly competitive market, the margins are sufficiently low that a firm has to pass costs through, lest it starts losing money on each consumer. Moreover, the subprime credit card market is arguably less competitive; however, the results are qualitatively the same for consumers with FICO scores under 660. Rather, one of the plausible explanations of not finding an effect is that consumer biases effectively render the credit card industry not competitive, resulting low cost pass-through in general.[36] In general, a low pass-through rate could also be due to specific shapes of cost and demand functions of firms, see Weyl and Fabinger (2013).

The timing of the Ross settlement happens to coincide with the aftermath of a recession and the implementation of the CARD Act. It is possible that both of these confound the findings; however, the differences-in-differences regression is specifically used to address at least some of these concerns. It is also possible that different issuers were affected in different ways that just happen to correlate with the cost of mandatory arbitration clauses, further confounding the results.

The cost increase due to the lack of mandatory arbitration clauses could be a fixed cost increase, as opposed to marginal. In that case, economic theory suggests that consumers should not see any effects, with the issuers absorbing all of the cost increase. This could be the case if, for example, each settler implemented a major one-time compliance, customer service, or legal policy restructuring after the settlement, while not changing the amount of resources spent on the marginal consumer.

A possible reason for not being able to find a statistically significant price increase is that the marginal cost change was too small to detect (either because the overall cost shock is low or because issuers perceive that cost to be fixed). To provide some magnitude of class litigation against credit card issuers, between 2008 and 2012 these issuers paid out around $100 million per year in class settlements, despite most issuers having arbitration agreements throughout the period (and thus severely limiting payouts from those issuers). Paid out in this case means that they documented actually paying to consumers or consumers' attorneys, as opposed to providing discounts, vouchers, or sending out notices that need to be mailed back for the money to be disbursed. In addition, any price increase would hit only new consumers: after the CARD Act it is hard to change existing consumers' rates.

Finally, while I analyzed a multitude of accounts, there were only four issuers subject to the settlement. In theory, pricing could be done based on all the controls that I include, in which case the fact that there are only four issuers affected would not matter as much, given the multitude of pricing decisions. I utilized clustered standard errors at the issuer level to account (at least to the extent possible) for potential within-issuer correlation.

There are several other important real-world frictions. First, there might be adjustment (menu) costs associated with any price adjustment: changing the pricing model, communicating between

[36] See Ausubel (1991), see also Agarwal, Chomsisengphet, Mahoney, and Stroebel (2015). However, see Grodzicki (2012) showing a much higher pass-through rate after 1995 than what Ausubel (1991) found, arguably at least partially due to an increased prevalence of variable APR contracts since Ausubel (1991).

different parts of the organization, and so on. If these costs are sizable relative to the profit foregone by the lack of mandatory arbitration clauses, it is plausible that the issuers would not adjust their prices. Similarly, it is plausible that issuers price at certain price-points: for example, an issuer might not even consider a spread of 3.14159%, and just use easier to understand spreads, similar to supermarket prices ending in .99, and that the optimal price adjustment would result in an undesirable from the marketing perspective spread. While plausible, these explanations, coupled with profit maximization by issuers, are unlikely given the number of prices that could be changed and/or would imply that the profit hit from settlement is relatively small. There are many other explanations of price stickiness, see Blinder, Canetti, Lebow, and Rudd (1998) and Klenow and Malin (2010), but many of these reasons relate to either the change in marginal cost being sufficiently small that keeping the prices fixed is the optimal response or to other aspects of the markets changing simultaneously in just the right direction.

4 The U.S. mortgage market

4.1 Background

In this section I analyze the magnitude (or the presence) of the second effect discussed in the introduction, expected liability cost pass-through in the U.S. mortgage market. I cannot reject the hypothesis of no cost pass-through at the standard statistical significance levels. Unlike the previous section, the standard errors are economically insignificant, allowing me to rule out economically significant effects.

In the aftermath of the subprime mortgage crisis, the U.S. Congress passed the Dodd-Frank Act.[37] The Act contained a provision that instructed the CFPB (created by the same Act) to pass a regulation that imposed a legal liability on creditors for originating mortgages that consumers are unable to repay. In other words, when a borrower defaults on their mortgage, and the creditor attempts to foreclose on the borrower, the borrower can counter-sue the creditor for failing to consider the borrower's ability to repay the loan at the time when the loan was originated. This liability provides the creditor with an additional incentive to inform consumers about the probability of default and, in the limit, simply not to originate a loan when the creditor believes that future default is likely, even if the collateral value of the property might be sufficiently high for an expected profit absent the liability.

Likewise to mandatory arbitration clauses, this is the first paper presenting a formal model of the consumer surplus and social welfare effect of an ability to repay regulation and offering an arguably causal test of the effect of the ability to repay provision's existence on prices. Provisions similar to ATR are also in effect for the U.S. credit card market. Also, CFPB recently released a notice of proposed rulemaking, proposing limits on payday loan origination, with one of the routes to satisfying the requirements being an ability-to-repay assessment by the payday lender.[38]

[37] See U.S. Congress (2010).

[38] See, for example, **?**.

Congress also provided for the establishment of a Qualified Mortgage (QM) loan-level designation: a type of mortgage that would be safer for the creditor to originate. If a creditor originates a QM, then the creditor receives a "safe harbor" or a "rebuttable presumption" of compliance for that loan. In practical terms, it would be hard, if not impossible, for a consumer in foreclosure to sue the creditor successfully for not considering the consumer's ability to repay, if the loan is a QM.

CFPB finalized the ATR-QM regulation in January 2013, and the regulation became effective in January 2014.[39] In a May 2013 rule, also effective in January 2014, CFPB included a special provision for "small" creditors that effectively made almost any loan that one of these "small" creditors originates a QM.[40] Thus, in January 2014 the new legal liability came into effect for all creditors in the U.S. except for the creditors designated as "small." The creditor is designated as "small" as long as the creditor originated less than 500 loans the previous year.[41] Roughly 90% of mortgage creditors in the U.S. were designated as small. However, my findings do not necessarily apply to larger creditors that are far from the 500-loan threshold.

As in the credit card market, consumers looking for a mortgage care about many non-price characteristics (such as distance to the nearest branch) and there is considerable price dispersion (50 basis points in APR for prime consumers, more for subprime) even when fixing all the relevant consumer characteristics (FICO, LTV, location, loan size).[42] This shows that different firms can and do charge different prices, and the law of one price does not operate in the mortgage market.

The firms close to the 500 cutoff that I analyze are small and operate in at most a few counties. There are over 3,000 counties in the U.S., and my analysis of firms close to the cutoff involves fewer than 200 firms. The chances of a considerable number of firms in my sample competing against each other are low, and thus I do not believe that strategic competition issues as discussed above for the credit card market are as relevant in the mortgage market.

Many rural mortgage markets might be less than competitive, especially for borrowers who are not prime and whose loans the lender ends up keeping on portfolio. Rural consumers seem to disproportionately care about the lender having a branch nearby, across all markets half of consumers do not shop (only consider one creditor), large national lenders frequently do not have branches nearby, and frequently only one lender has a branch in a given community. The regression

[39] See Consumer Financial Protection Bureau (2013a).

[40] For example, consider mortgage loans with balloon features. These mortgages are usually originated for five years, with a balloon payment at the end, and the creditor does not have to refinance the loan, let alone refinance it at the same rate, when the balloon payment is due. In other words, this type of a loan makes the consumer bear most of the risks that we generally associate with creditors' risks in a mortgage transaction: both the interest rate risk and the risk that the consumer's situation deteriorates significantly in the next five years. These types of mortgages were seen as problematic even during the Great Depression, see Campbell, Jackson, Madrian, and Tufano (2011). These types of mortgages are, de-facto, not subject to consumer lawsuits on ability-to-repay grounds as long as the creditor is small (with some other more technical conditions that the vast majority of small creditors satisfies). There are several other types of mortgages that become de-facto not subject to these consumer lawsuits only if a small creditor originates the mortgage.

[41] There is also an assets prong in the "small" test that I describe later in the paper. I use the data to account for it and, moreover, it was not binding for the vast majority of the firms. The 500 limit includes only Truth In Lending Act eligible first-lien loans, I focus on these loans (identifiable from HMDA) from now on.

[42] See http://files.consumerfinance.gov/f/201508_cfpb_national-survey-of-mortgage-borrowers-technical-report-15-02.pdf and http://www.consumerfinance.gov/owning-a-home/explore-rates/.

for such loans (portfolio loans in rural areas) shows results similar to the main specification.

4.2 Regression setup and results

I compare the output of creditors just below and just above the 500 threshold to find out whether being subject to lawsuits (not being small) led the creditor to originate comparatively fewer mortgage loans overall – standard regression discontinuity design. I analyze creditors that originated between 450 and 550 loans in 2013; however, similar results hold when restricting the sample to creditors that originated between 475 and 525. Note that the 500 threshold number is not a special number for mortgage creditors in any other sense: there was no other significance to it before the rule became effective.

The regulation came into effect in January 2014, but the threshold became known for sure in May 2013 and the creditors had a reasonable probability of guessing it in January 2013. Thus, there could have been some strategic behavior by creditors to get just under the 500 threshold. However, examining the data does not support that conclusion: see Figure 1 plotting a histogram of the creditors that originated between 400 and 600 loans in 2013, after they knew about the regulation requirements including the small definition but before the regulation itself became effective. It seems clear that if there is a selection effect, it is negligible. There is neither a pre-cutoff bump that would indicate creditors stopping right below 500, nor is there a steep drop off right over 500. There are more creditors that originated under 500 loans, but that is consistent with the fact that there are many more smaller creditors in general and the frequency distribution function is decreasing, see Figure 2. Arguably, Figure 1 by itself might be enough to support an argument that the optimal quantity of creditors just above the 500 threshold did not decrease materially. I present the confidence bounds from the McCrary test in the Appendix.

Moreover, in the Appendix, I run a specification where I analyze creditors that are a bit further from the threshold: those with between 425 and 475 loans and those with between 525 and 575 loans. These creditors are likely to be sufficiently far from the threshold not to have serious strategic incentives, yet close enough together that regression discontinuity is still meaningful.[43]

I use the data that creditors report due to the Home Mortgage Disclosure Act (HMDA). Most U.S. creditors (with certain exceptions for very small creditors and creditors outside of metropolitan statistical areas) have to report every mortgage loan they originate, including several characteristics of that loan. It is possible to aggregate loan-level information into institution-level information, and then match that information to the Federal Depository Insurance Corporation's and National Credit Union Administration's "Call Reports" data reporting assets among other things. For example, from 2013 HMDA data coupled with the "Call Reports," it is possible to identify which creditors are deemed small for the purposes of 2014. It is also possible to match institutions from one year

[43]Summer is the peak time for mortgages, and there is some lag in mortgage origination (between the first time the consumer comes through the door and the actual mortgage origination), so close to the end of June firms know whether they are close to the 500 limit for the calendar year. Moreover, if the firm can see that it's far above target in June, there is still plenty of time to decrease lending, alleviating the need to be particularly strategic early in the year. For the econometric argument of not utilizing the creditors right around the threshold, see for example **?**.

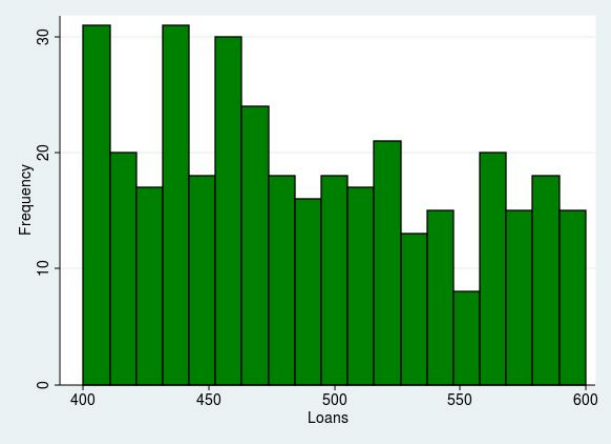

Figure 1: Histogram of creditors by 2013 originations (only the creditors that originated between 400 and 600 loans).

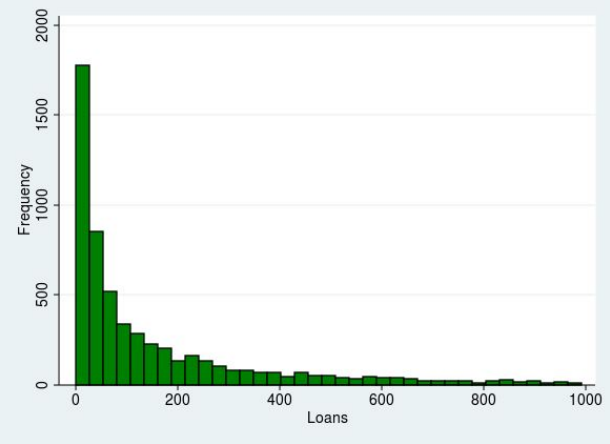

Figure 2: Histogram of creditors by 2013 originations (only the creditors that originated fewer than 1000 loans).

to another, creating a panel.

Accordingly, I use HMDA data from 2013 and 2014 and "Call Reports" from 2013. The calendar year 2013 was the last year before the effective date, and the calendar year 2014 was the first year after. I can apply a regression discontinuity design, exploiting the fact that having made just under 500 loans in 2013 puts the creditor in the privileged standing of small and thus little to no liability for loans originated in 2013, while originating just over 500 loans in 2013 exposes creditor to more legal liability for originating loans in 2014 that consumers will eventually not be able to repay.

I use the following specification:

$$Loans_{2014} = \alpha_0 + \alpha_1 Small_{2013} + \alpha_2 Loans_{2013} + \alpha_3 Loans_{2013}^2 + \alpha_4 Loans_{2013}^3 + \overline{\alpha} X_{2013}, \qquad (11)$$

where the regression is run at the level of a creditor. $Loans_{2014}$ indicates the number of loans that the creditor originated in 2014, similar with $Loans_{2013}$. Dummy variable $Small_{2013}$ indicates whether the creditor was designated as small based on its 2013 results. An adverse effect of the ATR-QM rule on output would result in small creditors that enjoy several special exemptions and provisions originating more loans in 2014 than the slightly bigger firms, and thus a significant positive coefficient on the $Small_{2013}$ dummy. I also include several creditor-specific controls in X_{2013}, all computed based on the creditor's performance in 2013: number of higher-priced mortgages, percentage of loans held on portfolio, a dummy variable for whether the creditor is a credit union, and a dummy variable for whether a creditor is a non-depository institution (a mortgage company, for example like Quicken Loans, albeit much smaller for the purposes of this regression).

Results of this regression are in Table 2. I only include creditors that originated between 450 and 550 loans in 2013: there were roughly 200 such creditors.[44] In the whole sample of almost

[44]Results are similar for a regression where I only include creditors that originated between 475 and 525 loans; however, only 91 creditor remains in that sample.

7,000 creditors, $Loans_{2013}$ and various powers of it are the best predictors of $Loans_{2014}$, and by far the only variables that matter, thus the absolute magnitudes of all the coefficients should be viewed with a healthy dose of skepticism. The coefficient on the variable of interest ($Small_{2013}$) is never significantly positive and often negative. The coefficient's magnitude is in loans per year, in comparison to several million originations in the market as a whole in 2014. Including the fourth power of $Loans_{2013}$ results in a previous power being omitted by the statistical software due to collinearity.

In the antitrust sense, the results measure harm to competitors as opposed to harm to competition: even if some creditors stopped originating loans due to the rule, others might have originated these loans instead, see also Alexandrov and Ang (2015), who do not find any statistically significant effects of a related regulation on escrows in the subprime mortgage market. A separate, but a related, point is that since firms just above 500 and just below 500 in 2013 might be competing against each other in 2014 in at least some mortgage markets, the coefficient of interest includes both the competitive harm to firms over 500 and the competitive advantage to the firms below 500, and thus the magnitude is an overestimate of the actual effect. However, as I note above, given the size of the creditors and the number of the markets, it is highly unlikely that any creditors from my treatment group are competing against creditors from my control group.

The vast majority of the loans of these lenders were likely to be QM loans: the QM definition is relatively broad and since the crisis lenders were originating fewer loans for which the ATR-QM constraints would have been binding. Therefore, in the remaining columns, I run the same specification using subsets of loans that might be particularly affected by the regulation based on anecdotal evidence and market specifics. In particular, I run the same specification, where the dependent variables are, from Column (3) on, number of loans secured by property located outside of Metropolitan Statistical Areas in 2014, number of loans held in portfolio in 2014, number of loans held in portfolio to LMI consumers in 2014 (I proxy LMI consumers by using only those loans where the creditor reported that consumer's income is below 50,000 dollars), and number of loans held in portfolio secured by property located outside of Metropolitan Statistical Areas in 2014. In short, I do not find any statistically significant evidence that creditors that enjoyed the small designation performed better (a significantly positive coefficient on $Small_{2013}$).

In the Appendix, I do a further consistency check to see whether there was any strategic behavior displayed by the creditors to position themselves just below the threshold, even despite the histograms above indicating otherwise. I run the same specifications as in this section, except I only use creditors that originated either between 425 and 475 loans or between 525 and 575 loans in 2013 (I move the two sides of my 100-loan window by taking out the 50 in the middle, keeping roughly the same number of creditors, close to 200, in the sample). The results are by-and-large the same.

Finally, I model quantity choice in the theoretical model (as opposed to price) and all the concerns from the creditors during the passage of the regulation and after are generally framed in terms of the number of mortgages originated. That said, theoretically, a price increase could also be

Table 2: HMDA Regression Table

	(1) Loans_2014	(2) HPML_2014	(3) Outside MSA Loans	(4) Portfolio Loans	(5) Portfolio LMI	(6) Portfolio Outside MSA
Small in 2013 Indicator	-636.2	-0.0566	-20.19	-101.9*	-3.692	0.820
	(359.5)	(0.0427)	(23.20)	(40.39)	(9.744)	(11.57)
Loans in 2013	3332.7	-0.0682	-145.0	227.9	-68.31	-147.8
	(4794.1)	(0.569)	(309.3)	(538.6)	(129.9)	(154.3)
Loans in 2013_squared	-6.576	0.000161	0.291	-0.452	0.135	0.295
	(9.661)	(0.00115)	(0.623)	(1.085)	(0.262)	(0.311)
Loans in 2013_cubed	0.00431	-0.000000125	-0.000194	0.000298	-0.0000888	-0.000196
	(0.00648)	(0.000000769)	(0.000418)	(0.000727)	(0.000176)	(0.000208)
Higher-Priced Loans	-0.485	0.00243***	0.606***	0.211	0.305***	0.454***
	(1.688)	(0.000200)	(0.109)	(0.190)	(0.0457)	(0.0543)
Portfolio Loans	-0.0968	0.00000468	0.0210	0.670***	0.157***	0.155***
	(0.788)	(0.0000936)	(0.0509)	(0.0886)	(0.0214)	(0.0254)
Credit Union Indicator	-123.7	-0.0304	-25.34	-2.320	6.378	-22.76*
	(275.0)	(0.0327)	(17.74)	(30.89)	(7.453)	(8.849)
Non Depository Indicator	-442.0	0.00758	-54.73*	-83.55	-8.299	-5.092
	(382.3)	(0.0454)	(24.67)	(42.94)	(10.36)	(12.30)
Constant	-559694.0	9.540	24127.5	-37934.1	11497.8	24584.2
	(791196.7)	(93.98)	(51053.2)	(88886.9)	(21445.1)	(25464.7)
N	186	186	186	186	186	186

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Lenders with 450-550 loans in 2013

an issue if demand is particularly inelastic. While price is not a part of the HMDA dataset for most loans, the most expensive loans (higher-priced mortgage loans, with APR over 150 basis points over the average prime offer rate) are flagged. In Column (2) I use the percentage of such loans relative to all mortgage loans a creditor originates as the dependent variable, with the coefficient of interest also not statistically significant.[45] Another theoretical possibility that was not mentioned by any industry participants even as a possibility is somehow reducing the loan amounts while originating the same number of loans.

5 Conclusion

I analyzed a theoretical model of imposing a liability on firms, when the liability depends on the gap between consumer beliefs and reality, and when the firms can control the size of the gap. I found that the effect of this liability on social welfare and consumer surplus depends on the relative magnitude of three factors: (1) the deterrence incentives due to the liability (firms shrinking the gap to avoid liability in expectation), (2) the increased cost and its pass-through onto price (due both to ex-ante deterrence incentives and the expected ex-post liability transfers), and (3) the amount transferred from firms to consumers (the actual liability) and the efficiency of this transfer (legal fees).

I also estimated the magnitude of one of the factors, (2) the increased cost and its pass-through onto price, in two different settings. I found no statistically significant effect using, arguably, causal identification techniques in both the U.S. credit card and mortgage markets. The standard errors were also economically insignificant in the mortgage market. Despite all the caveats of these empirical exercises, it is notable that even using account-level and loan-level data that includes the vast majority of credit cards and mortgage loans in the United States, and having events that could produce causal estimates, there is still no statistically significant evidence of higher prices or lower quantities – while many commentators, legal academics, and public decisionmakers taking these results almost for granted.

Previous literature, Fitzpatrick (2010) and Consumer Financial Protection Bureau (2015), analyzed class action settlement data to uncover the magnitude of another factor, (3) the amount transferred from firms to consumers (the actual liability) and the efficiency of this transfer (legal fees). Both studies showed moderate losses due to legal fees.[46]

[45] See also **?** for an analysis of price changes after the QM rule went into effect, showing roughly similar results.

[46] Also, the lawsuit itself is generally an off-the-equilibrium path threat, and as an off-the-equilibrium path event, it might not be costly to carry out. In particular, before the Congress passed the Dodd-Frank Act that required the current ability to repay regime, the U.S. Federal Reserve System introduced a similar legal liability on higher priced mortgage loans (effectively the subprime segment of the mortgage market, about 4% of the market at the time) in 2009. However, I have not found any evidence of lawsuits related to this. Apparently, neither had the major creditor associations and other financial institutions commenting on the CFPB's various proposed regulations, despite it being, arguably, in their best interest to find even some anecdotal evidence of these lawsuits occurring. Also note that mortgages tend to be especially vulnerable in the first three years after the origination and that such a lawsuit becomes more difficult to win after a sufficient time elapses with consumer making payments, thus no lawsuits from 2009 up to 2014 is not a by-product of not having a sufficient amount of time elapse to see any lawsuits.

The only factor that is left unexamined is (1) the deterrence incentives due to the liability. This omission is not due to the relative unimportance of this factor. Arguably, this is the most important factor of the three, both in terms of class actions, "[c]onsumer class actions have never been about compensation; they have always been about deterrence [Fitzpatrick (2015)]" and in terms of ability to repay "[t]he benefits from the ability-to-repay requirements therefore come from further limiting and deterring unaffordable lending[...] and thereby reducing the ensuing private and social costs of excess delinquency and default [Consumer Financial Protection Bureau (2013a)]." However, the data on, for example, changes in foreclosures due to the ability to repay rule in residential mortgages is not yet available.[47] I hope that future empirical work will fill this gap. If the magnitude of this factor is negligible, then the findings in this paper and in Fitzpatrick (2010) and Consumer Financial Protection Bureau (2015) suggest that introduction of such liability is a hassle that does not result in massive harm. However, if the magnitude of this factor is substantial, then the findings in this paper and in Fitzpatrick (2010) and Consumer Financial Protection Bureau (2015) suggest that introduction of such liability could bring considerable welfare improvement.

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[47] In this example due to the fact that it is simply too early right now to observe foreclosures for mortgages that were originated after January 2014.

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Appendix

Related literature: noisy signals of quality, disclosures, contracts, and private and social incentives for bringing lawsuits

A branch of economics literature analyzes markets where the consumers either get just a noisy signal of the quality of the product or, as a limiting case, they cannot discern the quality by themselves at all. The second type of products is generally known as credence goods. The term was popularized by Darby and Karni (1973), see Dulleck and Kerschbamer (2006) for a review of that literature. The term is often applied to markets like car repair, medical treatment, and taxi rides in unfamiliar cities: in short, markets where most consumers know full well that they are at the mercy of the seller. Of course, empirical studies confirm that inexperienced consumers end up unknowingly paying more: see Schneider (2012) for car mechanics, Gruber, Kim, and Mayzlin (1999) for medical treatment, and Balafoutas, Beck, Kerschbamer, and Sutter (2013) for taxi rides in unfamiliar cities.

Reputation combined with competition solves some of the issues in such markets, but not all: a finding that dates back to, at least, Shapiro (1982).[48] To the extent that these reputational interactions can be modeled as repeated games, sufficiently high discount factors of players can support almost any outcomes, see for example Kandori (2008) for an introduction on folk theorems in repeated games. Similar folk theorem intuition might apply even if firms are anonymous, see Deb (2007). Bar-Isaac and Tadelis (2008) provide a comprehensive review and analysis of the literature on seller reputation, in particular, the relevant parts of their review include models on hidden action and mixed models between hidden action and hidden types.

Literature on disclosure is also relevant. Beales, Craswell, and Salop (1981a) and Beales, Craswell, and Salop (1981b) make the case for disclosure as a consumer protection tool and describe how firms would have better incentives to compete once a proper disclosure system is in place. However, Ben-Shahar and Schneider (2011) argues that disclosures rarely, if ever, work in practice. Moreover, with mandatory arbitration clauses, the aforementioned naked exclusion argument applies. Daughety and Reinganum (2008) analyze a model where firms (manufacturers) have different product qualities, can signal through price, and can engage in costly disclosure. The safer (higher quality) firm has an incentive to do both; however, not to the socially optimal level. Interestingly, when some consumers are naive, then firms have less incentive to engage in price signaling. Also, mandatory disclosure is not always beneficial due to the safer firm's ability to signal through price.

Manufacturers disclosing information about their products is also related to failure to warn torts, Henderson and Twerski (1990), and strict liability/negligence discussion in Daughety and Reinganum (2013). Hanson and Kysar (1999a) consider consumers that mis-estimate a product's risk, and argue that manufacturers will exploit these consumers in order to survive in the market.[49]

[48] Competition in combination with tacit collusion can result in an inverted U-shape relationship between a market's competitiveness and the equilibrium quality, see Dana and Fong (2011).

[49] From Hanson and Kysar (1999a):

My model is intricately related to these authors' idea: the firm caters to consumers mistaken beliefs. The authors argue that, in the tort context, the solution is strict liability. I believe that this is an empirical question, but my model strongly suggests that if consumers have mistaken beliefs, at the very least *stricter* liability is likely warranted.

The difference between these models, with the exception of some consumers in Daughety and Reinganum (2008), and mine is that consumers in my model do not realize that they are in a reputation game or that there is a hidden action/type/product characteristic that is waiting to be discovered or that is being signaled to them. Of course a richer model would generalize my setup to include this concept as well; however, it is not clear what this combination would add over and above what one can tell from this paper and the reputation literature separately.

Similarly, contract theory literature is not particularly useful in my setup. The contracts could be complete, as in all the future contingencies might be specified (see Spier (1992) and Tirole (1999) for incomplete contracting). Consumers are simply misunderstanding the effective terms of the contract or the likelihood of future events. Legally, the contract terms cannot be so adverse to one of the parties that the terms are unconscionable.[50] However, at least as of now, the courts are yet to apply this to, for example, either mortgage contracts when consumers do not realize probabilities of default or contracts with mandatory arbitration clauses where consumers either do not know about the clauses or do not realize that the no class action provision implies that many contract breaches might not result in anyone bringing action against the firm.[51]

The law and economics literature highlights many issues for why private and social incentives for bringing lawsuits might be different, and for why the current rules might not be optimal. I abstract from all these issues in my theoretical model. It is of course possible that, for example, there are too many class action lawsuits from the societal perspective right now, and that having fewer class action lawsuits would be better than the current level from the social welfare perspective. The point of this paper is different: in my model, an incremental amount of, say, class action liability might be better than having no class action liability at all. Relatedly, a discussion of private enforcement's complementarity/substitutability with public enforcement (for example, regulators'

"The lower the consumer's risk estimate, the more consumers will be willing to pay for the product, leading to greater sales and increased profits for manufacturers. Generating consumer underestimation of product risks in this manner is simply another means of cost externalization, a practice that manufacturers have every incentive to pursue. Manipulation goes further than just minimizing perceived costs, however. Manufacturers can also attempt to shape consumer views of product benefits. That is, manufacturers may also elevate consumer willingness to pay by manipulating the view that consumers have of a product's benefits (as opposed to its costs). In either case, consumer failure to accurately perceive product attributes can lead to undesirable levels of consumption."

In my model, introduction of liability counteracts the manufacturers' incentives to induce undesirable levels of consumption, and quality. See also Hanson and Kysar (1999b) for some applications.

[50] See, for example, Williams v. Walker-Thomas Furniture Co., 350 F.2d 445 (C.A. D.C. 1965), ruling that a contract for credit at a furniture store, so that the consumer could not pay off credit on a particular piece of furniture unless all of the credit on all pieces of furniture ever bought from the store was paid off could be declared unconscionable (and thus unenforceable).

[51] In the interest of space I am glossing over a discussion of the applicability of unconscionability and other contract law themes in arbitration in light of the Federal Arbitration Act and several Supreme Court decisions (especially *Concepcion* that effectively implied that the Federal Arbitration Act preempts state law, and *Italian Colors*). See, for example, Gilles and Friedman (2012). Also note that the decision on whether a mandatory arbitration clause is unconscionable can be shifted to the arbitrator herself, see Rent-A-Center, West v. Jackson 561 U.S. 63 (2010).

actions) is beyond the scope of this paper, but is nonetheless an important consideration, see Glover (2011) and Consumer Financial Protection Bureau (2015), and references therein.

There are reasons both for why there is not a sufficient amount of litigation due to potential plaintiffs not being able to internalize some positive externalities in some cases and for why there is too much litigation due to plaintiffs not internalizing all the costs, see Shavell (1982), Shavell (1997), and Spier (2007) for a summary. Relatedly, Kaplow (2011) derives rules for allocating the optimal burden of proof, along with the enforcement level and the level of sanctions. Note that, for example, mandatory arbitration system has more flexible fee shifting rules than the U.S. court system.

Proofs

Proof of Proposition 1.

Proof. First, when $\theta = 0$, the firm has no incentive to invest in x_0, thus $x_0 = 0$. Marginally implementing firm's responsibility for consumers' mistaken beliefs, starting from no liability by firms, implies increasing θ slightly, starting from $\theta = 0$. Thus, to evaluate the effects of an incremental increase of a possibility of a lawsuit on the variables of choice, we take the derivative with respect to θ, evaluated at $\theta = 0$. We start by analyzing the class action case. Partially differentiating relevant equations in (3), and dropping unambiguous subscripts and arguments:

$$\frac{\partial q^*}{\partial \theta} = \frac{\frac{\partial^2 \pi}{\partial q \partial x_0}\frac{\partial x_0}{\partial \theta} + \frac{\partial^2 \pi}{\partial q \partial \theta}}{\frac{-\partial^2 \pi}{\partial {q*}^2}} = \frac{(-\frac{\partial^2 C(x_0,q)}{\partial q \partial x_0} + \theta \frac{\partial^2 L(r,q)}{\partial q \partial r})\frac{\partial x_0}{\partial \theta} - \frac{\partial L(r,q)}{\partial q}}{-\frac{\partial^2 \pi}{\partial {q*}^2}}, \tag{12a}$$

$$\frac{\partial x_0^*}{\partial \theta} = \frac{\frac{\partial^2 \pi}{\partial q \partial x_0}\frac{\partial q}{\partial \theta} + \frac{\partial^2 \pi}{\partial x_0 \partial \theta}}{-\frac{\partial^2 \pi}{\partial x_0^2}} = \frac{(\frac{-\partial^2 C(x_0,q)}{\partial q \partial x_0} + \theta \frac{\partial^2 L(r,q)}{\partial q \partial r})\frac{\partial q}{\partial \theta} + \frac{\partial L(r,q)}{\partial r}}{-\frac{\partial^2 \pi}{\partial {x_0*}^2}}. \tag{12b}$$

We can perform the same analysis for the case of ATR:

$$\frac{\partial q^*}{\partial \theta} = \frac{\frac{\partial^2 \pi}{\partial q \partial x_p}\frac{\partial x_p}{\partial \theta} + \frac{\partial^2 \pi}{\partial q \partial \theta}}{\frac{\partial^2 \pi}{-\partial {q*}^2}} = \frac{\left(\frac{\partial P(x_p,q)}{\partial x} + q\frac{\partial^2 P(x_p,q)}{\partial x \partial q} - \theta \frac{\partial^2 L(r,q)}{\partial q \partial r}\right)\frac{\partial x_p}{\partial \theta} - \frac{\partial L(r,q)}{\partial q}}{\frac{\partial^2 \pi}{-\partial {q*}^2}}, \tag{13a}$$

$$\frac{\partial x_p^*}{\partial \theta} = \frac{\frac{\partial^2 \pi}{\partial q \partial x_p}\frac{\partial q}{\partial \theta} + \frac{\partial^2 \pi}{\partial x_p \partial \theta}}{\frac{\partial^2 \pi}{-\partial x_p^2}} = \frac{\left(\frac{\partial P(x_p,q)}{\partial x} + q\frac{\partial^2 P(x_p,q)}{\partial x \partial q} - \theta \frac{\partial^2 L(r,q)}{\partial q \partial r}\right)\frac{\partial q}{\partial \theta} - \frac{\partial L(r,q)}{\partial r}}{\frac{\partial^2 \pi}{-\partial {x_p*}^2}}. \tag{13b}$$

It is clear that, for $\theta = 0$, $\frac{\partial q^*}{\partial \theta} \leq 0$, while $\frac{\partial x_0^*}{\partial \theta} \geq 0$ and $\frac{\partial x_p^*}{\partial \theta} \leq 0$ (in other words, x_0 and x_p are getting closer together, but which one actually moves depends on whether the liability is class action or ability to repay). ■

Proof of Corollary 4

Proof. First,

$$\frac{\partial SW}{\partial x_0} = \int_0^q \frac{\partial P(x_0,q)}{\partial x_0} dv - \frac{\partial C(x_0,q)}{\partial x_0} + (1-\gamma)\theta \frac{\partial L(r,q)}{\partial r}. \tag{14}$$

Note that, when there is no liability incentive, $\theta = 0$, the firm has no incentive to invest in the effective contract terms, and thus $x_0 = 0$. Thus, by our assumptions, $\frac{\partial SW}{\partial x_0} \geq 0$ at $\theta = 0$: better effective terms are better for social welfare since the firm was underinvesting.

The effect of decreasing x_p is clear: higher consumer beliefs are a pure social cost, thus decreasing x_p is beneficial to consumers,

$$\frac{\partial SW}{\partial x_p} = -k'(x_p) - (1-\gamma)\theta \frac{\partial L(r,q)}{\partial r} \leq 0. \tag{15}$$

■

Additional regression results

Figure 3: Confidence bounds for the McCrary test (only the creditors that originated between 400 and 600 loans).

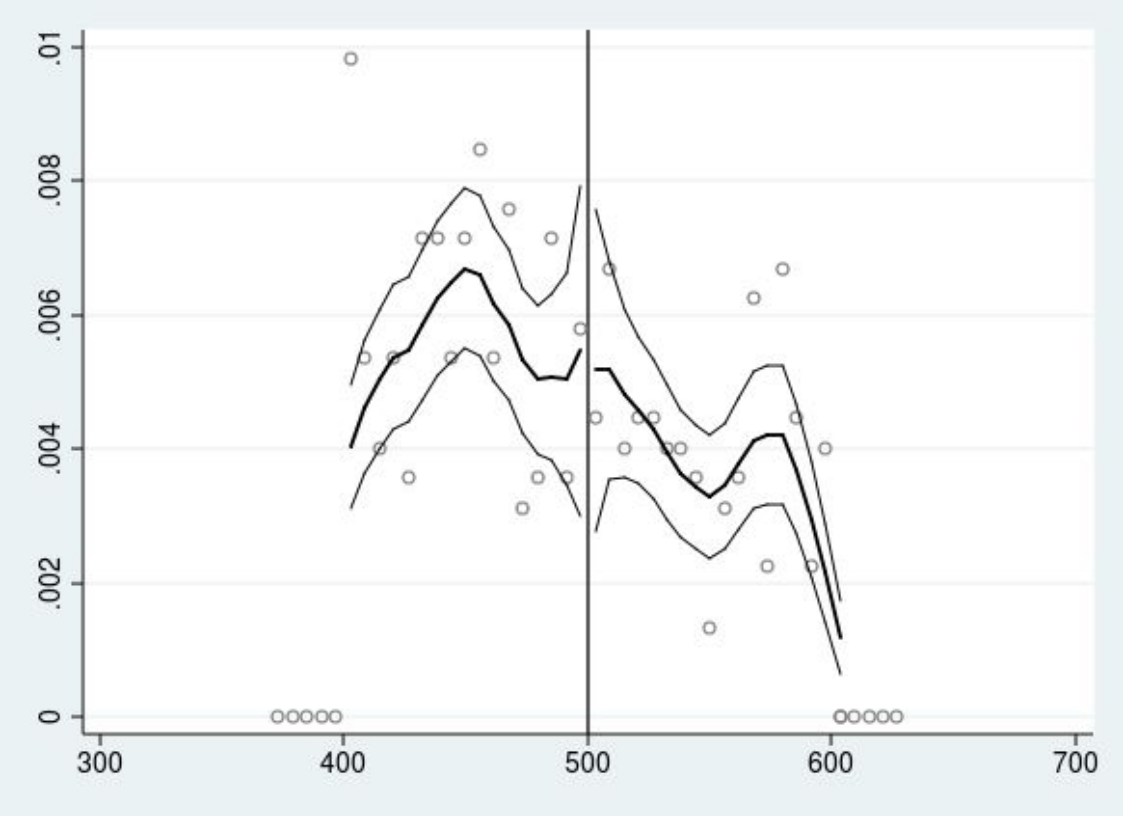

Table 3: Ross Different Windows Regressions. As in the main text, for each window I present the results for the whole sample, then for subprime, and then for prime. The three windows presented are, in order: Nov 2009 – May 2010 (columns 1-3); November 2009–November 2010 (columns 4-6); April 2009 – May 2010 (columns 7-9).

	(1) Whole	(2) Subprime	(3) Prime	(4) Whole	(5) Subprime	(6) Prime	(7) Whole	(8) Subprime	(9) Prime
PostXSettler	0.0294	-0.0150	0.0291	0.0171	-0.0274*	0.0193	0.0294	-0.0150	0.0291
	(0.0243)	(0.0199)	(0.0250)	(0.0180)	(0.0126)	(0.0192)	(0.0243)	(0.0199)	(0.0250)
Settler	0.0761*	-0.283***	0.000700	0.0854**	-0.272***	0.00801	0.0761*	-0.283***	0.000700
	(0.0269)	(0.0189)	(0.0238)	(0.0217)	(0.0128)	(0.0192)	(0.0269)	(0.0189)	(0.0238)
Post	-0.00244	0.0795**	-0.0140	-0.0265	0.0102	-0.0272	-0.00244	0.0795**	-0.0140
	(0.0188)	(0.0199)	(0.0135)	(0.0185)	(0.0117)	(0.0197)	(0.0188)	(0.0199)	(0.0135)
FICO Controls (linear, square, and log)	X	X	X	X	X	X	X	X	X
Income Controls (linear, square, and log)	X	X	X	X	X	X	X	X	X
Issuer Fixed Effects	X	X	X	X	X	X	X	X	X
Mandatory arbitration clause	X	X	X	X	X	X	X	X	X
Month/Year Dummies	X	X	X	X	X	X	X	X	X
Loan Channel Dummies	X	X	X	X	X	X	X	X	X
Banking Relationship Dummies	X	X	X	X	X	X	X	X	X
N	308737	73089	235648	308737	73089	235648	308737	73089	235648

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: HMDA Regression Table Without Lenders Close To The Cutoff

	(1) Loans_2014	(2) HPML_2014	(3) Outside MSA Loans	(4) Portfolio Loans	(5) Portfolio LMI	(6) Portfolio Outside MSA
Small in 2013 Indicator	-36.93	-0.0234	-16.35	-46.54*	2.340	-5.435
	(32.27)	(0.0198)	(23.89)	(20.06)	(8.827)	(11.93)
Loans in 2013	103.1	0.0263	50.16	67.07	17.85	18.78
	(96.60)	(0.0591)	(71.52)	(60.05)	(26.42)	(35.71)
Loans in 2013_squared	-0.202	-0.0000531	-0.0993	-0.134	-0.0335	-0.0362
	(0.195)	(0.000119)	(0.144)	(0.121)	(0.0533)	(0.0721)
Loans in 2013_cubed	0.000132	3.51e-08	0.0000651	0.0000879	0.0000209	0.0000230
	(0.000131)	(7.99e-08)	(0.0000966)	(0.0000811)	(0.0000357)	(0.0000482)
Higher-Priced Loans	0.259*	0.00237***	0.427***	0.239**	0.248***	0.271***
	(0.127)	(0.0000776)	(0.0938)	(0.0787)	(0.0346)	(0.0468)
Portfolio Loans	0.0442	-0.0000157	-0.0442	0.648***	0.148***	0.103***
	(0.0630)	(0.0000386)	(0.0467)	(0.0392)	(0.0172)	(0.0233)
Credit Union Indicator	10.81	-0.00755	-19.46	7.926	5.222	-12.98
	(21.65)	(0.0133)	(16.03)	(13.46)	(5.923)	(8.005)
Non Depository Indicator	47.33	0.00731	-55.07*	-44.66*	-11.11	-14.13
	(29.88)	(0.0183)	(22.12)	(18.58)	(8.173)	(11.05)
Constant	-17203.4	-4.211	-8311.1	-11101.2	-3147.1	-3201.0
	(15875.1)	(9.721)	(11753.5)	(9868.6)	(4342.3)	(5868.8)
N	188	188	188	188	188	188

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Lenders with 425-475 or 525-575 loans in 2013