Consumption Smoothing and Debtor Protections

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Abstract

Protections for debtors are a significant source of consumption insurance. This paper evaluates the insurance created by laws that protect defaulting debtors' assets, both inside and outside of bankruptcy. First, I show that households are not fully insured; consumption declines by 3-5% upon non-bankruptcy default. Second, I estimate the effect of changes in asset protection on the default rate, repayment in default, and interest rates. While additional protection does smooth consumption, the default distortion generates a substantial interest rate cost. Adopting a sufficient statistics formula from the literature, the estimates imply that less asset protection would significantly increase welfare.

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1 Introduction

Allowing borrowers to default on debt can be viewed as one of the largest social insurance programs in the United States. Around 10% of households have filed for bankruptcy and a greater percentage have defaulted on debt outside of bankruptcy.[1] A key protection given to these defaulting debtors is the asset exemption. When a debtor defaults, states' asset exemptions protect certain property from seizure by unsecured creditors. The level of protection varies widely across states, with the total protected value of assets ranging from less than $10,000 to over $500,000.

These exemptions help borrowers smooth consumption, and a large literature has empirically examined the impact of these exemptions on credit markets and consumption smoothing in bankruptcy. Bankruptcy is not the only method of default, however, and there is growing evidence of the importance of debt collection outside of bankruptcy (Dawsey and Ausubel, 2004, Fedaseyeu and Hunt, 2014, Fedaseyeu, 2015, Drozd and Serrano-Padial, 2017). There are two ways in which exemptions can substantially influence debt collection outside of bankruptcy. First, exemptions directly apply outside of bankruptcy by preventing unsecured creditors who have won a court judgment from seizing protected assets. Second, by operating as a threat point, the potential seizure of non-exempt assets can influence debt collection and bargaining that occurs outside of the legal system. This paper departs from much of the literature by also evaluating the role of exemptions outside of the formal bankruptcy system.[2] The differences between bankruptcy and non-bankruptcy default significantly alter the policy implications for debtor protections.

Optimal exemption policy depends on a few key parameters: the change in consumption

[1] Stavins (2000) reports that 8.5% of households have filed for bankruptcy, and more recently, Dobbie et al. (2016) reports that 15% of individuals have filed for bankruptcy based on their calculations in the Federal Reserve Bank of New York's Consumer Credit Panel/Equifax Data. VISA reports that 55-60% of charge-offs occur without a bankruptcy filing (NBRC, 1997).

[2] The role of exemptions outside of bankruptcy and their influence on decisions about whether to default informally has been examined in Dawsey and Ausubel (2004), Dawsey, Hynes and Ausubel (2013), and Agarwal, Liu and Mielnicki (2003). This paper estimates the key determinants of consumption changes upon default, rather than the default decision.

upon default, the effect of exemptions on interest rates, and the effect on consumption in default (Dávila, 2016).[3] There exist several estimates of the effect of exemptions on interest rates,[4] but less is known about the other two parameters. The main contribution of this paper is to estimate these parameters and use these estimates to evaluate the welfare impact of exemption protection. To the best of my knowledge, I provide the first estimate of the decline in consumption that occurs when a debtor defaults outside of bankruptcy, which is the key determinant of the value of additional debtor protections. I show that consumption declines, but only during non-bankruptcy default. This *decline* generates sharply different policy implications when compared with the 8-13% *increase* in consumption after filing for bankruptcy found in Filer and Fisher (2005). Second, using data from credit unions, I estimate the effect of exemptions on the repayment of defaulted debt. This estimate provides a new measure of the consumption smoothing benefit of exemptions, and captures the effects both inside and outside of the bankruptcy system.[5] I then use this estimate, combined with an estimate of the interest rate effect, to calculate the cost of exemption-generated consumption insurance. Finally, with these estimates of the benefits and costs of exemption-generated consumption insurance, I evaluate the welfare impact within the sufficient statistic of Dávila (2016).

The empirical strategy consists of two parts. First, I estimate the drop in consumption that occurs upon default using data from the Panel Study of Income Dynamics. A drop in consumption indicates that borrowers are imperfectly insured against shocks causing default,[6] and a larger drop implies a greater value for additional exemption protection. I

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[3] The consumption change and the effect of exemptions on interest rates appear directly in the sufficient statistic of Dávila (2016), but the effect of exemption increases on consumption during default appears indirectly. In Appendix A, I show how the formula of Dávila (2016) is mapped to these parameters.

[4] Papers estimating the effect of exemptions on interest rates include Gropp, Scholz and White (1997), Berkowitz and Hynes (1999), Berkowitz and White (2004), Berger, Cerqueiro and Penas (2011), and Severino, Brown and Coates (2015).

[5] In the benchmark calibration of Dávila (2016), it is assumed that a \$1 increase in exemptions generates a mechanical \$1 increase in the consumption of bankruptcy filers with non-exempt assets. In this paper, my estimates imply a much smaller effect, resulting in a transfer that is, at most, around half as large.

[6] Individuals use default and bankruptcy to offset income and expense shocks such as unemployment

examine instances of default, including bankruptcy, missed bill payments, debt collection calls, and judicial collections actions (e.g. garnishment or repossessions), and find a 3-5% *decrease* in consumption that occurs upon default. This consumption decline is driven by non-bankruptcy default. Consistent with Filer and Fisher (2005), I find that consumption increases upon filing for bankruptcy. The 3-5% consumption drop implies a relatively small value for additional debtor protections when compared with, for example, the 7-10% drop upon job loss.

However, even the 3-5% consumption drop may overstate the value of additional exemption protection. The largest exemptions are for home equity, but the types of borrowers that may benefit most from increasing these exemptions (homeowners and those with non-exempt assets) experience little to no change in consumption upon default. Instead, the consumption volatility is concentrated among renters, who are less likely to benefit from the large exemptions for home equity. This absence of a consumption drop among homeowners and households with non-exempt assets suggests that exemptions, at their current levels, protect households with little need for additional insurance. In robustness checks, I show that consumption is stable during the years prior to default with no evidence of anticipatory consumption responses, and that the estimates of consumption changes are robust to using non-defaulters living in the same state and year as a comparison group.

In the second part of the empirical strategy, I examine the impact of exemptions on consumption. By protecting defaulting debtors, exemptions increase consumption by reducing the amount repaid on debt. To measure this effect on consumption, I directly estimate the effect of higher exemptions on the repayment (recovery) rates of defaulted consumer debt. The recovery rate is the share of charged-off non-real estate debt that is eventually recovered through debt collection, and so captures the amount paid by consumers after they default. Using data from Credit Union Call Reports for 1994-2004, I estimate difference-in-differences regressions using 57 within-state changes in exemption levels.[7] A 10% increase in exemptions

(Keys, forthcoming), divorce (Lyons and Fisher, 2006), and health shocks Himmelstein et al. (2005).

[7] Fedaseyeu (2015), who first used recovery data from credit unions in studying a different set of debt

reduces recovery rates by 36 basis points, and this lower recovery rate reflects the additional consumption insurance during default. Estimates from event study regressions show that the recovery rates in treatment and control states followed parallel trends and then diverged after an exemption increase. Using the same strategy, I find interest rate effects on credit card and auto loans that corroborate a set of papers finding higher interest rates in states with greater exemptions (Gropp, Scholz and White, 1997, Berkowitz and White, 2004, Berger, Cerqueiro and Penas, 2011, Severino, Brown and Coates, 2015).[8] These estimates indicate that exemptions transfer resources from states of the world where borrowers repay to states where they default, but the transfer is expensive. For exemptions to increase consumption during default by \$1, debtors must pay around \$5 in higher interest rates.

Next, I evaluate the normative implications by comparing the costs and benefits of increased exemption protection within the recent sufficient statistics model of Dávila (2016). Dávila (2016) applies the Baily-Chetty sufficient statistics approach to asset exemptions, focusing on their impact within formal bankruptcy, and derives a sufficient statistic for the optimal level of exemptions. Using illustrative benchmark values, he finds that current exemptions are close to their optimal level, but also acknowledges the need for additional empirical work to generate improved estimates of key parameters. A key contribution of this paper is to provide these estimates. I make slight modifications to the model to incorporate default outside of bankruptcy, then evaluate the sufficient statistic using the estimates from the empirical section. These estimates imply a much smaller benefit to increasing exemptions, suggesting that exemptions are well-above the optimal level. Strikingly, I find

collection regulations, notes that unlike large commercial banks, credit union credit unions are often local lenders, so their financial information reflects state laws. In addition to using state-level aggregates, as in Fedaseyeu (2015), I use individual level credit union data, controlling for credit union fixed effects. An updated version of Fedaseyeu (2015) includes exemptions as a control in a robustness check and the coefficients are consistent with the results of this paper. Since his paper focuses on the regulation of third-party debt collectors, these coefficients are not discussed.

[8] I find extremely similar interest rate effects to Severino, Brown and Coates (2015), which is the only paper to also use difference-in-difference regressions and estimates the impact of exemptions on unsecured personal loan interest rates.

that while debtors are only willing to pay 5-25% over the actuarially fair rate for additional default insurance, exemptions generate insurance that is marked up 355%.

Given the central role that this large markup plays in the welfare analysis, I develop a second method to calculate the cost of exemption-generated insurance from an estimate of the effect of exemptions on default. I first estimate the effect of exemptions on the annual charge-off rate, then infer the magnitude of the interest rate increase from this charge-off effect and a zero-profit assumption on lenders.[9] This method is analogous to the sufficient statistic for optimal unemployment insurance, which infers the tax rate response from the elasticity of unemployment durations and the government's balanced budget constraint. In a zero-profit model of lending, the magnitude of the default distortion implies that exemption-generated default insurance is marked up 360% over the actuarially fair rate, similar to the observed interest rate markup of 355%. The similarity of two markup calculations demonstrates that the observed interest rate markup is both consistent with a competitive model of lending and can be explained by the distortion to debtors' default decisions.

This paper builds on and contributes to several strands of the literature related to debtor protections and social insurance more generally. The estimate of the consumption drop upon default adds to the literature that estimates consumption changes relevant for traditional social insurance programs. A set of papers has estimated consumption drops upon job loss (7-10%), illness (11-14%), and the development of a disability with no workers' compensation (30%).[10] In comparison, the average consumption drop upon default of 3.5% is small, suggesting that the shocks causing default are, on average, less severe or more easily insured. Additionally, the consumption decline upon non-bankruptcy default differs sharply with the consumption increase of 8-13% upon bankruptcy found in Filer and Fisher (2005), and the

[9] This charge-off effect seems to conflict with Severino, Brown and Coates (2015), which finds no change in default rates following an exemption increase. However, the difference could due to measurement, as I use the share of charge-off debt, while Severino, Brown and Coates (2015) uses the fraction of households with delinquent debt.

[10] Gruber (1997), East and Kuka (2015), and Kroft and Notowidigdo (2016) estimate the consumption drop upon unemployment, Cochrane (1991) estimates consumption changes upon a number of shocks, including illness, and Bronchetti (2012) estimates the drop upon work-limiting disabilities.

difference suggests that debtor protections are more valuable outside of bankruptcy. These consumption patterns are also consistent with legal research that documents years of informal debt collection and financial struggle that occur before most bankruptcy filings (Mann, 2007, Mann and Porter, 2010).

Second, this paper adds to the large literature examining asset exemptions.[11] A number of empirical papers have examined the credit market costs of increasing asset exemptions (Gropp, Scholz and White, 1997, Berkowitz and Hynes, 1999, Berkowitz and White, 2004, Berger, Cerqueiro and Penas, 2011, Severino, Brown and Coates, 2015). Yet, there exists little empirical evidence on how much exemptions benefit defaulting consumer debtors. Unlike traditional social insurance, increasing exemptions by $1 does not mechanically generate $1 of consumption insurance. The relationship between exemptions and repayment is blurred by the fact that most debt collection occurs outside of the bankruptcy system, with asset seizure serving as a threat point that is rarely carried out.[12] Filer and Fisher (2005) estimates the effect on the consumption of bankruptcy filers, but finds little impact of exemptions by themselves, and Lehnert and Maki (2002) shows that exemptions slightly reduce state level consumption volatility for renters. This paper contributes to this literature by quantifying the benefit of raising exemptions to defaulting consumers, and using this to calculate the overall cost of smoothing consumption with exemptions. These estimates complement Mahoney (2015), which, among other things, shows that uninsured households protected by higher exemptions repay less of their medical debt, and Fedaseyeu (2015), which also uses credit union data and estimates the impact of debt collector regulations on repayment rates and credit outcomes.

[11] The welfare analysis of asset exemptions consists mostly of structural or quantitative models (Athreya, 2006, Li and Sarte, 2006, Pavan, 2008, Mitman, 2016, Hintermaier and Koeniger, 2016). See Livshits (2015) for a recent review and discussion of the dispersion of findings in the literature evaluating the welfare impact of default policy.

[12] Additionally, exemptions protect specific assets, and many people do not hold non-exempt amounts of the types of assets protected. Even in bankruptcy, only 11% of debtors in asset cases receive a distribution from exemptions (Chapter 7 Trustee Final Reports, 2000-2013). Unlike the seizure of physical assets, garnishment of bank accounts or wages is much more common.

The paper proceeds as follows. Section 2 describes the role that exemptions play inside and outside of bankruptcy. Section 3 estimates the change in consumption that occurs upon default. Section 4 estimates the causal effect of changing exemptions on the recovery rate and interest rate. Finally, Section 5 calculates the welfare effect using these estimates and develops an alternative method for calculating the interest rate markup. Section 6 concludes.

2 Institutional Background

When debtors default, exemption laws protect specific assets from seizure by unsecured creditors. While federal exemptions are available, the large majority of states have opted out or set their own exemption laws alongside the federal exemptions. This generates substantial variation across states in the amount protected, shown in Figure 1. For example, for an unmarried debtor, Virginia exempts \$5,000 in home equity and \$6,000 in vehicle equity, while Texas exempts an unlimited amount of home equity and one vehicle per adult.

The state exemptions can influence the collection process in both the formal bankruptcy system and outside of bankruptcy in the state courts. Inside of bankruptcy, almost all consumers file under Chapter 7 or Chapter 13.[13] In Chapter 7, which accounts for 70% of consumer bankruptcies, exemptions determine the debtor's non-exempt assets, which the court sells then transfers the proceeds to creditors. In Chapter 13, exemptions apply indirectly, since creditors must receive at least as much as they would have under a Chapter 7 liquidation.[14]

Outside of bankruptcy, exemptions affect debt collection in two primary ways. First, the majority of exemptions still protect debtors' assets from the collection efforts of unsecured

[13] Individuals are sometimes required to file under Chapter 11 if they fail the Chapter 7 means test and have debts that exceed Chapter 13's debt limits, and some individuals choose Chapter 11 even though the other chapters are available. However, individual Chapter 11 bankruptcies account for only 0.15% of individual bankruptcy filings (2016).

[14] In both chapters, secured creditors are paid the collateral value and other priority debts are paid first (e.g. domestic support obligations or taxes), so exemptions may have the largest impact general unsecured credit such as credit cards or unsecured loans.

creditors in state court (Hynes and Posner, 2002). If an unsecured creditor sues in state court, he can obtain a judgment allowing additional collection actions, including the right to seize assets as payment. Court judgments are common, with almost 5% of all credit reports containing a record of a court judgment (Avery et al., 2003). These unsecured creditors with a judgment can only seize assets that are not protected by state exemption laws. Second, asset exemptions determine the debtor's potential cost of filing for bankruptcy or entering the court system, which can influence informal negotiations between debtors and creditors. Thus, exemptions can affect debt collection directly through asset seizure, or with asset seizure operating indirectly as a threat.

The main impact of exemptions may be indirect, as the actual seizure and sale of assets in both the bankruptcy system and the state courts is rare.[15] In bankruptcy, 93-96% of Chapter 7 filers have no assets seized (Flynn, Bermant and Hazard, 2003, Jiménez, 2009). Less is known about seizure outside of bankruptcy, but the available evidence suggests that actual seizure is rare, thought court judgments and judgment liens are common. Hynes (2008) reports that non-monetary asset seizure, at least in Virginia, is seldom used. There is, however, anecdotal and empirical evidence that exemptions and seizable assets influence negotiations between debtors and creditors. A consumer guide advises delinquent debtors that when settling, the "amount you offer to pay should be directly related to what the collector could seize ..." (NCLC, 2016). Similarly, creditors are more likely to accept partial payment if the debtor has few seizable assets (Finlay, 2010). Mahoney (2015) provides empirical support for the importance of these laws in the negotiation process of medical debt, showing that uninsured individuals with fewer seizable assets repay less of the debt. Later in this paper, I will show that higher exemptions reduce the amount that banks recover on delinquent consumer debt.

These settlements, asset seizures (or the threat of seizure), and other collection efforts recover a nontrivial share of defaulted debt, particularly when done outside of the formal

[15] There is an analogy with criminal law, where the rules of criminal procedure influence plea bargains, although criminal trials are rare.

bankruptcy system. Visa reports that the average recovery rate on debt charged-off without a bankruptcy is 18%, compared to only 3% when a bankruptcy is filed (NBRC, 1997).[16] In summary, although assets are rarely seized, they still affect debt collection, including debt collection that occurs outside of the bankruptcy system.

3 Changes in Consumption upon Default

In this section, I estimate the drop in consumption that occurs upon default, which captures the extent to which individuals are imperfectly insured against shocks causing default. If individuals default in response to adverse events such as job loss (Keys, forthcoming), divorce (Lyons and Fisher, 2006), or health shocks (Himmelstein et al., 2005), then consumption may be lower during times when individuals default. In this case, exemptions may provide additional insurance against losses that are not fully covered by the traditional social insurance system. Alternatively, if default is mostly strategic and not caused by adverse events, consumption may remain unchanged or increase upon default, and there would be little value to additional insurance.[17] Thus, as shown in Baily (1978) and Chetty (2006) the direction and magnitude of the change in consumption upon default is a key determinant of the value of additional protection during default.

3.1 Data: Panel Study of Income Dynamics

The Panel Study of Income Dynamics (PSID) from 1991-1996 contains information about instances of default and a measure of consumption. In 1996, the PSID asked families about

[16] As another example of the efficacy of collection outside of bankruptcy, in 2013, the bankruptcy courts collected $3.2 billion from Chapter 7 asset cases, while third-party debt collection agencies alone, which excludes in-house collection, recovered over $55 billion (United States Trustees Program Annual Report, FY 2013 and (Ernst and Young, 2012)).

[17] A set of papers examine the degree to which bankruptcies are driven by adverse events, and find evidence of both strategic and non-strategic bankruptcies (Fay, Hurst and White, 2002, Zhang, Sabarwal and Gan, 2015, Keys, forthcoming). Looking at consumption changes in the PSID, Filer and Fisher (2005) finds that consumption increases upon bankruptcy.

financial distress that occurred between 1991 and 1996. Each family reports the year that they missed a bill payment, had a debt collector call, dealt with judicial collection actions (repossession, garnishment, lien), or filed for bankruptcy.[18] In the main analysis, I count the occurrence of any of these events as default, though in Appendix Table A1 I use a stricter definition of default. Since the goal is to estimate the change in consumption upon default, the unit of observation is an instance of default. The main defaulter sample consists of household heads that report defaulting in some year t but did not default in year $t-1$. The same head can enter the sample multiple times as long as the instances of default are not in consecutive years.[19]

The measure of consumption available in the PSID is each family's annual food expenditure. While focusing on food consumption seems limiting, Chetty (2006) shows that as long as agents make optimal consumption choices, the change in a single good is sufficient to calculate the value of additional insurance. Following Gruber (1997), I measure consumption as the sum of at-home food expenditure (including food stamps) and out-of-home food expenditure, deflated by the corresponding component of the CPI for the month of the interview. I exclude households with imputed food consumption and households that report a change in food consumption over 300%.[20]

I combine these data from the PSID with states' asset exemption levels collected from historical state statutes and various editions of Elias, Renauer and Leonard (1989-2013), a popular consumer bankruptcy guidebook.[21] For each individual, I sum the homestead

[18] I use the 1991-1996 PSID because these are the only years which include information about financial distress and an annual consumption measure.

[19] The PSID only asks about default in years 1991-1996. I drop households that report default in 1991, since I do not know whether they were in default in 1990.

[20] Following Zeldes (1989) and Gruber (1997), I drop households where $log(c_t/c_{t-1}) > 1.1$ or < -1.1 (4% of the sample). Including these households does not affect the results.

[21] I thank Jeffrey Traczynski for generously sharing data on exemptions from Traczynski (2011) for comparison. I collected data on homestead and property exemptions from editions of Elias, Renauer and Leonard (1989-2013) and corrected the timing of the changes by referencing historical state statutes. For states that allow individuals to choose between the state homestead exemption and the federal homestead exemption (available only in bankruptcy), I use whichever is higher. I code states with unlimited homestead exemptions as \$550,000, the maximum exemption level among states without un-

and personal property exemptions available in the state during the year of default. If the household head is married and lives in a state that allows married couples to double their exemptions, I double the exemption value. I group individuals into exemption terciles based on the total amount of homestead and personal property exemptions available to them.[22] I refer to these groups as individuals living in low-exemption, mid-exemption, and high-exemption states, although the exemption tercile is a function of both state and marital status.

Table 1 reports descriptive statistics for two groups: PSID respondents who never report an instance of financial distress (non-defaulters), and the analysis sample, which consists of the 1,144 instances of default (defaulters). The first row shows the average change in log food consumption. In the sample of non-defaulters, the average change in food consumption is 0.04%. In the defaulter sample, however, food consumption drops by 3.5%. One concern is that this drop may be due to shocks that change the food requirements of the family and are correlated with default, such as divorce or death of a spouse. The second row rules this out by showing that food needs, the PSID's measure of the household's food requirements based on household size and composition, does not change among defaulters. The third column shows that, consistent with the 8% increase found in Filer and Fisher (2005), consumption increases by 5.7% during the year of a bankruptcy filing. The remaining rows of Table 1 show that the sample of defaulters tends to be younger and are more likely to be female, non-white, unmarried and have more unsecured debt than non-defaulters.

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limited exemptions during the period 1991-2014. I ignore lot size restrictions. I assume the filer is not a senior citizen. For personal property exemptions, I sum the wildcard, cash, and vehicle exemptions.

22 Low-exemption states have total exemptions less than $14,990, mid-exemption states range from $14,990-52,100, and high exemption states have total exemptions above $52,100 (including the unlimited exemption states). To allow for robustness checks on the sample of non-defaulters, the tercile thresholds are determined using the full PSID sample, including both defaulters and non-defaulters.

3.2 Empirical Strategy

The sample statistics in Table 1 show that borrowers experience an average drop in consumption of 3.5% upon default. The purpose of the additional analysis in this section is to investigate how the consumption drop varies with the exemption level and across individuals more or less likely to benefit from exemption protection. The sample consists of 1,144 instances of default, indexed by i. I estimate regressions of the form:

$$\Delta logC_i = \alpha_L exempt_i^L + \alpha_M exempt_i^M + \alpha_H exempt_i^H + \delta X_i + \varepsilon_i. \tag{1}$$

$\Delta logC$ is the change in the log of consumption and $exempt^L, exempt^M$ and $exempt^H$ are indicators for whether an individual is protected by low-, middle-, or high-exemption levels. Note that there is no constant term, so the significance of the α coefficient tests whether the average consumption drop in low, middle, or high exemption states is statistically different from zero. X is a set of individual characteristics (discussed below) and ε is the error term. The X variables are de-meaned so that the α coefficients capture the average drop in consumption upon default for borrowers in low-, middle, or high-exemption states. The X variables include (de-meaned) year fixed effects in all regressions.

The α coefficients do not capture the causal effect of exemptions on consumption smoothing. Instead, they capture the combined effect of exemptions and any other factors (e.g. social or private insurance) correlated with exemptions that affect changes in consumption upon default. It is this combined effect, not a causal effect, that is needed to determine the value of additional default insurance, as it reflects the extent to which borrowers remain imperfectly insured given existing methods of smoothing consumption in default.[23] I also investigate the role of observable compositional differences by including controls for individual characteristics in some regressions. The individual characteristics X_i include the year fixed effects, age, sex, years of education, an indicator for white, marital status, number of

[23] Kroft and Notowidigdo (2016) highlight the same point for the case of unemployment benefits.

children, and the change in the log of the food needs of the family. In some specifications, I also add controls for the state unemployment rate and log of state median income at the time of default. All results report standard errors clustered by state.

3.3 Results

Table 2 reports the results from estimating specification (1) on the default sample. The key coefficients are α_L, α_M, and α_H, which capture the average (log) consumption change upon default in low-, mid-, and high-exemption states. Column 1 includes only the exemption tercile indicators and year fixed effects. In all specifications, control variables are de-meaned, so the standard errors on the α coefficients test whether there is a statistically significant decline in consumption in low-, middle-, and high-exemption states. The estimate of α_L indicates that, in the low-exemption states, consumption drops by an average of 5.1% and this drop is statistically different from zero. For comparison, the mean drop in consumption upon unemployment is 7-10% (Gruber, 1997, Kroft and Notowidigdo, 2016). The α_M and α_H show that the average drop in consumption is 3.4% in mid-exemption states and 1.9% in high-exemption states, though neither drop is statistically different from zero (nor from the estimate of α_L). That consumption drops upon default (at least in low-exemption states) demonstrates that some borrowers are not fully smoothing consumption over the shocks that cause default, so additional exemption insurance may be valuable.

Again, the differences in the α estimates capture the combined effect of exemptions, compositional differences, and other factors correlated with exemptions. The remaining columns investigate the role of compositional differences and economic conditions in explaining these estimates. Column 2 adds controls for individual characteristics and column 3 adds controls for state-level economic conditions during the year that the default occurred. If the results were driven by differences in the observed characteristics of borrowers or economic conditions, the estimates of the average consumption drop across exemption terciles would converge after controlling for these variables. Instead, columns 2 and 3 show little change. The estimates in column 3 indicate that the average consumption drop is 5.0% in low-exemption states, 4.0% in mid-exemption states, and 1.5% in high-exemption states.

Exemptions, which protect only certain types and amounts of assets, will not benefit all debtors equally. I now investigate heterogeneity across borrowers in the drop in consumption upon default. Figure 2 reports the average consumption drop for various subsets of defaulters. The first estimate shows the average drop in consumption among all debtors. The next two estimates show that the consumption drop is larger for renters (4.9%) than homeowners (1.7%) and those with non-exempt assets (3.4%). If raising exemptions mostly protects homeowners and those with non-exempt assets, the small average declines in consumption among these groups would imply a low value for additional insurance. This is even more true for bankruptcy filers, who experience sizable increases in consumption upon default (Filer and Fisher, 2005). In Appendix Table A2, I construct the PSID sample following Filer and Fisher (2005) and show that the difference between the consumption drop upon default and consumption increase upon bankruptcy is statistically significant and robust to using non-defaulters as a comparison group. Overall, the figure shows that many of the groups likely to be benefit from exemption increases - homeowners, those with non-exempt assets, and bankruptcy filers - experience smaller declines in consumption upon default, reflecting that they are already able to smooth consumption.

3.4 Robustness and Anticipation

In this section, I run a series of robustness checks designed to address potential concerns. The first concern is that there may be omitted variables correlated with exemptions that affect the consumption of all borrowers, not only borrowers in default. The regression in equation (1) already controls for time-invariant household characteristics, since the outcome variable is the change in consumption, but there may be state consumption trends or unobserved shocks correlated with the exemption tercile that could bias estimates of changes in consumption. If there were general consumption trends or shocks, they would also be apparent in the sample of non-defaulters. Figure 3 presents the estimates of the consumption change for defaulters and non-defaulters living in the three exemption terciles. The consumption changes among the group of non-defaulters are close to zero. I test these differences more formally in Table 3. Columns 1-3 report the estimates from regressions on the sample of non-defaulters. Columns 4-5 pool the samples of non-defaulters and defaulters and adds state×year fixed effects, so that the estimates compare defaulters and non-defaulters in the same state and year. The specification interacts an indicator for default with the low-, mid-, and high-exemption terciles to capture the drop in consumption among defaulters relative to non-defaulters.[24] These results show that the declines in consumption occur only among individuals reporting default.

A second concern is that there is uncertainty about the timing of consumption changes around default. One source of uncertainty is the ambiguity about the reference year of the food expenditure questions in the PSID (East and Kuka, 2015). In most years, the PSID asks about food consumption in the average week, and the question is asked immediately after a question about food stamp use in the prior month. For this reason, I follow prior research in assuming that individuals report their consumption during the year of the interview (Zeldes, 1989, Gruber, 1997, East and Kuka, 2015). A second source of uncertainty is that the data on default was asked in 1996 and only contains the calendar year that default occurred, which will not correspond exactly to the timing of the PSID food expenditure questions in those years. A third source of uncertainty is due to the potential for borrowers to anticipate default and reduce consumption in advance. For example, Hendren (2017) shows that households reduce consumption in the year before a job loss. I address these concerns about timing by investigating changes in consumption in the years around default. Table 4 reports estimates from the years before and after the reported instance of default. Columns 1-3 show that, for borrowers defaulting in year t, there is no change in consumption prior to default. Due to

[24] Columns 4-5 estimate $\Delta logC_i = \alpha_L exempt_i^L \times Default_i + \alpha_M exempt_i^M \times Default_i + \alpha_H exempt_i^H \times Default_i + \delta X_i + \tau_{s(i),t(i)} + \varepsilon_i$, where $\tau_{s(i),t(i)}$ represents the set of state×year fixed effects. There are multiple years for each household, so i indexes household-year observations.

missing data and sample attrition, the sample of defaulters included in columns 1-3 changes slightly. To ensure that a composition change is not driving the results, columns 4-6 limit the sample to the 1,017 defaulters who have full data for the surrounding years and the results are unchanged.

4 The Consumption Smoothing Effects of Exemptions

The previous section shows that there is a drop in consumption that occurs upon default, implying a potential consumption smoothing role for higher exemptions. But the magnitude of the consumption smoothing benefit depends on how exemption protection affects household repayment. In this section, I use difference-in-differences and event study regressions to estimate the causal effect of exemptions on repayment rates on defaulted debt. Also, I estimate the interest rate cost of increasing exemptions, and find results that are consistent with other estimates in the literature.

4.1 Data: Credit Union Call Reports

I use state-level and individual credit union data on recovery rates on debt in default from Credit Union Call Reports. Each quarter, credit unions must submit a Call Report with financial information such as balance sheets and income statements. These Call Reports are publicly available from the website of the National Credit Union Administration. State-level aggregates from Credit Union Call Reports were first used to study collection in Fedaseyeu (2015), which examined how regulations on debt collectors, such as licensing requirements or criminal penalties, affect credit markets. I use similar state level aggregates, but also take advantage of the individual level credit union data available.

One advantage of using credit union data, as argued in Fedaseyeu (2015), is that credit unions are local lenders, so their lending practices reflect state laws. Over 92% of credit unions in 2013 have branches in only one state, and over 98% have branches in two or fewer states.[25] A drawback, however, is that the lending practices of credit unions may differ from those of larger banks. Between 1991 and 2004, credit unions issued 7-10% as much revolving credit as commercial banks.[26] Credit union credit card interest rates are lower, averaging 12.3% from 1994 to 2004, compared with 14.7% at commercial banks.[27] The recovery rates for credit unions are also lower than those of commercial banks, with average recovery rates of 17.2% and 19.3%, respectively.[28] However, the similarity of the credit union interest rate responses that I find with those in the literature suggest that credit unions and banks response to exemptions in similar ways. Additionally, the recovery rates of credit unions and banks exhibit similar patterns over time, as shown in Appendix Figure A1.

I use credit union data for the years 1994-2004. I limit the sample to this period for two reasons. First, two shocks, a major bankruptcy reform and a severe recession, may cause the impact of exemptions in the late 2000s to differ from the typical impact of exemptions. The transition to the new bankruptcy system introduced a large, temporary spike in bankruptcies in 2005. Also, the falling home prices during the recession erased a substantial amount of home equity, reducing the benefit of the largest exemption, the home equity exemption.[29] The second concern with the later period is that spatial heterogeneity in credit markets and defaults caused by the bankruptcy reform and recession make estimates of the effects of marginal changes in exemptions during this period noisy and potentially biased.

I use 4th-quarter Call Reports to construct annual recovery rates on charged-off non-real

[25] In the main analysis, I drop two major national credit unions, Navy Federal Credit Union and the Pentagon Federal Credit Union, from the sample. In Appendix Table A6, I show that the main results hold when the sample is restricted to credit unions operating in only one state.

[26] Source: Board of Governors of the Federal Reserve System, G.19 series - Consumer Credit. Revolving credit is mostly credit card loans but other types, such as prearranged overdraft plans, are also included for commercial banks but not credit unions (J. Furletti and Ody, 2006).

[27] Another difference is that credit unions must obey an interest rate cap of 18%, but this is binding for less than 0.1% of the sample (weighted by credit card amount).

[28] Source: Author's calculations from aggregating commercial and Credit Union Call Reports and taking the mean annual recovery rate between 1994 and 2004. These numbers differ slightly from those in Table 5, which reports averages of the state-level recovery rates.

[29] In 2010, 55-65% of homeowners were completely protected by exemptions (Dobbie and Goldsmith-Pinkham, 2015).

estate loans. A charge-off occurs when a creditor marks a debt as unlikely to be collected, typically after 120-180 days of delinquency for consumer debts.[30] Recoveries reflect the amount collected after a debt has been charged-off, and can consist of post-charge-off payments by debtors or revenues from selling the charged-off debt (Furletti, 2003). Therefore, recoveries capture the amount that creditors ultimately collect on debt that is severely delinquent, including collections in and out of bankruptcy. Credit unions report total charge-offs and recoveries and real-estate charge-offs and recoveries separately. Exemptions matter most for unsecured credit, so I construct non-real estate charge-offs and recoveries for each credit union.[31] I use the individual credit union data as well as state-level aggregates. To form the state-level measure, I aggregate non-real estate charge-offs and recoveries by state and measure the recovery rate in state j as aggregate recoveries divided by aggregate charge-offs.

Credit Union Call Reports also include data on credit card interest rates. Each credit union reports the most common interest rate offered for credit cards and the total number of credit card loans. I also aggregate these interest rates to the state level, weighting each credit union's interest rate by the number of outstanding credit card loans. The summary statistics of the main variables are presented in Table 5. The primary outcomes in the analysis are shown in the first two rows. The mean interest rate on credit card debt is 12.3% and the average recovery rate on charged-off non-real estate debt is 17.73%. I combine the interest rates and recovery rates with data on exemption levels.

To calculate the exemption level, I sum the homestead and property exemptions available

[30] Bank (FFIEC) regulatory accounting requirements state that revolving credit must be charged-off after 180 days of delinquency and installment loans after 120 days - Uniform Retail Credit Classification and Account Management Policy, 65 Fed. Reg. 36903 (June 12, 2000). When loans are charged-off, issuers reverse the fees and finance charges on the loan in a process called "purification" (Furletti, 2003). Therefore, the charged-off amounts will reflect the unpaid principal (see NCUA 5300 CALL REPORT INSTRUCTIONS - June 2005).

[31] These charge-offs are primarily unsecured consumer loans (e.g. credit cards) and the underwater portion of vehicle loans. Estimates based on the share of unsecured debt and non-real estate debt that is charged-off suggest that at most 44% is comprised of auto loans. These numbers are obtained by multiplying the shares of unsecured (22%) and auto (78%) loans by their respective charge-off rates of 2.18% (for credit cards) and 0.56%. Since credit unions have the option of only charging off the difference between a loan and its collateral, auto loan charge-offs are likely a smaller share.

to an unmarried bankruptcy filer under the age of 65 for each state and year. Although some states allow doubling of exemptions for a married debtor, my specification uses the log of the exemption level and so the coefficient would not be affected by doubling. Between 1994 and 2004, there were 57 changes among 28 states, and the average (credit union membership-weighted) change is $10,507 or 17.5 log points. Appendix Figure A2 shows the number of exemptions changes in each state between 1994 and 2004, and Figure A3 shows the distribution and timing of changes in the exemption level.

4.2 Empirical Strategy

I use the state-level data to estimate the effect of exemptions on recovery rates and interest rates. For state s at time t, the regressions are of the following form:

$$y_{st} = \alpha + \eta ln(E_{st}) + X_{st}\beta + \delta_s + \tau_t + u_{st}. \tag{2}$$

where $ln(E_{st})$ is the log of the exemption level.[32] Using the log of a state's exemption level allows the effect of exemptions to diminish as the exemption level rises, reflecting the fact that more debtors will be fully protected (Mankart, 2014). For example, an increase in Virginia's $5,000 homestead exemption would affect everyone with more than $5,000 in home equity, while an increase in Minnesota's $390,000 homestead exemption would affect the few with more than $390,000 in equity. Consistent with this, in Appendix Tables A4 and A5, I show that the estimated effect of a $1 increase in exemptions is much larger in states that have lower exemptions, and close to zero for states with high exemptions.[33]

The outcome variable y_{st} is either the interest rate or the recovery rate in state s during

[32] An alternative approach with be to calculate the financial benefit or cost of defaulting using data on asset holdings and exemptions (Fay, Hurst and White, 2002, Mahoney, 2015). To be consistent with the model in Section 5, I estimate the effect of changing the log exemption level (or linear exemption level in Appendix A4) because the exemption level, m, is the parameter directly controlled by the policy maker.

[33] Using the coefficients from the linear specifications results in a very similar markup of exemption protection (355% vs. 333%), and so does not change the policy implication.

year t. The coefficient η captures the effect of a 100 log point increase in a state's exemption level. The state controls, X_{st}, contain the log of median income, the log of the home price index from the Federal Housing Finance Agency, and the state unemployment rate. I also include state fixed effects (δ_s) and year fixed effects (τ_t) in all specifications. The error term, u_{st}, represents the unobserved state-year shocks that affect interest or recovery rates.

Unlike the previous section, I argue that these estimates reflect the causal effect of exemptions. The identifying assumption is the parallel trends assumption: in the absence of an exemption increase, interest rates and recovery rates in states that increase exemptions and in control states would have been parallel. I support this assumption in two ways. First, I argue that the changes in exemptions arise out of a political process that does not depend on states' lending conditions. Several states and the federal bankruptcy exemptions are adjusted at predetermined intervals to adjust for inflation. Additionally, Severino, Brown and Coates (2015) examines a number of potential predictors of exemption changes, including house prices, state GDP, medical expenditures, the unemployment rate, the political climate, bankruptcy filings, and income growth. Only medical expenditure is found to be statistically significant. Other important debtor protection laws, namely wage garnishment restrictions and statutes of limitations on debt, were stable over this period.

Second, using an event study specification, I test whether trends in treatment and control states were parallel prior to an exemption increase. Since states have multiple exemption increases, a standard event study specification is not appropriate. Instead, I use a multiple event study framework, similar to those in Dube, Lester and Reich (2010) and Sandler and Sandler (2014), that allows for overlapping events within a state. I estimate the following regression for state s in year t:[34]

$$y_{st} = \alpha + \sum_{k=-6}^{5} \eta_k \Delta ln(E_{s,t-k}) + \eta_6 ln(E_{s,t-6}) + X_{st}\beta + \delta_s + \tau_t + u_{st}. \quad (3)$$

[34] To produce a balanced panel in this regression, I use exemption data from 1989-2010 even though y_{st} is only used from 1995-2004.

The one-period difference operator, Δ, produces coefficients η_k that represent the cumulative effect of a one log-point increase in the exemption level k years later. For example, if the log exemption increased by 0.5 in a state during 2000, η_{-3} captures the difference in bankruptcies in that state in 1997 ($\Delta ln(E_{s,t+3}) = 0.5$ when $t = 1997$), while η_3 captures the effect of that increase on state bankruptcies in 2003. The estimates provide evidence about the identification assumption by testing whether the trends were parallel prior to an exemption increase. If interest rates y_{st} in the treatment and control states are similar prior to an exemption increase, then the coefficients $\eta_{-6}, \ldots, \eta_{-1}$ will be zero. The coefficients η_0 through η_5 capture the cumulative effect of an exemption increase in the first six years after the increase. Since η_6 does not use the difference operator, it captures the average effect of the exemption increase in and after year $t + 6$.

4.3 Results

Table 6 reports the estimates from the difference-in-differences equation (2). The estimate in column 1 indicates that a 10% increase in the exemption level reduces recovery rates by 0.2 percentage points, or 20 basis points, though it is not statistically significant. Columns 2 and 3 add state-level economic controls and region-year fixed effects for the four Census regions. After controlling for economic conditions, the magnitude in column 2 indicates that a 10% increase in the exemption level reduces the recovery rate on charged-off debt by 36 basis points, significant at the 1%-level, and the magnitude is slightly larger after controlling for region$\times$year fixed effects in column 3. Columns 4-7 show that the estimates are unchanged when using individual credit union data and including fixed effects for the individual credit unions. Thus, the effect represents changes that occur within an individual credit union, and not a shift in credit across credit unions. Given the average household credit card debt of $5,700 in the 2013 Survey of Consumer Finances, these estimates imply that increasing exemptions by $1 reduces the amount paid in default by $0.005-0.02 for the average debtor.[35]

Table 7 reports the estimates from the difference-in-differences equation (2) with the credit card interest rate as the dependent variable. The estimate in column 1 indicates that a 10% increase in the exemption level raises credit card interest rates by 0.042 percentage points, or 4.2 basis points, and is statistically significant at the 1%-level. The results remain similar when economic, geographic, and individual credit union controls are added in columns 2-7. In Appendix Table A3, I show significant but smaller interest rate responses for auto loans, consistent with secured loans being less affected by exemption increases. The magnitude of these interest rate effects are very close to the estimate found on unsecured personal loans in Severino, Brown and Coates (2015), which uses a similar identification strategy with bank interest rates, and in the lower end of the range of estimates found in papers using cross-sectional variation in exemptions (for example, Gropp, Scholz and White (1997)).[36] That these estimate from credit unions are consistent with other results from commercial banks provides reassurance about their external validity.

Figure 4 plots the η_t estimates and 95% confidence intervals from the event study specification in equation (3). The pattern of coefficients in these event study regressions lend credibility to the empirical design and show the longer-run effects of raising exemptions. For both interest rates and recovery rates, the coefficients $\eta_{t-6}, \ldots, \eta_{t-1}$ are small and insignificant, consistent with the parallel trends assumption. In the period t, when exemptions increase, interest rates rise and remain elevated for at least six years. At the same time, the recovery rate on charged-off loans falls sharply in period t, and remains low over the next six years.

In the Appendix, I report a number of robustness checks. Tables A4 and A5 show that the results are similar if the exemption level is included linearly and that the effects are

[35] To calculate these values, I use the constant percentage change estimate from column 2 of Table 6 and consider a $1 exemption increase in states with current exemption values of $10,000 to $40,000. Similar values are obtained if I use estimates from the linear specifications in Tables A4 and A5.

[36] I provide a more detailed comparison with other estimates in Appendix B.

driven by states with lower exemption levels. Table A6 shows that the results are similar if the sample is constructed from credit unions operating in only one state. Table A7 shows that the results are largely unchanged if only the homestead exemption is used.

Overall, these estimates show that when exemptions increase, there is a simultaneous reduction in recovery rates and increase in interest rates. In this way, exemptions transfer resources from states of the world where borrowers repay, to states where borrowers default. Because all debtors pay the higher interest rates, but debtors only benefit from exemption protection when they default, the cost of transferring \$1 of consumption to the default state using asset exemptions can be expressed as $\frac{r'(m)}{\pi s'(m)}$, where $r'(m)$ and $s'(m)$ are the responses of interest rates and recovery rates to changes in the exemption level, and π is the ratio of debt in default to debt in repayment, i.e. the charge-off rate. Within this ratio, the estimates from column 6 from Tables 6 and 7, combined with the charge-off rate of 0.022 for π, indicate that the interest rate payment increase is five times as large as the reduction in payments during default. Thus, exemptions are an expensive method of transferring resources. The next section examines both the sources and the welfare implications of this transfer.

5 Calculating the Welfare Impact

In this section, I use the sufficient statistics approach of Dávila (2016) to map these estimates into a statement about the welfare impact of raising exemptions. After introducing the sufficient statistics formula, I calculate the welfare impact of raising exemptions, conduct sensitivity analysis, and then provide an alternative method of calculating the cost of raising exemptions.

5.1 Model of Default and Exemptions

I use the baseline exemption model of Dávila (2016), which is a two-period model based on Eaton and Gersovitz (1981), and slightly modify it to incorporate exemptions' impact on debt collection outside of bankruptcy. There are two periods, $t = 0, 1$, a single consumption good, and a unit measure of borrowers. At $t = 0$, income is certain and borrowers choose how much to borrow, B_0. At $t = 1$, borrowers receive an income draw y_1 from a distribution $F(\cdot)$ with support $[\underline{y_1}, \overline{y_1}]$ then decide whether to default or repay their debt. In deciding whether to default or repay, there is an endogenously determined optimal decision rule y^* where borrowers default if and only if $y_1 < y^*$. The decision rule can depend both on the exemption level m and the amount borrowed B_0.

Thus, borrowers maximize:

$$W(m) = \max_{C_0, \{C_1\}_{y_1}, B_0, y^*} U(C_0) + \int_{\underline{y_1}}^{y^*} U(C_1^D) dF(y_1) + \int_{y^*}^{\overline{y_1}} U(C_1^N) dF(y_1) \tag{4}$$

where

$$\begin{aligned} C_0 &= y_0 + q(m)B_0, \\ C_1^N &= y_1 - B_0 \\ C_1^D &= (1-\phi)y_1 - s(m)B_0. \end{aligned}$$

In period 0, borrowers consume the income endowment, y_0, plus the amount borrowed, $q(m)B_0$, where $q(m)$ is the price of debt with $q = \frac{1}{1+r}$.[37] In period 1, borrowers repay if $y_1 > y^*$ and consume the income that remains after repaying the debt, $C_1^N = y_1 - B_0$. Otherwise, period 1 borrowers default if $y_1 < y^*$ and consume C_1^D, which is income less the costs of default.

The difference from the model of Dávila (2016) is how exemptions affect consumption in default. If exemptions apply only in bankruptcy, as in Dávila (2016), then defaulting debtors give up any assets above the exemption level. In that setting, $\frac{\partial C_1^D}{\partial m} = 1$ if the

[37] Dávila (2016) allows $q(m)$ to also depend on the level of debt, B_0, in the main model, but also considers the price-taking case of $q(m)$. Allowing $q(\cdot)$ to depend on B_0 would require an estimate of $\frac{\partial q}{\partial m}$, rather than $\frac{dq}{dm}$ obtained from the credit union data.

individual is a bankruptcy filer with non-exempt assets ($y_1 > m$) and is zero otherwise. With informal default, however, the relationship between exemptions and consumption is less certain, and the empirical results in Section 4 imply that a \$1 increase in exemptions increase consumption by only \$0.02 on average. To capture this, I assume that defaulting borrowers repay a portion of their debts, $s(m) < 1$ that depends on the exemption level m and will be informed by the estimates in the empirical section. Debtors also pay a default cost that depends on their income ϕy_1, which can reflect other collection actions (e.g. wage garnishment), stigma or reduced access to future credit and is similar to the non-pecuniary cost extension in Dávila (2016).

Baily (1978) and Chetty (2006) show that taking a Taylor expansion of U' around C_0 yields the approximation $\frac{U'(C_1^D)}{U'(C_0)} \approx 1 + \gamma \frac{\Delta C}{C_0}(m)$,where $\gamma = -\frac{U''(C_0)}{U'(C_0)} C_0$ is the coefficient of relative risk aversion evaluated at C_0 and $\frac{\Delta C}{C_0}(m) = \frac{C_0 - C_1^D}{C_0}$ is the change in consumption among those who default.[38] Differentiating $W(m)$ and employing the Baily-Chetty approximation gives the following formula for the welfare impact of increasing exemptions:[39]

$$\frac{dW/dm}{U'(C_0)T} = \gamma \frac{\Delta \overline{C}}{C_0} - \left(\frac{q'(m)}{\pi s'(m)} - 1 \right), \tag{5}$$

The welfare change is normalized by the value of an equivalent transfer to period 0, $U'(C))T$, where $T = -\pi s'(m) B_0 > 0$ is the amount transfered to defaulters. The term π is the fraction of individuals defaulting, and $\frac{\Delta \overline{C}}{C_0}$ is the average drop in consumption upon default. Intuitively, this formula compares the amount debtors are willing to pay for default insurance to the cost of generating default insurance using asset exemptions. The first term on the right side in equation (5) represents the maximum markup over the actuarially fair rate that a borrower would be willing to pay in period 0 for additional consumption during default. This markup depends on a measure of risk aversion γ and the drop in consumption upon default

[38] This approximation assumes that the higher order terms (e.g. U''') are negligible relative to the first-order term.

[39] For derivation of this formula and the mapping to Dávila (2016), see Appendix A.

$\frac{\Delta \overline{C}}{C_0}$. The second term is the interest rate markup that the borrower has to pay if additional consumption in default is generated by increasing asset exemptions, which depends on the effect of exemptions on interest rates $q'(m)$ and recovery rates $s'(m)$. Thus, the formula maps the empirical estimates of this paper into a statement about welfare.

5.2 Calculating the Welfare Gain

The formula in equation (5) can be calculated using the estimates found earlier in this paper for the consumption change and the effect of exemptions on interest rates and recovery rates. The policy parameter is $m = log(exemption)$, though the calculations are similar if I use the estimates from the linear exemption specification in Table A4.[40] To calculate the welfare formula, I use the following empirical values:

$$\frac{\Delta c}{c_h}(m_j) = 0.05$$
$$q'(m) = -0.36$$
$$s'(m) = -3.6$$

Since $q(m) = \frac{1}{1+r(m)}$, I use the value $\frac{-r'(m)}{(1+r)^2} = \frac{-0.45}{1.12^2}$ for $q'(m)$. I set the share in default the mean credit card charge-off rate so that $\pi = 0.022$.[41] There is uncertainty about the appropriate value for the coefficient of relative risk aversion over food consumption, γ, so I report the welfare gains for $\gamma = 1, 3, 5$. The results from this welfare calculation are reported in Table 8. For these levels of risk aversion, debtors are willing to pay a markup of 5-25% over the actuarially fair rate, but the transfer generated by asset exemptions is marked up 355% over the actuarially fair rate. Consequently, at current exemption levels, $1 of exemption-

40 The magnitude of the markup is robust to functional form. If I use the values from the linear exemption specification in Appendix Table A4, the markup is 333% compared to 355% in the main analysis.

41 I use the charge-off rate, rather than the share of borrowers in default, because the benefits and costs are proportional to the amount of debt held.

generated default insurance reduces welfare by \$3.30-3.50 per borrower. Thus, the policy implication is that lower exemptions would significantly increase welfare.[42]

In contrast, the calibration exercise of Dávila (2016) finds that current exemptions levels are near or slightly below the optimal level. The calibration values used in Dávila (2016) are sometimes chosen to demonstrate features of the model, and the author notes the need for improved estimates and additional empirical work. A main contribution of this paper is to provide estimates of the key parameters.

There are two components that differ significantly from the calibration values chosen in Dávila (2016), and both contribute to the policy implication that lower exemptions would increase welfare. First, I estimate the consumption drop upon default to be 5%. This halves the willingness to pay for insurance relative to the 10% value used in Dávila (2016).[43] There are reasons to believe that even this 5% drop in consumption overstates the consumption smoothing value. This paper shows that the groups more likely to benefit from exemptions - those with non-exempt assets and homeowners - experience even smaller consumption declines upon default. Moreover, this paper highlights the importance of protecting debtors outside of bankruptcy, because consumption declines only during non-bankruptcy default and so only non-bankruptcy defaulters would benefit from additional consumption insurance.

The second major difference is that the estimated benefit of increasing exemptions is smaller than previously thought. Dávila (2016) has a \$1 exemption causing a mechanical \$1 increase in consumption for bankruptcy filers with non-exempt assets. The estimates of this paper, however, show that a \$1 exemption increase raises consumption by only \$0.02 for the average defaulter. A small effect is consistent with evidence about the use of exemptions in and outside of bankruptcy. The indirect effects of exemptions on debt settlement negotiations can dampen the impact of a \$1 exemption increase. Moreover, even in bankruptcy cases

[42] Appendix Table A8 shows that this policy implication is not sensitive to reasonable variation in the estimates of the components.

[43] This 10% decrease in consumption is based on Filer and Fisher (2005), but they find an 8-13% increase in consumption, not a decrease.

with non-exempt assets, many of the non-exempt assets are not of the type protected by exemptions. For example, an increase in the homestead exemption only affects bankruptcy filers who have non-exempt home equity. Consequently, in bankruptcy, only the very few filers (roughly 0.6%) who own specific non-exempt assets would benefit from greater exemption protection.[44] The smaller impact of exemptions generates a total transfer to defaulters that, at most, half that of Dávila (2016).[45] This small transfer, in turn, implies a large markup cost for exemptions. Given the importance of this large markup in the welfare analysis, I provide another method of calculating the markup in the next section.

5.3 Calculating the Markup: An Alternative Method

The observed interest rate markup exceeds the actuarially fair rate by 355%, significantly more than the 5-25% markup that debtors are willing to pay. Instead of using the observed interest rate change, I infer the interest rate response from a zero-profit restriction on lenders and the magnitude of the default rate distortion. This is analogous to the sufficient statistic for optimal unemployment insurance, which uses the government's balanced budget constraint and the behavioral response of unemployment durations to infer the response of the tax rate.

If lenders are competitive and risk-neutral, then the returns from lending satisfy the

[44] When assets are sold, any exempted amount is returned to the debtor. This provides a measure of how many filers would benefit from additional protection. Only 4-6% of bankruptcy cases have any non-exempt assets (Flynn, Bermant and Hazard, 2003). Of these asset cases, between 2000 and 2013, only 10.8% of them returned any funds back to the debtor because of state or federal exemptions (Chapter 7 Trustee Final Reports, 2000-2013). The largest exemptions are for home equity, but in a sample of cases with non-exempt assets, only 11% of them had non-exempt equity in real estate of any kind, which can include home equity as well as unprotected equity in other property (Jiménez, 2009). Thus, only about 10% of the asset cases would benefit from additional exemption protection.

[45] To generate a comparison, I use the share of defaulters ($\pi = 0.022$), the linear effect of exemptions from column 4 of Table A5 ($s'(m) = \frac{0.0036}{1000}$), and the average debt from Dávila (2016) ($B_0 = 5,645.5$), which together imply that increase exemptions by \$1 results in a transfer of size $\pi s'(m)B_0 = 0.00045$, which is half the transfer size of 0.0008 assumed for bankruptcy filers. Moreover, in this comparison I use the estimate for low-exemption states. If instead, I use the average transfer size for the full sample from Table A4, the transfer would be only one-tenth as large.

zero-profit condition $(1-\pi)+\pi s=(1+\tilde{r})q$, where π is the probability of default, q is the period 0 price of debt, s is the recovery rate on defaulted debt, and $\tilde{r}$ is the risk-free rate of return. This zero profit condition implies that the expected interest rate increase is given by

$$(1+\tilde{r})q'(m) = \underbrace{-\frac{d\pi}{dm}(1-s)}_{\text{behavioral cost}} + \underbrace{\pi\frac{ds}{dm}}_{\text{mechanical cost}}. \tag{6}$$

The first term on the right hand side reflects the losses due to the distortion of borrowers default decisions. The second term reflects the losses due to the mechanical effect of higher exemptions on the recovery rate. If rates are competitive, the increase in interest rates (reduction in $q(m)$) will exactly offset lenders' losses due to the increase in the probability of default and the loss in recovery upon default. Rearranging equation (6) provides an alternative formula for the markup:

$$\frac{q'(m)}{\pi s'(m)} - 1 = -\frac{(1-s)\pi'(m)}{(1+\tilde{r})\pi s'(m)}. \tag{7}$$

This version of the markup is calculated as the cost of the additional loan losses due to more default relative to the additional losses from the mechanical effect of higher exemptions on repayment rates.

Evaluating this markup requires estimates of exemptions effect on borrowers' default decisions, $\frac{d\pi}{dm}$. Table 9 reports difference-in-differences estimates from equation (2) with the credit card charge-off rate as the outcome. The credit card charge-off rate is not available before 1998, so the sample covers 1998-2004. After including controls for economic conditions, the point estimate in column 2 indicates that a 10% increase in asset exemptions raises the credit card charge-off rate by 0.035 percentage points, a 1.6% increase. In Appendix Figure A4, I show event study estimates for this specification.

Using estimates of $\frac{ds}{dm}=-0.036$, $\frac{d\pi}{dm}=-0.0035$, $\tilde{r}=0.01$ and the sample means for π, and s, equation (7) implies a zero profit interest rate markup is 360%, similar to the estimated

355% markup. Thus, the observed magnitude of the interest rate markup is consistent with exemptions increasing the default rate within a risk-neutral, competitive model of lending. Moreover, the two methods of calculating the markup both indicate that exemptions create insurance that far more costly than the 5-25% markup that debtors are willing to pay.

6 Conclusion

In this paper, I estimate the consumption smoothing benefits and costs of the default insurance provided by asset exemptions. I find that consumption falls when debtors default outside of bankruptcy, so there is potentially a consumption-smoothing role for debtor protections. Exemptions, however, are an expensive means of providing this protection. While exemptions do create default insurance, this insurance is marked up 355% over the actuarially fair rate, while debtors are only willing to pay a 5-25% markup. As a result, the sufficient statistic formula slightly adapted from Dávila (2016) indicates that welfare would be improved if states reduced exemption levels.

This welfare analysis investigates the main trade-off in raising exemptions, but does neglect some potential costs and externalities. First, exemptions may also affect the set of loan contracts offered or loan denial rates, and this could make increasing asset exemptions even more costly. Second, the welfare analysis assumes that consumers make financial decisions optimally, but behavioral biases are important in many household financial decisions (see Zinman (2014) and Zinman (2015) for an overview). If consumers do not make decisions optimally, the analysis in this paper could either overstate or understate the welfare gains of exemptions, depending on the specific behavioral biases of borrowers.

Third, debtor protections exist alongside many other forms of social and private insurance programs and influence the collection of non-consumer debts, such as medical debt. There is evidence that some of these programs interact, as consumers view health insurance, unemployment insurance, and default or bankruptcy as substitutes (Gross and Notowidigdo, 2011, Hsu, Matsa and Melzer, Forthcoming, Mahoney, 2015). Changes in exemption policy may reduce or exacerbate externalities in other social insurance programs, and this paper ignores these effects. The interaction of debtor protections and social insurance programs is important, since debtor protections affect consumers' ability to self-insure through credit markets. If individuals can adequately self-insure, it reduces the need for social insurance. Additional responses of lenders, behavioral biases in borrowing, and externalities on other forms of insurance are three important avenues for future research on the welfare impact of debtor protection laws.

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Table 1: Consumption Sample (PSID)

	Non-Defaulters	**Defaulters**	**Bankruptcy Filers**
Δ log consumption	.00043	-.035	.057
Δ log food needs	-.0021	-.0042	-.012
Food consumption (1990$)	4,815	4,346	4,697
Age	46	38	38
Female	.24	.38	.27
Years of education	13	12	12
White	.7	.48	.62
Number of children	.86	1.3	1.1
Married	.63	.43	.58
Unsecured debt (1990$)	3,504	3,827	4,703
Mortgage debt (1990$)	24,986	14,171	15,007
Observations	20,717	1,144	111

This table displays means for a sample of individuals who never reported defaulting (non-defaulters), and the defaulter sample, which consists of the observations of defaulters during the period of default. It also shows the means for the sample of bankruptcy filers, as in Filer and Fisher (2005). Column 3, following Filer and Fisher (2005), includes individuals who were not heads of their household at the time of default.

Source: PSID 1991-1996

Table 2: The Consumption Drop Upon Default

	Default sample		
	Baseline (1)	Controls (2)	State Controls (3)
Low-exemption states (α_L)	-0.051***	-0.049***	-0.050***
	(0.014)	(0.014)	(0.015)
Mid-exemption states (α_M)	-0.034	-0.038*	-0.040*
	(0.023)	(0.021)	(0.023)
High-exemption states (α_H)	-0.019	-0.017	-0.015
	(0.018)	(0.018)	(0.019)
Log(median income)			0.034
			(0.080)
Unemp. rate			-0.002
			(0.012)
Observations	1,144	1,144	1,144
Year FE	X	X	X
Demographic controls		X	X

*** p<0.01, ** p<0.05, * p<0.1

This table reports regression results from the regression in equation (1) estimated on the sample of default instances. Demographic controls consist of age, sex, years of education, an indicator for white, marital status, number of children, and the change in the log of the food needs of the family, which is a function of family size and age computed by the PSID. The control variables are de-meaned and there is no constant, so the coefficients on the exemption interactions represents the average drop in consumption among defaulters in those states. Standard errors are clustered by state.

Source: PSID 1991-1996

Table 3: Non-Defaulters as a Comparison Group

	Non-Defaulters Sample			Pooled Sample	
	Baseline (1)	Controls (2)	State Controls (3)	Baseline (4)	Controls (5)
Low-exemption (α_L)	-0.006*	-0.004	-0.005		
	(0.003)	(0.003)	(0.003)		
Mid-exemption (α_M)	0.006	0.003	0.004		
	(0.004)	(0.004)	(0.004)		
High-exemption (α_H)	0.001	0.002	0.001		
	(0.003)	(0.003)	(0.003)		
Low-exemption×Default				-0.041***	-0.037**
				(0.015)	(0.015)
Mid-exemption×Default				-0.032	-0.041*
				(0.022)	(0.022)
High-exemption×Default				-0.009	-0.010
				(0.018)	(0.018)
State controls			X		
Demographic controls		X	X		X
Year FE	X	X	X	X	X
State×Year FE				X	X
Observations	20,717	20,717	20,717	21,861	21,861

Columns 1-3 estimate equation (1) on the sample of individuals who never report financial distress (non-defaulters). Columns 4-5 pool the sample of defaulters and non-defaulters, include state×year fixed effects, and report coefficients for the exemption level interacted with an indicator indicator for default and an indicator for bankruptcy. Demographic controls consist of age, sex, years of education, an indicator for white, marital status, number of children, and the change in the log of the food needs of the family, which is a function of family size and age computed by the PSID. State controls include the log of median income and the unemployment rate. Standard errors are clustered by state.

Source: PSID 1991-1996

Table 4: Leads and Lags of the Consumption Change

	Full sample of defaulters			Defaulters with a lead and lag		
Period relative to default	t-2 to t-1 (1)	t-1 to t (2)	t to t+1 (3)	t-2 to t-1 (4)	t-1 to t (5)	t to t+1 (6)
Change in consumption	-0.011	-0.035***	-0.019	-0.009	-0.031**	-0.020
	(0.013)	(0.011)	(0.014)	(0.014)	(0.012)	(0.014)
Observations	1,030	1,144	1,130	1,017	1,017	1,017

This table reports estimates from a regression of leads and lags of the log change in consumption on a constant and de-meaned demographic controls. The constant captures the mean change in consumption. Columns 1-3 estimate the equation on the full sample of defaulters. Columns 4-6 estimate the equation on the subsample of defaulters for which a lead and lag of the consumption change are available. All specifications include year fixed effects and demographic controls for age, sex, years of education, an indicator for white, marital status, number of children, and the change in the log of the food needs of the family. Additionally, state-year level controls for the log of median income and the unemployment rate are included. Standard errors are clustered by state.

Source: PSID 1991-1996

Table 5: Credit Union Summary Statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Interest rate	12.30	0.93	9.56	14.49	550
Recovery rate, non-real estate debt	17.73	6.44	6.21	48.56	550
Charge-off rate, credit cards	2.16	0.516	0.88	5.82	350
Charge-off rate, non-real estate debt	0.91	0.24	0.25	1.91	550
Exemption level (1990$)	33,222	40,951	0	346,741	473

This table shows descriptive statistics of the state-year level credit union data. Observations are weighted by the credit union membership in that state-year. The sample size is smaller for credit card charge-offs because that data is only available from 1998. The exemption statistics exclude the 7 states with unlimited exemptions.

Source: 1994-2004 NCUA Call Reports; Exemptions are from Elias, Renauer and Leonard (1989-2013) and state statutes.

Table 6: The Effect of Exemptions on Recovery Rates

	Dependent Variable: Recovery Rate on Charged-Off Consumer Debt						
	State Aggregate Data			Individual Credit Union Data			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log(exemption)	-1.987	-3.573***	-4.144***	-2.689*	-3.380***	-3.163**	-3.002**
	(1.648)	(1.259)	(1.524)	(1.525)	(1.073)	(1.247)	(1.270)
Log(median income)		0.627	1.792		-0.00931	-0.0204	-0.660
		(4.743)	(4.697)		(4.238)	(4.164)	(3.620)
Unemp. rate		-1.776***	-1.265**		-2.177***	-2.193***	-2.072***
		(0.607)	(0.591)		(0.552)	(0.565)	(0.509)
Log(house price index)		12.01***	10.31***		12.75***	12.21***	12.28***
		(2.913)	(2.374)		(2.956)	(2.844)	(2.420)
Observations	550	550	550	52,731	52,731	52,731	51,108
Year FE	X	X	X	X	X	X	X
State FE	X	X	X	X	X		
Region-year FE			X				
Credit Union FE						X	X
Drop Rec. rate > 1							X

This table reports regression results from estimating equation (2). Standard errors clustered at the state-level are in parentheses. Columns 1-3 show estimates from the state-level aggregates, with observations weighted by credit union membership. Columns 4-7 use individual credit union data. The sample of credit unions is restricted to those with a positive amount of credit card loans. Some credit unions (less than 0.5% of the weighted sample) report recovery rates or charge-off rates over 100% due to timing issues (recoveries can be from previous years' charge-offs, while charge-offs are only from the current year) or reporting errors. To reduce the influence of these outliers, columns 4-5 truncate the recovery rates at 100%, and column 6 drops observations with recovery rates over 100%. Observations in columns 4-7 are weighted by the amount of credit card debt.

Source: 1994-2004 NCUA Call Reports

Table 7: The Effect of Exemptions on Interest Rates

	Dependent Variable: Credit Card Interest Rate						
	State Aggregate Data			Individual Credit Union Data			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log(exemption)	0.415***	0.448***	0.357**	0.306**	0.342**	0.363**	0.360**
	(0.129)	(0.125)	(0.158)	(0.141)	(0.146)	(0.143)	(0.144)
Log(median income)		-0.436	-0.215		-0.448	-0.919*	-0.905*
		(0.512)	(0.540)		(0.487)	(0.508)	(0.514)
Unemp. rate		-0.0141	0.00441		-0.0293	-0.0248	-0.0246
		(0.0448)	(0.0524)		(0.0541)	(0.0526)	(0.0533)
Log(house price index)		-0.258	-0.128		-0.293	-0.123	-0.127
		(0.280)	(0.402)		(0.300)	(0.331)	(0.333)
Observations	550	550	550	52,731	52,731	52,731	51,108
Year FE	X	X	X	X	X	X	X
State FE	X	X	X	X	X		
Region-year FE			X				
Credit Union FE						X	X
Drop Rec. rate > 1							X

This table reports regression results from estimating equation (2). Standard errors clustered at the state-level are in parentheses. Columns 1-3 show estimates from the state-level aggregates, with observations weighted by credit union membership. Columns 4-7 use individual credit union data. The sample of credit unions is restricted to those with a positive amount of credit card loans. Column 6 drops observations with recovery rates or charge-off rates over 100%. Observations in columns 4-7 are weighted by the amount of credit card debt.

Source: 1994-2004 NCUA Call Reports

Table 8: Welfare Impact from $1 of Default Insurance

Risk Aversion	**WTP**	**Markup**	**Welfare Impact**
γ	$\gamma \frac{\Delta C}{C_0}$	$\frac{1}{\pi} \frac{q'(m)}{s'(m)} - 1$	WTP - Markup
1	0.05	3.55	-$3.50
3	0.15	3.55	-$3.40
5	0.25	3.55	-$3.30

This table reports the willingness to pay, actual cost, and welfare impact of an additional $1 of exemption-generated default insurance, varying the coefficient of relative risk aversion, according to the formula in equation (5). The parameters are set to $\frac{\Delta c}{c_h}(m) = 0.05$, $q'(m) = -0.36$, $q'(m) = -3.6$, and $\pi = 0.022$.

Table 9: The Effect of Exemptions on Credit Card Charge-off Rates

	Dependent Variable: Credit Card Charge-off Rate						
	State Aggregate Data			Individual Credit Union Data			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log(exemption)	0.0999	0.354***	0.397***	0.101	0.260***	0.267**	0.268**
	(0.169)	(0.0903)	(0.112)	(0.152)	(0.0758)	(0.108)	(0.109)
Log(median income)		-0.577	-0.656*		-0.616*	-0.806	-0.819
		(0.386)	(0.385)		(0.343)	(0.508)	(0.508)
Unemp. rate		0.101***	0.0958***		0.127***	0.142***	0.142***
		(0.0358)	(0.0327)		(0.0359)	(0.0455)	(0.0456)
Log(house price index)		-1.985***	-2.148***		-2.025***	-1.841***	-1.832***
		(0.223)	(0.276)		(0.168)	(0.165)	(0.166)
Observations	350	350	350	33,399	33,399	33,399	32,697
Year FE	X	X	X	X	X	X	X
State FE	X	X	X	X	X		
Region-year FE			X				
Credit Union FE						X	X
Drop Rec. rate > 1							X

This table reports regression results from estimating equation (2). Standard errors clustered at the state-level are in parentheses. Columns 1-3 show estimates from the state-level aggregates, with observations weighted by credit union membership. Columns 4-7 use individual credit union data. The sample of credit unions is restricted to those with a positive amount of credit card loans. Some credit unions (less than 0.5% of the weighted sample) report recovery rates or charge-off rates over 100%. This is due to timing issues (recoveries can be from previous years' charge-offs, while charge-offs are only from the current year) or reporting errors. To reduce the influence of these outliers, columns 4-5 truncate the recovery rates at 100%, and column 6 drops observations with recovery rates over 100%. Observations in columns 4-7 are weighted by the amount of credit card debt.

Source: 1998-2004 NCUA Call Reports

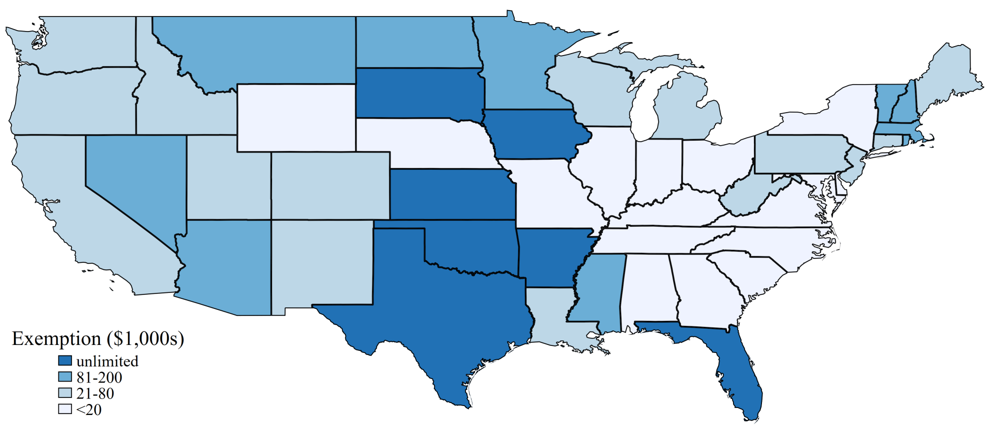


Figure 1: **State Exemption Levels (2004)** Exemption levels are collected from historical state statutes and various editions of Elias, Renauer and Leonard (1989-2013). The exemption level is the sum of the home and non-home exemptions.

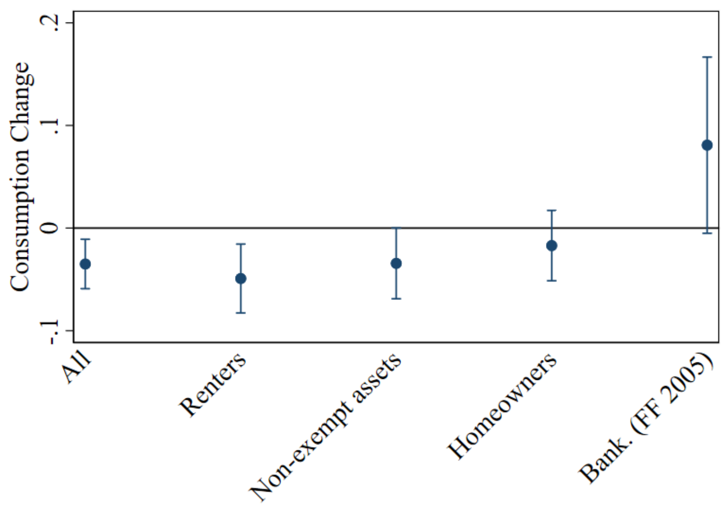


Figure 2: **Heterogeneity in the Consumption Change upon Default** This figure presents the mean and 95% confidence intervals of the change in consumption upon default for subsamples of defaulters. Non-exempt assets are those with vehicles or home equity that is not protected by exemptions. For comparison, Bankruptcy (FF2005) shows the estimates and confidence intervals from Filer and Fisher (2005) Table 4 column 1. The means in this figure are shown in Table A1.

Source: PSID 1991-1996

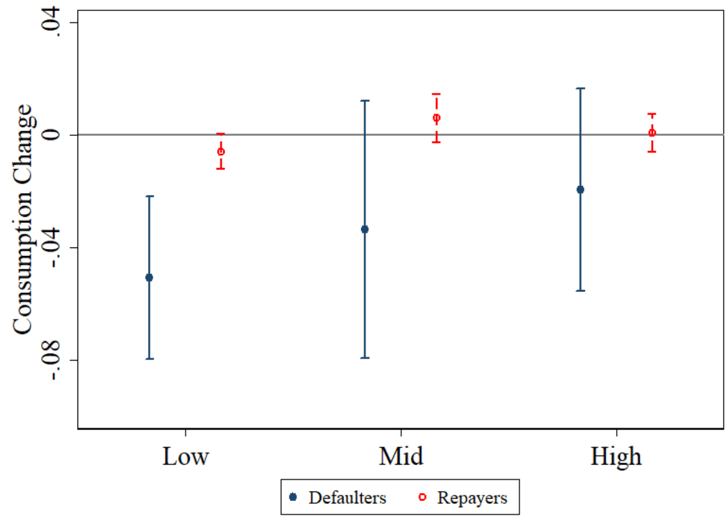
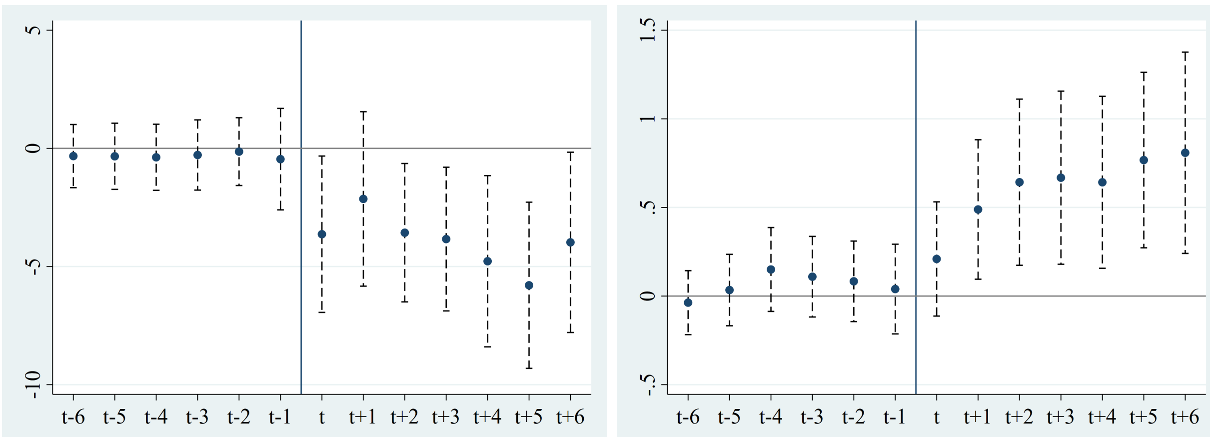


Figure 3: **Change in Consumption by Exemption Tercile** This figure presents the mean consumption drop upon default and 95% confidence intervals for defaulters living in low-, mid-, and high-exemption states. It also presents the average consumption change for non-defaulters living in those states. The estimated coefficients and 95% confidence intervals are from the regression in specification (1). The "Repayer" results present the estimated coefficients from the same regression estimated on the sample of individuals who never report financial distress (non-defaulters). Both regressions include only year fixed effects and an indicator for whether the respondent lives in a low-, mid-, or high- exemption state. Low-exemption states have total exemptions less than $14,990, mid-exemption states range from $14,990-52,100, and high exemption states have total exemptions above $52,100 (including the unlimited exemption states).

Source: PSID 1991-1996



(a) Recovery Rates on Charged Off Loans

(b) Credit Card Interest Rates

Figure 4: **Annual Effects of Exemption Increases in Year t**

The cumulative effect of a 100 log point increase in asset exemptions in period t, estimated from the distributed lag model in equation (3). The sample period is 1995-2004, with exemption data used from 1989-2010 to allow for 6 leads and lags for each observation. Observations are weighted by credit union membership. The dotted lines show 95% confidence intervals for standard errors clustered at the state level.

Source: 1994-2004 NCUA Call Reports

Online Appendices

A Derivation of the Welfare Gains Formula

In this appendix, I derive the welfare gains formula in equation (5). The derivation follows Dávila (2016) almost exactly, and Dávila (2016) shows that the formula holds under a variety of extensions relevant to credit markets.

Borrowers maximize:

$$\max_{C_0, \{C_1\}_{y_1}, B_0, y^*} U(C_0) + \int_{\underline{y_1}}^{y^*} U(C_1^D) dF(y_1) + \int_{y^*}^{\overline{y_1}} U(C_1^N) dF(y_1) \tag{8}$$

where

$$\begin{aligned} C_0 &= y_0 + q(m)B_0, \\ C_1^N &= y_1 - B_0 \\ C_1^D &= (1-\phi)y_1 - s(m)B_0. \end{aligned}$$

With $0 < \phi < 1$, the optimal default rule is to default if $y_1 < y^*$, where y^* satisfies $C_1^N(y^*) = C_1^D(y^*)$. The first order condition for borrowing is

$$U'(C_0)q = -\int_{\underline{y_1}}^{y^*} U'(C_1^D)\frac{\partial C_1^D}{\partial B_0} dF(y_1) + \int_{y^*}^{\overline{y_1}} U'(C_1^N) dF(y_1),$$

where the optimal default rule eliminates the terms related to $\frac{dy^*}{dB_0}$.

From the borrower's problem,

$$
\begin{aligned}
\frac{dW}{dm} &= U'(C_0)\frac{\partial q(m)}{\partial m}B_0 + \int_{\underline{y_1}}^{y^*} U'(C_1^D)\frac{\partial C_1^D}{\partial m}dF(y_1) \\
&\underbrace{\left[U'(C_0)q + \int_{\underline{y_1}}^{y^*} U'(C_1^D)\frac{\partial C_1^D}{\partial B_0}dF(y_1) - \int_{y^*}^{\overline{y_1}} U'(C_1^N)dF(y_1)\right]}_{=0}\frac{dB_0}{dm} \\
&\underbrace{\left[U(C_1^D(y^*))f(y^*) - U(C_1^N(y^*))f(y^*)\right]}_{=0}\frac{dy^*}{dm}.
\end{aligned}
$$

The second and third lines are zero due to the first order conditions in the borrowing decision and the optimal default rule.

This welfare change is in units of utility. To obtain the money-metric measure of the welfare gain in equation (5), normalize the effect of exemptions by the marginal utility of an additional dollar in period 0, $U'(C_0)$:

$$
\frac{dW(m)/dm}{U'(C_0)} = \int_{\underline{y_1}}^{y^*} \frac{U'(C_1^D)}{U'(C_0)}\frac{\partial C_1^D}{\partial m}dF(y_1) + q'(m)B_0 \tag{9}
$$

$$
= -\int_{\underline{y_1}}^{y^*} \left(1+\gamma\frac{\Delta C}{C_0}\right)s'(m)B_0dF(y_1) + q'(m)B_0 \tag{10}
$$

$$
= \left[\gamma\mathbb{E}\left[\frac{\Delta C}{C_0}|D\right] - \left(\frac{q'(m)}{\pi s'(m)} - 1\right)\right]T \tag{11}
$$

The second line follows from replacing $\frac{\partial C_1^D}{\partial m}$ with B_0 and using the Baily-Chetty approximation to replace $\frac{U'(C_1^D)}{U'(C_0)}$ with $1+\gamma\frac{\Delta C}{C_0}$. In the final line, $\pi = F(y^*)$ is the probability of default, $\mathbb{E}\left[\frac{\Delta C}{C_0}|D\right]$ is the average drop in consumption condition on default, and $T = -\pi s'(m)B_0 > 0$ is a scaling factor equal to expected reduction in debt payments during default from increasing m.

The main difference between this and the model of Dávila (2016) is that I assume increasing exemptions by \$1 raises consumption by $s'(m)B_0$ in the default state, while Dávila (2016) assumes that it raises consumption by \$1, but only for bankruptcy filers with non-exempt assets. In equation (9), if you replace $\frac{\partial C_1^D}{\partial m}$ with an indicator for bankruptcy filers with non-exempt assets $\mathbb{1}(m < y_1 < m + B_0)$ and find the maximum by setting $\frac{dW}{dm} = 0$, it produces the sufficient statistic of Dávila (2016):

$$m^* = \frac{\frac{\Pi_m\{C^D\}}{C_0}}{\Lambda \varepsilon_{\tilde{r},m}},$$

where $\frac{\Pi_m\{C^D\}}{C_0} = \int_m^{m+B_0} \frac{C_1^D}{C_0} \frac{U'(C_1^D)}{U'(C_0)} dF(y_1)$, $\Lambda = \frac{qB_0}{y_0 + qB_0}$, and $\varepsilon_{\tilde{r},m} = -\frac{\frac{\partial q(B_0,m)}{q}}{\partial m}$.

B Comparison with Other Estimates in Literature

Other estimates of the interest rate effect are similar to or larger than the estimate in this paper. There are a variety of samples, specifications, and loan types used in the literature, so to make the estimates comparable, I convert the consider the effect of moving from a state with a \$5,000 exemption to one with a \$50,000 exemption. The estimates in this paper predict such a change would result in a 100 basis point increase on credit card interest rates. Using a sample of 310 auto loans rates in the 1981 Survey of Consumer Finances, Gropp, Scholz and White (1997) report that such a change would result in a 230 basis point increase for the average borrower. Berkowitz and White (2004), using a sample of non-corporate small business loans, would predict a 225 basis point increase. Berger, Cerqueiro and Penas (2011), using a sample of corporate small business loans, predict a 23 basis point increase. The other paper using panel variation, Severino, Brown and Coates (2015), finds effects on unsecured loan (not credit card) interest rates from Ratewatch.com that are extremely close to the estimates of this paper. In summary, despite using different data, empirical strategies, and loan types, four of the five other papers providing estimates of the impact of exemptions on interest rates find estimates that are similar to or larger than the effect that I estimate. Using one of these larger estimates for the interest rate effect would strengthen the policy conclusion that lower exemptions would increase welfare.

Table A1: Heterogeneity in the Consumption Drop

Consumption Drop:	**Average**	**N**
Defaulters	-.035	1,144
Renters	-.049	639
Homeowners	-.017	505
Non-exempt home equity	-.014	246
Non-exempt assets	-.034	537
Severe Defaulters	-.03	571
Bankruptcy (FF2005)	.081	

This table reports the mean drop in consumption for subsamples of defaulters. Non-exempt assets are those with vehicles or home equity that is not protected by exemptions, and non-exempt home is the subsample of homeowners that are not fully protected by exemptions. Severe defaulters are those who report a more serious type of financial distress (debt collection actions, judicial actions, or bankruptcy). For comparison, Bankruptcy (FF2005) shows the mean consumption increase from Filer and Fisher (2005) Table 4 column 1.

Source: PSID 1991-1996.

Table A2: Default vs. Bankruptcy

	Defaulters Sample			Pooled Sample	
	(1)	(2)	(3)	(4)	(5)
Default	-0.055***	-0.058***	-0.058**	-0.037***	-0.030**
	(0.019)	(0.022)	(0.022)	(0.013)	(0.013)
Bankruptcy	0.110**	0.109**	0.110**	0.106**	0.096*
	(0.053)	(0.054)	(0.054)	(0.049)	(0.049)
Log(median income)			-0.100		
			(0.076)		
Unemp. rate			-0.006		
			(0.009)		
Observations	1,658	1,658	1,658	24,667	24,667
Year FE	X	X	X	X	X
State FE				X	X
Demographic controls		X	X		X

I construct the sample following Filer and Fisher (2005), which uses the 1990-1995 PSID and includes individuals with consecutive defaults, non-heads of household, and consumption changes over 300%. Default is an indicator for default and includes bankruptcy, so the coefficient on bankruptcy represents the difference between bankruptcy and non-bankruptcy default. Columns 1-3 report estimates from the regression in equation (1) estimated on the sample of default instances, but adds an indicator for a formal bankruptcy filing. The control variables are de-meaned and there is no constant, so the coefficient on Default represents the average drop in consumption among defaulters. Columns 4-5 pool the sample of defaulters and non-defaulters, include state×year fixed effects, and report coefficients for the exemption level interacted with an indicator indicator for default and an indicator for bankruptcy. Demographic controls consist of age, sex, years of education, an indicator for white, marital status, number of children, and the change in the log of the food needs of the family, which is a function of family size and age computed by the PSID. State controls include the log of median income and the unemployment rate. Standard errors are clustered by state.

Source: PSID 1990-1995

Table A3: Impact of Exemptions on Credit Card and Auto Loan Interest Rates

	Credit cards		New auto loans		Used auto loans	
	(1)	(2)	(3)	(4)	(5)	(6)
Log(exemption)	0.415***	0.448***	0.145	0.175*	0.172*	0.191**
	(0.129)	(0.125)	(0.0918)	(0.102)	(0.0862)	(0.0833)
Log(median income)		-0.436		0.0571		-0.0671
		(0.512)		(0.330)		(0.309)
Unemp. rate		-0.0141		-0.0694**		-0.0961***
		(0.0448)		(0.0278)		(0.0297)
Log(house price index)		-0.258		-0.291		-0.205
		(0.280)		(0.206)		(0.212)
Observations	550	550	550	550	550	550
State and year FE	X	X	X	X	X	X

This table reports regression results from estimating equation (2) with state-level interest rate data. Observations are weighted by credit union membership. Standard errors clustered at the state-level are in parentheses.

Source: 1994-2004 NCUA Call Reports

Table A4: Linear Exemptions

	Credit card interest rates			Recovery rates on non-real estate debt		
	(1)	(2)	(3)	(4)	(5)	(6)
Exemption ($1,000s)	0.00196***	0.00226***	0.00129*	-0.00641	-0.0189***	-0.0189***
	(0.000393)	(0.000409)	(0.000712)	(0.00531)	(0.00379)	(0.00423)
Log(median income)		-0.511	-0.258		1.237	2.382
		(0.519)	(0.548)		(4.951)	(5.082)
Unemp. rate		-0.0160	0.0111		-1.758***	-1.309*
		(0.0471)	(0.0553)		(0.631)	(0.682)
Log(house price index)		-0.243	-0.0919		11.98***	10.27***
		(0.283)	(0.411)		(3.102)	(2.490)
Observations	550	550	550	550	550	550
State and year FE	X	X	X	X	X	X
Region-year FE			X			X

Estimates are from specification (2), but including *exemption* linearly instead of as $log(exemption)$. Observations are at the state-year level and weighted by credit union membership. Standard errors clustered at the state-level are in parentheses.

Source: 1994-2004 NCUA Call Reports

Table A5: Linear Exemptions - Heterogeneity by Exemption Level

	Credit card interest rates			Recovery rates on non-real estate debt		
	(1)	(2)	(3)	(4)	(5)	(6)
Exemption (\$1,000s)	0.0342***	0.0330***	0.0295***	-0.362**	-0.356***	-0.344***
	(0.0104)	(0.0103)	(0.0102)	(0.180)	(0.104)	(0.125)
High × Exemption	-0.0322***	-0.0308***	-0.0281***	0.356*	0.338***	0.325**
	(0.0102)	(0.0103)	(0.00998)	(0.178)	(0.104)	(0.125)
Log(median income)		-0.342	-0.0823		-0.624	0.348
		(0.513)	(0.544)		(4.625)	(4.834)
Unemp. rate		-0.00693	0.0192		-1.856***	-1.403**
		(0.0420)	(0.0509)		(0.567)	(0.592)
Log(house price index)		-0.188	-0.0398		11.38***	9.673***
		(0.286)	(0.409)		(2.772)	(2.439)
Observations	550	550	550	550	550	550
State and year FE	X	X	X	X	X	X
Region-year FE			X			X

Estimates are from specification (2), but including *exemption* linearly instead of as $log(exemption)$. $High$ is an indicator that is constant within each state and equals 1 if the state's average exemption level from 1994-2004 is above the median average exemption level. Observations are at the state-year level and weighted by credit union membership. Standard errors clustered at the state-level are in parentheses.

Source: 1994-2004 NCUA Call Reports

Table A6: Estimates from Sample of One-State Credit Unions

	Credit card interest rates			Recovery rates on non-real estate debt		
	(1)	(2)	(3)	(4)	(5)	(6)
Log(exemption)	0.469**	0.470***	0.368*	-0.265	-2.573**	-2.803**
	(0.176)	(0.164)	(0.184)	(1.367)	(1.190)	(1.284)
Log(median income)		-0.477	-0.212		2.453	4.091
		(0.497)	(0.512)		(5.837)	(5.622)
Unemp. rate		0.0566	0.0736		-1.637***	-1.118**
		(0.0488)	(0.0554)		(0.533)	(0.537)
Log(house price index)		0.0873	0.252		14.19***	13.30***
		(0.367)	(0.540)		(3.500)	(3.114)
Observations	550	550	550	550	550	550
State and year FE	X	X	X	X	X	X
Region-year FE			X			X

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Estimates are from specification (2), but the sample of credit unions is restricted to those with branches in only one state. Credit union call reports available from the NCUA begin including branch locations in 2010. I use the 2013 data, which include branch locations for 99.97% of credit unions (compared with 95.29% in the 2010 data). 92.9% of credit unions have branches in only one state, and 98.2% have branches in two or fewer states. Observations are weighted by credit union membership. Standard errors clustered at the state-level are in parentheses.

Source: 1994-2004 NCUA Call Reports

Table A7: Estimates using Homestead Exemptions Only

	Credit card interest rates			Recovery rates on non-real estate debt		
	(1)	(2)	(3)	(4)	(5)	(6)
Log(home exemption)	0.376***	0.394***	0.305*	-2.877	-3.781***	-4.146***
	(0.130)	(0.130)	(0.159)	(1.936)	(1.252)	(1.455)
Log(median income)		-0.511	-0.290		0.446	2.045
		(0.525)	(0.543)		(4.859)	(4.883)
Unemp. rate		-0.0227	-0.00389		-1.689***	-1.150*
		(0.0454)	(0.0538)		(0.604)	(0.594)
Log(house price index)		-0.188	-0.0486		11.95***	9.433***
		(0.285)	(0.414)		(2.912)	(2.405)
Observations	528	528	528	528	528	528
State and year FE	X	X	X	X	X	X
Region-year FE			X			X

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Estimates are from specification (2) with the (log) homestead exemption used as the main independent variable. Observations are weighted by credit union membership. Maryland and Delaware, which had no homestead exemption from 1994-2004, are excluded from the sample. Standard errors clustered at the state-level are in parentheses.

Source: 1994-2004 NCUA Call Reports

Table A8: Sensitivity of the Welfare Impact

Parameter		Assigned Value	Lower 95% CI	Upper 95% CI	Values Needed for Welfare Gain
Risk aversion	γ	3.000	-	-	> 71
Consumption drop	$\frac{\Delta c}{c}$	0.05	0.021	0.079	> 1.53
Interest rate change	$q'(m)$	-0.36	-0.557	-0.157	> -0.09
Recovery rate change	$s'(m)$	-3.57	-6.04	-1.10	< -14.1
Probability of default	π	0.022	0.012	0.032	> 0.087

Assigned value reports the value used in the welfare calculations. The lower and upper bound of the 95% confidence intervals are shown for the estimated parameters. The final column shows the range of values for each parameter that would generate a welfare gain from increasing exemptions, holding other parameters constant at their assigned value.

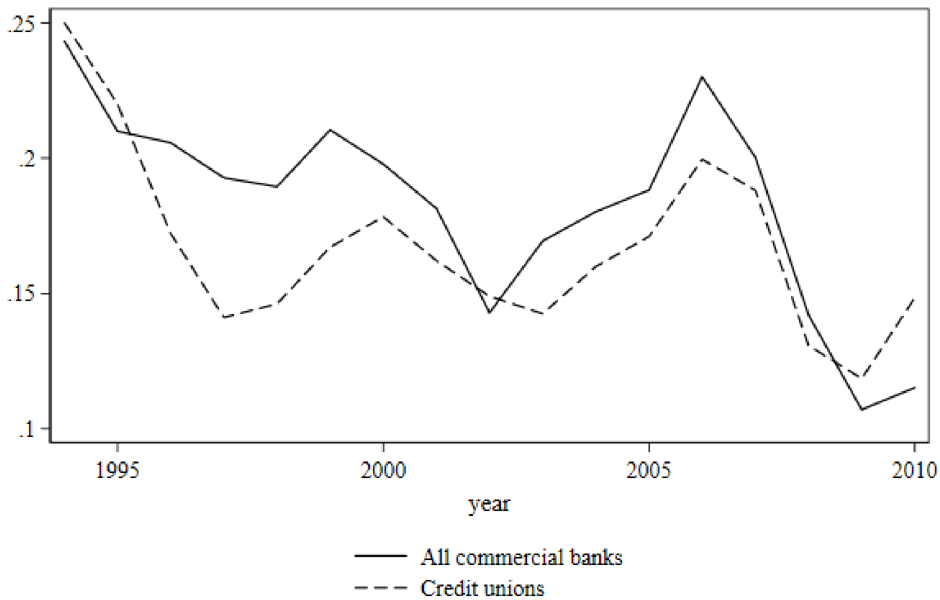


Figure A1: **Comparison of Recovery Rates on Charged-Off Loans**

Source: Aggregated Credit Union and Commercial Bank Call Reports.

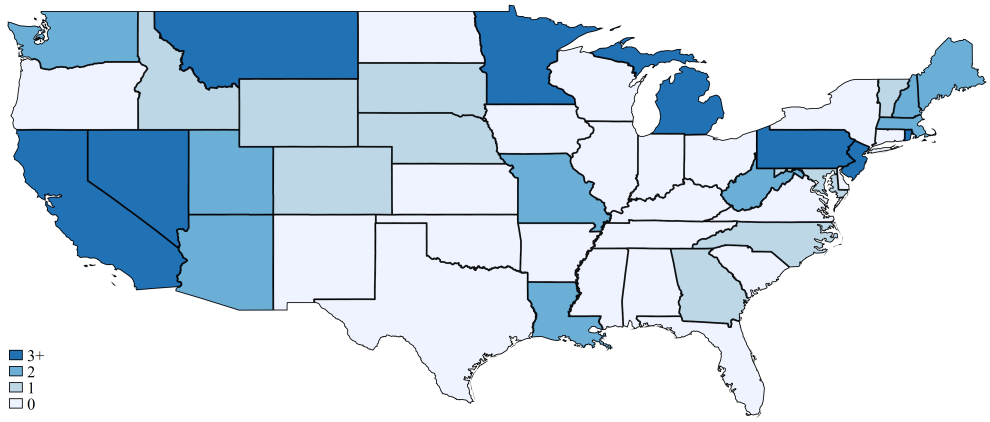
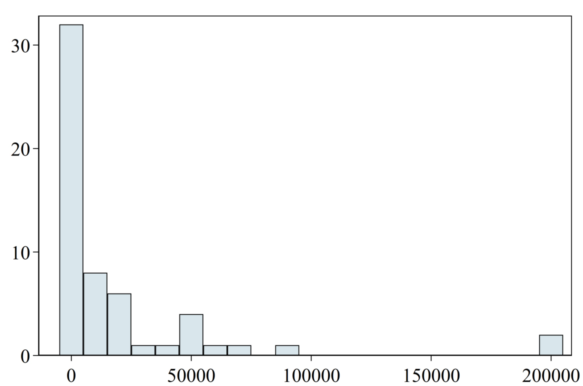
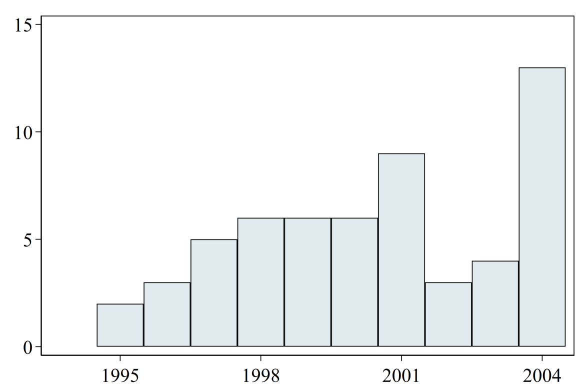


Figure A2: **Number of Exemption Changes (1994-2004)**

Source: Exemptions are from Elias, Renauer and Leonard (1989-2013) and state statutes.



(a) Size of Exemption Changes



(b) Number of Exemption Changes

Figure A3: Distributions of the size and number of changes in homestead exemptions from 1994-2004.

Source: Exemptions are from Elias, Renauer and Leonard (1989-2013) and state statutes.

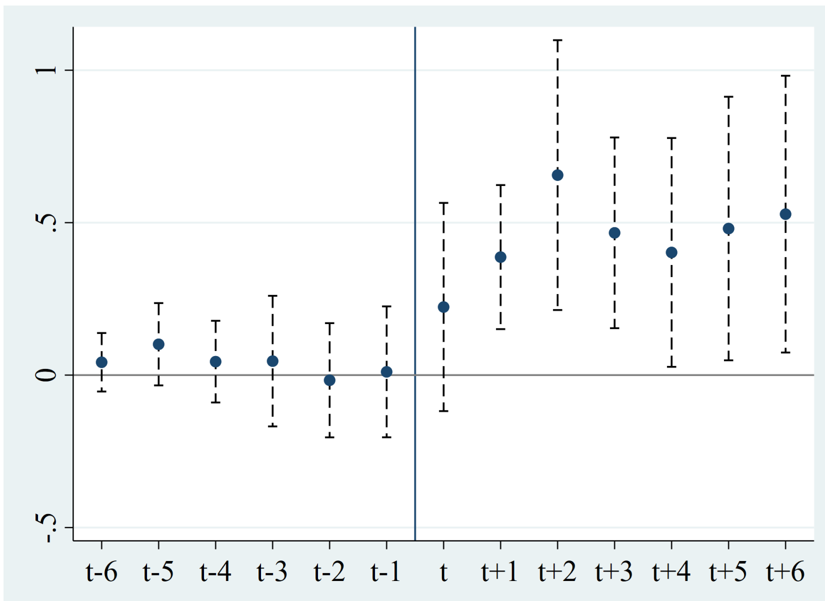


Figure A4: **Effect of Exemption Increases in Year t on the Default Rate** The cumulative effect of a 100 log point increase in asset exemptions in period t on the share of charged of credit card debt, estimated from the distributed lag model in equation (3). The sample period is 1998-2004, with exemption data used from 1992-2010 to allow for 6 leads and lags for each observation. Observations are weighted by credit union membership. The dotted lines show 95% confidence intervals for standard errors clustered at the state level.

Source: 1994-2004 NCUA Call Reports