Predatory Lending in a Rational World[*]

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Abstract

Regulators express growing concern over "predatory lending," which we take to mean lending that extracts excessive rent from borrowers. We present a rational model of consumer credit in which such lending is possible, and we identify the circumstances in which it arises with and without competition. Predatory lending is associated with highly collateralized loans, inefficient rolling over of subprime loans, lending with disregard to ability to pay, prepayment penalties, balloon payments and poorly informed borrowers. Under most circumstances competition among lenders ameliorates predatory lending. We use our model to analyze the effects of prominent legislative interventions.

1   Introduction

Consumer credit has grown significantly in recent years. So, too, have consumer delinquencies, defaults, foreclosures and bankruptcies. While some incidence of negative outcomes is natural, there is widespread concern that the observed incidence is excessive, swollen by "predatory lending." We address this concern by analyzing a rational economy where predatory lending can potentially arise. We characterize the circumstances where such lending is and is not an equilibrium outcome, and also the equilibrium effects of the relevant laws.

What is "predatory lending"? According to a recent report by the U.S. General Accounting Office (GAO), it is an "umbrella term" denoting consumer welfare loss due to (i) "Excessive fees," (ii) "Excessive interest rates," (iii) "Single-premium credit insurance," (iv) "Lending without regard to ability to pay," (v) "Loan flipping," (vi) "Fraud and deception," (vii) "Prepayment penalties," and (viii) "Balloon payments." In this paper we propose the following simple and workable definition: a loan is predatory if the lender knowingly extracts more surplus from the borrower than the loan delivers to the borrower. We study the conditions under which such lending occurs in equilibrium, and show that they are largely consistent with the conditions identified by the GAO report.

The main features of the model are as follows. A consumer takes out a mortgage, which for simplicity we assume has two repayment dates, to buy a house from which she derives private benefits, and her income at each payment date can be either high or low. Additionally, at the first payment date she has an attractive consumption opportunity. Two low incomes are insufficient to repay the mortgage; two high incomes are sufficient to fund both the mortgage and the extra consumption, if the consumer refinances her mortgage to take cash out; and one high and one low can fund only the mortgage, though if the low income comes first the borrower must refinance to avoid foreclosure. In summary, the borrower in our model often has a liquidity problem at the first payment date with respect to either her existing mortgage or new spending, so she potentially benefits from refinancing her original mortgage. Whether or not she actually benefits depends on her future income, since this affects whether she ultimately pays off her debts and keeps her house. Consequently, the probability distribution of this income is crucial to the surplus generated by the refinancing.

The key assumption in our model is that, with regard to this distribution, the borrower's existing lender knows something the borrower does not. This assumption is intended to capture the learning that accrues during a lending relationship, through

observing the payment history, the time series of credit reports, and potentially other useful information that would be costly or impossible for a non-related party to gather,[1] but would be a cheap or free externality of an existing relationship. There are presumably other sources of informational advantage beyond existing relationships, but because this source is inexpensive, and because refinancing figures prominently in concerns regarding predatory lending, this is the one we focus on here.

Our model predicts two distinct forms of predatory lending, both of which fit well with anecdotal accounts of the problem. The first form that we identify occurs when the market price of the borrower's house is high, and the borrower's first period income is high enough to cover her scheduled mortgage payment. Predatory lending occurs when the lender offers to allow a borrower with poor future income prospects to refinance so that she can afford the new consumption opportunity. The lender is happy to refinance the borrower because he knows he will be able to foreclose on the borrower's house (in the words of the GAO report, "Lending without regard to ability to pay"). The borrower accepts the refinancing offer because she lacks the lender's forecasting ability with respect to her future income.

The second form of predatory lending we identify occurs when the borrower's first period income is low and she cannot afford her scheduled mortgage payment. Again, predatory lending occurs when the lender offers to allow a borrower with poor future income prospects to refinance. The lender refinances the borrower because absent refinancing the lender forecloses on the house immediately, while under refinancing the lender induces the borrower to continue paying down the loan, and can still foreclose at a future date. Refinancing hurts the borrower with poor income prospects because she continues making payments to save a house she is doomed to lose. However, she accepts the refinancing offer because she lacks the lender's forecasting ability with respect to her future income.

Our model delivers a number of predictions related to when predatory lending is most likely to occur. To summarize our main findings, predatory lending is associated with subprime markets, house price appreciation, and home improvement loans. Loan terms such as prepayment penalties and balloon payments engender predatory behavior. In contrast to the views of some credit-market observers, loan securitization has at least some mitigating effects on predatory lending.

Concerns about predatory lending have motivated a substantial amount of recent leg-

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[1]For example, because old credit reports may contain information that is no longer legal to sell (see 15 U.S.C. 1681c), a prospective lender can view only the current credit report, and not the earlier reports an existing creditor could have seen and kept.

islative activity. We close our analysis by using our model to consider the equilibrium effects of these credit market interventions.

The rational context of the predatory lending we analyze contrasts with the existing literature's focus on limits to rationality: difficulties with understanding loan terms, unwarranted optimism about future states, panic and confusion created by lending agents, and so on. We do not argue that such effects are unimportant. But the rational context delivers both its usual benefit of solid microfoundations of descriptions and predictions, and also an upper bound on the efficacy of combatting predation through consumer counseling. That is, if society were to succeed in eliminating irrationality-driven predation, the predation presented here would survive.

The paper is in eight sections. Section 2 covers the related literature, Section 3 lays out the model, Section 4 solves the monopoly case, Section 5 solves the competitive case, Section 6 explores the model's implications, Section 7 discusses regulatory interventions, and Section 8 concludes.

2   Related literature

In general, previous studies of predatory lending have generally stressed the combination of wilful misrepresentation by the lender and the borrower's inability to understand the true terms of the loan. Engel and McCoy [13], Renuart [29], and Silverman [34] are representative examples. Richardson [30] presents a formal model in which borrowers know that some lenders will deceive them, and this affects their decision to apply for credit; but once they have approached a dishonest lender, there is nothing they can do to avoid being taken advantage of. Predatory lending is often viewed as a subcategory of subprime lending, which is itself the object of study of a large literature — see, e.g., Crews-Cutts and Van Order [9], and Calem et al. [5], for recent contributions.

A number of studies by policy groups have tried to empirically assess the scope of predatory lending. For example, ACORN Fair Housing's study of Montgomery County, Pennsylvania, [1] documents the fraction of foreclosed loans that have high interest rates, balloon payments and pre-payment penalty clauses. A recent study by Hanson and Morgan [17] also addresses the significance of predatory lending. After first presenting a behavioral model in which lenders exaggerate households' future income in order to increase loan demand,[2] the authors attempt to detect predatory

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[2]In contrast to the existing paper, borrowers are assumed to be unable to infer any useful infor-

lending by payday lenders[3] by examining whether borrowers without college degrees and/or uncertain income are disproportionately more likely to be delinquent in states that are more permissive of payday loans.

A second strand of the empirical literature deals with the effects of laws aimed at combatting predatory lending. North Carolina's anti-predatory lending law has been the object of particular study — see e.g., Quercia *et al* [28], Elliehausen and Staten [11], and Litan [21]. Ho and Pennington-Cross [18] construct an index measuring the comparative severity and scope of anti-predatory lending laws in different states, and use this index to study the effect of these laws. We discuss anti-predatory lending laws, and the findings of these papers, in Section 7.

More generally, our paper bears some relation to the extensive literature on competition for partially informed consumers. Prominent contributions include (but are certainly not limited to) Stigler [35], Salop and Stiglitz [32], Wilde and Schwartz [38], and Varian [36]. Subsequent papers, such as those of Beales et al. [3] and Schwartz and Wilde [33], have sought to draw policy implications from these formal analyses. A recent article by Hynes and Posner [19] surveys a variety of issues related to the regulation of consumer finance, including the application of these models to the specific context of consumer loans. Ausubel [2] presents evidence that competition fails to eliminate profits in the credit card market, and sketches a model in which some borrowers are irrational and ignore the possibility that they will actually borrow using credit cards.

We consider borrowers who observe and understand the offers they receive, and interpret them correctly with respect to the information structure. The obstacle between them and the first-best outcome is not their rationality but rather the private information regarding their future incomes residing with their current lenders. This "informed investor" information structure has been explored in a variety of contexts, dating back at least as far as Rock [31].[4]

Finally, while our focus in this paper is on conditions under which predatory lending can arise when borrowers are rational, it is of course possible to analyze the same phenomenon using a model in which borrowers are "behavioral." Representative models of consumer credit and behavioral borrowers include those of Ausubel [2], Manove and Padilla [22], Della Vigna and Malmendier [10], and Gabaix and Laibson

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mation from the terms of the loan contract.

[3]For the an empirical analysis of payday lending, see Flannery and Samolyk [14].

[4]For recent examples in various financial contexts, see Manove et al. [23], Garmaise [16], Bernhardt and Krasa [4], Inderst and Mueller [20], and Villeneuve [37].

[15], though none of these papers consider predatory lending.

3   The Model

The model has three dates - 0, 1 and 2 - and we analyze the borrowing and lending decisions made at date 1, when a consumer has an existing mortgage from date 0, and may be offered refinancing. We assume this is a standard mortgage in which the mortgage payments are the same at each payment date (there is no interest rate risk in our model). We assume that all lending is non-recourse to the borrower, i.e. that an underpaid creditor has the right to foreclose by seizing any pledged collateral, selling it for its market value and paying himself up to the amount he is owed, with any residual going to the borrower, but the creditor has no right to take anything else. We also assume that the borrower has the right to prepay with no penalty by paying extra principal at date 1, and thereby owing the remaining principal accreted at the mortgage interest rate at date 2. In Section 6 we consider the effects on predatory lending of changing each of these three assumptions.

Everybody is risk neutral and maximizes expected terminal, i.e. date 2, utility, and all lenders have limitless cash and will loan for an expected return of at least 0.

Date 0 Decisions

The date 0 decisions which create the date 1 status quo are exogenous to the model. At date 0, a consumer, whom we call the Borrower, buys a house for H_0 and she (for expositional clarity, the Borrower is female and all lenders are male) finances some of the purchase price with a two-period mortgage. The loan amount is L_0, and the rate (expressed as a gross return) is $R \geq 1$, so the payment due to the date 0 lender, whom we call the Incumbent, at dates 1 and 2 is $P = \frac{L_0 R^2}{1+R}$, and the Borrower can prepay the mortgage at date 1 by paying $L_0 R$.

Borrower's Income

Predatory lending is generally viewed as occurring in *subprime* credit markets, a key property of which is substantial borrower repayment risk. (See Section 6 for a brief

discussion of prime markets.) Formally, on both dates 1 and 2 the Borrower receives a publicly-observable income of either K or I, where $K < I$. We sometimes refer to K as low income and I as high income, and we denote date t income as y_t. As of date 0, the Borrower and all potential lenders know that at each of dates 1, 2, the probability of high income for the Borrower is p. That is, the parameter p in our model corresponds to the Borrower's credit score. For simplicity, we assume that the Borrower's incomes at the two dates are uncorrelated, so that her date 1 income realization reveals nothing about her date 2 income prospects.[5] Finally, we also assume that entering date 1, the Borrower has no savings, only the house.

Incumbent's information

The key assumption in the model is that by date 1 the Incumbent has acquired some additional information about the Borrower's date 2 income prospects, while the Borrower herself still knows only that the probability of high date 2 income is p. That is, the lending relationship imparts information about the Borrower, and, considering that the typical consumer creditor can compare this information to that from thousands or even millions of other relationships, this information could tell the lender something private about the Borrower's prospects. This advantage does not turn on whether the Borrower knows and understands her credit score, since a credit score summarizes only part of her debt history, and none of her assets, income, or other relevant circumstances (see, e.g., Musto [25] and Chatterjee et al. [6]). For expositional convenience we focus on the extreme case in which the Incumbent is perfectly able to foresee the Borrower's date 2 income as of date 1.[6]

The assumption that at date 1 the Incumbent has an informational advantage relative to the Borrower is key because it creates the possibility that the Incumbent makes a date 1 loan that he knows makes the Borrower worse off. Indeed, welfare-reducing lending to rational borrowers would appear impossible without an informational advantage of this type. The Incumbent's advantage is common knowledge, and both the Borrower and other lenders must adapt to it.

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[5]If the probablity that the Borrower has high date 2 income differs across the two realizations of her date 1 income, then she will update her posterior beliefs to calculate the probability of high income, say $\hat{p}$, using the prior probability p. As long as period 1 income does not perfectly reveal period 2 income, then $\hat{p} \in (0, 1)$. Consequently, our results remain unchanged qualitatively with $\hat{p}$ replacing p in our analysis.

[6]For our results, the crucial assumption with respect to information structure is that the Incumbent has more precise information in comparison to the borrower. However, assuming perfect information for the Incumbent is inessential. It allows us to avoid one additional layer of notation.

Throughout the paper we refer to the Borrower as possessing good prospects — or as simply good — if the Incumbent privately knows that the Borrower's date 2 income is I, and as bad otherwise. So good vs. bad is a distinction that only the Incumbent can make directly at date 1; all others can only try to infer it from the Incumbent's actions.

Date 1 Developments

At date 1, when the Borrower is scheduled to make a payment P to the Incumbent, we assume she learns of a new spending opportunity, which we call the Project. The Project requires a payment of M, and it returns a non-pecuniary benefit of $M + S$, $S > 0$, at date 2. Both M and S are publicly observable. The Project could be tuition, a wedding, a medical procedure, or just general consumption. For now, we assume that the benefit is non-pecuniary and so cannot be seized by a lender in the event of default (in Section 6 we relax this). We assume there is no other spending opportunity at date 1, so that the Borrower still possesses at date 2 any cash she did not pay to the lender or spend on the Project.

Also at date 1, the market value of the house, which is H_0 at date 0, changes permanently to H, a draw from a distribution with lower bound H_d.[7] The market value of the house is publicly observable. The Borrower derives private benefits from living in the house. For simplicity, we assume the dollar-equivalent present value of these benefits is $X > 0$, and that these benefits accrue only if she still owns the house at date 2.[8]

Date 1 Lending

At date 1, the Incumbent, and potentially new lenders, may offer refinancing. This could be just a restructuring of the original loan, or instead it could include extra lending to allow the Borrower to undertake the Project. The borrower is free to reject any offers, but if she defaults on a payment then her lender can foreclose.

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[7]The assumption that the house value H is constant after period 1 is inessential. For instance, if instead H followed a random walk process agents would have to take an additional expectation when calculating their expected utilities, but our results would be qualitatively unaffected.

[8]Allowing for a benefit at each date prior to date 2 would not qualitatively change our results, provided it is not too large.

Chronology

To recapitulate, the main events of the model are as follows:

- Date 0: The Borrower buys a house with market value H_0, borrowing L_0 from the Incumbent, with promised repayment $P = \frac{L_0 R^2}{1+R}$ on dates 1 and 2.

- Date 1: The house is now permanently worth H, the Borrower receives income y_1 which is either K or I, and the Borrower has an opportunity to spend M on a project with non-pecuniary payoff $M + S$. This is all public information. It is also public information that the Incumbent privately knows whether $y_2 = I$, and that everybody else, regardless of y_1, puts probability p on $y_2 = I$. The Incumbent can foreclose at date 1 if underpaid, and he and potentially other lenders can offer refinancing. If the Borrower has sufficient cash she can spend M on the Project.

- Date 2: The Borrower receives income y_2 which is either K or I. If she still has the house then if she makes her scheduled payment she keeps the house, and if she does not make it then her lender can take the house in foreclosure. The Borrower's terminal utility is any cash on hand plus, if she has the house, the house's market value plus X, plus, if she spent M on the Project, $M + S$.

Parameter Restrictions

To focus the analysis on important real-life financial decisions, we impose some restrictions on relative parameter values:

- $2K < L_0$. The Borrower's worst-case income, two draws of K, is insufficient to repay the initial mortgage. Since $R \geq 1$, it follows that $K < P$.

- $2K < H_d$. The Borrower's worst-case income is not enough to buy the house from the lender, in case of foreclosure, even if the house's market value goes down.

- $K > R(RL_0 - I)$. If $y_1 = I$, the Borrower can pay off the initial mortgage even if $y_2 = K$. It follows that $I > P$,[9] and (since $R \geq 1$) $I + K > L_0 R$.

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[9] If an income of I then K is enough to repay the original mortgage, then certainly an income of I then I is also. Formally, since $I > K$ then clearly $I(1 + R) > R^2 L_0$, and hence $I > P$.

- $2I > L_0 R + M$. The Borrower can afford to both pay down the mortgage and undertake the Project if both income realizations are high.

- $L_0/2 + M > I$. Even if $R = 1$ and $y_1 = I$, the Borrower cannot make her mortgage payment and undertake the Project at date 1 with the cash available.

- $L_0 + M > I + K$. Even if $R = 1$, the Borrower cannot pay for both the house and the Project if at least one income realization is low.

- $pX > S$. Conditional on public information, the net surplus from undertaking the Project is negative if it adds the future high-income state to the states where the Borrower loses the house.

The next two sections characterize when equilibria with predatory lending arise in our model. Date 0 actions are taken as given, and the question is what lenders and the Borrower decide to do at date 1, when they can all observe the collateral value H and whether y_1 is high or low, but only the Incumbent observes whether y_2 will be high or low. In Section 4 we address the Monopoly case, where the Incumbent is the Borrower's only potential lender, and in Section 5 we address the Competition case, where new lenders without the Incumbent's private information can enter at date 1.

4 Monopoly

In this section we assume the Incumbent is the only possible lender at date 1. This allows us to gauge the effect of competition on predatory lending by later introducing competing lenders and comparing the equilibria. Throughout the paper we limit our attention to pure strategies.

Before we solve the model, we need a precise definition of what constitutes predatory lending, which we refer to equivalently as predation, in this context. In accordance with the discussion above, we say that:

Definition: *Predatory Lending occurs when a lender offers, and a borrower accepts, a loan which takes more expected surplus from the borrower than it provides, relative to the borrower's expected surplus had the loan not been accepted, conditional on the lender's information.*

The goal of this section is to characterize the incidence of predation arising in the model's equilibria. And while predation could in principle involve good borrowers

— borrowers whose repayment prospects are better than they realize — our focus, consistent with the public and regulatory concern, will be on predation involving bad borrowers.

At date 1, the Borrower's income realization is either high or low. If income is low, the Borrower cannot afford both the house and the Project, and the operative refinancing question is whether to try to just keep the house, which will not be possible if the next income is low too. If income is high, the Borrower *can* afford both the house and the Project, provided the next income is also high, but if the next income is low she can afford only the house, and will therefore lose the house if she undertook the Project. So the Incumbent's information would help low-income borrowers avoid wasting money on doomed mortgages, and help high-income borrowers avoid endangering their mortgages with excess spending. But the Incumbent's incentive to share this information is weak, since he can benefit from extracting more date 1 payment. We consider the low-income scenario first.

Low Income at Date 1

A Borrower with $y_1 = K$ cannot make her first mortgage payment, and so will default if she does not refinance. Since the Incumbent has no recourse to her cash, she will keep her K if she defaults, and the Incumbent will foreclose, which yields him $\min \{L_0 R, H\}$, with the residual $\max \{0, H - L_0 R\}$ reverting to the Borrower. The Borrower's terminal utility is therefore $2K + \max \{0, H - L_0 R\}$ if she gets K at date 2, and $K + I + \max \{0, H - L_0 R\}$ if she gets I.

Suppose the Incumbent makes a take-it-or-leave-it refinancing offer: pay me the K you have at date 1, and if you also pay me P_2 at date 2, then the house is yours. If the Incumbent proposes $P_2 \leq K$ his total recovery is less than he obtains if the Borrower simply defaults, since by assumption $2K < H$ and $2K < RL_0$. Thus, the only refinancing offers that the Incumbent contemplates are those with $P_2 > K$. We also know that $P_2 \leq I$, since that is the maximum possible payment.[10] So if the Borrower accepts the offer, she can successfully repay if and only if $y_2 = I$. Finally, if the Incumbent optimally makes the same offer regardless of y_2, then the Borrower learns

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[10]If the Incumbent sets $P_2 > I$ then the Borrower knows that default and foreclosure are inevitable. In this case, refinancing fails to increase the overall surplus of the Incumbent and the Borrower, so any refinancing offer acceptable to both the Incumbent and the Borrower is equivalent to no refinancing and immediate default.

nothing about y_2 from the offer being made, and therefore calculates a probability p that she will get $y_2 = I$, pay P_2 out of that, and keep the house, giving her terminal utility $I - P_2 + H + X$, and she puts probability $1 - p$ on getting $y_2 = K$, keeping it, and losing the house in foreclosure, for a terminal utility $K + \max\{0, H - P_2\}$. Our first result is that there is always an equilibrium where the Incumbent makes an offer that the low-income Borrower accepts, and which the Incumbent knows makes the bad-prospects borrowers worse off than if they had just defaulted on the original mortgage:

Proposition 1 *Suppose the Borrower's date 1 income is low ($y_1 = K$). Then there exists an equilibrium in which the Incumbent offers to refinance the loan, the Borrower accepts, and the loan is predatory.*

So predation of distressed borrowers is always possible. The Incumbent knows when the Borrower's goal of owning the home is unattainable, but strings her along anyhow to receive payments the Borrower is better off withholding. Note that this form of predatory lending does not reduce total social surplus, since with or without refinancing the Borrower ends up losing her house when her date 2 income is low. Instead, refinancing transfers resources from borrowers with poor income prospects to lenders.

Predatory lending occurs here because the Incumbent's actions do not reveal his private information to the Borrower. The reason is that if the Incumbent does not refinance, the amount he can recover is bounded above by the value of the Borrower's house. Since the house will still be available at date 2, this means there are refinancing terms that the Incumbent is prepared to offer even when he knows the Borrower has bad prospects. *A fortiori*, the Incumbent is prepared to offer these same terms to the Borrower with good prospects.

High Income at Date 1

To the Borrower, high date 1 income means she can definitely pay down the mortgage and keep the house, or instead risk the house to undertake the Project. To the Incumbent, it means an additional lending opportunity, but one that does not involve or create any new collateral. Since a bad borrower repays nothing at date 2, the value of the existing collateral is intuitively the key to whether a bad borrower gets a loan, and consequently, whether predatory lending is possible. As the next proposition establishes, a sufficiently high house value H is both necessary and sufficient for a predatory equilibrium to exist.

Proposition 2 *Suppose the Borrower's date* 1 *income is high* $(y_1 = I)$. *There exists an equilibrium with predatory lending if and only if* $H \geq (RL_0 - I) R + M$ *and* $S \geq (1 - p) X$. *In such equilibria, the Incumbent offers new loan terms that enable the Borrower to afford the Project, and the uninformed Borrower accepts.*

When collateral is high enough, the Incumbent finances the new spending even when he knows this means the Borrower will lose the house she could have kept. This is despite the fact that the Borrower's surplus from the new spending is less than her surplus from the house. Thus, predatory lending destroys total social surplus here — in contrast to the form of predatory lending that occurs when the Borrower's date 1 income is low. As such, the Incumbent's inability to commit not to lend to a Borrower with bad prospects lowers his profits.

As in the case of low income at date 1, predatory lending arises only when there exist loan terms that the Incumbent is prepared to offer when he knows the Borrower has bad prospects. Since the Borrower with high initial income will repay her mortgage balance with interest R, the Incumbent is prepared to offer new financing only if doing so nets him at least this return. This occurs precisely when the Borrower's house is valuable enough to cover both this return and the additional cash M.

If, on the other hand, the house is not this valuable, then in equilibrium the lender extends new credit only to the good prospects:

Proposition 3 *Suppose the Borrower's period* 1 *income is* I. *If* $H < (RL_0 - I) R + M$ *there is an equilibrium in which only good prospects are refinanced and undertake the Project. There is no equilibrium in which bad prospects are refinanced.*

Thus, there is neither default nor predatory lending when collateral is low.

To summarize, when a borrower's only source of refinancing is her original lender, she may not benefit from the lender's private information about whether refinancing is harmful. She may continue trying to pay a mortgage she should walk away from, and, if her house is sufficiently valuable, may finance new consumption she cannot ultimately afford. The next section considers whether her situation improves when her lender faces competition.

5   Competition

To borrowers with monopolist lenders, refinancing brings two potential benefits -
for low-income borrowers, keeping the house, and for high-income borrowers, extra
consumption. To borrowers with competing lenders, there may be a third benefit
- a lower interest rate. In this section there are, in addition to the Incumbent, at
least two more lenders who can make refinancing offers to the Borrower. Like the
Incumbent, they have limitless cash to lend, are risk neutral and require an expected
return of 0, but unlike the Incumbent, they possess only public information about the
Borrower's prospects. The Borrower knows the Entrants have no private information,
and the Borrower can see which offer is from whom.

The mechanics of competition are that all offers are simultaneous, and lenders are
bound to honor terms if their offers are accepted. The Borrower chooses which, if any,
offer to accept, and is assumed to choose the Incumbent's offer when she is otherwise
indifferent. If the Borrower is indifferent between multiple offers from Entrants,
and strictly prefers them to the Incumbent's offer, then she randomizes between the
Entrant offers.

As before, we begin with the case of low date 1 income, and then address high income.

Low Income at Date 1

A key quantity in our analysis is the date 2 loan payment P_2^K that makes an unin-
formed Entrant indifferent between lending and not lending, given by

$$P_2^K = \begin{cases} RL_0 - K & \text{if } RL_0 - K \leq H \\ \frac{1}{p}\left(RL_0 - K - (1-p)H\right) & \text{if } RL_0 - K > H \end{cases}.$$

To see this, note that if $RL_0 - K \leq H$ a loan requesting payment $RL_0 - K$ is fully
collateralized; while if $RL_0 - K > H$, then P_2^K defined above is more than H, and so
the entrant receives P_2^K with probability p and H with probability $1 - p$.

Proposition 4 *Suppose the Borrower's date 1 income is low ($y_1 = K$). If $pX \geq$
$RL_0 - H$ there is an equilibrium in which the uninformed Borrower refinances her
loan by paying K at date 1 and agreeing to pay P_2^K at date 2. Refinancing makes the
uninformed Borrower strictly better off, but is predatory when $H < RL_0$. There is
no equilibrium in which the Borrower who has bad prospects finances at terms more
disadvantageous to her than P_2^K.*

Between them, Propositions 1 and 4 allow us to gauge the effect of competition on predatory lending when the Borrower's income at date 1 is low. As our next result establishes, in many cases competition ameliorates the problem of predatory lending.

Proposition 5 *Suppose date 1 income is low ($y_1 = K$). If $H \geq RL_0$ competition eliminates predatory lending. If $H \in (RL_0 - \min \{pX, K\}, RL_0)$ competition reduces predatory lending in the following sense: there is an equilibrium under monopolistic conditions in which the bad Borrower's utility loss strictly exceeds the maximum utility loss under competitive conditions. If $H \leq RL_0 - \min \{pX, K\}$ competition has no impact on predatory lending.*

Competition provides the Borrower a zero cost of funds, but whether that eliminates predation depends on whether she surrenders any of her valuable limited liability by refinancing. By defaulting, a bad borrower realizes $2K + \max \{0, H - RL_0\}$, her two incomes plus the value of her limited liability. If $H \geq RL_0$ then she does equally well refinancing her RL_0 liability at zero interest, because she gets $2K + H - RL_0$ either way. But if $RL_0 - K < H < RL_0$, i.e. the refinancing is fully collateralized after the date 1 payment of K, but the original mortgage was not, then by refinancing the borrower loses the value of the limit to her liability: she still gets $2K + H - RL_0$ from refinancing, but she would have done better with the $2K$ from defaulting. It still helps to have a zero interest rate rather than a positive one, so competition can still reduce the severity of the welfare loss.

Competition ceases to help, however, when H falls below $RL_0 - pX$. In this region, the Entrants' willingness to make zero expected returns on date 1 loans is irrelevant because the Incumbent is already making negative expected returns on date 1 loans. To see this, observe that when $H < RL_0 - pX$, an uninformed Borrower expects negative surplus from zero-interest-rate refinancing. Thus, the Borrower needs a negative rate to forego defaulting. This rules out the Entrants but not necessarily the Incumbent, because unlike the Entrants, the Incumbent suffers a bad borrower's default in the status quo. That is, by refinancing both good and bad types at a negative rate, the Incumbent is providing some value to good types but also getting more payment out of bad types whose default he is already certain to bear.

High Income at Date 1

Competition can help the high-income borrower the same way, by reducing her interest rate. And since the Incumbent's expected return on the initial mortgage is non-

negative, he will not offer to refinance into a negative-return loan. Thus, in contrast to the low-income case, in the high-income case the Entrants can break even at any terms the Incumbent might offer to both good and bad prospects. Entrants are therefore always potential competitors to the Incumbent in any situation that might involve predation, and we can see that this generally succeeds in weakening predation, relative to monopoly, though there is a parameter region where it can lead to predation when it was impossible under monopoly.

The high-income borrower needs a cash-out refinancing loan of $RL_0 - I + M$ if she is to finance the consumption: $RL_0 - I$ to repay the current mortgage, and M for the consumption, with a scheduled date 2 repayment of P_2.[11] As in the low income case, a key quantity in the analysis is the date 2 payment that enables an uninformed Entrant to break even on the average Borrower (i.e., taking into consideration the Borrower may have either good or bad prospects). We denote this payment P_2^I; it is given by

$$P_2^I = \begin{cases} RL_0 - I + M & \text{if } RL_0 - I + M \leq H \\ \frac{1}{p}\left(RL_0 - I + M - (1-p)H\right) & \text{if } RL_0 - I + M > H \end{cases}.$$

We can now characterize the predatory equilibria:

Proposition 6 *Suppose the Borrower's date 1 income is high ($y_1 = I$). An equilibrium with predatory lending exists if and only if*

$$RL_0 - I + M \quad \leq \quad H, \tag{1}$$
$$S - (1-p)X \quad \geq \quad 0, \tag{2}$$
$$(R-1)(RL_0 - I) \quad < \quad X - S. \tag{3}$$

In any equilibrium, the maximum utility loss of the Borrower with bad prospects is $(RL_0 - I)(R-1) - (X-S).$

How does this compare to the monopoly case? Contrasting Propositions 2 and 6 we see that when predatory lending is possible in the monopoly case competition ameliorates the problem:

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[11]Of course, the Entrant is free to offer different refinancing terms. However, offering the Borrower either a smaller or larger amount at date 1 serves no purpose.

Proposition 7 *Suppose date 1 income is high ($y_1 = I$). If conditions are such that predatory lending is possible under monopolistic conditions, then (except for the boundary case $S = (1 - p) X$) competition either eliminates predatory lending or reduces its severity, in the sense that the biggest utility loss of the bad prospects Borrower is lower under competitive conditions.*

Proposition 7 shows that when predatory lending is possible under monopolistic conditions, it is either eliminated or ameliorated by an increase in competition. The reason is the same as for competition's beneficial effect when date 1 income is low: competition improves the terms of refinancing.

However, if date 0 loan terms are such that $R > 1$, competition can have the opposite effect: it can allow predatory lending to occur in circumstances where it is not possible under monopoly. Specifically, if $RL_0 - I + M \leq H < R(RL_0 - I) + M$ then predation is possible under competition but not monopoly. This is because, with $H < R(RL_0 - I) + M$, a monopolist lender is better off at date 1 *not* refinancing a bad prospect, but rather just earning R on the remaining balance. But when facing competition, the Incumbent can no longer earn more than zero net return going forward, and $H = RL_0 - I + M$ is just enough for him to earn zero net return while financing the consumption of bad prospects. So by reducing the returns to informed lenders, competition reduces the collateral required by informed lenders, and in some cases the result is that bad prospects become able to engage in collateralized borrowing that is not in their best interests.

If the home value is below this range, so lenders cannot break even lending to bad prospects, then we get the Borrower's optimal outcome — cash-out financing only for those who can afford it, and zero-interest refinancing for everyone:

Proposition 8 *Suppose $y_1 = I$ and $H < RL_0 - I + M$. If $X > RL_0 + M + S - I - H$, then in every equilibrium only good prospects get loans that enable extra consumption. In these equilibria, the good prospects refinance their loan by paying $I - M$ at date 1 and agreeing to pay $RL_0 - I + M$ at date 2 whereas the bad prospects refinance their loan by paying I at date 1 and agreeing to pay $RL_0 - I$ at date 2.*

To summarize the results of this section, competition at the refinancing stage reduces the interest rate, and in general this either eliminates or ameliorates the welfare loss suffered by borrowers with poor future income prospects.

6 Implications

In this section we use our framework to develop predictions for when predatory lending is most likely to be observed. The first few implications that we discuss stem directly from the comparative statics of our basic model; subsequent implications involve perturbations of our basic model.

Subprime markets

Predatory lending is typically viewed as a subclass of subprime lending. Our analysis suggests why this is the case.

First, Propositions 5 and 7 indicate that predatory lending is more likely to occur under monopolistic conditions — which, in turn, are much more likely to obtain in subprime markets.

Second, a necessary condition for predatory lending in our model is that a borrower has a substantial risk of low future income, and the lender has some ability to identify which types of borrower are most at risk. This condition is much more likely to hold in subprime than prime markets.

For comparison purposes, we briefly describe the equilibrium outcome in prime markets — which we take to be characterized by a negligible risk of low borrower income at date 2 (i.e., $p = 1$). If a prime borrower suffers a temporary shock to her income at date 1 (i.e., $y_1 = K$), then she is able to refinance. Likewise, if her date 1 income is sufficient to cover her loan payment, she is able to restructure her loan so as to afford the new consumption. Since the prime borrower knows her date 2 income will be good, there is no danger of her losing her house. As such, refinancing is never predatory. Moreover, if the prime market is competitive, refinancing occurs at an interest rate equal to lenders' cost of funds.

Predatory lending and house price appreciation

Borrowers with current income high enough to cover their existing loan payments are at risk only when the value of their homes is sufficiently high (Propositions 2 and 6). Arguably this is the form of predatory lending that is most widely reported in the

popular press — a borrower with substantial equity in her house and whose current loan payments are affordable is persuaded to refinance, and the new loan payments are no longer affordable. Consequently, following an appreciation in house prices, more subprime borrowers will become vulnerable to predatory lending.

Predatory lending and spending crises

Borrowers with current income above scheduled repayments but who derive high utility from additional spending (high S) are at risk of falling victim to predatory lending. This squares well with popular perception, according to which borrowers are preyed upon in moments of personal need — care of sick relatives being a prime example. Note, however, that if S is very high, that is, if borrowers derive a great deal of surplus from refinancing, lending would not be predatory. In this case, the assumption $pX > S$ no longer holds. Economically, borrowers would agree to loan terms that they know place them at risk of losing their home, but the urgency of current consumption needs justifies this trade off.[12]

Predatory lending and income crises

Borrowers with low current income are at risk from predatory lending for a wider range of house values (Propositions 1 and 4). Here, given that it is hard for a lender to garnish a delinquent borrower's income, the lender has a strong incentive to restructure loan terms so that the borrower can afford to pay. Although such forbearance might at first seem generous, it may in fact lower the borrower's well-being. In our analysis, lenders can know that a borrower will never succeed in paying off her house, in which case "forbearance" amounts to stringing the borrower along to extract more repayment. We abstract from any benefits the consumer receives from the house while being strung along, but provided these are not too big, she would be better off just walking away from the house instead.

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[12]Borrowers who place high value on their homes (high X) are especially at risk of predatory loans when they have low income. Conversely, however, they are less likely to agree to predatory loan terms when they have high income, for the simple reason that they do not want to jeopardize their prospects of staying in their homes.

The analysis so far assumes the mortgage is non-recourse, so that underpaid lenders have access only to the house, not to other assets such as cash. In some states this reflects the letter of the law: so-called deficiency judgements, whereby a lender can collect out of a borrower's other assets, are forbidden in nine states (California is the best known example).[13] But even in states where lenders have recourse, borrowers who have decided to default have time to consume or convey wealth (perhaps fraudulently) before the lender's recourse becomes active, so our assumption of no recourse corresponds to the assumption that such consumption and conveyance is efficient, complete and unpunished.

Nonetheless, it is worth asking how our analysis would change if we instead modeled the lender as having a greater ability to seize the borrower's income in the event of default. Specifically, we consider the opposite extreme in which if the Borrower fails to make her date 1 loan payment, the Incumbent can garnish as much of the Borrower's date 1 and date 2 income as is needed to repay the loan.

The effect of this change is most clearly exhibited by the low-income Incumbent-monopoly case. When the Borrower's date 1 income is protected following default, the Borrower is at risk of taking a predatory loan for all house values (Proposition 1). If instead the Incumbent is able to garnish the Borrower's income, he collects $\min\{H + K, RL_0\}$ from the Borrower at date 1, and $\min\{y_2, R(RL_0 - \min\{H + K, RL_0\})\}$ at date 2. A necessary condition for predatory lending to occur is that under refinancing the Incumbent is able to strictly increase his total payment from the Borrower with bad prospects. This is impossible if the lender already gets all the income of the bad-prospects borrower in default, i.e., if

$$R(RL_0 - \min\{H + K, RL_0\}) \geq K,$$

or equivalently,

$$H \leq RL_0 - K - \frac{K}{R}. \tag{4}$$

Thus, in contrast to the non-recourse case, predation by lenders with recourse is not possible when the Borrower's date 1 income is low and her house value is also low.

To summarize, laws that protect borrowers' incomes encourage lenders to seek alternate routes to those funds. Offering predatory refinancing to borrowers destined to default is one such route.[14]

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[13]See, e.g., Pence [27].

[14]Although laws that protect borrowers' income leave borrowers more exposed to predatory lend-

Predatory home improvement loans

Discussions of predatory lending often link it to home-improvement loans. We can address this link by recasting the extra date 1 spending as home improvement. In this case, the Project is to spend M to increase the market value of the house to $H + M$. As before, the Borrower derives a surplus of S from this home improvement.[15]

Economically, the key difference between a home improvement loan and the consumption loans analyzed thus far is that the money spent on home improvement can be recovered by the lender upon default. Given that high home values engender predatory lending, it follows that home improvement loans are more likely than other forms of lending to involve predation. In particular, the minimum house value that makes a borrower vulnerable is lower: $(RL_0 - I) R$, instead of $(RL_0 - I) R + M$.

Proposition 9 *Suppose the Borrower's date 1 income is I and the Incumbent enjoys a monopoly position. If the Project is home improvement, then there exists a predatory equilibrium if and only if $H \geq (RL_0 - I) R$ and $S \geq (1 - p) X$.*

Predatory lending, prepayment penalties, and balloon payments

Thus far we have assumed that the initial date 0 loan terms do not include a penalty for early repayment. However, commentators often associate such penalties with predatory lending (see, for example, the GAO report discussed in the Introduction) and predatory lending legislation often directly restricts them (e.g. Section 30 of Illinois' High Risk Home Loan Act, Public Act 93-0561).

The main impact of prepayment penalties is on the degree of monopoly power enjoyed by the Incumbent at date 1, as higher prepayment penalties on the initial loan entrench the Incumbent's position. As our analysis demonstrates, competition

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ing, they do nonetheless raise the utility of borrowers. For example, when inequality (4) holds a borrower with low income K in both periods ends up with zero utility absent borrower protection laws — she loses her house and all her income. In contrast, under a law which protects her income she keeps her date 2 income even when she is the victim of predatory lending. As such, borrower protection laws do provide borrowers with some protection — but predatory lending reduces the amount.

[15]For expositional convenience we continue to assume that the surplus S accrues immediately. However, our results would be little changed if instead the the borrower gained S only if and when he keeps his house at the end of date 2.

generally reduces the extent and severity of predatory lending, so our analysis is generally consistent with the view that prepayment penalties are an important element of predatory behavior.[16]

As with prepayment penalties, many observers have expressed particular concern about loan contracts that call for balloon payments, i.e. outsized terminal payments that typically necessitate new financing. We can approximate the balloon structure by making the initial mortgage a one-payment loan due at date 1. The main difference between this loan and the two-period loan we analyzed in our basic model is that now the Borrower never has enough income to meet his date 1 payment, so he must always seek refinancing. As we have seen, in this case there always exists an equilibrium featuring predatory lending, because an Incumbent who expects eventual default will still contrive to extract more payment.

Predatory lending and loan securitization

The incidence of predation has also been linked to the practice of securitizing after origination (see the GAO report, and Engel and McCoy [13]). The standard argument is that the lender who originates the loan cares little about whether or not a borrower is able to repay since he will sell the loan. However, our analysis suggests a countervailing effect, whereby securitization may actually curtail predatory lending.

Consider again the form predatory lending takes when a borrower's income falls below her scheduled loan payment, where the lender refinances to extract more cash before liquidating. If the house value is low enough this extra cash does not eliminate the lender's loss on the original mortgage, but instead only reduces it. Therefore, the refinancing is profitable for the lender facing the loss, even though the refinancing loan itself loses money.

Under securitization, the original lender sells the loan to a second party, and may or may not bear the cost of a later default.[17] Thus, there are two cases to consider, corresponding to whether or not the Incumbent has retained exposure to the original mortgage. If he has then our existing analysis applies. But if he has not then he cares only about whether the refinancing loan itself makes money, so if collateral

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[16]In this comparison we have ignored the effect of prepayment penalties on the initial interest rate R. If the initial loan market is competitive, forward-looking borrowers should demand a lower interest rate to compensate them for the increase in monopoly power enjoyed by the incumbent lender.

[17]See, e.g., "Bad Loans Draw Bad Blood," *Wall Street Journal*, October 9, 2006.

is low enough he will not offer a loan to a Borrower whom he knows to have bad prospects. As such, securitization mitigates this variety of predatory lending. Note that this argument applies to both the monopolistic and competitive refinancing environments.

7   Legislative interventions

Anti-predatory lending laws

A number of recently introduced laws explicitly aim to combat predatory lending. The standard form of predatory lending laws is two-part: loans with sufficiently high interest rates or fees are labeled "high-cost," and then the form of high-cost loans is tightly restricted. A representative example is the North Carolina Predatory Lending Law of 1999, widely regarded as the model for other states' laws. Loans of no more than $300,000 with interest rates at least 8 percent above Treasuries are considered high cost, and with high-cost loans there can be no call provision, balloon payment, negative amortization, interest-rate increase after default, advance payments or modification or deferral fees. Furthermore, there can be no lending without home-ownership counseling, or without due regard to repayment ability (though repayment ability is presumed if the borrower's debt payments are $\leq 50\%$ of his current income[18]). The Federal Home Ownership and Equity Protection Act (HOEPA) of 1994 is similar.

In general, our analysis is consistent with the legislative intent of such laws.

First, if a prohibition on lending without "due ability to pay" were actually enforceable, it would directly eliminate the form of predatory lending that occurs in our model. In practice, the enforcement hurdle appears hard to clear — it would require a regulator to have access to the same information advantage as the Incumbent lender has acquired by virtue of its lending activity.

Second, the specific clauses of the law target aspects of lending that our analysis suggests are indeed associated with predatory behavior. In particular, the concern with high-interest loans is consistent with our prediction that predatory lending is most likely to occur in subprime and/or monopolistic conditions; and the prohibitions on balloon payments and pre-payment penalties also make sense in terms of our model.

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[18]See http://www.responsiblelending.org/pdfs/longsumm.pdf.

(See Section 6 above for a discussion of all three issues.)

Third, by subjecting high-interest loans to additional requirements, anti-predatory lending laws may lead lenders to avoid such loans entirely. That is, anti-predatory lending laws may have a similar effect to explicit usury laws. The impact of usury laws in our model are to a large extent standard. A very strict usury law would throttle all lending. A very soft usury law would have no effect. A moderate usury law will in general make borrowers better off. There are several effects. (I) A usury law may reduce the initial interest rate. (II) A usury law may directly reduce the rate at which a borrower can refinance. (III) Moreover, by lowering the initial interest rate, the borrower's alternative to refinancing is improved. This also acts to lower the refinancing rate.

However, our analysis also suggests that in some circumstances usury laws can actually make borrowers worse off. Specifically, consider the case in which the Borrower in our model has high income at date 1. In the benchmark monopoly case (see Proposition 2) she is at risk from predation if and only if $H \geq (RL_0 - I)R + M$. So if a usury law forces a small reduction in the original interest rate R, it can push a Borrower with bad prospects from a situation in which she simply pays off her original loan (total cost $(RL_0 - I)R + I$) and keeps her house, to a situation in which she accepts refinancing, makes approximately the same net payment to her lender, gains additional surplus S, but loses her house for sure. The Borrower's utility is lower in the latter case, since by assumption the surplus associated with home ownership, X, exceeds the surplus of new consumption, S.

The economic intuition underlying this perverse effect is that a lender only finds it worthwhile to offer a borrower funds for additional consumption if her house value is high enough compared to the amount currently owed by the borrower. A reduction in the interest rate lowers this amount, and so makes the lender more prepared to offer an additional loan. Moreover, note that this perverse effect of usury laws stems from an expansion of credit (as opposed to a contraction of credit, which is the standard concern).

As we noted in reviewing the literature in Section 2, a number of papers have studied the effect of state-level anti-predatory lending laws. North Carolina's law has received particular attention, and there is broad consensus that lending activity decreased after its introduction. Ho and Pennington-Cross [18] expand the scope of study beyond North Carolina, and find that when anti-predatory laws are more restrictive, credit has declined by a greater amount.

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Quercia *et al [28]* claim that most of the lending decrease in North Carolina was due to reduced predatory lending, which they measure by examining loan terms for prepayment penalities, ballon payments, and high loan-to-value ratios. Other authors (e.g., Elliehausen and Staten [11], and Litan [21]) sharply disagree with this finding, and claim that the law led to a reduction in overall subprime lending, which they take to be a negative outcome.

The findings that subprime credit decreased overall, and may have decreased most rapidly in the segment of the market using "predatory" terms, are both consistent with our analysis. Moreover, our analysis casts doubt on the negative assessment of the law articulated by Elliehausen and Staten [11] and Litan [21]: in our model, prepayment penalties and ballon payments are associated with predatory lending, but are not essential for it. As such, a reduction in subprime lending does *not* by itself imply a large negative impact on welfare, as these authors suggest.

Community Reinvestment Act

As described by the Federal Reserve, the Community Reinvestment Act of 1977, revised 1995, "...requires that each depository institution's record in helping meet the credit needs of its entire community be evaluated periodically. That record is taken into account in considering an institution's application for deposit facilities."[19] This law is not a response to predatory lending but, as others have noted,[20] it may have relevant consequences.

To the extent this law encourages local banks to compete with the big subprime lenders to offer credit in their communities, this law pushes uninformed entrants into the market, thereby moving the local economy from the monopoly to the competitive case. As discussed above, our model predicts that is generally a benefit to borrowers, since under many circumstances competition either eliminates or ameliorates predatory lending. A notable feature of this effect is that when predatory lending is eliminated the volume of lending may actually *decrease*, and this decrease benefits the poorest borrowers in the community. To see this, simply note that predatory lending necessarily entails loans to borrowers with both good and bad prospects; while from the proof of Proposition 6, when predatory lending is eliminated at most one of the two borrower types receives financing.

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[19]http://www.federalreserve.gov/dcca/cra/
[20]See, for example, Marisco [24].

The chief exception to the beneficial effects of competition occurs when both borrower income and collateral are low, such as in a recession (see Proposition 4). In this case predatory lending occurs when the Incumbent lender makes a loss-making loan to a borrower with poor future income prospects in order to extract additional funds from the borrower. Even though the Incumbent loses money on the loan, he loses less than under the alternative of not offering refinancing. Clearly in this case the borrower is not helped by Entrants willing to break even.

If the local banks are rewarded for closing loans, rather than just offering them, this corresponds in our framework to a below-zero required return. That is, when Entrants need to break even they affect the equilibrium but do not actually lend, so to lend they must discount further. This translates to better terms for borrowers, though again, in a deep-enough recession there may be no effect because the discounting necessary to undercut the Incumbent may be too much.

8   Conclusion

We analyze predatory lending in sub-prime lending markets in which the creditors enjoy an informational advantage over the borrower and other potential competitors about the likelihood of default. We provide both a definition and a working model of predatory lending in this framework.

Overall, our analysis associates predatory lending with monopolistic lending, high collateral values and (inefficient) rolling over of loans with disregard to ability to pay. Loans for creating collateral, such as those for home purchase and improvement, are particularly susceptible. Competition at the refinancing stage generally lowers interest rates, with the result that the excess rent extraction due to predatory lending is generally either completely mitigated or at least ameliorated.

Many of the predictions of our model correspond to the common impressions of the conditions under which predatory lending occurs, and with the main focus of legislators' concern. There remains the question, however, of how one would actually determine whether a loan is predatory according to our definition. We conclude with a discussion of this issue.

There are two significant challenges that the econometrician must overcome. First, he or she must quantify the borrower's welfare loss from foreclosure, and the borrower's welfare gain from additional consumption (the Project, in our model). While

it is naturally impossible to measure either value for any individual borrower, the population distributions of both can be estimated using standard revealed preference techniques. Second, the econometrician must be able to proxy for the lender's information set at the time he made the loan. By assumption, the lender's information is not possessed by the borrower, and so it is unlikely that the econometrician is able to directly observe it either. However, at least in principle it is possible to *indirectly* observe the lender's information, by examining the correlation between lending activity and house (collateral) values. That is, a prediction of our model is that borrowers who a lender has negative information about receive "cash out" refinancing only when house values are high. One could use this prediction to determine which configurations of borrower characteristics are associated with negative lender information. The implementation of this empirical program lies beyond the scope of the current paper, and we defer it for future research.

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9 Appendix: Mathematical proofs

Proof of Proposition 1: The proof we offer for Proposition 1 is constructive: we exhibit an equilibrium in which predatory lending occurs. For expositional ease the equilibrium we construct gives the Incumbent an arbitrarily small surplus from refinancing. We want to stress, however, that in general there exist other equilibria in which predatory lending occurs and the Incumbent receives non-negligible surplus. This will be clear from Proposition 5, where we compare the severity of predation under monopolistic and competitive lending conditions.

Suppose the Borrower expects the Incumbent to make the following offer, independent of his private information: in place of your existing mortgage, pay me K today and $\hat{P}_2$ at date 2, where $\hat{P}_2 = \min\{H, L_0 R\} - K + \varepsilon$, and $\varepsilon > 0$. Suppose also that the Borrower's off-the-equilibrium-path belief is that if the Incumbent asks for more payment, then the Incumbent knows that $y_2 = K$. We will show that there is always a ε small enough that, in equilibrium, the Incumbent makes the offer, the Borrower accepts it, and it makes the Borrower worse off if $y_2 = K$.

First, we observe that if the Borrower accepts, she pays $\hat{P}_2$ at date 2 if and only if $y_2 = I$. If $y_2 = K$ then she is incapable of paying $\min\{H, L_0 R\} - K + \varepsilon$, since $H > 2K$ and $RL_0 \geq L_0 > 2K$. If $y_2 = I$, then she *can* pay, since $I + K > RL_0$, and she *will* pay, since $\hat{P}_2 < H$ implies that if she does not pay then the Incumbent takes $\hat{P}_2$ out of the house value anyway, and the Borrower loses the surplus X.

Next, we show that the Borrower will accept for small enough ε. First consider the case $M > K + \max\{0, H - L_0 R\}$, so it is not possible for a defaulting borrower to undertake the Project. If the Borrower does not accept then if $y_2 = K$ then her terminal utility is $2K + \max\{0, H - L_0 R\}$, and if $y_2 = I$ then her terminal utility is $K + I + \max\{0, H - L_0 R\}$. If she does accept then if $y_2 = K$ her terminal utility is $2K + \max\{0, H - L_0 R\} - \varepsilon$, and if $y_2 = I$ then her terminal utility is $K + I + \max\{0, H - L_0 R\} + X - \varepsilon$. Since the Borrower puts probability p on $y_2 = I$, her expected terminal utility is increased by accepting if $\varepsilon < pX$, and this decreases her expected welfare if $y_2 = K$.

Now consider the case $M \leq K + \max\{0, H - L_0 R\}$, so a defaulting borrower can afford the Project. If the Borrower rejects the offer to invest in the Project, she gets $I + K + \max\{0, H - L_0 R\} + S$ if $y_2 = I$, and $2K + \max\{0, H - L_0 R\} + S$ if $y_2 = K$. Her expected utility is higher by $S - pX + \varepsilon$ than her expected utility from accepting the offer. Since $S < pX$ by assumption, this means that as long as $\varepsilon < (pX - S)$, the Borrower will not default and undertake the Project even if she can afford to.

Finally, we show that, given the Borrower's beliefs, the Incumbent makes the offer. Since $\min\{H, L_0 R\} - K + \varepsilon < H$, the Incumbent receives the same payment in date 2 regardless of y_2 — after refinancing, the loan is fully collateralized. To see that the Incumbent prefers making the offer $\hat{P}_2$ to making no offer, note that making no offer leads to date 1 liquidation which nets $\min\{H, L_0 R\}$, whereas from both borrower types making the offer nets $K + \min\{H, L_0 R\} - K + \varepsilon = \min\{H, L_0 R\} + \varepsilon$. It is then immediate that the Incumbent would not make a higher offer, since the Borrower would conclude that $y_2 = K$ and not accept it. Likewise, any lower offer would also either be rejected (depending on the Borrower's beliefs), or else would simply lower the Incumbent's profits. **QED**

Proof of Proposition 2: Under the original loan terms, the Borrower makes her date 1 payment $\frac{R^2 L_0}{1+R}$. By assumption, she cannot simultaneously afford the extra consumption M. Since $R \geq 1$, she spends the remainder of her income to pay down her original loan. The date 2 loan balance is then $R(RL_0 - I)$, which by assumption she can afford to pay, so under the original loan terms both types of borrower pay $I + R(RL_0 - I)$ to the Incumbent over the two dates.

The Incumbent can offer to change the terms of loan. Specifically, the Incumbent can offer to accept a payment P_1 at date 1 and P_2 at date 2.

If the Incumbent proposes $P_1 > I - M$, the Borrower is still unable to afford the date 1 consumption, in which case, regardless of P_2, there is no way to simultaneously improve the welfare of both the Borrower and the Incumbent. So any new loan terms offered must feature $P_1 \leq I - M$. Note also that the Borrower would never choose to default on the house to undertake the Project, since she would be giving up a sure surplus X for a sure surplus $S < X$.

First, suppose that $H < (RL_0 - I)R + M$. We show that the Incumbent will never offer to refinance a bad borrower in this case. The Incumbent gets at most $P_1 + P_2$ from the new loan. So he will only offer the new loan if

$$P_2 \geq I + R(RL_0 - I) - P_1 \geq M + R(RL_0 - I) \geq M + L_0 - I.$$

Since by assumption $L_0 + M > I + K$, it follows that any new loan terms that the Incumbent is prepared to offer lead to default in date 2 when the Borrower's income is low. Moreover, since $P_2 \geq M + R(RL_0 - I) > H$, the Incumbent collects the full value of the house when the Borrower defaults. So the Incumbent obtains at most $P_1 + H$ from the Borrower, which is strictly less than $I - M + (RL_0 - I)R + M$. Therefore, the Incumbent does not offer a bad borrower new loan terms that the Borrower would accept.

Next, suppose that $S < (1 - p) X$. As we showed above, if the Incumbent offers new loan terms then the Borrower will default, and therefore lose surplus X when she has low income at date 2, which to the uninformed Borrower has probability $1 - p$. So the new loan terms produce a net surplus of at most $S - (1 - p) X < 0$. So there is no set of new loan terms that the Incumbent and uninformed Borrower can agree on.

Finally, suppose that both $H \geq (RL_0 - I) R + M$ and $S \geq (1 - p) X$. In this case, we claim there is a predatory equilibrium. Specifically, we claim there is an equilibrium in which the Incumbent offers $P_1 = I - M$ and $P_2 = (RL_0 - I) R + M$, and the Borrower accepts.

Since $H \geq P_2$, the Incumbent is paid in full whenever the Borrower defaults, so the Incumbent is exactly indifferent between the new loan terms and the status quo. Provided that the Borrower interprets any alternate offer as indicating that $y_2 = K$, then the lender has no profitable deviation: since $X > S$, there is no set of new loan terms that strictly increase welfare for both the Incumbent and a Borrower who knows she has bad prospects.

Since the Incumbent is indifferent between the status quo and the new loan terms, the full surplus from the new arrangement goes to the Borrower. This is $S - (1 - p) X$, which by hypothesis is positive. So the uninformed Borrower accepts the offer.

Finally, the equilibrium is predatory, since the Borrower with bad prospects makes exactly the same total payment to the lender as before, receives a surplus S from additional consumption, but loses surplus $X > S$ when she defaults at date 2. **QED**

Proof of Proposition 3: From the proof of the previous proposition, we know that if $H < (RL_0 - I) R + M$ there is no equilibrium in which bad prospects are refinanced. Now, we show that $H < (RL_0 - I) R + M$ implies a separating equilibrium in which only the good prospects borrow for new consumption. Note that the Borrower will pay $I + (RL_0 - I) R$ if she does not borrow for extra consumption. The Incumbent can offer to change the terms of loan. Specifically, the Incumbent can offer to good prospects a payment P_1 at date 1 and P_2 at date 2 in exchange for M such that $P_1 + P_2 = I + (RL_0 - I) R + M$. The borrower with good prospects is better off, as she captures the entire surplus S, so she accepts the offer, and the Incumbent is willing to offer it because he breaks even. **QED**

Proof of Proposition 4: We first exhibit an equilibrium with lending at P_2^K and characterize when it entails predatory lending. Second, we show that there is no equilibrium in which a Borrower with bad prospects agree to pay more than P_2^K at date 2.

The following is an equilibrium. All lenders offer P_2^K. The Borrower accepts the Incumbent's offer. If the Incumbent offers $P_2 < P_2^K$ the Borrower believes she has good prospects and accepts the Incumbent's offer. If the Incumbent offers $P_2 > P_2^K$, the Borrower believes that she has bad prospects, and rejects all offers when $RL_0 - K > H$. (As we will make clear below, it is irrelevant how the Borrower responds when $RL_0 - K \leq H$.)

We start with the Borrower. In equilibrium she is uninformed. If she rejects the equilibrium offer P_2^K she pays $\min\{RL_0, H\}$ to the Incumbent and loses her house; while if she accepts the offer she pays out a total of RL_0 in expectation, and keeps her house with probability p. When $RL_0 \geq H$ the latter option is clearly preferable; when $RL_0 < H$, it is preferable provided $pX \geq RL_0 - H$. Given the stated out of equilibrium beliefs, she will clearly accept any better offer than P_2^K. Finally, when $RL_0 - K > H$ she will respond to an upwards deviation by the incumbent by rejecting all offers, as follows. If she borrows at all, she will clearly do so from an Entrant. She expects to pay $K + \min\{H, P_2^K\} = K + H$ (recall that she believes she has bad prospects). If she instead defaults today she pays just H.

The uninformed Entrants make zero profit. Since P_2^K is constructed to be the minimum payment at which they can profitably lend, offering lower payments results in negative expected profits. Higher offers are clearly rejected.

The informed Incumbent cannot make higher profits by offering lower payments as this will result in strictly lower expected profit. If he deviates and makes a higher offer after observing a good signal, then his offer will be rejected — resulting in lower profit. Finally, can he profitably deviate after observing a bad signal? Following an upwards deviation by the Incumbent, the borrower will certainly *not* borrow from the Incumbent. So a necessary condition for the deviation to be strictly profitable is that the equilibrium offer P_2^K is loss-making, i.e., $RL_0 - K > H$. However, in this case the borrower responds by not borrowing at all, and so the Incumbent receives $\min\{RL_0, H\} = H$ today. This is less than the $K + H$ the Incumbent receives when he sticks to the equilibrium offer.

When $H \geq RL_0$ the equilibrium is not predatory. When $H \leq RL_0$ the equilibrium entails the Borrower with bad prospects paying $K + \min\{H, P_2^K\}$ in place of H. So if $RL_0 - K \leq H < RL_0$ he pays $RL_0 - H$ more; while if $H < RL_0 - K$ he pays K more.

It remains to establish that there is no equilibrium in which the Borrower with bad prospects refinances at worse terms than P_2^K. Suppose to the contrary that such

an equilibrium exists, with $P_2 > P_2^K$ the terms accepted. The equilibrium cannot be a separating equilibrium. We showed above that the bad prospects Borrower is either indifferent between refinancing at P_2^K and defaulting, or else strictly prefers defaulting. So she strictly prefers defaulting to refinancing at $P_2 > P_2^K$. However, the equilibrium cannot be a pooling equilibrium either: for in this case, one of the Entrants could profitably deviate by offering $P_2 - \varepsilon$ (where ε is arbitrarily small) and capturing the whole market. **QED**

Proof of Proposition 5: Proposition 4 establishes that under competition the Borrower never agrees to refinancing with a date 2 payment above P_2^K. As the Proposition statement makes clear, we have three cases to consider:

Case: $H \geq RL_0$: In this case $P_2^K = RL_0 - K$. Since no predation occurs when the Borrower agrees to make a date 1 payment of K and a date 2 payment of $RL_0 - K$, the same is true for any lower date 2 payment.

Case: $H \in (\max\{RL_0 - pX, RL_0 - K\}, RL_0)$: We claim the following is an equilibrium when the Incumbent enjoys a monopoly: the Incumbent offers $P_2^K + \varepsilon$ (where ε is small) and the uninformed Borrower accepts. Here, $P_2^K = RL_0 - K$, and the Incumbent receives this payment in full from both types of Borrower at date 2. As such, the Incumbent is certainly prepared to refinance the Borrower with bad prospects at terms $P_2^K + \varepsilon$. Provided ε is small enough that $RL_0 - pX + \varepsilon \leq H$, the uninformed Borrower accepts. Since $H > RL_0 - K$ the bad prospects Borrower is strictly worse off under refinancing terms $P_2^K + \varepsilon$ than terms P_2^K. As in Proposition 1, it is straightforward to exhibit off-equilibrium-path beliefs such that the Incumbent has no profitable deviation. Because the Incumbent has a monopoly, undercutting from other lenders does not arise.

Case: $H > RL_0 - pX$ and $H \leq RL_0 - K$: Take any pooling equilibrium under monopolistic conditions in which the uninformed Borrower accepts refinancing at terms P_2. We will establish that there is also a pooling equilibrium under competitive conditions in which the bad prospects Borrower pays weakly more.

This is straightforward. In any equilibrium, the bad prospects borrower pays at most $K + H$ over the two periods. In the parameter case under consideration, $P_2^K \geq H$. So in the equilibrium established by Proposition 4 the bad prospects Borrower pays $K + H$ over the two periods.

Case: $H \leq RL_0 - pX$: Take any pooling equilibrium under monopolistic conditions in which the uninformed Borrower accepts refinancing at terms P_2. We will establish that there is also a pooling equilibrium under competitive conditions in which the

uninformed Borrower accepts refinancing at these same terms.

Note first that $P_2 \leq P_2^K$. To see this, suppose to the contrary that $P_2 > P_2^K$. By construction, the refinancing terms P_2^K are such that the *average* Borrower pays $RL_0 - K$ to the lender at date 2. However, this implies that the uninformed Borrower would not accept these terms: by defaulting immediately she pays $\min \{RL_0, H\} = H$ to the lender, while by accepting refinancing she pays K at date 1, $RL_0 - K$ at date 2, and keeps her house with probability p. Since $pX - RL_0 \leq -H$ in the case under consideration, it follows that the uninformed Borrower would never agree to pay strictly more than P_2^K in equilibrium — even under monopolistic conditions.

Given that $P_2 \leq P_2^K$, it is then immediate that there is an equilibrium under competitive conditions in which the Incumbent offers to refinance at terms P_2 and the uninformed Borrower accepts. Given that an equilibrium with these properties exists under monopolistic conditions, the only condition to check is that the Entrants do not want to undercut P_2. Since $P_2 \leq P_2^K$, the proof is complete. **QED**

Proof of Proposition 6: We start with a couple of preliminaries. If the Borrower does not undertake new consumption in equilibrium she cannot experience a welfare loss — under her existing loan she pays the Incumbent a total of $I + (RL_0 - I)R$ and keeps her house, and any refinancing must lower her payment. Moreover, the only candidate for a pooling equilibrium in which the Borrower undertakes additional consumption is that in which the Borrower promises to pay the amount P_2^I at date 2. By construction, P_2^I is the payment that makes an Entrant indifferent between not lending, and lending $RL_0 + M - I$ to both types of Borrower at date 1 in return for a promise of P_2^I at date 2. Therefore, if the Borrower promises to pay strictly more than P_2^I as part of an equilibrium, one of the Entrants can profitably deviate by undercutting. An Entrant will never lend at strictly less than the break-even P_2^I in a pooling equilibrium, and neither will the Incumbent, since if he does not refinance he receives $I + (RL_0 - I)R \geq RL_0$.

When conditions (1) - (3) hold we claim the following is an equilibrium: all Entrants offer to supply $RL_0 + M - I$ at date 1 in return for a promise to pay P_2^I at date 2, while the Incumbent offers to accept a payment $I - M$ at date 1 in return for a promise to pay P_2^I at date 2. The Borrower accepts the Incumbent's offer. The Borrower accepts any better offer, and interprets any worse offer from the Incumbent as independent of the Incumbent's private information.

By (1), the Borrower always makes her promised date 2 payment — though she loses her house in doing so when date 2 income is low.

The Borrower is indifferent between the Entrant and Incumbent offers. If the Borrower rejects all offers she pays a total of $I + (RL_0 - I)R$ to her existing lender. If instead she accepts the Incumbent's offer her total net payment at dates 1 and 2 is RL_0; she enjoys new consumption with a surplus of S; but loses the utility flow X from her house with a probability of $(1 - p)$. Therefore, she accepts the Incumbent's offer if

$$S - (1 - p)X - RL_0 \geq -I - (RL_0 - I)R,$$

which is certainly implied by condition (2). The loan is predatory if it makes the Borrower worse off when she has bad prospects, which (by an analogous calculation) occurs whenever condition (3) is satisfied. The welfare loss is $(RL_0 - I)(R - 1) - (X - S)$.

It remains to show that the lenders are happy to make the offers described. The Entrants make zero profits from their offer. They would make a loss from any alternate offer in which they provide $RL_0 + M - I$ at date 1 but accept a promise of less than P_2^I at date 2; while the Borrower would never accept an offer in which she promises more than P_2^I at date 2. Moreover, there is no profitable deviation in which the Entrant offers to supply less than $RL_0 + M - I$ at date 1. To see this, suppose to the contrary that such a deviation exists. The Entrant must make strictly positive profits on the loan, and so the Borrower's total net transfer to all lenders across dates 1 and 2 is strictly more than RL_0. Because the Borrower is unable to afford the additional consumption Project, by condition (2) she strictly prefers to accept the Incumbent's refinancing offer, in which her total net payment is exactly RL_0, she obtains an additional surplus S, but loses the surplus X from her house with probability $1 - p$.

In equilibrium the Incumbent receives a total of RL_0 from the Borrower. Under any lower offer, he would receive less. Under any higher offer, the Borrower would accept one of the Entrants' offers, and the Incumbent would still receive just RL_0. Finally, a similar argument to above establishes that he cannot make higher profits by offering terms that do not allow the Borrower to afford the Project at date 1.

Next, we establish that $(RL_0 - I)(R - 1) - (X - S)$ is the maximum utility loss experienced by the Borrower with bad prospects in *any* equilibrium. A utility loss can only occur as part of a pooling equilibrium in which the Borrower undertakes new consumption. If the Borrower undertakes new consumption in a pooling equilibrium he promises to pay P_2^I at date 2 (see the start of the proof). If (1) holds the welfare loss is exactly $(RL_0 - I)(R - 1) - (X - S)$. Suppose instead that (1) does not hold, so that if the Borrower's date 2 income is low a lender recovers just H from the Borrower. If the Borrower accepts refinancing from an Entrant, he must receive at

least $RL_0 + M - I$ at date 1 (otherwise refinancing is useful). Since he pays RL_0 to the Incumbent, his total net payment in dates 1 and 2 to the Entrant and Incumbent is less than $M - I + H < RL_0$. By a parallel calculation, the same is true if he accepts refinancing from the Incumbent. So the Borrower's welfare loss is strictly less than $(RL_0 - I)(R - 1) - (X - S)$.

Finally, conditions (1) - (3) are necessary as well as sufficient for predatory lending to occur in equilibrium, as follows. If (1) does not hold the candidate pooling equilibrium entails a payment of $P_2^I > H$. However, the incumbent will never lend to the Borrower with bad prospects at this rate: he receives RL_0 if the Borrower takes a loan from an Entrant, and $I + (RL_0 - I)R$ if the Borrower sticks with his existing loan. Both give him a higher income than supplying $M - I$ at date 1 and receiving H at date 2.[21] If (1) holds but (2) does not hold, then the borrower will not refinance at the terms P_2^I; finally, if (1) and (2) both hold but (3) does not, refinancing at terms P_2^I does not reduce the borrower's utility. **QED**

Proof of Proposition 7: Proposition 2 establishes that predatory lending arises under monopoly conditions if and only if $H \geq (RL_0 - 1)R + M$ and $S \geq (1 - p)X$. Throughout the proof we assume these conditions are satisfied (and that the latter is satisfied strictly). It is then immediate from Proposition 6 that predatory lending is possible under competitive conditions if and only if condition (3) holds. From the proof of Proposition 6, when predatory lending occurs under competitive conditions the refinancing terms are given by P_2^I. To establish the result, we will show that there is an equilibrium under monopolistic conditions in which the Incumbent proposes to supply $M - I$ to the Borrower at date 1, in return for a promise of $P_2^I + \varepsilon$ (where ε is small) at date 2, and the uninformed Borrower accepts.

Since certainly $H \geq RL_0 - I + M$, the payment P_2^I equals $RL_0 - I + M \leq H$. So the Incumbent is willing to provide $M - I$ at date 1 in return for a promise of any amount above P_2^I at date 2. The uninformed Borrower accepts the terms $P_2^I + \varepsilon$, as follows. By construction the financing terms P_2^I entail her making a total payment of RL_0 to the Incumbent over the two periods, whereas under the terms of the existing loan she pays $I + (RL_0 - I)R \geq RL_0$. Additionally, she receives a surplus S from the

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[21]There remains the possibility of an equilibrium in which the Entrants offer to lend at a terms P_2^I, while the Incumbent makes a higher offer that is always rejected. Under our definition, this equilibrium is not predatory because the lender making the loan does not know that it reduces the Borrower's welfare. Moreover, even if one were to view this equilibrium as predatory, it does not satisfy weak refinement concepts. In particular, it requires out-of-equilibrium Borrower beliefs in which the Borrower interprets an offer just below P_2^I as coming from an Incumbent who knows the Borrower is bad — even though the Incumbent would lose money from such an offer, while an Incumbent who knows the Borrower is good would make money.

consumption Project, but loses surplus X when she loses her house with probability $1 - p$. Since $S > (1 - p) X$, the uninformed Borrower accepts the terms $P_2^I + \varepsilon$ when ε is small enough. As in Proposition 2, it is straightforward to exhibit off-equilibrium-path beliefs such that the Incumbent has no profitable upwards deviation. Because the Incumbent has a monopoly, undercutting from other lenders does not arise. **QED**

Proof or Proposition 8: From the proof of the previous proposition, we know that if $H < RL_0 - I + M$, then there is no pooling equilibrium with refinancing with extra consumption. Similarly, there does not exist such a separating equilibrium with lending to bad prospects either as the borrower or the lender or both will be strictly worse off.

Now, we show that $H < RL_0 - I + M$ implies a separating equilibrium in which only the good prospects borrow for new consumption. In such an equilibrium, uninformed lenders offer two different loans, one with a total payment $RL_0 + M$ (or equivalently, a second period payment of $RL_0 - I + M$ for extra consumption. The other offer involves a smaller loan for refinancing without new consumption with total payment RL_0 (or equivalently, a second period payment of $RL_0 - I$). The informed lender matches the larger loan if the Borrower's prospects are good and the smaller loan if they are bad. All lenders are indifferent between lending and not lending. The borrower with good prospects is better off accepting the larger loan, as he captures the entire surplus S, and therefore accepts the offer. The borrower with bad prospects strictly prefers the smaller loan provided that $X > RL_0 + M + S - I - H$. **QED**

Proof of Proposition 9: The proof is very similar to that of Proposition 2. The sufficiency of the conditions follows exactly as before. For necessity, suppose to the contrary that a predatory lending equilibrium exists when $(RL_0 - I) R > H$. By the same argument as before, the Incumbent will only offer new financing terms with $P_2 \geq M + R (RL_0 - I) > M + H$. As such, at date 2 the Incumbent will recover only $M + H$ from the Borrower if he has bad prospects. So under refinancing, the total net payment in dates 1 and 2 from the Borrower with bad prospects to the Incumbent is weakly less than $(I - M) + (M + H)$. By assumption, this is strictly less than $I + R (RL_0 - I)$, which the Incumbent can obtain from the Borrower by not offering refinancing. **QED**