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Abstract

Conventional wisdom holds that individuals who have gone bankrupt face difficulties getting credit for at least some time. However, there is very little non-survey based empirical evidence on the availability of credit post-bankruptcy and its dependence on the credit cycle. Using data from one of the largest credit bureaus in the US, this paper makes three contributions. First, we show that individuals who file for bankruptcy are indeed penalized with limited credit access post-bankruptcy, but we find that this consequence is very short lived. Ninety percent of individuals have access to some sort of credit within the 18 months after filing for bankruptcy, and 75% are given unsecured credit. Second, we show that those individuals who have the easiest access to credit after bankruptcy tend to be the ones who have shown previously the least ability and least propensity to repay their debt. In fact, a significant fraction of individuals at the bottom of the credit quality spectrum seem to receive more credit after filing. We interpret the widespread post-bankruptcy credit access and the differential credit provision across borrower types as evidence that lenders target riskier borrowers. Employing a simple theoretical framework we show that this interpretation is consistent with a profit maximizing lender whose optimal strategy involves segmenting borrowers by observable credit quality and bankruptcy status. This interpretation is also in line with survey evidence that shows lenders repeatedly solicit debtors to borrow after bankruptcy, especially with offers of revolving credit. Finally, we show that our findings depend heavily on the aggregate credit environment: the ease of credit and limited bankruptcy credit cost observed in the initial period of our data (2003-2004) become much less significant when we repeat the analyses in 2007, as the recent credit downturn began.

JEL Classification Codes: D14, I30, K45

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1 Introduction

The last two decades have seen a massive increase in both consumer credit and personal bankruptcies. Policymakers and academics have attempted to understand the sources of these trends and the causal link between them. As part of this debate, there has been much discussion about whether bankrupt individuals are (or should be) excluded from credit markets, and whether these individuals have gone bankrupt due to demand side factors, such as income and employment shocks, or as part of a general trend of increased credit supply. Gross and Souleles (2002) argue that demand side factors play a more important role than those on the supply side by showing that the changes in default rates are not caused by changes in the risk composition of borrowers. More recently, Dick and Lehnert (2009) have suggested that increased bankruptcies are a consequence of increased competition in the banking sector. They argue that improved credit scoring algorithms have helped banks compete and have increased lending to riskier households, which has led to a rise in bankruptcies. In this paper, we seek to refine the supply-side story to better understand the consequences of filing for bankruptcy by studying the availability of credit to households post-bankruptcy. Understanding the consequences of filing provides insights into the incentives and determinants to file. This question is important for understanding the implications of the credit card legislation recently signed into law, which limits the penalizing strategies banks have previously used to generate significant income, particularly from riskier borrowers.[1]

Our results provide the most detailed picture to date of credit access for post-bankruptcy consumers. We have three principal contributions to the literature. We find broadly that credit availability does decline, but that the average decline is relatively small and short lived. Second, the lowest quality borrowers seem to face the smallest decrease, and in some cases see an increase in credit. To accompany these results, we develop a simple theoretical framework to show that this pattern is a logical, and profitable, strategy for lenders to follow. Third, our results provide confirmation and support for the Dick and Lehnert (2009) story regarding supply changes in the provision of credit being related to bankruptcy; in particular, we show that as credit supply tightened by the end 2007, access to credit post bankruptcy decreased, reducing the ex-ante incentives to file. We also provide a refinement to the Dick and Lehnert (2009) explanation in that we find low quality borrowers have both the greatest relative increase in credit post bankruptcy and the largest difference in access between high and low credit supply periods. This suggests that the link between expansion of credit and bankruptcy may operate principally through extension of credit to low credit quality

[1] The bill, titled the 'Credit Card Accountability, Responsibility and Disclosure Act' was signed by President Obama on May 24, 2009.

borrowers rather than to all borrower types.

While there have been many theoretical studies analyzing these questions, there is very little empirical evidence, especially regarding facts about credit access post-bankruptcy. The economics literature, in particular, the macro-quantitative models of bankruptcy mostly assume an exclusion penalty where individuals are not allowed to borrow post-bankruptcy for a given period of time. The legal literature on the other hand suggests that there is relatively easy access to credit, relying principally on survey evidence. We discuss both these lines of research in detail in the section below.

The aim of this paper is to contribute to this debate by investigating the degree to which individuals that file for personal bankruptcy have access to credit markets afterwards. To our knowledge, this is the first study of post-bankruptcy credit access based on a nationally representative sample of consumer credit information that is drawn from lenders themselves.[2] Using panel data provided by a large US credit bureau data, we establish some basic facts about the availability of credit post-bankruptcy and provide a related discussion about the potential behavior of lenders consistent with our empirical results. We focus primarily on access to unsecured lending as measured by credit limits on revolving credit lines, such as credit cards.

Using an empirical methodology to estimate the counterfactual credit for bankrupt borrowers if they had not filed for bankruptcy, we first show that, on average, households are indeed 'punished' for having gone bankrupt through limited credit access. However we also show that this reduced credit availability is very short-lived. Indeed, 90% of individuals have access to some sort of credit within the 18 months after filing for bankruptcy, and 75% have access to revolving credit. Second, and more interestingly, we find that access to credit after bankruptcy is highly heterogeneous: a significant proportion of the population (18.3% in our 2003-04 sample) actually seem to receive *more* credit after filing for bankruptcy than if they had not filed. In particular, there appears to be a strong division between individuals that had poor credit histories prior to bankruptcy and those that had good credit histories. We find that bankrupt individuals with the lowest credit scores have more access to credit, compared to individuals with the highest credit scores prior to bankruptcy: 65% of individuals in the lowest credit score bracket that file for bankruptcy receive more credit after bankruptcy, while that figure is just 4.5% for the highest score individuals that filed for bankruptcy. When we further investigate the characteristics of these individuals who received more credit than expected, we find that they are on average more likely to have low credit scores and live in poorer, less educated communities. In other words, individuals with the least ability and propensity to repay their

[2] Musto (2004) provides an empirical investigation of post-bankruptcy credit that focuses primarily on the credit effect of a removal of the bankruptcy flag from individual credit reports after 10 years. This paper focuses on post-bankruptcy access to credit in the months following the bankruptcy filing. We discuss at greater length below.

debts prior to declaring bankruptcy and the least to access financial or educational resources seem more likely to experience an increase in their credit limits after filing for bankruptcy. Third, we also show that these results are highly dependent on the aggregate credit environment: the large differences in credit access between good and bad creditworthy bankrupts observed during booming credit years of 2003 and 2004 become much less significant as the credit crunch begins in 2007. That is, the lowest credit score individuals experience the largest change in credit access post-bankruptcy with the credit cycle.

We interpret these findings that lenders differentiate credit supply both as a function of credit quality and bankruptcy status. This interpretation is consistent with some of the survey evidence provided by legal studies as discussed in Section 2 below that find evidence that lenders quickly offer credit even to low credit quality borrowers after bankruptcy. A recent NY Times article also provides a discussion on how the credit card industry has relied on riskier households as a significant source of revenue through penalty interest rates and fees.[3] Moreover, this interpretation is also supported by economic theory. To show this and more importantly, to help us better interpret these findings in a more structured fashion, we build a simple theoretical framework to help understand lenders' decisions and debt valuation. We then use this framework to illustrate that our empirical findings are consistent with a profit maximizing lender that differentiates lending decisions by borrowers, as segmented by credit score and bankruptcy status. Two pieces of intuition emerge from our framework. First, lenders have no incentive to reduce borrowers' credit limit unless bankruptcy reveals a change in a borrower's likelihood of repayment in the future or changes recovery rates post default. Second, from an economic perspective, declaring bankruptcy can provide creditors with information about a borrower's ability or willingness to repay debt. Using our data we show that it is the default behavior of only prime-borrowers that changes significantly after filing for bankruptcy. For those at the low-end of the credit quality spectrum, delinquency rates remain relatively constant after a bankruptcy filing. This helps explain why lending to low quality borrowers is much less impacted.[4] Indeed, the observed increase in credit provision to subprime borrowers is very much related to increased recovery rates for these borrowers after bankruptcy. To further highlight this result, we present some simple simulation exercises at the end of Section 3. The empirical observations of increased credit access for some borrowers and the differential provision of credit to potentially riskier borrowers are in-line with the implications of our simple model of lender behavior. We then use this framework to analyze how

[3] "Credit Card Industry Aims to Profit From Sterling Payers," May 19, 2009, Andrew Martin, The New York Times.

[4] The finding that low credit quality borrowers see relatively small changes in default probabilities pre- versus post-bankruptcy is consistent with the story that the bankruptcy of a formerly prime-borrower signals the presence of a permanent shock, while people who are at the low-end of the credit quality spectrum tend to be there due to frequent and transitory shocks. We are, however, cautious in this interpretation as we do not have direct evidence of shocks.

lending decisions depend on the credit cycle. We argue that in a credit crunch the repayment ability of the low quality borrowers is highly impaired, specially after bankruptcy, while for prime borrowers default probabilities are just slightly increased. Additionally, since the credit cycle is closely related to the business cycle, recovery rates on defaulted debt tend to decrease in a downturn. In consequence, lending to bankrupt low quality borrowers in downturn periods is not as profitable than in credit booms. Our empirical analysis shows that by the end of 2007 bankrupt subprime borrowers faced more difficulties to access the credit market than in 2004, while access to credit for bankrupt prime borrowers is largely unchanged with the credit cycle. This is consistent with the anecdotal evidence provided in a recent NY Times article that the value of debt by non-payers is much higher in a boom than in a recession.[5]

The remainder of the paper is organized as follows. In Section 2 we provide a short summary of the economics and legal literature on personal bankruptcy. Both these literature reviews are limited in scope, but intended to provide a baseline for our discussion. In Section 3 we provide a simple stylized model of lender decisions. Section 4 describes our dataset, while Section 5 presents the methodology we use to assess credit availability post bankruptcy, and our results. We follow this with a short section discussing some potential caveats to the analysis in section 6. Section 7 concludes the paper.

2 Literature on Personal Bankruptcy

Economics and Finance Literature

Following the dramatic rise in bankruptcies over the last couple of decades and the surrounding policy discussions, many researchers have attempted to study household bankruptcy decisions and tried to explain the sources and the links between increasing consumer lending and defaults. In doing so, economists have mainly relied on quantitative macroeconomic models, and to a smaller degree on applied analyses that exploit different sources of micro data.

The quantitative macroeconomic models are part of a recent literature on equilibrium models of consumer bankruptcy. Examples include Athreya (2002, 2004), Chatterjee et al. (2007), and Livshits et al. (2007), which comprise of dynamic equilibrium models where interest rates vary with borrowers' characteristics. Almost all of these models assume the presence of a market exclusion following default. The existence of such an exclusion penalty facilitates these quantitative macro models in a number of ways. Most importantly, by imposing the presence of a non-renegotiable ex-ante exclusion, the models rule out moral hazard problems. Agents cannot accumulate assets with the explicit intention of expunging debt and

[5] "Credit Bailout: Issuers Slashing Card Balances," June 16, 2009, David Streitfeld, The New York Times.

then acquiring new debt. Of course, debt renegotiation does occur and nothing prevents a credit issuer from providing credit to a bankrupt ex-post. The presence of an exclusion serves as a reasonable assumption that captures a type of well quantified 'punishment' for bankrupts and allows researchers to calibrate a cost associated with bankruptcy. Such costs are a key to generating realistic solutions to models where households trade-off such costs against the benefit from a fresh-start (discharge of their debt). Similarly, another motivation for the exclusion assumption in these models is the fact that US Law prevents repeat bankruptcies within an 8 year period and that bankruptcy of an individual is kept on their credit history records for 10 years.

More recently, however, there has been increased discussion about whether these assumptions are realistic, followed by a move away from reliance on such assumptions. For example, Athreya and Janicki (2006) evaluate "the commonly used (but rarely justified) assumption" that bankrupt individuals get excluded from unsecured credit markets, as well as examine the quantitative role of exclusion in explaining the surge in both consumer debt and personal bankruptcies. They conclude that such an assumption is hard to justify from a theoretical perspective, especially without a better understanding of the income shocks households face—a key determinant of bankruptcies. This is because lenders have no incentive to punish borrowers after bankruptcy unless bankruptcy reveals a change in their likelihood of repayment. Accordingly, only in the case of small or primarily transitory shocks that exclusion penalties would have the most effect as the option-value to borrow is much less when facing a permanent shock

Within the quantitative macro literature, Chatterjee et al. (2009) provide the closest study. They argue that an exogenous credit market exclusion restriction is puzzling because a household that files for Chapter 7 is ineligible to file again for ~7 years and with its debts discharged may represent a better future credit risk. This should be true especially if the bankruptcy was caused by a temporary shock. Our empirical finding of a limited exogenous exclusion period supports their framework and suggests that lenders do indeed use current repayment and bankruptcy status to infer future probabilities of default when deciding whether to lend and to whom to lend.

On the applied analyses front, there are only a handful of studies, primarily due to lack of suitable data. Stavins (2000) examines the relationship between consumer credit card borrowing, delinquency rates, and personal bankruptcies. She finds that having been turned down for credit makes one substantially more likely to have filed for bankruptcy in the past. Similarly, bankruptcy filers are less likely to hold at least one credit card. While both of these observations are suggestive, they do not have an unambiguous interpretation of "exclusion" from credit markets. The extent of this exclusion is especially questionable given her finding

that the average number of credit cards held by those with a past bankruptcy was 2.91 compared to 3.58 for those without a bankruptcy. One of the most interesting findings in Stavins (2000) is that the individuals with prior bankruptcies have higher delinquency rates than the rest of the population, a finding that is suggestive of the systemically different characterization of bankrupt individuals.

Musto (2004) and Fisher, Filer and Lyons (2000) provide other evidence in support of an exclusion period. Musto (2004) analyzes the impact of the removal of the bankruptcy record from an individual's credit record and shows that especially the credit-worthy individuals get more cards and see big jumps in their credit limits. Indeed, such a finding is consistent with our results in that the high-credit individuals here see a relatively larger 'penalty' in the form of reduced credit lines and can thus have larger increases at the time the bankruptcy flag is removed from the record. Using a panel study of households, Fisher, Filer, and Lyons (2000) show that consumption of the bankrupt households depict higher sensitivity to their incomes than in the period preceding the filing, which is consistent with binding borrowing constraints in the post-bankruptcy period.

Unfortunately, these theoretical arguments or the indirect nature of the evidence so far presented in empirical studies limit our ability to have a solid understanding of the basic facts surrounding households' credit access after bankruptcy, a gap this paper hopes to fill. A very recent study by Han and Li (2009) also analyze this question using data from the Survey of Consumer Finances and a different methodology attempting to understand the equilibrium dynamics and disentangling changes in demand and supply.

Legal Literature

Outside of the economics literature, legal studies on post-bankruptcy rely primarily on available survey data to describe the exclusion patterns. That said, the legal literature has produced a wide range of work on bankruptcy. Among these works is a long-running debate over whether bankruptcy filings are strategically motivated or caused by unexpected external events. Among others Block-Lieb and Janger (2006), Sullivan et al. (2006) and Weiner et al. (2005) find support for the latter explanation for most bankruptcy filings. A comprehensive overview is available in Porter and Thorne (2006) and Porter (2008). Porter (2006) also uses data from the 2001 consumer bankruptcy project, a survey of a few thousands individuals experience before and after bankruptcy to provide some statistics on market exclusion and to opine on the reasons for bankruptcy.

In a seminal study that preceded the large 1973 change in the US bankruptcy code, Stanley et al. (1971) interviewed a small sample of people, and, notably found that credit was relatively easy to come by post bankruptcy. Among the literature that has found evidence of access on post 1973 data, Porter (2008) finds

that a very high percentage of individuals being offered unsecured lines of credit within a year of going bankrupt. As well, she finds support for the 'adverse event' theory of bankruptcy. She also notes that little prior empirical work has been done, but that a number of authors have cited the need for more data and evidence on the topic (see Braucher (2004) and Jacoby (2005)). In other work, Staten (1993) looks at the role of post-bankruptcy credit on the number of bankruptcies. He draws his data from a survey as well, and finds that one year post bankruptcy, 16.2 percent got new credit. Three years after, 38.6 percent obtained credit. About half of each came in installment and revolving debt. However, highlighting the problems with surveys and sample size, these numbers are quite different from the Porter (2008) results.

The background to the literature directly on post-bankruptcy lending is the work that has found that the changes in the bankruptcy code enacted in 2005 made consumer bankruptcy more difficult to obtain, and more expensive for the filer both in terms of filing costs and time allocation (Mann 2007, Sommer 2005).

Our question is about lending to consumers who have already filed for bankruptcy. Porter (2008) describes the criteria that should apply, "If even a modest proportion of bankruptcy debtors are untrustworthy deadbeats who behave in immoral or strategic ways, the credit industry should be reluctant to lend to these families." Indeed, individuals with low credit scores, defined as those individuals who have been unreliable in repayment of debts, should not typically be a target of credit issuance. In a story that is consistent with our findings, Porter (2008), using a longitudinal study of bankrupt individuals, finds evidence that consumers are 'bombarded' with credit offers, including from the very issuers that have just had debts expunged. Overlain with this motive is evidence that more than a third of families post bankruptcy had worsening financial conditions, even accounting for the bankruptcy discharge (Porter and Thorne, 2006).

Why would issuers pursue a strategy to lend to borrowers with worsening financial conditions? Porter (2008) and Mann (2007) argue that issuers stand to profit by charging sufficiently high interest rates, large fees and by trapping consumers in a debt trap. Broadly speaking the trap is that consumers, even at high interest rates, can pay interest on existing debt obligations using new credit. This, of course leads to higher debt and an increased chance that future payments will need to be met with new credit as well. At high enough rates, issuers can profit from borrowers that never repay initial principal. Consider the following example. John borrows $500 at 20% interest on a credit card. In the event that John misses a payment, his rate will change to 30% for the duration of the debt, plus a late fee of $39 for each missed payment. John is late on average 3 times a year. Thus, interest and fees on Jon's debt average $267. Principal payments are typically 2% ($10) per month. If John pays the principal payment and half the interest and fees in cash and finances the rest, his debt after a year will actually grow by $13.

While these results are based on surveys alone, the patterns are largely consistent with our findings.

3 A Simple Model of Creditor Decisions

3.1 Model Setup

To gain insight into why credit issuance may increase for some bankrupt borrowers, we draw on a stylized model of debt valuation and lenders' decisions. The framework starts with a simple definition of debt from a lender's perspective. The value of debt can be obtained as the weighted average, by the probability of default, of two terms. The first is the stream of risk free cash flows and second the recovery value in case of default. In other words, the first term is the value of debt when lenders know that individuals will repay their debt for certain, so it can be valued as simply the discounted future value of payments using the risk-free rate. The second term is the value of debt in case of default and can be obtained by multiplying the face value of debt by the recovery rate and the exposure at default. Accordingly, the value of a debt to a lender can be expressed as:

$$V = (1 - PD)FV + PD\,(1 - LGD)\,(EAD)\,B \tag{1}$$

where FV is the discounted future value of payments in the non-default scenario, PD is the probability of default i.e. the likelihood of non-payment, LGD is the loss given default i.e. the percentage of losses conditional on default, EAD is the exposure at default i.e. the percentage of the face value of debt owed at time of default, and B is the face value of debt. While the FV can have a complex form depending on the type of debt, for our purposes we treat FV to reflect the full credit line rather than the amount borrowed. This allows us to simplify the assumptions regarding the EAD and abstract from credit line utilization rates. Realistically, the exposure at default might vary depending on credit lines and consumer types. We focus on total credit limit available and assume that the exposure at default is 100% in all cases. Given that many debtors increase utilization rates prior to default, we believe this to be a reasonable assumption. Furthermore, we are interested in analyzing credit supply and therefore credit limit is more relevant than balance for our purpose.

With this broad framework in place, our goal is to uncover differences in profitability by type of borrower and by bankruptcy status. In other words, suppose there are four types of borrowers defined along two dimensions, bankruptcy status and repayment behavior: prime borrowers who have never gone bankrupt, ex-ante prime borrowers who went bankrupt, ex-ante subprime borrowers who have never gone bankrupt, and subprime borrowers who filed for bankruptcy. Note that the most straightforward way to think about prime vs. subprime borrowers within our empirical framework above is looking at the spectrum of high-

to-low credit scores, which mainly reflect a borrower's debt holding and historical repayment behavior. Accordingly, a lender considers the following four versions of equation 1:

$$V = [V_{NB}^{P}, V_{B}^{P}, V_{NB}^{SP}, V_{B}^{SP}]$$

where the superscripts P, SP refer to prime and subprime borrowers, and the subscripts NB and B refer to not-bankrupt and bankrupt, respectively. It is important to note that an individual can be in default of payment but not bankrupt.

To distinguish between these four types of borrowers and to understand the profitability of each type, we now analyze each of the components of equation 1 in turn. Table 1 presents a summary of our assumptions regarding each of these components. As we have already mentioned, we assume EAD to be 100% for all types. On the other hand, FV and B do vary across these four types of borrowers. However, we can assume these terms to be equivalent across each type without loss of generality as part of a normalization assumption. After all, the risk-free component of one dollar of riskless lending has equal future value for all types of borrower. This claim is based on two assumptions which we think reasonable given the institutional features of the credit card market. One, the length of contract loan is equivalent for each borrower. This ensures that the discounted value of a $1 risk free loan is equivalent across types. Two, we assume that there is a one-to-one mapping from probability of default to interest rate. This enables us to ensure that lenders choosing a particular interest rate for a loan associates that loan with a particular default probability. Once individuals are segregated into the four groups by observables, the loan rates are associated with type alone.

This leave us with two parameters that are key in for our story: the probability of default (PD) and loss given default (LGD). By signing the relationships between each of these parameters for all four types, we can make some claims and derive inference on the profitability of lenders and thus potentially gain insight into the observed patterns. Note that, for each of these cases we consider the lender's decision at the margin for a single marginal dollar of lending.

Table 1: Summary of Assumptions

Prime borrower (P)	Subprime borrower (S)
$PD_{NB}^{P} << PD_{B}^{P}$	$PD_{NB}^{SP} \leq PD_{B}^{SP}$
$LGD_{NB}^{P} > LGD_{B}^{P}$	$LGD_{NB}^{SP} > LGD_{B}^{SP}$
$EAD_{NB}^{P} = EAD_{NB}^{SP} = EAD_{B}^{P} = EAD_{B}^{SP} = 100\%$	

The key component that distinguishes ex-ante prime vs. ex-ante subprime borrowers who have gone

into bankruptcy is the change in the probability of default. In our simple model, we assume that ex-ante subprime borrowers move marginally from high to higher default probability post-bankruptcy, while ex-ante prime borrowers show a significant increase in default probabilities on average. In other words, ex-ante prime borrowers who file for bankruptcy look a lot more like a subprime borrower after they have filed for bankruptcy. This assumption is strongly backed by evidence from our data as shown in Figure 1, which shows the 90-day delinquency rate for non-bankrupt and bankrupt borrowers in each of 5 credit categories where the 90 day delinquency rate is used as a proxy for non-bankruptcy default. Note that the credit scores listed on the x-axis correspond to the credit score of the bankrupt borrowers before their bankruptcy filing. As for ex-ante subprime borrowers, the data show that these borrowers' delinquency / default rates are largely unchanged after bankruptcy. These are, largely speaking, borrowers that were already at the bottom of the credit quality spectrum and the shocks that lead to bankruptcy appear not to change their environment to a great extent such that: $PD_B^{SP} \geq PD_{NB}^{SP}$. For prime borrowers, however, the same data show a very large increase in default: prime borrowers that go bankrupt have much larger default probabilities than prior to filing, such that we can write: $PD_B^P >> PD_{NB}^P$. In fact, it is these large average changes and differences in post-bankruptcy probability of default which help explain the relative decline in access to credit for prime-borrowers post-bankruptcy that we observe in the data. This finding is also in-line with our prior belief that bankruptcy is likely to carry a stronger signal about the post-bankruptcy repayment ability of ex-ante prime borrowers: it is very likely that individuals who had higher ex-ante credit scores ended up in bankruptcy due to a permanent shock, while those who are consistently around the low-end of the credit quality spectrum might be more prone to frequent, transitory shocks.

Unfortunately, the comparison of the expected loss given default across borrower types is a little bit more difficult. In a simplified sense, we would like to know whether the amount a lender can recover after default on a loan changes once borrowers enter bankruptcy. It is certainly plausible to think that creditors' losses conditional on default are lower for both prime and subprime borrowers inside bankruptcy. After all, for subprime borrowers who are not in bankruptcy, the industry expectation is broadly that little or none of the principal of a loan will be recovered. However, once a borrower files for bankruptcy, creditors have a few additional tools at their disposal for the recovery of principal after default due to an exclusion on repeat Chapter 7 filings as well as additional mechanisms that provide lenders the ability to recoup some of their losses under Chapter 7. The same story about legal restrictions also affects the prime borrowers in a similar way. Accordingly, we can also assume $LGD_{NB}^{SP} > LGD_B^{SP}$ and $LGD_{NB}^P > LGD_B^P$. However, there is no empirical evidence available to support these assumptions. Accordingly, we also carry-out a simple

simulation exercise to better capture the effects of changes in LGD across our borrower types on lender's decisions.

Following these assumptions, we can now evaluate the relationship between debt values for each group and make some claims about lenders' decisions to supply credit to these different groups.

Claim 1 *From a lender's perspective, the value of an extra dollar lent to a subprime borrower who has gone bankrupt is greater than one that is lent to a subprime borrower who has never gone bankrupt:* $V_{NB}^{SP} < V_{B}^{SP}$.

To see this, we can re-write the debt value equation above for subprime borrowers who have never filed for bankruptcy:

$$V_{NB}^{SP} = (1 - PD_{NB}^{SP}) + PD_{NB}^{SP}\left(1 - LGD_{NB}^{SP}\right) \tag{2}$$

Recalling our assumptions that $LGD_{NB}^{SP} > LGD_{B}^{SP}$ and $PD_{B}^{SP} \geq PD_{NB}^{SP}$, we can evaluate how equation 2 changes when this borrower becomes bankrupt. Breaking the equation into two parts, we can see that the first term decreases as individuals move to bankruptcy. However, this change is rather small because the probability of default only slightly increases for these subprime borrowers as discussed above and as shown in Figure 1:

$$(1 - PD_{NB}^{SP}) \geq (1 - PD_{B}^{SP})$$

However, the second term increases as both the probability of default modestly increases and the loss given default decreases:

$$PD_{NB}^{SP}\left(1 - LGD_{NB}^{SP}\right) < PD_{B}^{SP}\left(1 - LGD_{B}^{SP}\right)$$

Accordingly, which of the two terms has a larger effect on V as subprime borrowers move to bankruptcy depends on the magnitude of change in each sub-component. We do know from data (as shown in Figure 1) that the change in PD is relatively small, and therefore, the change in V will be determined by the change in LGD. When the loss given default for bankrupts is sufficiently small compared to the loss given default for non-bankrupts we can conclude that $V_{NB}^{SP} < V_{B}^{SP}$. We discuss this LGD relationship in more detail in Section 3.2.

Claim 2 *Contrary to the case of subprime borrowers, the value of an extra dollar lent to a prime borrower who has gone bankrupt is much smaller than one that is lent to a prime borrower who has never gone bankrupt:* $V_{NB}^{P} > V_{B}^{P}$

To see this, we can again start from the debt value equation for prime borrowers who have never filed for bankruptcy:

$$V_{NB}^{P} = (1 - PD_{NB}^{P}) + PD_{NB}^{P}\left(1 - LGD_{NB}^{P}\right)$$

Given our assumptions and what we observe in the data, we can see that the first term $(1 - PD_{NB}^{P})$ decreases significantly when a prime borrower enters bankruptcy as their post-bankruptcy probability of default increases. On the other hand, the latter term, $PD_{NB}^{P}\left(1 - LGD_{NB}^{P}\right)$, increases as probability of default increases and loss given default declines. Again, we need to determine which one of the two terms has a larger effect on V as prime borrowers move to bankruptcy. We can see in Figure 1 that the change in PD_{NB}^{P} to PD_{B}^{P} is a very large one—on the order of 20%. So, we conjecture that V^{P} will fall as prime borrowers enter bankruptcy unless LGD changes on a very large magnitude.

3.2 A short simulation

We conduct two short simulation exercises to test the two conjectures seen above. As mentioned, the conclusions drawn rest on assumptions about the nature of loss given default for each type. In the prime case, we posited that $V_{NB}^{P} > V_{B}^{P}$ unless LGD changes by a large amount. In the subprime case, we claimed that $V_{NB}^{SP} < V_{B}^{SP}$ based on the assumption that $LGD_{NB}^{SP} > LGD_{B}^{SP}$.

To illustrate these assumptions, we solve equation 1 for each of the four types based on known values for probability of default (see Figure 1) and for all possible values of LGD. We can then determine what range of values of LGD are needed to confirm the conjectures above. Figure 2 shows the results of two simulations.

In the prime case, our exercise shows that there are no values of LGD that permit in increase in V^{P} as borrowers move to bankruptcy (Panel A). There is a negligible black region meaning that Claim 1 is invalidated only in the very unlikely situation where $LGD_{B}^{P} = 0$, i.e. recovery rates on defaulted debt of prime bankrupt individuals are close to 100%. In the subprime case, there is a range of LGD combinations before and after bankruptcy that are consistent with the conjecture above (Panel B). The shaded region is composed of LGD combinations that have post bankruptcy recoveries increase with respect to pre-bankruptcy. While this cannot currently be verified empirically, we believe that it is consistent with the concept that lenders have increased ability to seize assets on new debt after bankruptcy. This invokes the law of unintended consequences: bankruptcy is intended to shield assets from creditors, and indeed it does. However, the trade-off is that lenders have increased ability to claim assets on new lending as borrowers cannot file again for a period of time.

To sum up, this model together with the results of our simulation exercise provides support for our findings regarding the differential supply of credit post-bankruptcy to prime and subprime borrowers. The

framework presented helps us illustrate why the value of lending may be higher for subprime borrowers after they have filed for bankruptcy as opposed to lending to prime borrowers, especially since the latter become more like a "subprime" borrower once they enter bankruptcy.

In the subsequent sections, we present data on credit availability pre and post bankruptcy for each type of borrower. These empirical analyses support the post-bankruptcy conjectures discussed above. We find that while prime borrowers receive less credit after bankruptcy, subprime borrowers may indeed receive more. Both of these are consistent with the value changes in the lender models above.

4 Data

Our analysis is based on a unique, very large proprietary data set provided by one of the three major credit bureaus in the US. The data are drawn from geographically stratified random samples of individuals and include information on variables commonly available in a personal credit report. In particular, the file includes age, a variety of account and credit quality information such as the number of open accounts, defaulted accounts, current and past delinquencies, size of missed payments, credit lines, credit balances, etc. The information spans all credit lines, including mortgages, bank cards, installment loans and department store accounts. The credit bureau also provides a summary measure of default risk—an internal credit score. As is customary, account files have been purged of names, social security numbers, and addresses to ensure individual confidentiality.

The primary data were drawn from two periods in time with an 18 month interval—June 2003 and December 2004—comprising a very large repeated panel with about 270,000 individuals. For each individual, the data provider includes information on a credit score. Credit scores, in general, are inverse ordinal rankings of risk. That is, an individual with a credit score of 200 is viewed to have higher risk of default than an individual of score 201. However, the difference in risk between 200 and 201 may or may not be equal to the change from 201 to 202. Having information on credit quality allows us to answer some of the outstanding questions more accurately than has been done to date. Importantly, the data set also includes information on individual public bankruptcy filings. Our key variable of interest is revolving credit line limits.[6] We focus on revolving credit because unsecured credit is discharged during bankruptcy, and furthermore, our interest is in credit supply and credit limit is the best available proxy for it as has been justified by previous research (e.g. Gross and Souleles, 2002). We also consider availability of secured lending as a robustness check.

[6]Most revolving credit lines are unsecured. However, a small fraction corresponds to secured cards (a card that requires a cash collateral deposit). In 2008 the number of offers of secured cards were 2 for every 10,000 unsecured credit card offers, as reported by Mintel Comperemedia. Our data does not allow distinguishing between the two.

Unfortunately, we do not observe and therefore are not able to comment on the "price" or cost of available credit to these individuals, which is likely to be an important indicator of credit availability. Nonetheless, we believe our results are still informative and provide the first direct evidence on credit access of bankrupt individuals.

For the analysis we drop individuals that have a total credit limit smaller than $1,000 in year 2003. We define two sub samples. The first one is the sample of individuals that have never filed for bankruptcy, comprising 122,159 individuals with complete information. Second, we construct the sub sample of individuals that go bankrupt between the two observation periods by selecting the individuals that have filed for bankruptcy in 2004 but had not declared bankruptcy before 2003 and, as a data cleaning exercise, drop individuals that in 2004 report more than 18 months since last derogatory public record. Indeed, the number of months permits to analyze the evolution of credit after bankruptcy across individuals.

Finally, we also use a larger and more recent panel dataset we have from the same credit bureau. This panel, drawn in June 2006 and December 2007, helps us to analyze whether there might have been changes in credit markets, especially as we entered the slow-down in this 2007/2008 crisis. In other words, we use this latter dataset to see whether the associated credit cost for bankruptcy—the ease at which bankrupt individuals can get credit—has changed between the credit boom period of 2003/2004 and the slow-down in 2007. Unfortunately matching the two data sets is not possible and limits our analysis to a comparison of two time periods as opposed to four.

Table 2 provides the summary statistics for the variables used in our analysis. Tables 3 and 4 provide more detailed descriptive statistics on the average credit limit by credit score brackets for the whole sample (Panel A), for the sub-sample of individuals that never filed for bankruptcy (Panel B), and for the sub-sample that file for bankruptcy (Panel C). In Panel C of Table 3 we can see that individuals with the lowest credit score ($<$300) have the lowest credit limit both before and after filing for bankruptcy, as expected: $5,105 and $1,980 in 2003 and 2004 respectively. Access to credit, measured by the percentage of individuals with positive credit limit in 2004, is increasing with pre-bankruptcy credit score: in the complete sample, 66% of individuals in the lowest credit score bracket have access to credit compared to an overall average of 96%. Also note that a significant fraction of the lowest credit score, bankrupt individuals (13%) experience an absolute increase in their credit limit.

5 Empirical Methodology and Results

5.1 Estimation of the credit access cost of bankruptcy

We define the credit access cost of bankruptcy (Credit Cost) as the difference in credit limit available to individuals that have filed for bankruptcy with respect to the credit limit that would have been available to them had they not filed for bankruptcy. This requires the estimation of a counterfactual credit limit for individuals that file for bankruptcy. We exploit the time dimension of our dataset to estimate the bankruptcy penalty of those individuals that file for bankruptcy sometime between June 2003 and December 2004 (our two observation times). We proceed in three steps. First, using the sample of individuals that have never filed for bankruptcy in 2003 or 2004, we estimate the following model for the availability of credit in 2004 using observables in 2003 the results of which are provided in Table 5:

$$L\_2004_i = \beta_1 L\_2003_i + \beta_2 X\_2003_i + u_i \tag{3}$$

where i is defined for all individuals that have never filed for bankruptcy and where $X\_2003 = \{creditscore_i, age_i, numbercards_i, income_i, race_i, etc.\}$ is a vector of borrower characteristics in year 2003, and L_2004 and L_2003 are the limits in 2003 and 2004 respectively. We emphasize here that this estimation is based on our understanding of the process used by issuers to determine limits. Credit card issuers typically employ credit bureau information to decide the amount of credit and terms offered, with the credit score itself often acting as the most relevant variable in this decision. Therefore we can assume that, as econometricians, our use of credit bureau information approximates the information set of credit card issuers.

Using model 3, we predict the credit limit in 2004 for the sample of i individuals that have filed for bankruptcy in 2004 but did not in 2003. This is the counterfactual: estimated credit limit that would have been available in 2004 if they had not filed for bankruptcy, conditional on their observable characteristics in 2003.[7]

$$\hat{L}\_2004_j = \widehat{\beta}_1 L\_2003_j + \widehat{\beta}_2 X\_2003_j$$

$\hat{L}\_2004_j$ is the predicted limit in 2004 for individuals that have declared bankruptcy between 2003 and 2004.

[7] Our data does not allow us to control for unobservables in the econometric model by including individual fixed effects given the short time dimension (two periods). We attempt to control for heterogeneity between bankrupt and non-bankrupt individuals by including as many borrowers' characteristics as possible and by complementing the data with census variables that control for unobserved individual characteristics that are shared with the surrounding neighbors. We also run a wide variety of alternative specifications as robustness checks by including interactions and splines with some of the explanatory variables (available upon request). The results are largely unchanged.

Next, we estimate the credit cost of bankruptcy for individuals that filed for bankruptcy between 2003 and 2004 by subtracting the estimated credit limit in (2) from the actual observed credit limit in 2004.

$$CreditCost_j = L\_2004_j - \hat{L}\_2004_j$$

The credit cost of bankruptcy is negative when individuals obtain less credit after bankruptcy with respect to the credit limit they would have had if they did not file.

5.2 Baseline Results

Figure 3 plots the average credit cost of bankruptcy against months since most recent derogatory public record, which includes bankruptcy filings. As explained above, the credit cost is estimated as of December 2004 for the cross-section of individuals that file for bankruptcy between the two observation periods. By examining the credit cost of bankruptcy of individuals in December 2004 with respect to the number of months since they filed for bankruptcy we can make inferences about how credit availability changes over time after bankruptcy. We observe a U-shaped pattern, with a decrease in available revolving credit during the first six months after filing for bankruptcy, as would be expected. The credit limit loss reaches its maximum five months after bankruptcy and is on average $24,000 at that point. After that, the credit cost gets smaller and approaches $15,000, on average, at 18 months after bankruptcy.[8] Unfortunately, we cannot calculate the credit cost beyond 18 months after bankruptcy due to data limitations. Similarly, notice also that the observed decline in the first months may just reflect the reporting lag to the credit bureau. Due to data limitations we cannot produce this figure using the 2006-2007 data (variable months since bankruptcy is not available).

5.3 Heterogeneity: Credit Score

While on average a bankrupt individual faces a significant (albeit temporary) drop in available credit there is quite a bit of heterogeneity behind the average plotted in Figure 3. In what follows, we attempt to identify and discuss the factors that explain the different patterns of access to credit post bankruptcy by examining the relationship between credit cost of bankruptcy and various borrower characteristics. Figure 4 plots the average drop in available credit for bankrupt individuals by credit score. It shows that on average there is a loss in available credit and for the highest credit score it is substantial—approaching $40,000 lost in revolving credit. In Figure 5 we show the probabilities of receiving an increase in counterfactual credit

[8] The distribution of the number of bankrupt individuals with respect the months since bankruptcy is fairly homogeneous. Furthermore, there is no relationship between the ex-ante credit score and number of months since bankruptcy filing. For the rest of the analysis, we aggregate all individuals that file for bankrutcy within this 18-month period.

(a positive credit cost) by credit score. For a significant fraction of individuals (18.3%) the credit cost of bankruptcy is indeed positive, meaning that they actually get more credit than predicted by model (3). This figure illustrates the phenomenon that we highlight; those with very low credit quality are much more likely to receive increases in credit.

In Table 6 one can observe that individuals with the lowest credit scores have, on average, a positive bankruptcy credit cost. We measure this 'benefit' to bankruptcy at $300 of increased revolving credit. While this increase is only 5.9% of the average credit limit prior to bankruptcy for the group of individuals, it is notable for the fact that it is positive. Importantly, this $300 reflect an average consumer experience, rather than a few outliers. Indeed, 65% of individuals in the lowest credit score group have a positive bankruptcy credit cost.

We interpret these results as supporting a credit supply story of bankruptcy along the lines of Dick and Lehnert (2009). Increased lending to low credit quality borrowers post bankruptcy provides a potential reduction in the deterrent to file for these individuals. In spite of the widely believed exclusion from credit markets, a default by a low credit quality borrower had a relatively small impact.

5.4 Heterogeneity: Credit Cycle

We next explore the degree to which our results are a function of the credit cycle. The 2003-04 period is one that has been characterized as a credit boom; indeed one that likely had particularly lax credit standards. Potentially then, credit was easy to obtain both before and after bankruptcy. This section will evaluate how well our results hold up in a more restrictive credit environment.

As a preliminary test of whether these trends in credit access may be dependent on the credit cycle, we compare the mean bankruptcy credit cost in terms of revolving credit limit in 2003–04 against 2006–07. We present our results in Figures 4 and 5 and some additional descriptive statistics in Table 6. As should be apparent, the figures show that in both time periods, the fraction of individuals that faced a positive credit cost of bankruptcy was declining in credit score; high quality borrowers suffered a larger relative decline in credit access.

The second notable feature of the figures is that during the credit boom of 2003–04 the bankruptcy credit cost was substantially lower for those of low credit quality. A much higher fraction of low credit quality individuals received counter-factually higher credit after bankruptcy during the credit boom (2003-04) than during the bust (2006-07). For individuals with high credit scores, the bankruptcy credit cost is similar in both time periods. These same results are shown in Table 6.

Again, this story is consistent with the supply-driven cause of bankruptcy, in the sense that credit supply

has an impact on the consequences of filing, and therefore, determines the propensity to file. Consistent with their results we also find that different credit quality individuals are impacted differently by the credit cycle.

We can use the bank lending framework we presented in Section 3 to interpret these empirical results. We can see that our findings are consistent with (1) a small change in the PDs and LGDs of prime borrowers, which makes them as profitable as before, and (2) a significant increase in the PDs and/or increase in LGDs of subprime borrowers after bankruptcy in a downturn, which makes them a less profitable option than similar subprime non-bankrupt borrowers. Unfortunately, the time period of our sample only captures the beginning of the current downturn period in December 2007. Further research is needed as more recent data becomes available.

5.5 Heterogeneity: Other Factors

Combining data from the US Census on characteristics of the neighborhoods of these individuals, Table 7 shows that individuals with positive credit cost tend to live in areas with lower educational attainment, higher divorce rates, more blacks, and lower incomes. To further investigate these trends, we present in Figure 6 the percentage of individuals with positive penalty by credit score, dividing the sample by percentage of minorities (Panel A), income brackets (Panel B) and education level (Panel C) of the neighborhoods of these individuals. We present the results for both 2003-04 and 2006-07. We can observe that individuals with the lowest credit score and a lower propensity to repay as proxied by income, race and education are the ones that are offered more credit after bankruptcy, especially in the 2003-04 period. These findings are consistent with the observation that lenders target riskier borrowers. In credit card industry parlance these individuals are referred as "cash cows" because they generate high income and profit margins, usually from high interest rates and fee income, as illustrated in the numerical example presented at the end of Section 2 and the NY Times article referenced in the introduction. Unfortunately, our data does not contain information on the interest rates or fees charged on the accounts, and therefore, we are cautious to derive further conclusions from those observed patterns.

5.6 Other Types of Credit

An alternative interpretation of the observed differential change in access to credit between prime and subprime borrowers may be that these individuals use different forms of credit after bankruptcy and looking at revolving credit alone may be misleading. This could manifest in two ways. We may observe relatively high access to revolving, unsecured credit because issuers have maintained these lines at the expense of other types of credit. Alternatively, one may observe differential changes in access if the composition of demand

by type of credit changes as a function of credit quality. For example, if low-risk individuals are more likely to apply for credit cards and high-risk individuals for auto-loans.

Accordingly, we repeat our analysis on the bankruptcy credit cost for other types of credit—mortgages, installments loans (including auto-loans), and total credit. Figure 7 presents the results from this exercise. The figure shows no evidence of the composition effects mentioned above and that total credit and mortgages follow a similar pattern to those observed using revolving credit alone. Having said so, interpreting the changes in secured lines, such as mortgages, is difficult especially because only unsecured debt is discharged in bankruptcy and not secured loans. Nonetheless, it is interesting that installment credit shows a different picture: a smaller fraction of low credit score individuals have a positive credit cost, as compared to other credit types, while the percentage of individuals with a positive installment credit cost is quite stable across the credit score dimension. This is again consistent with the patterns reported in Porter (2008) for secured lending and is likely driven by other supply factors, such as differences in underwriting standards between secured vs. unsecured loans.

However, the fact that low credit-score individuals get more unsecured lending than secured remains a puzzle. One would expect that secured lending, which is generally considered to be a lower risk channel, would be more easily obtained in a high-risk context. We encourage future research on this topic.

6 Potential caveats

As is standard, there are a few factors that confound our interpretation of these observed facts. Among these is the identification of supply vs. demand effects. Recall that one of our central findings is that individuals with higher ex-ante credit scores face a larger credit cost on average. One potential explanation for this might be that individuals who historically had good credit records but ended up in bankruptcy have suffered a permanent income shock or that they have defaulted strategically. Both of these possibilities would explain a decrease in a lender's willingness to lend to such individuals *and* a decrease in the demand for credit by these individuals. After all, individuals would be more likely to reduce their consumption and reliance on borrowing in the face of permanent income shocks. However, this on its own cannot explain the differential issuance of credit observed, unless there is reason to believe that the ex-ante low credit-score individuals are more likely to face frequent but temporary shocks. In short, there is currently no evidence that bankruptcy provides a signal about the nature of realized idiosyncratic shocks that differs systematically by ex-ante credit quality. Without such a differential, we are confident that the results provided in this paper are reflective of lender supply decisions.

Similarly, it may well be that, well-educated individuals and/or those with ex-ante good credit histories are better at reading the fine print on solicitations they receive compared to others, and less likely to accept credit limits at any cost. Accordingly, lenders might well be targeting all bankrupt individuals but only those with low-credit scores accept the offers, explaining the observed patterns in our data.

However, both of these explanation are difficult to justify in an equilibrium framework. In such an environment, one would expect lenders to respond to react; however, the legal literature provides ample evidence that all types receive continued solicitations for credit after bankruptcy. This suggests that our results emerge from differences in the provided limits rather than systematic demand differences amongst the borrowers.

Despite the fact that we cannot disentangle these demand factors from supply and even if the differential access is due to differences in demand, our initial finding about the provision of credit across the board still suggests that lenders seem to target bankrupt individuals. In other words, whether lenders are targeting riskier, sub-groups of individuals or not, they certainly do not seem to be shy about lending to individuals shortly after bankruptcy. This is consistent with the survey evidence provided by Porter (2006) on targeted solicitations of recently bankrupt individuals by lenders, as discussed in Section 2.

7 Conclusion

This paper presents, to our knowledge, the first direct evidence on credit access of individuals post-bankruptcy, a topic that has generated much discussion and speculation in economics and other literatures. We first show that while individuals do see significant drops in their credit lines immediately after they file for bankruptcy (probably as their debt gets discharged), they seem to be able to regain access to credit very soon thereafter. Second, we show that those individuals who are effectively the least punished and can get the easiest access to credit afterwards tend to be the ones who have shown the least ability and propensity to repay their debt prior to declaring bankruptcy. In fact, a significant fraction of individuals at the bottom of the credit quality spectrum seem to receive more credit after filing than before.

We interpret this increase in credit access and the difference in credit provision across borrowers as evidence that lenders target riskier borrowers. This interpretation is consistent with anecdotal evidence on certain credit card industry practices of increasing interest rates and imposing punitive fees on negligent customers. The recent credit card legislation ‘Credit Card Accountability, Responsibility and Disclosure Act’ is meant to protect consumers by introducing greater disclosure requirements and prohibiting certain practices by credit card issuers.

Nevertheless we need more analysis to resolve some of the confounding issues to have a clearer, stronger picture. In particular, we need a better understanding of the nature of income shocks or other factors that derive an individual's bankruptcy decision. After all, such an understanding is the key to whether bankruptcy reveals a change in an individual's future repayment behavior. Similarly, using longer time-series data it will be interesting to see how the exclusion credit cost might have changed over the last couple decades and whether credit availability for recently bankrupt individuals will change as part of the ever changing landscape associated with the current financial turmoil, as hinted by some of our results based on limited data from 2007.

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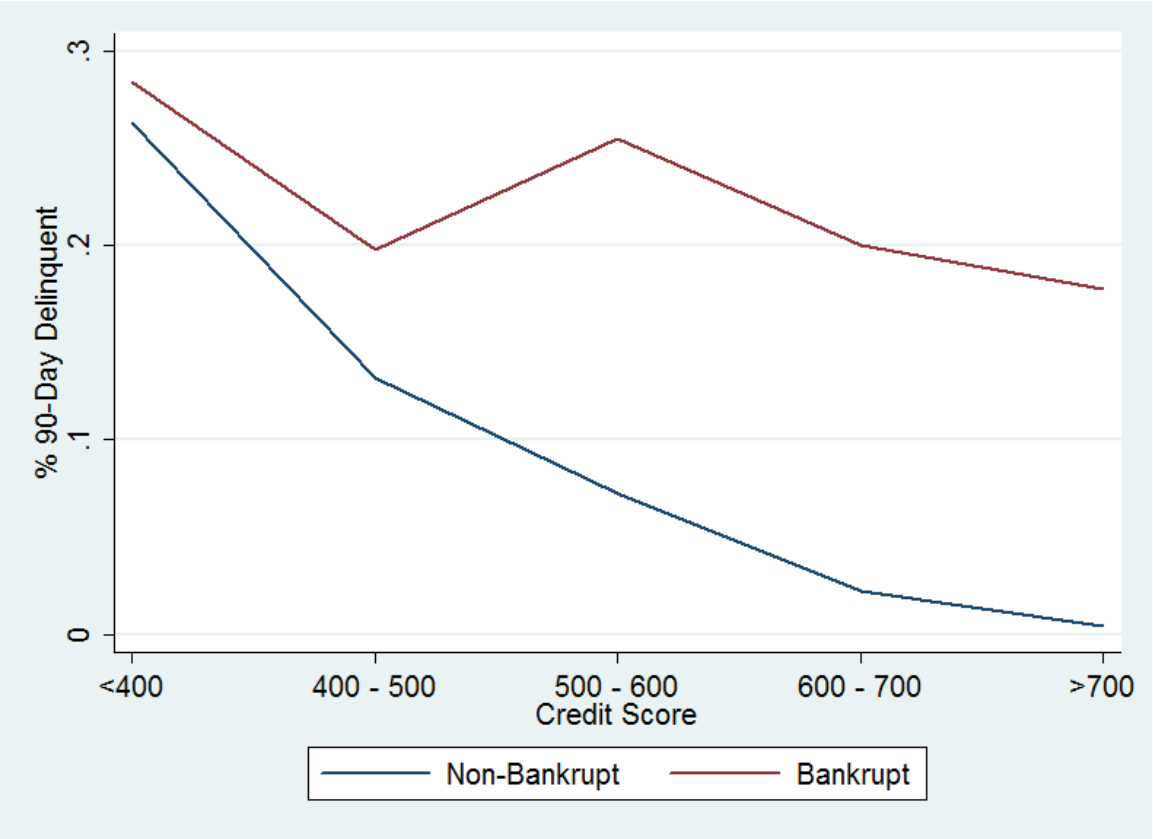
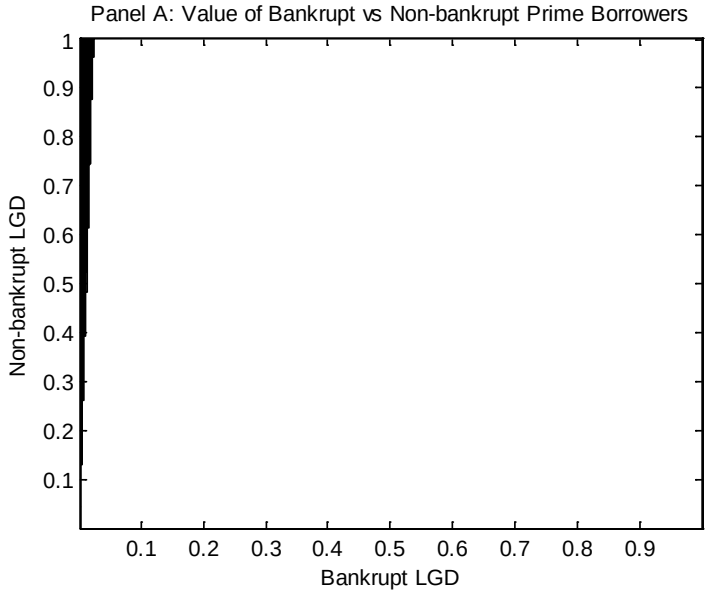
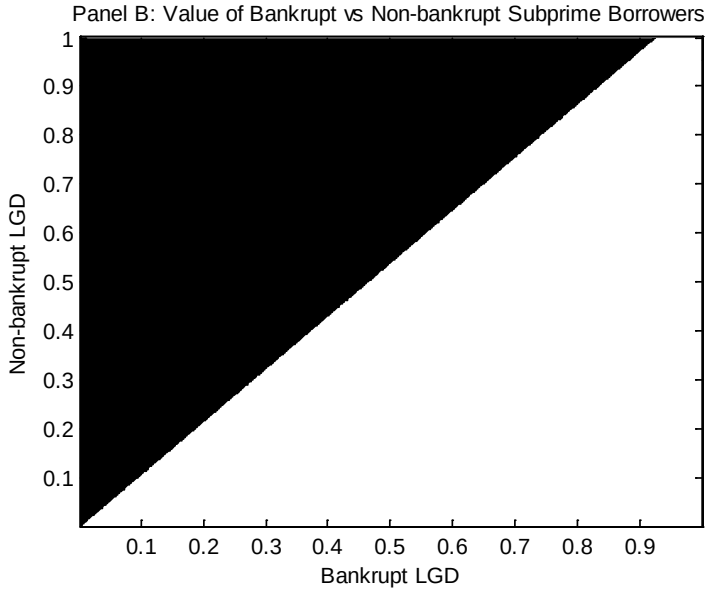
FIGURE 1: FRACTION OF INDIVIDUALS 90-DAY DELINQUENT BY CREDIT SCORE AND BANKRUPTCY STATUS



Note: Each observation indicates the percentage of individuals who were 90-days delinquent in December 2004. The lines divide the sample into agents who declared bankruptcy at some point *before* the 90-day delinquency and those who did not declare bankruptcy. The x-axis indicates credit score and the y-axis the percentage of individuals in each group.

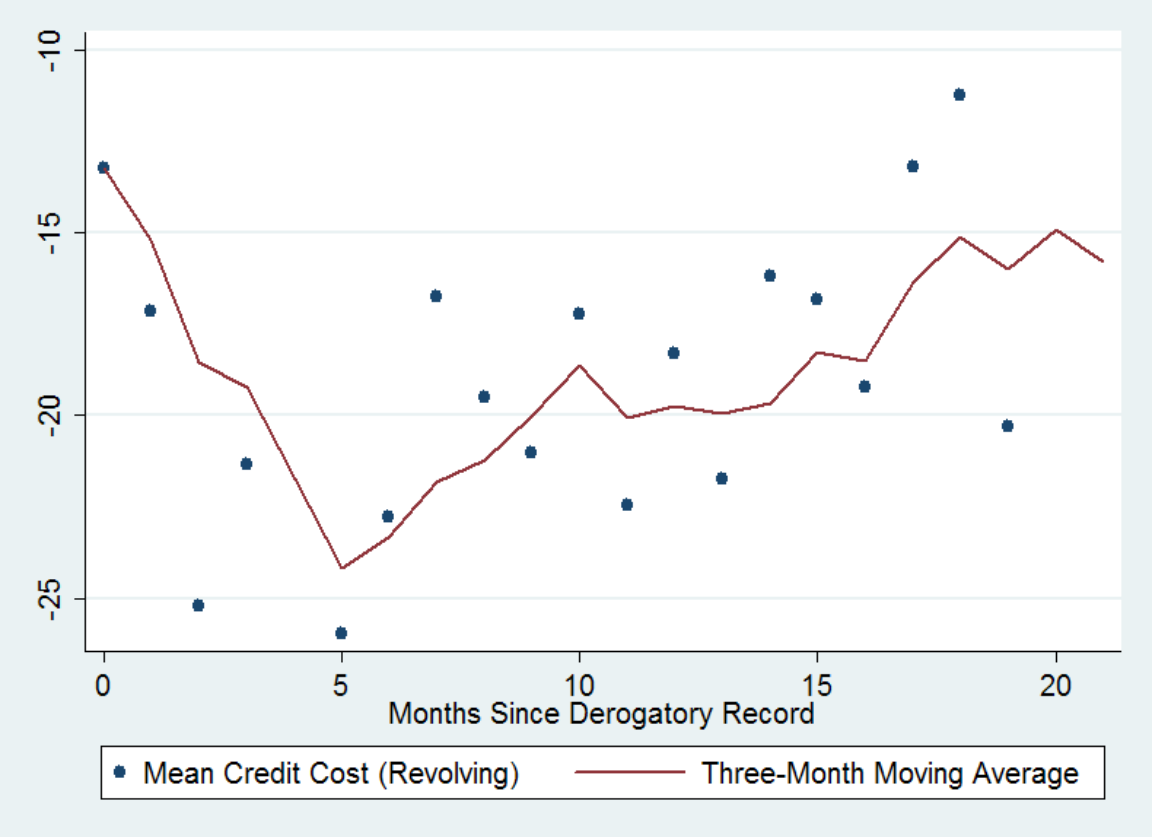
FIGURE 2: VALUE OF BANKRUPT VS. NON-BANKRUPT SUBPRIME AND PRIME BORROWERS





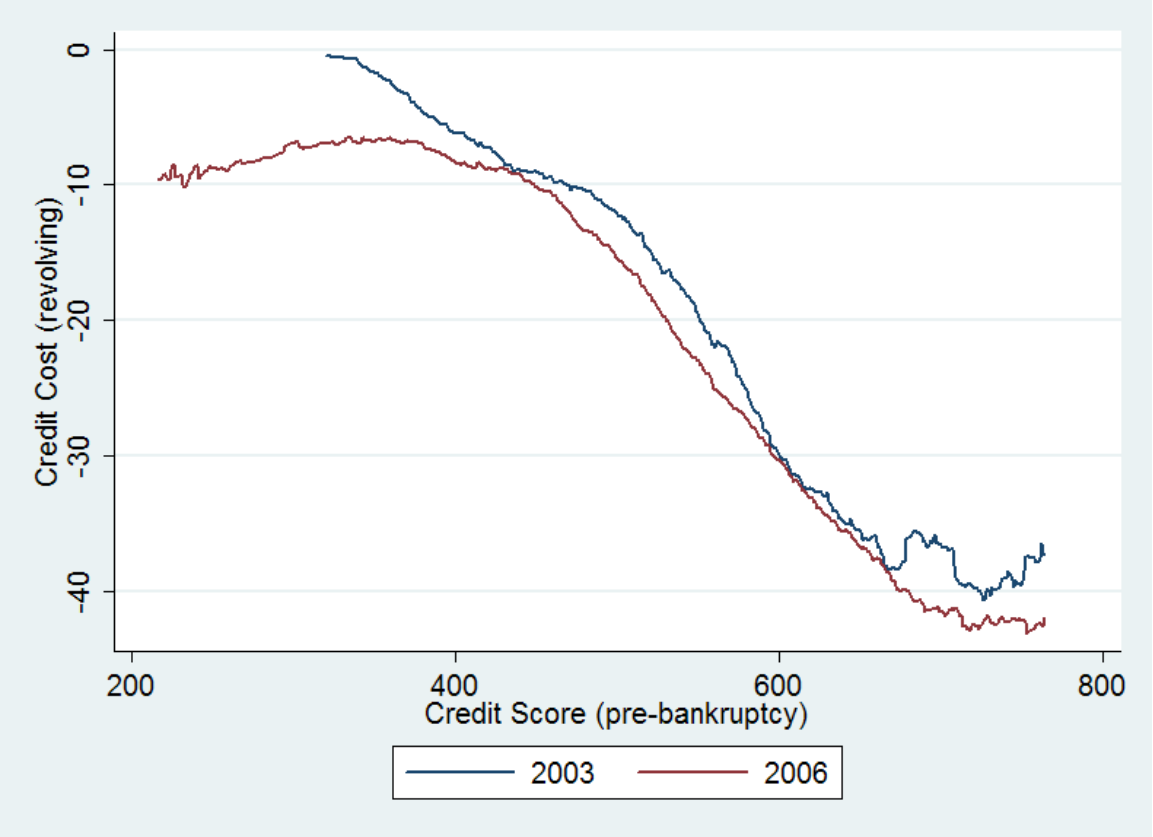
Note: Panel A shows the values of Loss Given Default that permit an increase in value for prime borrowers. Panel B shows the values of Loss Given Default that permit an increase in value for sub-prime borrowers. The black shaded regions denote that the value of bankrupt individuals, to the lender, is greater than the value of non-bankrupt individuals.

FIGURE 3: AVERAGE CREDIT COST BY MONTHS SINCE FILING
(in thousands of dollars)



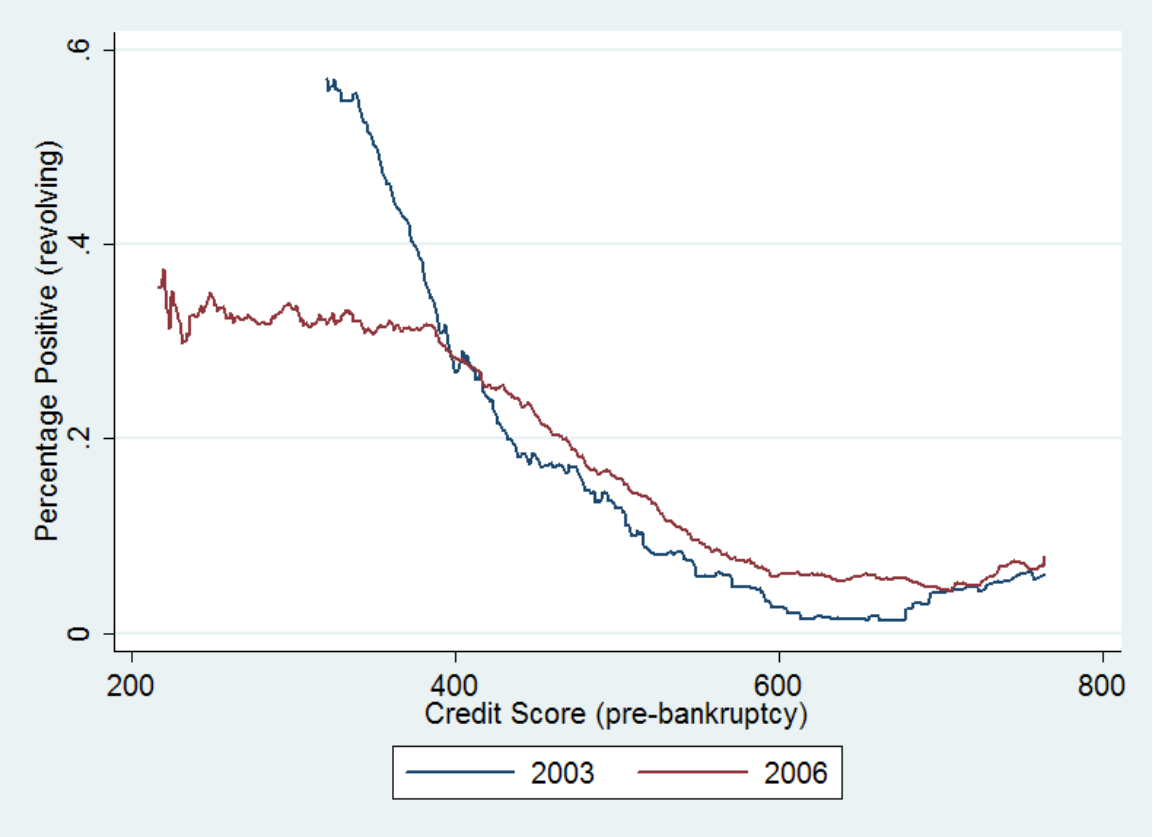
Note: Solid line indicates 3-month moving average, dots indicate the average bankruptcy credit cost if filed by bankruptcy X months ago. Methodology for calculating the credit cost is discussed in Section 4. X-axis indicates time since bankruptcy. Y-axis indicates change in credit available versus counterfactual of similar individuals who did not declare bankruptcy in thousands of dollars.

FIGURE 4: CREDIT COST BY CREDIT SCORE
(in thousands of dollars)



Note: Methodology for calculating credit cost is discussed in Section 4 of the paper. X-axis indicates credit score in year preceding bankruptcy. Y-axis indicates change in credit available versus counterfactual of similar individuals who did not declare bankruptcy in thousands of dollars.

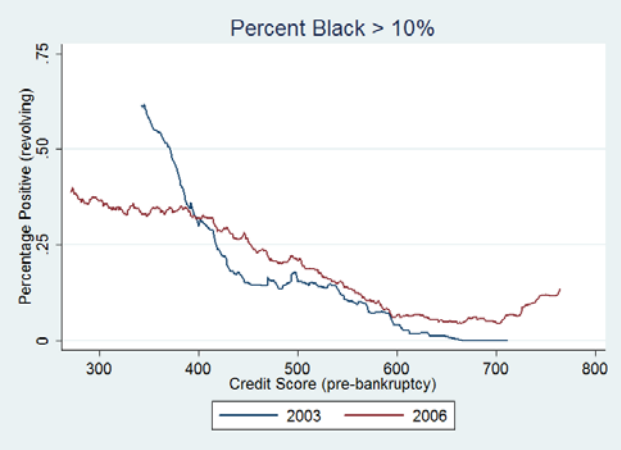
FIGURE 5: FRACTION OF INDIVIDUALS WITH *INCREASE* IN COUNTERFACTUAL CREDIT FOLLOWING BANKRUPCY (POSITIVE CREDIT COST)



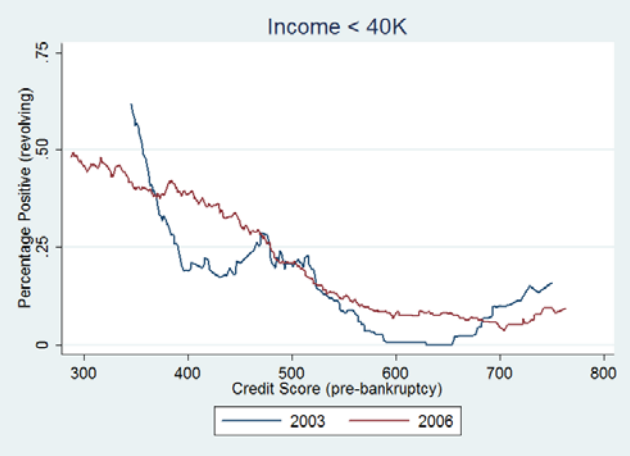
Note: The figure shows the number of individuals who had more credit than would have otherwise been available divided by the total number declaring bankruptcy, for a particular credit score. The line indicates the moving average across 100 of these credit score groups. Methodology for calculating the credit cost is discussed in Section 4. X-axis indicates continuous credit scores.

FIGURE 6: FRACTION OF INDIVIDUALS WITH *INCREASE* IN COUNTERFACTUAL CREDIT FOLLOWING BANKRUPCY (POSITIVE CREDIT COST)

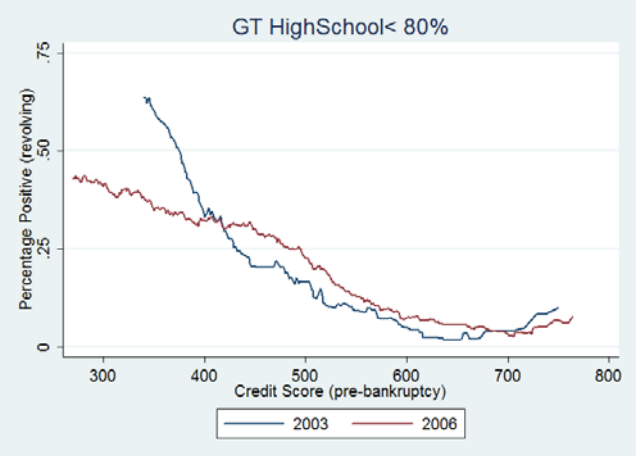
PANEL A: RACE



PANEL B: INCOME



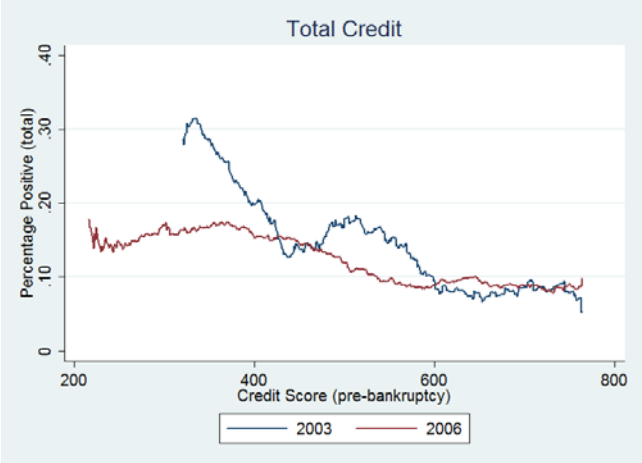
PANEL C: EDUCATION



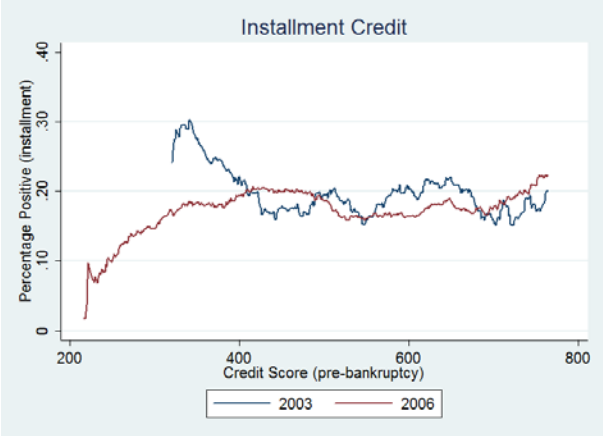
Note: The figure shows the number of individuals who had more credit than would have otherwise have been available divided by the total number declaring bankruptcy, for a particular credit score. Solid line indicates the moving average across 100 of these credit score groups (Panel B is the exception where the moving average was calculated across 75 credit scores). Methodology for calculating the credit cost is discussed in Section 4. X-axis indicates continuous credit scores.

FIGURE 7: FRACTION OF INDIVIDUALS WITH *INCREASE* IN COUNTERFACTUAL CREDIT FOLLOWING BANKRUPCY (POSITIVE CREDIT COST)

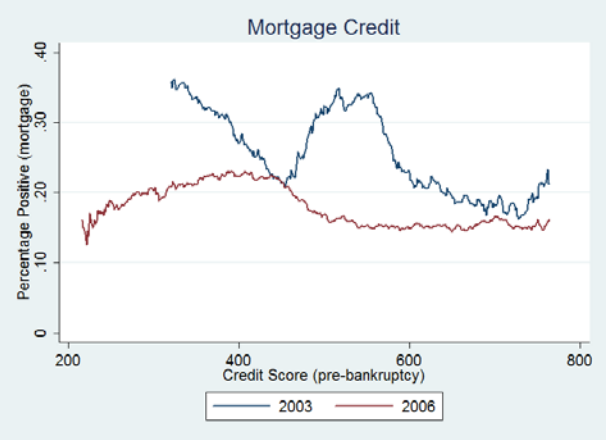
PANEL A: TOTAL CREDIT LIMIT



PANEL B: INSTALLMENT CREDIT LIMIT



PANEL C: MORTGAGE LIMIT



Note: The figure shows the number of individuals who had more credit than would have otherwise have been available divided by the total number declaring bankruptcy, for a particular credit score. Solid line indicates the moving average across 100 of these credit score groups. Methodology for calculating the credit cost is discussed in Section 4. X-axis indicates continuous credit scores.

TABLE II: SUMMARY STATISTICS

	COMPLETE SAMPLE		NON-BANKRUPT INDIVIDUALS		BANKRUPT INDIVIDUALS	
VARIABLES	**2003/2004**	**2006/2007**	**2003/2004**	**2006/2007**	**2003/2004**	**2006/2007**
Age	49.12	38.47	49.18	38.48	44.05	36.70
Bank Cards: number (t-1)	1.77	1.78	1.76	1.77	2.78	2.83
Black (% in 1 mile radius)	0.092	0.096	0.092	0.096	0.138	0.131
Credit Score (t)	664.1	703.9	667.8	705.1	347.3	500.4
Credit Score (t-1)	668.6	707.5	670.9	708.7	468.0	497.9
Divorced (% females in 1 mile radius)	0.106	0.096	0.106	0.096	0.117	0.105
Divorced (% males in 1 mile radius)	0.083		0.083		0.095	
Greater Than High School Equivalency (% in 1 mile radius)	0.829	0.828	0.830	0.828	0.801	0.807
Hispanic (% in 1 mile radius)	0.104	0.119	0.104	0.119	0.108	0.103
Income Growth	0.475	1.120	0.477	1.122	0.282	0.693
Median Household Income	45,011	50,505	45,038	50,517	42,791	48,340
No Earnings (% in 1 mile radius)	0.184	0.185	0.184	0.185	0.191	0.190
Population Density	2,195	2,484	2,207	2,487	1,128	1,806
Public Assistance (% in 1 mile radius)	0.029	0.030	0.029	0.030	0.036	0.034
Revolving Credit Limit (t)	39.14	45.09	39.53	45.30	5.51	8.60
Revolving Credit Limit (t-1)	33.93	40.11	34.05	40.18	23.65	28.79
Revolving Credit Utilization (t)	24.15	23.44	24.07	23.37	33.55	44.02
Revolving Credit Utilization (t-1)	24.63	24.20	24.17	23.99	63.54	61.11
Total Credit Limit (t)	117.3	140.6	118.2	141.0	47.19	67.91
Total Credit Limit (t-1)	97.75	122.8	97.83	122.8	91.22	129.1
Unemployment Rate	5.751	5.041	5.749	5.040	5.884	5.223
Uninsured (health)	16.93	15.72	16.93	15.72	17.25	15.31
Number of observations	122,159	949,976	120,726	944,567	1,433	5,409

Notes: Based on authors' calculations using credit bureau data, Census, and the Bureau of Labor Statistics. The coefficient reported for Divorced (Female) in 2006/2007 represents the combined male/female divorce rate. All data are the means of the variable indicated.

TABLE III: 2003/2004 CREDIT STATISTICS BY CREDIT SCORE (REVOLVING CREDIT)

PANEL A: COMPLETE SAMPLE (N = 122,159)

CREDIT LIMIT	**<300**	**300-400**	**400-500**	**500-600**	**600-700**	**700+**	**Full Sample**
Credit Limit in 2003 ($ thousands)	3.565	7.820	11.604	25.00	37.14	39.96	33.93
Credit Limit in 2004 ($ thousands)	1.991	5.168	10.555	26.63	44.77	46.55	39.14
Credit Change 2004-03 ($ thousands)	-1.574	-2.652	-1.049	1.628	7.631	6.586	5.209
Increase in Credit Limit 2003-04 (% cohort)	18.12	24.87	39.7	54.12	64.75	55.29	54.33
Positive Credit Limit 2004 (% cohort)	66.47	81.08	90.45	95.67	98.05	98.15	96.09
	n = 2329	n = 5179	n = 5791	n = 16795	n = 24990	n = 67075	n = 122159

PANEL B: NON-BANKRUPT INDIVIDUALS (N = 120,726)

Credit Limit in 2003 ($ thousands)	3.420	7.559	11.502	24.75	37.08	39.95	34.05
Credit Limit in 2004 ($ thousands)	1.992	5.334	10.794	27.17	45.04	46.57	39.53
Credit Change 2004-03 ($ thousands)	-1.428	-2.224	-0.708	2.420	7.955	6.612	5.486
Increase in Credit Limit 2003-04 (% cohort)	18.56	26.23	40.8	55.49	65.22	55.32	54.89
Positive Credit Limit 2004 (% cohort)	66.73	82.08	91.18	96.03	98.13	98.16	96.34
	n = 2128	n = 4815	n = 5601	n = 16355	n = 24796	n = 67031	n = 120726

PANEL C: BANKRUPT INDIVIDUALS (N = 1,433)

Credit Limit in 2003 ($ thousands)	5.105	11.274	14.61	34.35	44.30	51.65	23.65
Credit Limit in 2004 ($ thousands)	1.980	2.964	3.510	6.536	10.448	19.235	5.508
Credit Change 2004-03 ($ thousands)	-3.124	-8.310	-11.10	-27.81	-33.85	-32.42	-18.14
Increase in Credit Limit 2003-04 (% cohort)	13.43	6.868	6.842	2.955	4.124	11.36	6.350
Positive Credit Limit 2004 (% cohort)	63.68	67.86	68.95	82.27	87.11	86.36	75.02
	n = 201	n = 364	n = 190	n = 440	n = 194	n = 44	n = 1433

Notes: The numbers reported are the mean of the credit variable indicated in the row header for a particular to the credit score in 2003. Panel A reports the statistics for the complete sample, Panel B reports the statistics for individuals who have never declared bankruptcy, and Panel C reports the statistics for individuals who did declare bankruptcy between 2003 and 2004.

TABLE IV: 2006/2007 CREDIT STATISTICS BY CREDIT SCORE (REVOLVING CREDIT)

PANEL A: COMPLETE SAMPLE (N = 949,976)

CREDIT LIMIT	**<300**	**300-400**	**400-500**	**500-600**	**600-700**	**700+**	**Full Sample**
Credit Limit in 2006 ($ thousands)	6.040	7.631	12.306	22.75	41.70	47.58	40.11
Credit Limit in 2007 ($ thousands)	4.241	6.246	12.271	25.33	48.31	53.37	45.09
Credit Change 2007-06 ($ thousands)	-1.799	-1.385	-0.035	2.59	6.60	5.80	4.98
Increase in Credit Limit 2006-07 (% cohort)	25.06	30.85	44.7	58.24	64.82	55.86	56.15
Positive Credit Limit 2007 (% cohort)	73.89	78.57	87.61	94.45	98.11	99.34	97.00
	n = 11396	n = 28934	n = 50766	n = 103938	n = 186095	n = 568847	n = 949976

PANEL B: NON-BANKRUPT INDIVIDUALS (N = 944,567)

Credit Limit in 2006 ($ thousands)	5.854	7.495	12.199	22.57	41.66	47.58	40.18
Credit Limit in 2007 ($ thousands)	4.308	6.345	12.420	25.55	48.51	53.39	45.30
Credit Change 2007-06 ($ thousands)	-1.546	-1.150	0.221	2.98	6.85	5.82	5.12
Increase in Credit Limit 2006-07 (% cohort)	25.91	31.55	45.4	58.93	65.15	55.88	56.41
Positive Credit Limit 2007 (% cohort)	74.55	79.10	88.01	94.69	98.20	99.35	97.14
	n = 10835	n = 27938	n = 49752	n = 102525	n = 185007	n = 568510	n = 944567

PANEL C: BANKRUPT INDIVIDUALS (N = 5,409)

Credit Limit in 2006 ($ thousands)	9.634	11.460	17.558	35.16	49.87	50.90	28.79
Credit Limit in 2007 ($ thousands)	2.941	3.487	4.958	9.11	14.68	22.41	8.60
Credit Change 2007-06 ($ thousands)	-6.694	-7.973	-12.600	-26.04	-35.19	-28.50	-20.18
Increase in Credit Limit 2006-07 (% cohort)	8.73	11.35	11.0	8.21	9.01	16.91	10.08
Positive Credit Limit 2007 (% cohort)	61.14	63.55	67.95	77.07	83.00	83.68	72.82
	n = 561	n = 996	n = 1014	n = 1413	n = 1088	n = 337	n = 5409

Notes: The numbers reported are the mean of the credit variable indicated in the row header for a particular to the credit score in 2006. Panel A reports the statistics for the complete sample, Panel B reports the statistics for individuals who have never declared bankruptcy, and Panel C reports the statistics for individuals who did declare bankruptcy between 2006 and 2007.

TABLE V: REGRESSION RESULTS (NON-BANKRUPT INDIVIDUALS)

	2003/2004		2006/2007	
Dependent Variable	**Total Credit Limit (2004)**	**Revolving Credit Limit (2004)**	**Total Credit Limit (2006)**	**Revolving Credit Limit (2006)**
Total Credit Limit	0.904***	0.0503***	0.984***	0.0367***
	(0.00621)	(0.00209)	(0.00162)	(0.000552)
Installment Credit Limit	0.102***	-0.0268***	0.0950***	-0.0181***
	(0.0187)	(0.00629)	(0.00728)	(0.00248)
Revolving Credit Limit	0.167***	0.895***	0.0204***	0.874***
	(0.0143)	(0.00482)	(0.00401)	(0.00136)
Revolving Credit Utilization	-0.120***	-0.0322***	-0.0795***	-0.0226***
	(0.0153)	(0.00515)	(0.00528)	(0.00180)
Revolving Credit Balance	0.871***	0.0595***	0.577***	0.0115*
	(0.0636)	(0.0214)	(0.0187)	(0.00635)
Revolving Credit Balance - Squared	-0.00887***	-0.00274***	-0.00407***	-0.00160***
	(0.000730)	(0.000246)	(0.000152)	(5.17e-05)
Credit Score	0.0385***	0.0207***	0.0201***	0.0138***
	(0.00403)	(0.00136)	(0.00142)	(0.000483)
Bank Cards (number)	0.787***	-0.526**	1.244***	1.759***
	(0.0702)	(0.208)	(0.0768)	(0.0261)
Ratio of Revolving to Total Credit Limit	16.84***	1.700***	10.10***	-0.333*
	(1.472)	(0.496)	(0.510)	(0.173)
Ratio of Installment to Total Credit Limit	18.60***	3.791***	20.93***	2.862***
	(1.835)	(0.618)	(0.661)	(0.225)
90-Days Delinquent (Current)	-11.62***	-0.877	-14.02***	-2.303***
	(2.284)	(0.769)	(0.842)	(0.286)
90-Days Delinquent (Ever)	-0.464	-0.300	-0.810**	-1.244***
	(1.024)	(0.345)	(0.400)	(0.136)
Age-Squared	-0.0108***	-0.00345***	-0.0110***	-0.00320***
	(0.000809)	(0.000272)	(0.000693)	(0.000236)
Age	0.353***	0.265***	0.342***	0.259***
	(0.0873)	(0.0294)	(0.0582)	(0.0198)
Divorced (Female)	19.69**	-1.549	-7.606**	-13.21***
	(9.090)	(3.062)	(3.445)	(1.172)
Divorced (Male)	-5.259	-9.824***	-	-
	(10.51)	(3.540)		
Greater Than High School Equivalency (Female)	47.98***	5.886***	34.71***	7.872***
	(3.973)	(1.338)	(1.633)	(0.556)
Income Growth	0.648***	0.148***	0.406***	-0.00734
	(0.103)	(0.0348)	(0.0384)	(0.0131)
Median Household Income	0.00103***	0.000143***	0.000396***	8.87e-05***
	(4.49e-05)	(1.51e-05)	(1.56e-05)	(5.32e-06)
Percentage with No Earnings	0.420	2.253*	-5.676***	1.360***
	(3.534)	(1.190)	(1.385)	(0.471)
Percentage Black	-2.407	-0.637	2.712***	-0.599**
	(1.946)	(0.655)	(0.773)	(0.263)
Percentage Hispanic	9.656***	1.112	19.78***	2.320***
	(2.759)	(0.929)	(1.084)	(0.369)
Population Density	1.84e-05	5.18e-06	0.000202***	5.38e-05***
	(4.49e-05)	(1.51e-05)	(1.63e-05)	(5.55e-06)
Povery Rate	1.155***	0.137***	0.206***	0.0509***
	(0.106)	(0.0357)	(0.0419)	(0.0142)
Percentage on Public Assistance	12.28	4.716	38.17***	8.422***
	(12.89)	(4.343)	(5.237)	(1.782)
Unemployment	0.680***	0.0800	-0.459***	-0.0544
	(0.231)	(0.0777)	(0.101)	(0.0342)
Uninsured	0.106	-0.0177	0.380***	0.159***
	(0.0684)	(0.0230)	(0.0310)	(0.0106)
Constant	-27.92***	-112.3***	-61.50***	-24.47***
	(1.978)	(5.871)	(2.479)	(0.843)
Observations	120720	120720	944567	944567
R-squared	0.556	0.539	0.651	0.626

Notes: The numbers reported are the coefficients estimated using a standard OLS model. The coefficient reported for Divorced (Female) in 2006/2007 represents the combined male/female divorce rate. Robust standard errors are reported in parentheses, and we adopt the usual convention: *** p<0.01, ** p<0.05, * p<0.1

TABLE VI: CREDIT COST (REVOLVING CREDIT)

	2003/2004		2006/2007	
	Credit Cost ($ thousands)	**Positive Credit Cost (% of cohort)**	**Credit Cost ($ thousands)**	**Positive Credit Cost (% of cohort)**
<300	0.302	65.2	(5.880)	34.6
300-400	(7.393)	24.7	(8.164)	28.4
400-500	(12.72)	12.6	(15.99)	15.6
500-600	(30.47)	2.0	(30.60)	6.1
600-700	(37.32)	3.1	(40.59)	5.0
700+	(39.72)	4.5	(34.25)	11.9
Full Sample	(19.1)	18.3	(23.4)	15.1

Notes: The values reported pertain to individuals who declared bankruptcy in the time periods 2003-2004 and 2006-2007. The first and third columns report the average difference between forecast revolving credit, as described in the text, and actual revolving credit in thousands of dollars (the bankruptcy credit cost) while the second and fourth columns report the the percentage of individuals who had an increase in counter-factual credit (positive credit cost). Each statistic is reported for the credit score group denoted in the row heading.

TABLE VII: DISTRIBUTION OF INDIVIDUAL CHARACTERISTICS - POSITIVE VS NEGATIVE CREDIT COSTS

	MEAN			MEDIAN		
	Negative Credit Cost	**Positive Credit Cost**	**Difference**	**Negative Credit Cost**	**Positive Credit Cost**	**Difference**
PANEL A: 2003/2004						
Black (% in 1 mile radius)	0.1193	0.2196	(0.1003122)***	0.0333	0.0601	(0.0267724)
Greater Than High School Equivalency (% in 1 mile radius)	0.8088	0.7651	0.0436923***	0.8277	0.7830	0.0447033***
Divorced (% females in 1 mile radius)	0.1153	0.1235	(0.0081883)***	0.1154	0.1242	(0.0087478)***
Divorced (% males in 1 mile radius)	0.0936	0.0993	(0.0056993)***	0.0912	0.0986	(0.0073737)***
Public Assistance (% in 1 mile radius)	0.0338	0.0463	(0.0124632)***	0.0249	0.0329	(0.0080182)***
No Earnings (% in 1 mile radius)	0.1878	0.2069	(0.0191085)***	0.1813	0.2051	(0.023841)***
Income Growth (in 1 mile radius)	0.3351	0.0460	0.2890982***	0.0733	-0.1634	0.2367139***
Hispanic (% in 1 mile radius)	0.1075	0.1101	(0.0026069)	0.0414	0.0312	0.0102375***
Median Household Income	43,269	40,700	2569.149***	42,143	40,736	1407.5***
Bank Cards (number)	3	1	2.3791083***	3	1	2***
	n = 1170	n = 262		n = 1170	n = 262	
PANEL B: 2006/2007						
Black (% in 1 mile radius)	0.1216	0.1874	(0.0658803)***	0.0373	0.0623	(0.025056)
Greater Than High School Equivalency (% in 1 mile radius)	0.8119	0.7824	0.0295308***	0.8347	0.8010	0.0337***
Divorced (% in 1 mile radius)	0.1042	0.1114	(0.0071866)***	0.1030	0.1107	(0.0077)***
Public Assistance (% in 1 mile radius)	0.0329	0.0402	(0.0072722)***	0.0233	0.0292	(0.0059115)***
No Earnings (% in 1 mile radius)	0.1872	0.2069	(0.0197069)***	0.1822	0.2044	(0.022205)***
Income Growth (in 1 mile radius)	0.7270	0.5021	0.2249104***	0.2976	0.1112	0.1864375***
Hispanic (% in 1 mile radius)	0.1047	0.0961	0.0086499***	0.0362	0.0309	0.0052895***
Median Household Income	48,828	45,588	3240.82***	46,456	43,993	2463***
Bank Cards (number)	3	1	2.3150063***	3	1	2***
	n = 4594	n = 815		n = 4594	n = 815	

Notes: Based on authors' calculations using credit bureau data, Census, and the American Community Survey. The values reported pertain to individuals who declared bankruptcy between 2003 and 2004 (Panel A) and between 2006 and 2007 (Panel B). Each sample is partitioned into two groups: positive credit cost and negative credit cost. The statistics reported are the mean and median values for each of the demographic measures in the row heading. We adopt the usual convention: *** p<0.01, ** p<0.05, * p<0.1 to indicate if the difference between the positive credit cost statistic and the negative credit cost statistic is meaningful.