Informal Bankruptcy

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Preliminary

Abstract

In the economic literature on bankruptcy, the standard methodology is to model the individual's bankruptcy decision as a binary choice between "bankruptcy" and "no bankruptcy." We define an additional choice—non-repayment without seeking the formal protection of the bankruptcy system—as *informal bankruptcy*. Using data from a large credit card issuer, we find evidence that while both lenient exemption laws and garnishment laws increase bankruptcies in the standard model, loose garnishment discourages default in our expanded model, while at the same time more pronouncedly shifting individuals from informal to formal bankruptcy. This result suggests that previous research may substantially understate the degree to which garnishment laws drive defaulting individuals to choose bankruptcy. Moreover, lenient exemption laws increase both formal and informal bankruptcy. We also find that borrowers living in majority black neighborhoods are more likely to choose informal bankruptcy, and less likely to choose bankruptcy, than other borrowers.

We also test whether creditors' strategic interactions increase bankruptcies. We develop a two-period model of the "creditor's dilemma," a popular hypothesis in the legal literature. We examine a testable implication of this model, namely, that increasing the number of creditors (while holding the amount and availability of credit constant) should increase the probability that a defaulting borrower enters bankruptcy rather than a workout, and either decrease or not affect the probability of informal bankruptcy. We find that the number of creditors indeed has a positive and statistically significant effect on the probability of bankruptcy, and, depending on the specification, a significant negative or insignificant effect on informal bankruptcy.

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I. Introduction

Personal bankruptcy provides a legal procedure giving individuals protection from their creditors. By filing for bankruptcy, a borrower halts collection activities and often obtains a discharge of debts, shielding some property in the process. However, the formal legal procedure of bankruptcy is not the only available alternative to repayment. Instead, a debtor can simply stop making payments—without seeking any legal protection—and place the burden on her creditors to collect. Especially if the debtor has few attachable assets or is difficult to find, the informal strategy may be extremely effective. We will refer to non-repayment without the benefit of the formal bankruptcy process as "informal bankruptcy."

While informal bankruptcy has received minimal attention in the economics literature, it is rather prevalent in the real world. According to the *1996 Visa Bankruptcy Survey*, some 65.2% of credit card loans were charged off[1] for reasons other than bankruptcy, and this percentage has been relatively constant in recent years.[2] In the data set of credit card accounts examined in the current paper, 50.7% of all written-off accounts (and 45.8% of credit losses in dollars) were lost without the debtor filing for bankruptcy.[3]

At first blush, the choice of informal bankruptcy by an individual may seem illogical. After all, the bankruptcy system has been severely criticized for its leniency: "Just as the old welfare system encouraged people not to get jobs and encouraged people not to even think about pulling their own weight, our lax bankruptcy system doesn't even ask people to consider paying what they owe, particularly when they have the ability to pay...Why pay your bills when you can walk

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[1] A charge-off is a loan that has been written off as a loss for tax purposes. However, the loan is still deemed collectable unless the account was charged off for bankruptcy, death, or fraud. According to current federal banking regulations, consumer loans can be charged off after six months delinquency. Throughout this paper, the estimates exclude losses due to fraud.

[2] *1997 Annual Bankruptcy Survey*, Visa U.S.A. Inc., September 1998.

[3] According to a survey produced by the American Bankers Association, between 55 and 65% of credit card loans were charged off for reasons other than bankruptcy. This survey also shows that losses due to default without bankruptcy, as a percentage of outstanding balances, have grown substantially over the past five years. [American Bankers Association, *Bank Card Industry Survey Report*, American Bankers Association, 1997] In addition, the *1998 Credit Collections Survey* conducted by the Consumer Banker's Association estimated that 60% of all credit card accounts that were charged off for tax purposes, and 70% of charge-offs on other consumer loans, were the result of long term delinquency rather than bankruptcy [As reported in *Consumer Bankruptcy News*, February 12, 1998]

away with no questions asked? Why honor your obligations when you can take the easy way out through bankruptcy?"[4]

However, a closer examination reveals that the costs of formal bankruptcy can be quite substantial. While both informal and formal bankruptcy can hurt an individual's credit record significantly, bankruptcy is generally the more damaging choice.[5] A poor credit record can interfere not only with an individual's ability to borrow, it can impose other inconveniences, such as trouble writing checks, renting an apartment, or finding employment.[6] Bankruptcy stays on a borrower's record for 10 years, while a debt written off for other reasons is expunged after 7 years.

Other costs include the assets a borrower must forfeit in a bankruptcy proceeding, which, depending on her state, may be considerable. While a few states allow bankrupts to keep substantial property following a Chapter 7 bankruptcy, 24 states set homestead exemption limits of $15,000 or less. Delaware, for example, has no homestead exemption and allows borrowers choosing bankruptcy to keep only $5,000 worth of personal property. Borrowers who file under Chapter 13 submit a repayment plan rather than non-exempt assets, but they are required to pay creditors at least as much as they would receive under Chapter 7. Finally, the legal and court costs involved in filing a bankruptcy, though small relative to other proceedings, may be prohibitive to highly leveraged individuals.

Borrowers choosing informal bankruptcy face the cost of resisting their creditors' collection attempts, but these costs will depend on the actions lenders are willing and legally able to take. A creditor can garnish a borrower's wages, but 75% is shielded from garnishment by federal law, %, and 16 states protect a higher percentage. Creditors may also seize property, but they cannot seize property that is exempt from a Chapter 7 bankruptcy proceeding. Before seizing non-exempt property, creditors must obtain a judgment and surpass several other legal hurdles. Finally, creditors can simply demand repayment, but they are limited by the Federal Fair Debt

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[4] Senator Chuck Grassley (R-Iowa), *Senate Debate on Bankruptcy Reform Bill*, September 28, 1999.

[5] This is not always the case. Some creditors have sought out borrowers who have recently declared bankruptcy under Chapter 7, because these borrowers are prevented from filing under Chapter 7 again for 7 years.

[6] Though discrimination against applicants based solely on bankruptcy is illegal. 11 U.S.C.A. §525

Collection Practices Act,[7] which restricts credit collections agents from inconvenient or harassing contact with borrowers.

While it would seem that these costs would impact a borrower's choice between informal and formal bankruptcy, we have no economic studies of informal bankruptcy to support this hypothesis. Economists are not alone in their neglect: informal bankruptcy has also received little attention from lenders and collectors. According to an article in *American Demographics*, "Demographic analysis has been common for years, if not decades, among companies that offer credit – using sophisticated formulas to figure out who to offer credit cards to. But even the credit card companies haven't expended much energy trying to understand why people stop paying their bills, and how best to persuade them to resume paying." Where firms have begun to utilize precise statistical methods, the results are largely proprietary and inaccessible to the public.[8]

The study informal bankruptcy is likely to contribute significantly to our understanding of insolvency is several ways. First, informal bankruptcy can clarify the effects of federal and state laws governing the interactions between creditors and insolvent borrowers. The feasibility of collection, and therefore the likely costs of informal bankruptcy, clearly vary according to state laws governing garnishment and exemptions. These laws have been examined in the context of formal bankruptcy alone, but they should affect the borrower's choice of informal bankruptcy. We test the impact of these statutes using a nested logit model, in which a borrower first chooses between repayment and delinquency, and if delinquent, chooses among informal and formal bankruptcy, and delayed repayment. We find that garnishment laws affect both the probability of repayment and the choice between informal and formal bankruptcy, effects which are conflated in the dichotomous bankruptcy model. Garnishment shifts individuals to repayment from non-repayment, while at the same time shifting individuals from informal bankruptcy into bankruptcy. This result suggests that the possibility of garnishment following a default deters borrowers from choosing not to repay their loans, but having defaulted, garnishment increases the likelihood they will choose bankruptcy. The large and significant impact of garnishment laws found in dichotomous models may actually underestimate the degree to which garnishment

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[7] Title VIII Consumer Protection Act, §§ 801-818, 15 U.S.C. § 1692 (1988)

[8] Fishman (1997).

influences individuals to choose bankruptcy after a default. On the other hand, it appears strict[9] bankruptcy exemptions do not significantly deter default, but do decrease the probability of bankruptcy following default.

Second, a model which includes informal bankruptcy can present a more complete picture of the level of insolvency in some groups. Race has been shown to be statistically and economically insignificant in standard models,[10] and we also find that race does not have a significant effect in a dichotomous model. However, in a model that includes informal bankruptcy, we find that borrowers living in majority African American neighborhoods are less likely than other borrowers to choose repayment *and* less likely to choose formal bankruptcy, which results in the insignificant parameter estimate in our dichotomous model. Instead, these borrowers are far more likely to choose informal bankruptcy. This result suggests that analyses of formal bankruptcy alone may overlook the real problem of financial distress among racial minorities, who may be less likely to avail themselves of the protections of the formal legal system.

Finally, the inclusion of informal bankruptcy allows an examination of the validity of the "Creditor's Dilemma" hypothesis, a prevalent theory in collections law.[11] The claim of the this literature is that self-interested creditors pursuing repayment often impose negative externalities on other creditors, which leads to inefficient outcomes. Inefficiency stems from externalities in the creditor's collection decision: outside of bankruptcy, creditors' payoffs depend crucially on their diligence relative to other creditors, so their own collections necessarily impose a negative externality on other lenders. An implication of the creditor's dilemma is that lenders will seize a borrower's assets and garnish her wages rather than attempting a workout, even if a workout would allow her to pay more of her total debt. This model of creditor behavior only applies when a borrower has defaulted on multiple loans but has not declared bankruptcy, which would forestall collections efforts, i.e. when the borrower is in informal bankruptcy. A clear implication is that increasing the number of creditors should increase the probability a borrower chooses

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[9] The terminology in this literature can be confusing. We will follow standard practice and use "lenient" and "strict" to refer to laws more and less favorable to borrowers, respectively. That is, "strict" exemption laws specify low levels of exempt property, and "strict" garnishment laws allow creditors to garnish more of a borrower's salary.

[10] See Domowitz and Eovaldi (1993).

[11] See Block-Leib (1993) and Letsou (1995), for example.

bankruptcy rather than a workout, and either decrease or not affect the probability of informal bankruptcy. Our results support the creditor's dilemma as an appropriate model of strategic interactions among creditors and borrowers.[12]

One reason informal bankruptcy has been neglected is a lack of appropriate data. Though some data on losses and charge-offs is available, because individuals can charge off any number of loans under bankruptcy, determining which are due to bankruptcy and which are not is difficult in aggregated data. We are able to overcome several difficulties faced by previous researchers by using an unusual data set collected by a large credit card issuer. The data includes a rich set of variables on the borrowers' loan histories and behavior, as well as their zip code, from which we obtain additional demographic and geographic information. We can also control for the creditor's own selection criteria, which should mitigate concerns over supply and selection effects.

II. Background and Motivation

Only one paper, White (1998), questions whether the standard dichotomous bankruptcy model may be incomplete. She estimates that if bankruptcy and repayment are the only choices available to borrowers, 15% of U.S. households appear to choose repayment suboptimally. In fact, White's result is only one of several possible weaknesses of a model which excludes informal bankruptcy. Most obviously, leaving out this substantial group of insolvent borrowers may present a distorted picture of the financial state of U. S. households. A study restricting attention to formal bankruptcies may be omitting half or more of the households in a state of financial collapse, a mammoth underestimation given the soaring bankruptcy rate.[13] Even more troubling, if borrowers see the choices of informal and formal bankruptcy as distinct, these left out informally bankrupt households may differ significantly from the population choosing bankruptcy, and the model will incorporate specification bias.

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[12] An additional reason to study informal bankruptcy is that bankruptcy has played a crucial role in several branches of economic theory, and most of these models use the term "bankruptcy" to refer to loan non-repayment, not asset forfeiture or other characteristics specific to the legal process. For example, in Stiglitz and Weiss' seminal work, bankruptcy, i.e. loan non-repayment, causes a non-linearity in a borrower's payoff function, which in turn can lead to credit rationing. Their results can be applied equally to bankruptcy and informal bankruptcy, as can the results much economic research into the consequences of bankruptcy.

[13] There were 312,486 non-business bankruptcy filings in the second quarter of 2000.

Including informal bankruptcy can not only correct this potential misspecification, but also provide a fuller picture of the factors which impact the borrower's choices, particularly the laws which govern collections and formal bankruptcy.

A. Legal Background: Non-Bankruptcy vs. Bankruptcy Law

The guiding principle of collections law is rewarding creditors for diligence, which is often justified with an efficiency argument: if creditors benefit from their own collections efforts, collection will be more productive, and the cost of credit will be minimized.[14] An unsecured creditor is not required to consult other creditors before entering into a bilateral payment or preference agreement with a defaulting borrower, such as a property lien.[15] A second, less diligent creditor is prevented from placing a lien on that property, even if his loan predates or exceeds the first creditor's loan. Thus creditors' repayment depends not only on the borrower's absolute willingness to repay, but also on their efforts relative to other creditors.

One of the more effective methods of collection is through garnishment. Garnishment laws regulate the percentage of a borrower's intangible property, such as wages or bank deposits, a creditor can collect directly from the borrower's employer or bank. Federal law shields 75% of a borrower's weekly wages or 30 times the minimum wage, whichever is greater. States can choose to protect a greater proportion of a borrower's wages, and sixteen states have done so,[16] while six states have outlawed garnishment altogether.[17] A summary of state laws on exemptions and garnishment can be found in Table 1.

States also determine whether garnishments will be continuous or consecutive. Under continuous garnishment rules, the more popular type of garnishment, once one creditor garnishes a borrower's wages, that creditor's claim is paid in full before subsequent garnishments are paid. Creditors who file orders for garnishment queue up, and their claims are settled one at a time. On the other hand, consecutive garnishment rules allow creditors to be paid a percentage of borrower's garnishable wages simultaneously, in proportion to their claim.

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[14] Williams(1998), 41.

[15] However, a preference granted soon before the borrower files may be nullified during a bankruptcy proceeding.

[16] In addition, 3 states have set absolute minima above the federal limit of 30 times the minimum wage.

[17] Since the passage of the Federal Debt Collection Procedures Act, garnishment for the collection of federal debts is determined by federal law, and therefore legal in all states.

In contrast to laws governing creditor and borrower interactions outside of bankruptcy, bankruptcy law explicitly forestalls competition among creditors through the automatic stay, which disallows all collections efforts. If an unsecured creditor obtained a lien before the bankruptcy filing, like any secured creditor, his right to that collateral is upheld in the bankruptcy proceeding. After taxes, administrative costs and secured creditors are paid, the value of remaining non-exempt assets is divided among creditors of the same class on a pro rata basis.

Individuals can choose to file under Chapter 7 or Chapter 13,[18] and exemption laws affect both. Borrowers filing for bankruptcy under Chapter 7 forfeit their non-exempt property in return for protection of their future income from creditors' claims. The amount of property individuals are allowed to exempt is ostensibly determined under federal law, but because states can opt out, states actually determine the level of exemptions borrowers are allowed. Most states list detailed and extensive descriptions of what property may be kept after a bankruptcy, and usually the most valuable is the homestead exemption. The homestead exemption can vary from nothing (Delaware), to virtually unrestricted (Florida, Texas). Exemptions also impact the costs of a Chapter 13 bankruptcy, in which a borrower submits a repayment plan in return for additional time to repay and a possible partial discharge. Under Chapter 13, a borrower must repay at least as much as she would under Chapter 7, which naturally will vary according to Chapter 7 exemptions. Creditors are also barred from attaching or seizing exempt property even outside of formal bankruptcy, unless the creditor provided funding for that property's purchase.

B. Economic Literature on Exemption and Garnishment Law

A substantial amount of research has focused on the role of bankruptcy exemptions, particularly whether borrowers respond to loose exemptions by choosing bankruptcy more often. The results are inconclusive: while several studies find that lenient exemptions do increase the number of bankruptcies,[19] others have found no effect.[20] At least one study finds that lenient exemptions decrease formal bankruptcy.[21]

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[18] Individuals with substantial debts and assets can choose to file under Chapter 11, and family farmers can file a Chapter 12 reorganization. These chapters are rarely used by individuals, and will not be considered here.

[19] See Domowitz and Sartain (1999), Nelson (1999)

[20] See, for example, Hynes (1998), Weiss, Bhandari, Robins(1996)

[21] Shiers and Williamson (1987)

The confusion may be due to several limitations in this literature. First, these studies are unable to control for credit supply effects. Gropp, Scholz, and White (1997) present evidence that creditors restrict lending to risky individuals in states with lenient exemptions. This result suggests that parameter estimates of the borrower's response to exemptions will be biased down in studies which do not control for the supply of credit.

Second, because these studies simply measure the likelihood of bankruptcy versus non-bankruptcy, they cannot rule out the possibility that this variable operates on a different margin: instead of shifting borrowers from loan non-repayment into repayment, exemption laws may simply shift borrowers from formal bankruptcy into informal bankruptcy. Policy makers who change laws intending to decrease default may only shift borrowers from a more observable form of insolvency to a less observable one.

The impact of garnishment laws is also ambiguous in this literature. We might predict that, like exemption laws, strict garnishment laws discourage risky borrowing behavior. However, bankruptcy studies that include a variable on the percentage of wages that can be garnished find almost universally that the coefficient on this variable is significantly positive: the more creditors can garnish, the more likely a borrower will choose bankruptcy. One benefit of filing a formal bankruptcy is the automatic stay, and so a likely explanation is that garnishment laws have an additional effect on a defaulting borrower: borrowers use a bankruptcy filing to forestall creditor garnishment. This theory is supported by a survey Visa conducted in 1998, which found that 13.4% of borrowers declaring bankruptcy cited garnishment as the "last straw" before bankruptcy, and 59.3% cited other creditor remedies.[22] Garnishment laws may therefore impact the personal bankruptcy decision in three ways: (1) strict laws may discourage risky borrowing behavior, decreasing the probability of default, (2) After a default, they may increase the likelihood of repayment over informal bankruptcy , and (3) they may increase the likelihood of formal over informal bankruptcy. Testing all three of these effects requires a model that includes informal bankruptcy.

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[22] *1998 Bankruptcy Debtor Survey*, Visa U.S.A. Inc, November, 1998.

C. The Creditor's Dilemma

In his book, *The Logic and Limits of Bankruptcy Law*, Thomas H. Jackson describes two fundamental roles of bankruptcy law. The first is to ensure that individual borrowers retain sufficient assets to provide them with a "fresh start" following financial difficulty. The second is to overcome inefficiencies caused when creditors pursue piecemeal collections from insolvent borrowers, the so-called "creditor's dilemma." Generally, this literature cites two sources of inefficiency: Multiple creditors under-forgive loans, and they rush collections, in comparison to a monopolist creditor. Before we describe why multiple creditors may forgive less, we must first identify why a monopolist creditor would be willing to enter into a loan forgiveness negotiation.[23] If a borrower will pay x to the creditor in a bankruptcy, she should only be willing to pay x in a negotiation, and so it is not clear what a creditor stands to gain from a negotiation. The key to understanding this literature's assumption of gains from negotiation involves the concept of "lost value," which is analogous to the economic concept of deadweight loss.[24] The fundamental rationale for assuming lost value in collections is that the transfer of assets from a borrower to a creditor could impose costs to the borrower that are not completely recouped by the creditor. For example, a borrower may have a sentimental attachment to the asset, or she may have private information about its value, which a creditor will be unable to credibly convey to potential buyers. Lost value has also been interpreted as the cost of obtaining judgements or garnishment orders, or the administrative costs of bankruptcy.

To illustrate the under-forgiveness externality, consider a two period model of a negotiation between a risk neutral borrower and creditor. Let $x \in (0,h]$ be the borrower's value of her non-exempt assets, which is common knowledge. Let lost value be a proportion of what the borrower pays, so that the creditor receives θx, where $\theta \in [0,1]$. The borrower is willing to pay income x in order to keep her assets, which the creditor strictly prefers to seizing the borrower's property if $\theta > 0$. If x and θ are commonly known, we would expect the borrower and creditor to negotiate some payment p such that $p \in [\theta x, x]$, depending on the structure of offers.

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[23]Though details of collection techniques are usually closely guarded secrets, at least one source suggests that partial loan forgiveness is standard practice. *The Handbook of Consumer Lending*, a how-to book on consumer credit, suggests collectors offer to forgive finance charges and reduce a loan by 10% before pursuing more aggressive tactics.

[24] See Scott (1989) for a discussion of the literature on lost value.

Assume the creditor makes a take-it-or-leave-it offer to the borrower in the first period, which the borrower can accept or refuse. If the borrower accepts the offer, she pays p to the creditor, and the game ends. If the borrower refuses the offer, in the second period, the creditor can choose whether to seize the borrower's non-exempt property. This game has a simple solution: Because $x>0$, the creditor always seizes the borrower's property in period 2, and so the borrower prefers to accept any offer $p \leq x$ in the first period.[25] The creditor maximizes his payoff by offering x in the first period, which the borrower accepts.

Now assume that x is private information to the borrower, but is drawn from a commonly known probability density function $f(x)$. The corresponding cumulative distribution function $F(x)$ is assumed to be twice differentiable, strictly positive on its support $[0,L]$, with an increasing hazard function. The creditor's payoff from bankruptcy is θx. Again, in the first period, the creditor makes a take-it-or-leave-it offer to the borrower, which is backed up by the threat of property seizure in the second period if the borrower refuses his offer. The borrower therefore only refuses the creditor's offer if her loss from bankruptcy is lower than the creditor's offer.

The creditor maximizes his expected payoff by choosing an offer and a cutoff type x. That is, the creditor solves the following:

$$\max_{x \in [0,L]} \int_0^x \theta y f(y)dy + \int_x^L x f(y)dy$$

The creditor's first order condition is given by

$$xf(x)(\theta - 1) + 1 - F(x) = 0$$

which has a unique solution. For example, if $f(.)$ is uniform, then the creditor maximizes his expected payoff at

$$x^* = \frac{L}{2-\theta}$$

If $\theta = 0$, the borrower receives nothing in bankruptcy, and his problem collapses to a standard monopoly optimization. As θ increases towards 1, the creditor's expected cost from asking for

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[25] We might expect the creditor to also attempt to garnish the full value of the loan from the borrower's wages in the second period. However, if the amount of the garnishment claim exceeds x, the borrower will optimize by declaring bankruptcy, and the outcome of the game is the same.

too much repayment, the increased chance of bankruptcy, decreases. If $\theta = 1$, the creditor asks for full repayment, because seizing the borrower's non-exempt property does not imposes deadweight loss and allows perfect price discrimination.

Now consider a model with one borrower and N creditors. Each creditor makes offers of loan repayment independently in the first period. Assume that if the borrower refuses the loan forgiveness offers, the her non-exempt assets are divided pro rata, as they would be under bankruptcy or consecutive garnishment rules.

The creditor's optimization problem becomes

$$\max{}_{x \in [0, L_T]} \int_0^X \frac{\theta}{N} yf(y)dy + \int_X^{L_T} xf(y)dy$$

where

$$X = \sum_N x_i$$

and L_T is the total loan owed to all creditors.

With $f(x)$ uniform, we can show that each creditor maximizes where

$$x_i^{**} = \frac{L_T}{N + 1 - \dfrac{\theta}{N}}$$

Holding balances and θ constant, the borrower is offered less loan forgiveness and enters bankruptcy more often as N increases. As in any common pool problem, while the creditors' total payoff would be maximized at $Nx_i^{**} = x^*$, creditors cannot reach their maximum payoff acting independently: all creditors benefit from the increased likelihood of repayment which results from loan forgiveness, but this benefit is largely external to any particular creditor's decision.

In addition to providing incentives to under-forgive, competition in collections may also deter creditors from allowing borrowers extra time to repay. In spite of high opportunity costs,[26] creditors may prefer to allow borrowers to delay repayment. Obviously, defaulting borrowers are

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[26] See Ausubel (1991) for a discussion of supernormal profits in the credit card market.

very likely to have few available assets, and a borrower's only liquidity may be her biweekly paycheck. If the expected recovery from the borrower's assets is small enough, the lender may prefer payments over time to other recovery methods. In addition, the creditor may be able to collect information about the borrower's ability to repay over time and/or her reservation value of bankruptcy, allowing him to make offers that are more likely to be accepted.

However, these incentives to delay may be overwhelmed by incentives to be the first in line to collect from a delinquent borrower with several creditors. Because non-bankruptcy law upholds collections by creditors over those they antecede, when the borrower has insufficient resources to cover her debts, collection by one lender decreases the probability that subsequent creditors will be paid. Even worse, collection by one creditor may decrease the borrower's total ability to repay, such as when garnishment or seizure of property (such as a car) leads to a borrower's losing her job.[27] Creditors therefore have strong incentives to collect quickly. As one bankruptcy judge put it, "there is no incentive for creditors to work things out. The rewards go to the meanest son of a bitch in the valley. They get paid first."[28] If the borrower's ability to resist the collection efforts of creditors is a function of her creditor's efforts, we would expect first in line effects to decrease informal bankruptcy.

Though the creditor's dilemma is widely accepted as justification for bankruptcy proceedings, it has not been justified empirically.[29] An obvious, testable assertion of the creditor's dilemma paradigm is that that increasing a borrower's number of loans, holding constant her balances and available credit, would increase the probability she will declare bankruptcy. If first in line effects are significant, we would expect higher numbers of loans to be associated with a lower probability of informal bankruptcy.[30]

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[27] Federal law prohibits firing for one incidence of garnishment, but not for more than one. Employers seem to find garnishment orders onerous, and are not allowed to deduct administrative costs directly from garnished employees. See "Employers must bear cost of wage deduction orders," *Consumer Bankruptcy News*, July 25, 2000, Vol. 9, No. 21.

[28] The honorable Lief Clark, quoted in USA Today, November 20, 1998.

[29] See Kripke (1985) for a discussion of the lack of factual support for one extension of the creditor's dilemma , the critique of secured credit.

[30] Of course, the borrower's number of creditors is endogenous, and we cannot rule out the possibility that some other factor causes borrowers to choose both numerous loans and bankruptcy.

III. The Empirical Bankruptcy Decision Model

A. Verifying Informal Bankruptcy as a Distinct Choice

Because informal bankruptcy is usually excluded from models of the personal bankruptcy decision, as a first step we test whether borrowers see informal bankruptcy as equivalent to either formal bankruptcy or repayment. Following Hill (1983),we perform this test by comparing the standard dichotomous model to a trichotomous model, which assumes the choices of informal and formal bankruptcy are independent.

We specify the trichotomous model as a choice among three alternatives: legal bankruptcy(B), informal bankruptcy (I), and loan repayment (P). Let V_{ij} be the maximum utility attainable for borrower i if she chooses repayment status j=B,I,P, and suppose this indirect utility function can be decomposed into a non-stochastic component (S) and a stochastic component (E), such that

$$V_{ij} = S_{ij} + E_{ij}$$

where S_{ij} is a function of observed variables and E_{ij} is a function of unobserved variables. The probability that the ith borrower chooses the jth outcome is

$$P_{ij} = \Pr[S_{ij} - S_{ki} > E_{ik} - E_{ij} \; for \; k \neq j, k = B,I,P]$$

or

$$P_{ij} = \Pr[V_{ij} > C_{ik} \; for \; k \neq j, k = B,I,P]$$

If we assume the stochastic terms have independent and identical Weibull distributions, then (E_{ik}-E_{ij}) has a logistic distribution and the choice model is multinomial logit. If we assume the non-stochastic portion takes a linear form, $S_{ij}=Aj'Xi$, then utility maximization yields the probability of any choice j to be

$$P_{ij} = \frac{\exp(A'_j X_i)}{\exp(A'_B X_i) + \exp(A'_I X_i) + \exp(A'_P X_i)}$$

We are interested in the question of whether this trichotomous model collapses into a dichotomous model. The dichotomous logit model can be specified as

$$P_{iP} = \frac{\exp(A'_P X_i)}{\exp(A'_{B,I} X_i) + \exp(A'_P X_i)}$$

where P subscripts "repayment" and B,I subscripts the combination of bankruptcy and informal bankruptcy. This model restricts the coefficients for legal bankruptcy to equal the coefficients for informal bankruptcy. Or a dichotomous model could also be specified as

$$P_{iP} = \frac{\exp(A'_P X_i)}{\exp(A'_{P,I} X_i) + \exp(A'_B X_i)}$$

where P,I subscripts the combination of informal bankruptcy and repayment. This model restricts the coefficients for repayment to equal the coefficients for informal bankruptcy. If the coefficients on informal bankruptcy are not the same as either those on formal bankruptcy or repayment, then a dichotomous model cannot correctly specify the personal bankruptcy decision.

We perform two tests: first we test whether borrowers see informal bankruptcy as distinct from bankruptcy, and then whether they see informal bankruptcy as distinct from repayment. The null for the first test is $A_B = A_I$, and the null for the second test is $A_P = A_I$, which can be checked using a likelihood ratio test. Under each null hypothesis, the test statistic

$$Q = -2[L(A_R) - L(A_U)]$$

has an asymptotically chi-square distribution with k degrees of freedom, where k is the number of restrictions. $L(A_R)$ is the log-likelihood function of the trichotomous model evaluated under the restrictions and $L(A_U)$ is the unrestricted log-likelihood function of the trichotomous model.

B. Data

For this analysis, we use an unusual data set of 50,831 pre-approved gold card recipients from a large credit card issuer. One especially interesting feature of this data is that it was collected to study the characteristics of borrowers who respond to different credit card offers. The issuer randomly assigned potential recipients into market cells, which differed by interest rate or length of a low interest introductory period, and then collected data on their response and

behavior over a 21-28 month period.[31] The data includes a rich set of variables from the borrowers' credit histories, along with how much they borrowed and paid off each month on their new card, whether and how long they were delinquent, whether they were charged-off, and whether the charge-off was due to bankruptcy. Because the credit card offers were for pre-approved gold cards, our empirical results should be taken with the caveat that they may not be applicable to the entire population of borrowers. We will discuss this issue in the next section.

We can also use the data to control for credit supply effects. Several studies have hypothesized that supply effects may obscure the impact of exemptions on individuals' behavior. Creditors may tighten lending in loose exemption states, so that the pool of borrowers in these states is less prone to risky borrowing behavior and bankruptcy than in strict exemption states. If credit supply is tightened enough, regressions will indicate that tough bankruptcy exemptions increase the probability an individual will file for bankruptcy. Our data contains the lender's own assessment of each individual's borrowing behavior, the credit score, which is a good proxy for the borrower's ability to obtain credit.[32]

To test whether creditors account for bankruptcy laws when assessing borrowers' credit worthiness, we included variables describing state bankruptcy laws in a regression of factors characterizing borrowers' credit history. Though we had no specific information about which variables were included in credit scores, all the variables used to compute the scores were included in our data set. These 39 potential covariates included information on number of loans, types of loans, balances on loans, delinquencies, and charge-offs. Only nine coefficients were not significant at the 5% level even in this straightforward estimation, and only six were not significant at the 10% level . In contrast, the coefficients on homestead exemptions, personal property exemptions, and garnishment laws were significant at the 32%, 52%, and 14% levels, respectively. A test could not rule out the null hypothesis that the coefficients on state laws were jointly 0. We repeated our test for card limits, and we found that state laws also do not affect the limit a borrower is assigned.

Our data also includes each respondent's zip code for every month of the experiment period, which allows us to include variables on the average wealth in a borrower's zip code,

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[31] Except where noted, we estimated separate intercepts for each market cell.

[32] Though not a perfect one. See Ausubel (1999) for a discussion of adverse selection in this market.

unemployment, and other demographic characteristics, such as their zip code's racial composition.

We also add data describing each borrower's state exemption and garnishment laws. The garnishment laws are relatively straightforward: most states either set no maximum salary garnishment level, in which case the federal 25% maximum applies, or set a percentage below the federal level. Six states outlaw garnishment altogether. Our garnishment variable is a dummy which equals one if garnishment is restricted below the federal maximum, and zero otherwise. Our results were not affected by using actual garnishment percentages, or by using different cut-off percentages to define the dummy variable.[33]

Nearly every state allows borrowers to exempt at least some equity in a homestead. As Table 1 shows, the amount of these exemptions varies widely from state to state, and tend to be higher in western states. Four states allow borrowers to keep households of unlimited value, and all of our results were robust to several classifications of these unlimited exemptions.

Other exemption laws, however, proved more difficult to categorize. Some states set extensive and detailed personal property exemptions, yet do not specify dollar limits on the value of specific items. However, it would be inappropriate to designate these exemptions as unlimited. Even a casual perusal of the case law in these states indicates that judges often disallow particularly valuable items, even if these items are categorized without limit in the state code. To further complicate classification of these laws, some states allow borrowers a maximum assessed value for any property, without restricting the type of property the borrowers can choose to exempt. A few states provide both property and property value restrictions, and we used these exemptions to match property descriptions to allowable values.[34] Our estimates are presented in Table 2. In spite of these efforts, we were unable to obtain consistent results for personal property exemptions, and so our discussion will follow previous studies and focus on the homestead exemption.[35]

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[33] In a few cases, states set absolute salary minima in addition to the percentages of salary. Converting these absolute restrictions into percentages or each borrower's income, or converting the percentage restrictions into dollars of income, had no effect on our results.

[34] Where more than one state set value limits on a specific type of property, we took the median value. Taking the maximum or the minimum did not affect our results.

[35] See Hynes (1998) for a critique of this approach.

Variable definitions are presented in Table 2. Data on the borrower's credit history, such as balances, limits, and number of loans, were recorded by the credit reporting agency immediately prior to solicitation. A few variables, including balances transferred, income, and credit limit, were recorded by the issuer at the beginning of the experiment period. We did not use monthly information on balances or other borrowing behavior, which is likely to be highly endogenous: a borrower planning a bankruptcy is likely to accumulate debt in anticipation of a discharge. While these effects are interesting, they are beyond the scope of this paper.

Because credit score and limits measure the lender's assessment of the borrower's credit worthiness, we would expect these variables to increase the probability of repayment. However, credit limits may have an additional demand effect of increasing the credit available to the borrower. If borrowers' types are not observable by creditors, limits might also serve to decrease probability of repayment.

The issuer also noted whether the borrower made payments on her loans each month, whether she was charged off, and if so, whether she was charged off for bankruptcy or long term delinquency. From this information, we constructed two outcome measures. First, we specified the borrower's bankruptcy decision as a trichotomous choice among bankruptcy, informal bankruptcy, and repayment, as described above. The following definitions were used:

> *Formal Bankruptcy*- Borrowers who declared bankruptcy within the experiment period.

> *Informal Bankruptcy*- Defined as borrowers who did not make payments on their balances for 6 months, and did not declare bankruptcy.

> *Repayment*- Borrowers who were not categorized in any of the above two categories.

We also constructed a second outcome measure which specified borrowers' choosing among four choices: repayment, delayed repayment, formal and informal bankruptcy:

> *Formal Bankruptcy*- As above.

> *Informal Bankruptcy*- As above.

> *Delayed Repayment*- Borrowers who were delinquent, but subsequently made payments on their loans. Delinquent borrowers did not make payments on their

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balances for 2 months, were first delinquent more than 6 months before the end

of the experiment period, and were not informally or formally bankrupt.

Borrowers who were delinquent near the end of the experiment period were

deleted from the sample.

Repayment- Borrowers who were not categorized in any of the above three

categories.

2066 observations could not be matched to zip code data, and an additional 967 individuals

were deleted for late delinquency, leaving a sample of 47,798 observations.

C. Modeling Informal Bankruptcy

Once we have established that a model which specifies independence between the choices of

informal and formal bankruptcy is more appropriate than a model that specifies complete

equality, we can generalize this model by allowing relatedness between the choices of informal

and formal bankruptcy. There are two reasons a more general model may be superior to the

trichotomous logit model described above. First, we might expect a borrower's utility in informal

bankruptcy to be linked to her utility of formal bankruptcy. For example, the borrower may place

high value on having a good credit rating relative to other borrowers, which would decrease her

utility of both informal and formal bankruptcy but would not be observable to a creditor. Or she

may have high asset levels, which we cannot control for completely in our estimation, which

would decrease her utility of both informal and formal bankruptcy, because those choices leave

some of her assets vulnerable to forfeiture.

Second, an implication of the independent error terms in the non-nested multinomial logit is

the independence of irrelevant alternatives assumption (IIA). If this assumption holds, then the

inclusion of an additional choice in an individual's decision problem does not change her

preferences over the other choices. Conversely, removing one of the choices from an individual's

decision function should leave the coefficients on the other choices largely unchanged, which

forms the basis of a test developed in Hausman and McFadden(1984). The null for this procedure

is that the coefficients on informal and formal bankruptcy are independent, and rejecting the null

is evidence of relatedness.

One computationally tractable way to handle relatedness between informal and formal bankruptcy is to allow their error terms, E_{iI} and E_{iB}, to be jointly distributed according to the Gumbel Type B bivariate extreme-value distribution, with correlation coefficient $1-a^2$. This error structure yields a nested logit. Under these assumptions, we would describe the borrower first choosing between repayment and non-repayment, and, after non-repayment, then choosing between formal and informal bankruptcy.

Alternatively, we could specify slightly different nested structure, such that the borrower first chooses between on time repayment and delinquency, and then chooses among informal bankruptcy, formal bankruptcy, and delayed repayment.[36] In this specification, the probability of repayment becomes

$$P_{Pj} = \frac{\exp(A'_P X_i)}{[1 + \exp(A'_I X_i / \alpha) + \exp(A'_B X_i / \alpha)]^{\ \alpha} + \exp(A'_P X_i)}$$

Note that because only n-1 parameter vectors can be identified for n alternatives in each stage of the nested model, we normalized

$$A_D'X_i = A_{DR}'X_i = 0.$$

D subscripts the choice of delinquency in the first stage, and DR subscripts delayed repayment in the second stage.

The probability of formal bankruptcy is now the product of the probability of delinquency and the probability of bankruptcy conditional on delinquency:

$$P_B = P_D \bullet P_{B|D}$$

Where

$$P_{Di} = \frac{[1 + \exp(A'_I X_i / \alpha) + \exp(A'_B X_i / \alpha)]^{\ \alpha}}{[1 + \exp(A'_I X_i / \alpha) + \exp(A'_B X_i / \alpha)]^{\ \alpha} + \exp(A'_P X_i)}$$

and

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[36] Because the second stage of this nested model is a multinomial logit, we verified that this stage (the choice of delayed repayment, formal or informal bankruptcy) does not violate the IIA assumption.

$$P_{B|Dj} = \frac{\exp(A'_B X_i/\alpha)}{1 + \exp(A'_I X_i/\alpha) + \exp(A'_B X_i/\alpha)}$$

The probability of informal bankruptcy is analogous.

IV. Results from Non-Nested Specifications

A. Dichotomous vs. Trichotomous Model

The likelihood ratio test clearly indicates that we should reject the null hypothesis that the coefficients on informal bankruptcy are equal to either the coefficients on bankruptcy or on repayment. The chi-square values at 1 degree of significance is 76.15, far less than our test statistics of 367.46 for bankruptcy or 1114.36 for repayment. We also reject the null hypothesis in a model where the bidder chooses among four options: on-time repayment, severe delinquency followed by repayment, informal bankruptcy, and bankruptcy.

As an additional test, Table 5 presents a comparison between the standard dichotomous model and a trichotomous model which includes informal bankruptcy. The table entries in the first column represent the change in the probability of formal bankruptcy versus the combination of repayment and informal bankruptcy, measured at the parameter means. Several factors, such as credit score, limits, and revolving limits, which estimate the borrower's credit worthiness, decrease probability of bankruptcy. Likewise, several factors which seem likely to reflect poor borrowing characteristics, such as revolving balances at the time of solicitation and the state unemployment rate, increase the likelihood an individual chooses bankruptcy.

As in Domowitz and Eovaldi (1993), race appears to have little effect on the personal bankruptcy decision in the standard model. However, the trichotomous model, as shown in the second and third columns of Table 5, yields a more detailed picture. Individuals living in neighborhoods with higher percentages of African Americans are less likely to choose formal bankruptcy over repayment than other borrowers, but are more likely to choose informal bankruptcy.

In addition, the borrower's number of loans affect informal and formal bankruptcy in opposite directions, and is statistically significant at the 5% level. Just as the creditor's dilemma

model would suggest, borrowers with more loans seem more likely to declare bankruptcy, but less likely to enter informal bankruptcy.

Lenient garnishment and homestead exemption laws both increase the probability an individual chooses bankruptcy in the standard and trichotomous models, yet garnishment decreases informal bankruptcy versus repayment, while lenient exemptions seem to have no effect on informal bankruptcy.

B. Selection into the Model

One concern with our results may be that they overestimate the true effects of policy variables: Ausubel (1999) presents evidence that in this data, respondents' borrowing characteristics are inferior to those of non-respondents. However, because the pool of borrowers who received offers were selected by the lender for superior credit characteristics, these effects may be lessened.

The unusual structure of the data allows us to test whether "riskier" borrowers are more responsive to garnishment and exemption laws. Ausubel demonstrates that the riskiness of a pool of respondents to an offer varies directly with the offer's quality. Because borrowers were initially randomly assigned an credit card package, selection into market cells is completely determined by borrowers. We can therefore use interest rate as a rough proxy for undesirable borrowing characteristics, from the perspective of the lender.

In columns 4 and 5 of Table 5, we include interactions between interest rate and policy parameters. The direct effect of the interest rate is to increase the probability the borrower chooses both informal and formal bankruptcy over repayment, as predicted by Ausubel. The parameter estimates of the interest rate interactions are largely insignificant, which could be taken as evidence that our estimates of the effects of policy variables are consistent over different types of borrowers. However, because we only have data on the interest rate for roughly half the sample, we cannot rule out the possibility that our estimates' imprecision is due to the fall in sample size.

The signs of the coefficients indicate that state laws are more influential on less risky borrowers. Higher exemption laws shift less risky borrowers into formal and informal bankruptcy to a greater extent than more risky borrowers, and less risky borrowers are more apt

than other borrowers to choose informal bankruptcy over repayment when garnishment is loose. To the extent that our data set consists of particularly risky borrowers, our results on the effects of policy variables may be biased downwards.[37]

Though these results are interesting, the Hausman test rejects the IIA assumptions. Excluding repayment significantly changes the coefficients on informal and formal bankruptcy, indicating that we should reject the null hypothesis that these choices are independent. Our data fails this test in both the three and four choice specifications, indicating a non-nested model is not the most appropriate specification.

V. Results from Nested Specifications

We estimate the four branch and three branch nested logit models described in section III using a full information maximum likelihood procedure, with starting values estimated from a sequential method described in Maddala (1983).[38] Because the four choice specification is slightly more intuitive, and our results are not fundamentally affected by our nesting structure, we will use this model for the subsequent discussion of the impact of factors on borrower's bankruptcy decision.

The predictive power of the nested model is quite good. As reported in first columns of Table 8, the predicted probabilities of each choice are within 1-2 percentage points of the actual probabilities in our sample. For example, our model predicts that a borrower has around a 1.6% chance of declaring formal bankruptcy and a 2.2% chance of entering informal bankruptcy, predictions which are very close to the actual probabilities of 1.5% and 2.3%, respectively. Our estimates of the probability of formal and informal bankruptcy following default, 21.6% and 20.9% respectively, are also very close to the actual probabilities of 23.3% and 20.1%.

Parameter estimates for the repayment/delinquency decision are presented in the first column of Table 6.[39] As in the non-nested specifications, several variables describing the

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[37] Because of the decreased sample size, we were not able to estimate the effect of interest rate in nested specifications.

[38] See Hensher(1986) for a discussion of the importance of consistent starting values in nested logit estimation.

[39] We estimated a two additional regressions of the four choice nested model: The first included additional geographic covariates, including regional dummies and level of urbanization, and additional state level effects, such as per capita state personal income and gross state product. The second added several variables describing balances

borrower's credit history, including credit score, revolving limits, and revolving balances, have a statistically significant impact on repayment. The borrower's credit limit does not appear to affect the borrower's probability of repayment in the first stage, which may be due in part to the counteracting supply and demand effects of limits discussed above. Our only indication of the borrower's age, months on file, has a significant effect in the first stage.

Parameter estimates for the informal and formal bankruptcy vs. delayed repayment decision are presented in the second and third columns of Table 6. Again, credit history variables are strongly significant, along with neighborhood home values and state unemployment rates. Months on file does not have a statistically significant effect in the second stage.

The coefficients should be interpreted with some care: the slope of each outcome with respect to our parameters depends on the coefficient estimates of each choice. A good measure of the direction of each parameter estimates' impact is given by its marginal effect, which are computed at the sample means and reported in Table 7. Standard errors were estimated using the delta method. Several parameters consistently increase (decrease) the probability of "bad" outcomes, default, informal, and formal bankruptcy, while decreasing (increasing) the probability of the good outcome, repayment. For example, the level of revolving balances decreases the probability of repayment and increases the probability of informal and formal bankruptcy, while the borrower's total revolving limits increases the probability of repayment and decreases her probability of entering either type of bankruptcy. The unemployment rate in the borrower's state of residence decreases her likelihood of repayment, while increasing her likelihood of choosing informal or formal bankruptcy.

Our estimates of the impact of the number of loans are consistent with our findings from the non-nested specification. Increasing a borrower's number of loans increases her probability of formal bankruptcy following a default, and decreases her probability of informal bankruptcy. In addition, as in the non-nested model, borrowers living in neighborhoods with higher percentages

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on loans other than revolving cards. These variables had very little explanatory power, and our primary results were robust to their inclusion. Unfortunately, α, the measure of relatedness between informal and formal bankruptcy, was estimated as 2.82, which is not interpretable as a correlation coefficient. While our coefficient estimates were quite robust, our estimate of α varied from .66 to over 3. We chose not to choose variables based on α in order to avoid pretest bias.

of African Americans are more likely to enter informal bankruptcy, and less likely to enter formal bankruptcy , than other borrowers.

In the nested model, strict homestead exemptions decrease both the probability of informal and formal bankruptcy. This result suggests that the effects of exemption law on insolvent borrowers are not confined to their decision to declare a formal bankruptcy, which is not surprising given that exemption laws are intended to protect a borrower's property in informal bankruptcy as well. In addition, this decrease in the probability of informal and formal bankruptcy not only increases the probability that a borrower will repay her loan following a default,[40] it also decreases the probability a borrower will default in the first place.

Strict garnishment laws also increase the probability a borrower will choose repayment, suggesting that garnishment is also a deterrent to default. However, unlike exemption laws, strict garnishment statutes increase the probability a borrower will choose bankruptcy, shifting borrowers out of both informal bankruptcy and delayed repayment. High garnishment allowances appear to shift borrowers away from any solution other than formal bankruptcy following default.

The effects of state laws are quite large. The second row in Table 8 labeled "lenient" can be interpreted as the predicted probability for each individual if garnishment were illegal in all states, averaged over individuals. The row labeled "strict" represents the average predicted probability if garnishment were universally illegal. From these estimates, we would predict that moving an individual from a garnishment state to a no garnishment state would have only a slight impact on that individual's probability of loan repayment: the predicted probability of repayment decreases less than a tenth of a percentage point. However, garnishment has a very large impact on her total probability of bankruptcy : the average probability of bankruptcy with legal garnishment is nearly 50% higher than the probability when garnishment is illegal. At the same time, our results suggest that garnishment shifts borrowers out of informal bankruptcy into bankruptcy and workouts. The average predicted probability of informal bankruptcy when garnishment is loose is .01619, over 11% higher than the average when garnishment is illegal.

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[40] The change in the marginal probability of repayment can be computed in a straightforward way from the estimated marginal effects of the other outcomes: $ME_{DR}=0-(ME_R+ME_{IB}+ME_B)$

This increase may seem economically insignificant, but it represents an increase in expected losses of roughly $ 515.50 per borrower.

Homestead exemptions also have strong effects on the probability individuals choose formal bankruptcy, both overall and conditional on default. The line in the third row of Table 8 labeled "unlimited" represents the average predicted probability for each individual if homestead exemptions were unlimited in all states. The line labeled "zero" shows the mean individual predicted probabilities if there were no homestead exemptions. As in our other specifications, strict homestead exemptions increase the probability of both informal and formal bankruptcy. These results predict that moving an individual from Delaware (no exemption) to Texas (unlimited exemption) would increase her total probability of bankruptcy by nearly a third, and increase her probability of informal bankruptcy by over 20%.

VI. Conclusion

The broader view of bankruptcy taken in this paper has immediate implications for evaluating potential policy prescriptions. To put matters in somewhat over-simplistic economic terms, formal bankruptcy and informal bankruptcy should conceptually be viewed as substitutes. Moreover, the results of this paper demonstrate that the empirical degree of substitutability between them is substantial. For example, strict garnishment laws effectively raise the relative cost of informal bankruptcy, and thus empirically induce a large amount of substitution from informal into formal bankruptcy. Indeed, the observed shift in composition swamps the relatively mild reduction in overall default activity.

In the current bankruptcy reform debate, the potential policy changes can be divided into two categories. Some proposals, such as "needs-based" bankruptcy requirements[41] or limitations on dischargeability,[42] raise the cost of formal bankruptcy without affecting the cost of informal

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[41] For example, borrowers may be required to pass a "means test" before filing for Chapter 7, and individuals who could pay a prescribed proportion of their loans would be required to file under Chapter 13.

[42] A provision in currently pending legislation prevents discharge of credit card debts incurred while the borrower did not have a reasonable expectation of repayment. Under current law, these debts would be discharged unless the borrower engaged in fraudulent or intentionally harmful conduct.

bankruptcy. As such, these are likely to induce a substantial shift from formal to informal bankruptcy, without necessarily reducing overall defaults. The official bankruptcy statistics may be improved, but insolvency and default will go on. Other proposals, such as capping the unlimited homestead exemption in Florida and Texas, raise both the costs of formal and informal bankruptcy.[43] A uniform nationwide homestead ceiling should thus be expected primarily to reduce defaults, without changing the margin between formal and informal bankruptcies. However, the conference report adopted by House and Senate conferees permits states to maintain unlimited homestead exemptions for residents of two years or more, so one of the most effective components of bankruptcy reform seems unlikely to be implemented.

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[43] As we have seen in Section II, creditors are also restricted in their ability to seize exempt property outside of formal bankruptcy.

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VIII. Tables

Table 1. State Garnishment, Homestead and Property Exemptions

State	% Garn[1]	Home[2]	Property	State	% Garn	Home	Property
AK	FED	$54,000	$8,000	MT	FED	$40,000	$5,700
AL	FED	$5,000	$6,925	NC	0%	$10,000	$5,000
AR	FED	Unlimited	$1,400	ND	FED	$80,000	$7,425
AZ	FED	$100,000	$9,250	NE	15%	$10,000	$2,550
CA	FED	$50,000	$8,350	NH	0%	$30,000	$11,350
CO	FED	$30,000	$4,800	NJ	10%	$15,000	$12,200
CT	FED	$75,000	$7,100	NM	FED	$30,000	$8,050
DE	15%	$0	$5,000	NV	FED	$95,000	$4,500
FL	FED	Unlimited	$2,000	NY	10%	$10,000	$7,400
GA	FED	$5,000	$5,400	OH	FED	$5,000	$2,900
HI	19%	$20,000	$2,000	OK	FED	Unlimited	$10,925
IA	FED	Unlimited	$10,600	OR	FED	$25,000	$9,150
ID	FED	$50,000	$5,750	PA	0%	$15,000	$12,200
IL	15%	$7,500	$7,125	RI	FED	$15,000	$12,200
IN	FED	$7,500	$4,000	SC	0%	$15,000	$12,200
KS	FED	Unlimited	$24,650	SD	20%	Unlimited	$3,250
KY	FED	$5,000	$6,500	TN	FED	$5,000	$7,925
LA	FED	$15,000	$15,125	TX	0%	Unlimited	$30,000
MA	FED	$15,000	$12,200	UT	FED	$8,000	$9,925
MD	FED	$0	$6,000	VA	FED	$5,000	$14,750
ME	FED	$12,500	$9,550	VT	0%	$30,000	$9,400
MI	FED	$15,000	$12,200	WA	FED	$30,000	$12,675
MN	FED	$200,000	$13,000	WI	20%	$40,000	$7,200
MO	10%	$8,000	$3,000	WV	20%	$15,000	$12,200
MS	FED	$75,000	$10,000	WY	FED	$10,000	$9,675

[1]'FED' indicates that the federal maximum of 25% garnishment allowable binds.
[2]Table entry is higher of state or federal exemptions, if that state allows borrowers to choose federal exemptions

Table 2. Definition of Variables

Source	Description
Credit Record Variables[1]	Months on file- The number of months the borrower has been on file with the credit reporting agency.
	Revolving/Non-revolving balances- The total balances the borrower has on all revolving/non-revolving loans.
	Revolving/Non-revolving limits- The borrower's total limits on all revolving/non-revolving loans.
	Revolving/Non-revolving loans- The borrower's total number of revolving/non-revolving loans, at the time of the credit report.
	Credit Score- A measure, compiled by the credit reporting agency, meant to capture the borrower's probability of default.
Merged Variables[2]	Unemployment- The unemployment rate of the borrower's state of residence.
	Household value- The average home value in the borrower's zip code.
	Percentage white/black/nonwhite- Racial demographics by zip code.
	Homestead/Personal Property Exemptions- The borrower's state's homestead/personal property exemptions, as described above.
	Garnishment Loose- A dummy which equals 1 if the borrower lives in a state where wages are protected beyond the federally mandated 75%, and 0 otherwise.
Issuer Variables[3]	Zip code
	Balances Transferred- The balances transferred to the newly issued card.
	Income- The borrower's self-reported income.
	Limit- The borrower's limit on the card.

[1] Data compiled by the credit reporting agency immediately prior to solicitation.

[2] Data merged from other sources. Demographic variables from U.S. Bureau of the Census (1990). If a borrower moved during the experiment period and defaulted, the borrower's residence was defined as the state and zip code where the default occurred. If the borrower moved and did not default, the borrower's residence was defined as the state where she lived longest during the experiment period. We found no correlation between individuals' probability of moving and either characteristics from their borrowing history or their probability of default or bankruptcy.

[3] Data recorded by the credit card issuer at the beginning of the experiment period of 21-28 months. We excluded factors determined by the borrower during the experiment period, such as monthly balances, which were likely to be highly endogenous to the borrower's bankruptcy decision.

Table 1. Variable Means by Outcome

	Total Sample	Delinquent	Informal	Formal
Months on File	140.66	111.40	95.19	122.94
Revolving Balances	$6,660.35	$9,145.42	$7,757.46	$14,247.65
Revolving Limits	$29,539.20	$22,578.62	$16,822.67	$28,565.89
Balance Transferred	$1,872.00	$1,315.84	$790.12	$1,618.60
Unemployment	5.46%	5.50%	5.62%	5.48%
Income	$38,683.17	$32,668.94	$29,156.41	$34,353.18
Homestead Ex	$65,434.17	$70,092.72	$78,601.83	$75,046.44
Property Ex	$9,825.79	$10,067.59	$10,447.68	$10,206.97
Garnishment Loose	44.66%	46.74%	54.07%	38.48%
Number of Loans	15.81	13.59	10.30	16.93
Percentage Zip Black	7.57%	10.45%	13.71%	8.49%
Median Zip Home	$106,999.43	$102,352.08	$98,920.51	$95,406.39
Credit Score	629.06	576.06	562.57	562.15
Limit	$7,354.11	$5,634.19	$4,647.19	$5,557.18
Observations	48,734	3,541	712	828

Table 2. Linear Regression of Credit History Variables on Credit Score

	Estimate	T Stat	Pr > |T|
Intercept	526.83048	71.21	0.0001
Variables 1 - 23	.	.	0.0001
Variable 24	0.00006	3.61	0.0003
Variable 25	-5.07674	-3.43	0.0006
Variable 26	-0.65107	-3.44	0.0006
Variable 27	0.01704	2.98	0.0029
Variable 28	-4.87168	-2.61	0.0092
Variable 29	-17.95368	-2.18	0.0292
Variable 30	-9.52352	-2.10	0.0355
Variable 31	-11.00485	-1.93	0.0530
Variable 32	-9.18290	-1.84	0.0663
Variable 33	0.81706	1.77	0.0766
Variable 34	0.21592	1.41	0.1594
Variable 35	0.08487	1.20	0.2305
Variable 36	-0.19875	-0.86	0.3872
Variable 37	0.00034	0.55	0.5844
Variable 38	-0.00001	-0.25	0.7988
Variable 39	0.08204	0.22	0.8252
Homestead Exemption	0.00000	1.00	0.3193
Personal Property Exemption	-0.00004	-0.65	0.5173
Garnishment Dummy	1.40136	1.48	0.1390

H0: Coeffs of State Laws are 0:
Chi-Square (3) =2.83
Prob > Chi-2 =.4194

R-square = 0.511

Table 3. Comparison of Marginal Effects of Dichotomous and Trichotomous Specifications

	Dichotomous	Trichotomous			
	FB vs. R, IB	Informal	Formal	Informal	Formal
Intercept	-0.0197159 (6.31E-03) **	-0.0210427 (4.65E-06) **	-0.0175784 (4.51E-06) **	-0.0197311 (7.23E-03) **	-0.030933 (1.01E-02) **
Months on File	-0.0000129 (4.68E-06) **	-0.0000169 (3.86E-08) **	-0.0000143 (4.06E-08) **	-0.000011 (5.20E-06) **	-2.26E-05 (6.11E-06) **
Revolving Balances	5.70E-07 (3.79E-08) **	6.06E-07 (2.71E-08) **	6.29E-07 (3.04E-08) **	3.14E-07 (4.26E-08) **	4.72E-07 (4.45E-08) **
Revolving Limits	-3.09E-07 (2.72E-08) **	-3.14E-07 (1.42E-07) **	-3.25E-07 (1.69E-07) **	-1.22E-07 (3.07E-08) **	-2.28E-07 (2.96E-08) **
Balance Transferred	8.86E-08 (1.44E-07)	-3.90E-07 (1.69E-07)	4.47E-08 (1.42E-07)	9.71e-08 (1.40E-07)	3.15E-07 (1.35E-07)
Unemployment	0.001077 (3.45E-04) **	0.001166 (5.09E-04) **	0.0011006 (4.82E-04) **	0.0007342 (3.97E-04)	0.0005378 (4.36E-04) *
Log Income	0.0010075 (5.18E-04) *	0.0018656 (3.73E-09) **	0.0010052 (3.27E-09) **	0.0008635 (5.24E-04) **	0.0016608 (8.18E-04) *
Homestead Ex	1.03E-08 (3.76E-09) **	9.26E-09 (5.04E-08)	1.08E-08 (4.27E-09) **	1.85E-08 (1.88E-08)	1.53E-08 (2.23E-08)
Property Ex	4.22E-08 (5.09E-08)	3.84E-08 (6.84E-04)	5.13E-08 (5.97E-04)	1.47E-07 (2.58E-07)	6.70E-07 (3.21E-07)
Garnishment Loose	-0.0033936 (6.91E-04) **	0.0014436 (5.97E-04) **	-0.0032644 (6.84E-04) **	0.002932 (3.60E-4)	-0.000830 (4.34E-03)
Number of Loans	0.0005878 (4.44E-05) **	-0.0001677 (2.21E-03) **	0.0005725 (1.60E-04) **	-0.0003317 (6.53E-05) **	0.0003995 (5.17E-05) **
Percentage Zip Black	-0.0019145 (2.23E-03)	0.008888 (5.61E-09) **	-0.001109 (4.73E-09) **	0.0083473 (2.00E-03)	0.0003626 (2.87E-04) **
Median Home Value	-1.54E-08 (5.67E-09) **	-1.43E-08 (4.32E-06)	-1.56E-08 (3.89E-06)	-4.49E-09 (5.69E-09)	-7.79E-09 (7.07E-09)
Credit Score	-0.0000501 (4.29E-06) **	-0.0000333 (1.42E-07) **	-0.0000512 (1.49E-07) **	-0.0000194 (4.64E-06) **	-3.71E-05 (5.58E-06) **
Limit	-1.35E-06 (1.42E-07) **	-1.64E-06 -(1.76E-02)	-1.76E-02 (5.56E-03) **	-8.99E-07 (1.44E-07) **	-1.16E-06 (1.58E-07) **
Interest Rate				0.0012932 (5.78 E-04) **	0.0017927 (7.13 E-04) **
Interest*Garnishment				-0.0003802 (1.56 E-04)	-.0001274 (7.40 E-04)
Interest*Homestead Exemption				-2.54E-09 (3.13 E-09)	-8.29E-10 (3.79 E-09)
Interest*Property Exemption				-1.95E-08 (4.28 E-08)	-1.09E-07 (5.52 E-08) **
	(N=47,903)	(N= 24,832)			

italic * significant at 10% level
italic ** significant at 5% level

Table 4. Two Stage Nested Logit Coefficients

	First Stage	Second Stage	
	Repayment	**Informal Bankruptcy**	**Formal Bankruptcy**
Intercept	1.90575 (0.633334) **	-5.44502 (1.81361) **	-1.85216 (2.03863)
Months on File	0.00222535 (0.00057644) **	.135458E-02 (0.00140889)	6.39443E-04 (0.0014499)
Revolving Balances	-2.2445E-05 (4.4655E-06) **	.116286E-03 (1.5866E-05) **	7.62162E-05 (1.1313E-05) **
Revolving Limits	4.2187E-06 (2.8007E-06)	-.880321E-04 (1.279E-05) **	-5.30310E-05 (8.2508E-06) **
Balance Transferred	1.5684E-05 (1.7139E-05)	-.203414E-03 (6.3417E-05) **	7.51778E-05 (4.2262E-05) *
Unemployment	0.080835 (0.046635) *	.368445 (0.131253) **	0.306592 (0.113485) **
Log Income	0.050998 (0.047965)	0.617607 (0.153566)	0.164416 (0.189491)
Homestead Ex	6.4948E-07 (4.8546E-07)	2.26742E-06 (1.2256E-06) **	2.71412E-06 (0.189491) **
Property Ex	-3.555E-06 (6.7358E-06)	-1.61920E-06 (1.5764E-05)	4.10799E-06 (1.1920E-06)
Garnishment Loose	-0.20842 (0.08297) **	0.084221 (0.224016)	-1.05106 (1.6490E-05) **
Number of Loans	0.00493825 (0.00636345)	-0.055694 (0.019445) **	.125332 (0.231141) **
Percentage Zip Black	-0.998254 (0.245409) **	0.547955 (0.547965)	-2.10896 (1.33231) **
Median Zip Home Value	-1.6482E-06 (5.6693E-07) **	-6.85087E-06 (1.7525E-06) **	-5.74179E-06 (0.731521) **
Credit Score	0.00215816 (0.00052578) **	-1.59469E-03 (0.00132882)	-5.90031E-03 (1.7746E-06) **
Limit	-1.3598E-05 (1.671E-05)	-3.68234E-04 (5.2213E-05) **	-2.62494E-04 (0.00130933)

* significant at 10% level
** significant at 5% level
Std errors in parentheses

Table 5. Marginal Effects in Nested Model: Total and Conditional on Default

	Unconditional Effects			Conditional on Default	
	Repayment	Informal Bankruptcy	Formal Bankruptcy	Informal Bankruptcy	Formal Bankruptcy
Months on File	8.20E-05	-7.27E-06	-1.49E-05	6.11E-05	2.03E-05
	(1.31E-05) **	(1.94E-06) **	(3.79E-06) **	(6.95E-05)	(8.57E-05)
Revolving Balances	-2.10E-06	3.88E-07	5.58E-07	4.95E-06	3.07E-06
	(1.05E-07) **	(2.64E-08) **	(3.32E-08) **	(6.63E-07) **	(6.92E-07) **
Revolving Limits	1.02E-06	-2.32E-07	-2.99E-07	-3.82E-06	-2.03E-06
	(6.22E-08) **	(1.83E-08) **	(2.34E-08) **	(5.18E-07) **	(5.06E-07) **
Balance Transferred	9.92E-07	-4.49E-07	5.90E-08	-1.16E-05	7.57E-06
	(3.83E-07) **	(1.01E-07) **	(1.00E-07)	(3.04E-06) **	(2.53E-06) **
Unemployment	-8.40E-04	5.58E-04	7.89E-04	1.48E-02	1.38E-02
	(1.01E-03)	(1.81E-04) **	(2.81E-04) **	(6.42E-03) **	(6.60E-03) **
Log Income	-2.09E-03	1.13E-03	6.01E-04	2.98E-02	1.36E-03
	(1.10E-03) *	(2.47E-04) **	(5.42E-04)	(8.01E-03) **	(1.18E-02)
Homestead Ex	-5.56E-09	3.20E-09	6.94E-09	7.94E-08	1.36E-07
	(1.07E-08)	(1.61E-09) **	(3.02E-09) **	(5.99E-08)	(6.90E-08) **
Property Ex	-1.75E-07	1.56E-08	4.47E-08	-1.43E-07	2.78E-07
	(1.53E-07)	(2.08E-08)	(4.20E-08)	(7.76E-07)	(9.74E-07)
Garnishment Loose	-5.35E-04	5.45E-04	-2.49E-03	1.94E-02	-6.64E-02
	(1.82E-03)	(3.16E-04) *	(5.80E-04) **	(1.13E-02) *	(1.28E-02) **
Number of Loans	-5.58E-04	-6.61E-05	4.34E-04	-4.69E-03	8.57E-03
	(1.44E-04) **	(2.99E-05) **	(3.67E-05) **	(9.47E-04) **	(8.39E-04) **
Percentage Zip Black	-0.027168	0.00458604	-4.0469E-05	0.058703	-0.138682
	(5.97E-03) **	(7.28E-04) **	(2.07E-03)	(2.71E-02) **	(4.22E-02) **
Median Zip Home Value	9.78E-09	-9.71E-09	-1.36E-08	-2.75E-07	-2.58E-07
	(1.28E-08)	(2.61E-09) **	(4.99E-09) **	(8.71E-08) **	(1.04E-07) **
Limit	3.29E-06	-8.46E-07	-1.16E-06	-1.54E-05	-1.10E-05
	(3.44E-07) **	(8.36E-08) **	(1.19E-07) **	(2.42E-06) **	(2.60E-06) **
Credit Score	1.46E-04	-1.68E-05	-4.24E-05	1.64E-06	-3.43E-04
	(1.20E-05) **	(2.01E-06) **	(3.44E-06) **	(6.58E-05)	(7.20E-05) **

* significant at 10% level
** significant at 5% level
Std errors in parentheses

Table 6. Mean Predicted Probabilities by Garnishment Laws

	Total Sample			Conditional on Default	
	Repayment	Formal Bankruptcy	Informal Bankruptcy	Formal Bankruptcy	Informal Bankruptcy
Probability					
Actual	0.92591	0.01734	0.01489	0.23340	0.20096
Predicted	0.92478	0.01630	0.01571	0.21612	0.20867
Garnishment					
Lenient	0.92527	0.01455	0.01619	0.19705	0.21541
Strict	0.92467	0.02006	0.01453	0.26024	0.19428
Homestead Exemptions					
Unlimited	0.92017	0.01910	0.01813	0.23703	0.22365
Zero	0.92680	0.01504	0.01483	0.20703	0.20342
Average Charge Off					
Informal Bankruptcy			$4,686.51		
Formal Bankruptcy			$4,756.63		