Consumption Smoothing and Debtor Protections

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Abstract

Protections for defaulting debtors are a widely used form of consumption insurance. This paper evaluates the costs and benefits of this insurance, both inside and outside of bankruptcy. First, I show that consumption declines by 6% upon default, revealing a potential role for greater debtor protections to smooth consumption. Second, I use changes in states' laws to estimate the impact of one type of debtor protection, asset exemptions, on repayment in default and interest rates. While higher exemptions smooth consumption by reducing collection in default, the interest rate cost is large relative to the benefits. Adapting a sufficient statistics formula from the literature, the estimates imply that the cost of additional exemption protection exceeds what debtors are willing to pay.

Keywords: social insurance, bankruptcy, consumer credit, consumption smoothing, sufficient statistic

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1. Introduction

Protections for borrowers who 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 default on debt without filing a formal bankruptcy.[2] The option to default on debt payments frees a household's financial resources, which they can then use to smooth consumption over shocks that are not otherwise insured. A household's ability to avoid repayment on delinquent debt is determined by the combination of state and federal laws that govern debt collection (e.g., wage garnishment restrictions, statutes of limitations, restrictions on collections practices, and the bankruptcy code).

One important protection for delinquent debtors is the asset exemption, which shields specific property (e.g., home and vehicle equity) from seizure by unsecured creditors. The amount protected varies across states from less than $10,000 to more than $500,000. Higher exemptions help households smooth consumption in default, but lenders compensate for additional losses by reducing the supply of credit. While there exist several estimates of the costs of raising exemptions,[3] namely more costly credit, there is little empirical evidence of exemptions' impact on repayment by delinquent borrowers and their role in providing consumption insurance.[4] This paper helps to fill this gap by examining the consumption smoothing role of debtor protections, and the costs and benefits of asset exemptions specifically.

There are three main contributions. First, I estimate the key determinant of the insurance value of debtor protections: the difference in average consumption between times when households repay and times when households default. Second, I evaluate the interest rate cost and consumption smoothing benefits of a specific debtor protection, asset exemptions, by estimating exemptions' effects on interest rates and the amount collected from delinquent borrowers. The estimates capture exemptions' causal effect on debt collection in both bankruptcy and informal default. Third, I adapt the Baily-Chetty sufficient statistic formula of Dávila (2019) to incorporate these estimates and evaluate the welfare implications of changing exemptions. The estimates imply that raising exemptions generates interest rate costs that far exceed

[2] Stavins (2000) reports that 8.5% of households have filed for bankruptcy, and more recently, Dobbie et al. (Forthcoming) 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. More than 10% of consumers with credit reports have a debt in third-party collections (FRBNY, 2018), and VISA reports that 55-60% of charge-offs occur without a bankruptcy filing (NBRC, 1997).

[3] Papers estimating the effect of exemptions on interest rates include Gropp et al. (1997); Berkowitz and Hynes (1999); Berkowitz and White (2004); Berger et al. (2011), and Severino and Brown (2017).

[4] One exception is that Mahoney (2015) demonstrates that exemptions play a substantial role as an alternative form of health insurance. Also, Lehnert and Maki (2007) and Grant (2010) find that exemptions reduce overall consumption volatility, but do not separate the benefits during times of default and the costs during times of repayment. Focusing on families that have filed for bankruptcy, Filer and Fisher (2005) finds no significant impact of exemptions on consumption, though the small sample makes the estimates imprecise.

what households are willing to pay for the additional protection provided.

First, I use the recent exemption model of Dávila (2019) to introduce a sufficient statistic that guides the empirical analysis. Within the model, debtor protections, specifically exemptions, provide consumption insurance by reducing debt payments in states of the world where a borrower defaults, at the cost of higher interest rates in states where he repays. This leads to a standard Baily-Chetty sufficient statistic formula (Baily, 1978; Chetty, 2006) where the welfare impact of additional debtor protections depends on only a few key features: the average consumption decline upon default, the effect of exemptions on interest rates, the effect of exemptions on repayment in default, and the probability of default. I also derive an alternative formula in which the cost is inferred from the behavioral distortion to default decisions.

Guided by the model, the empirical strategy consists of two parts. The first uses the Panel Study of Income Dynamics (PSID) to estimate the consumption decline upon default. If consumption falls during times of default (e.g., households default in response to job loss or illness), additional debtor protections could help smooth consumption.[5] Alternatively, if consumption is already smooth when households default, either because households default strategically (Fay et al., 2002; Gerardi et al., 2017) or because households are already adequately insured through other sources, additional debtor protections would have little value.[6] I find a clear consumption smoothing role for additional debtor protections, with food consumption falling 6% during times of default. Moreover, the consumption decline is larger for informal defaulters than for bankruptcy filers, although these differences are not always statistically significant.

The second part estimates the consumption smoothing costs and benefits of a specific debtor protection, asset exemptions. With data from Credit Union Call Reports, I estimate difference-in-differences regressions using 57 within-state changes in exemption levels.[7] The estimates indicate that exemptions benefit defaulters by reducing recovery rates on delinquent consumer debt, but lenders compensate by raising interest rates. Event study regressions show that the recovery rates and interest rates in treatment and control states follow parallel trends and then diverge after an exemption increase. One concern with these estimates is that the reductions in repayment may be due to changes in borrowers' behavior, while the

[5] There is evidence that individuals use default and bankruptcy to offset income and expense shocks such as unemployment (Keys, 2018), divorce (Lyons and Fisher, 2006), and health shocks (Himmelstein et al., 2005).

[6] The limited available evidence suggests additional protection for bankruptcy filers provides little insurance value; Filer and Fisher (2005) find that, at the current level of protection, households are better off in bankruptcy with consumption increasing by 8-13% upon a bankruptcy filing.

[7] Fedaseyeu (2020) first used recovery data from credit unions to examine a different set of debt collection regulations, noting that unlike large commercial banks, credit unions are often local lenders, so their financial information reflects state laws.

model's object of interest would hold their behavior constant. To address this, I implement a second strategy that uses information on delinquent households' assets and debts to estimate the effect on repayment while holding borrower behavior constant.

With the estimates from the two empirical strategies, I then evaluate the welfare impact of additional exemption protection within the sufficient statistic formula. Strikingly, while debtors are only willing to pay 17% over the actuarially fair rate for additional default insurance, exemptions generate insurance that costs 469% more than the actuarially fair rate, with a 95% confidence interval of $[1.11, 33.35]$. The high cost reflects that the interest rate response is large relative to the benefits for defaulting debtors. As a result, an additional dollar transferred to borrowers in default generates a welfare loss of \$4.52, with a 95% confidence interval of $[-34.26, -0.97]$. The implications are similar when using the repayment estimates which hold borrower behavior constant and when implementing the alternative welfare formula using an estimate of the effect of exemptions on default rates. These estimates imply that current exemptions are above the optimal level and reducing exemption protection would increase welfare. Importantly, these welfare implications hold locally and the costs and benefits may change if exemptions were significantly below current levels.

In the final section, I allow heterogeneity in exemptions' impact within bankruptcy and informal default, with two main results. First, around 65% of exemptions' benefits accrue to those defaulting informally. Second, consistent with the earlier estimates, exemption increases generate only a small amount of protection in bankruptcy. A \$1,000 exemption increase reduces repayment by bankruptcy filers by around \$2 on average, with larger effects of \$5-15 in low-exemption states. I find additional evidence of these small effects using administrative data on disbursements in bankruptcy. One reason for the small effect is asset mismatch; most of the observed exemption changes raise the protection of home equity, while the large majority of defaulting debtors' home equity is already fully protected. The small benefit of exemptions drives the different welfare implications between this paper and Dávila (2019), which focuses only on bankruptcy and concludes that higher exemptions would increase welfare. This paper complements Dávila (2019) by extending the analysis to informal defaulters and providing several estimates of the impact of exemptions on repayment in bankruptcy and informal default needed to evaluate the welfare impact of exemptions.

This paper also adds to the large empirical literature examining the consumption smoothing benefits of the social safety net. Focusing on traditional forms of social insurance, papers have estimated consumption drops upon job loss (7-10%), illness (11-14%), and the development of a disability (18-30%).[8] Compared to these estimates, the average consumption

[8] Gruber (1997), East and Kuka (2015), Kroft and Notowidigdo (2016), and Hendren (2017) estimate the consumption drop upon unemployment, Cochrane (1991) estimates consumption changes upon several shocks, including illness, Bronchetti (2012) estimates a 30% drop upon work-limiting disabilities if there were no worker's compensation, and Meyer and Mok (2018) estimates an 18% decline in consumption in

drop upon default of 6% is similar or smaller, suggesting that the shocks during times of default are, on average, less severe or more easily insured. This consumption decline upon default also provides evidence distinguishing between two theories of default: adverse events vs. strategic default (Fay et al., 2002; Zhang et al., 2015; Gerardi et al., 2017).[9] Strategic default, in which individuals default in response to the financial benefits, would predict no decline (or potentially an increase) in consumption upon default. In contrast, the consumption decline in the years around default is consistent with defaulting in response to adverse events such as job loss, divorce, or illness.

This paper also contributes to the literature examining debtor protections and asset exemptions. I provide the first estimates of how increasing exemptions affects the amount repaid by informal defaulters and bankruptcy filers. These estimates of the payment reduction complement a large literature focusing on the interest rate costs of higher exemptions (Gropp et al., 1997; Berkowitz and White, 2004; Berger et al., 2011; Severino and Brown, 2017). This paper also adds to this literature examining the interest rate costs. While most papers rely on cross-sectional variation, the credit union interest rate data allow me to estimate difference-in-difference and event study regressions. Additionally, this paper provides empirical evidence that much of the interest rate cost is due to default distortions; I find that the additional defaults and losses given default explain almost all of the observed interest rate increase. Other papers focus on the benefits of access to consumer bankruptcy more generally (Dobbie and Song, 2015; Dobbie et al., 2017), other debtor protection laws (Fedaseyeu, 2020), or the impact of exemptions on entrepreneurship (Fan and White, 2003; Cerqueiro and Penas, 2016).

Finally, the estimates and approach of this paper complement the literature evaluating the impact of exemptions within structural and macroeconomic models. Livshits (2015) provides a recent review and discussion of the dispersion of findings in the quantitative macroeconomic literature that evaluates the welfare impact of default and bankruptcy policy, and several models focus on the welfare impact of asset exemptions in particular (Athreya, 2006; Li and Sarte, 2006; Pavan, 2008; Mankart, 2014; Mitman, 2016; Hintermaier and Koeniger, 2016).

The paper proceeds as follows. Section 2 describes the role that exemptions play inside and outside of bankruptcy. Section 3 introduces a model of debtor protections and derives a formula for the welfare gain. Section 4 estimates the change in consumption that occurs upon default. Section 5 estimates the causal effect of changing exemptions on recoveries from delinquent debtors and the interest rate. Section 6 calculates the welfare effect using these estimates and Section 7 extends the welfare analysis to consider heterogeneity between

the years around the onset of a disability.

[9] As discussed in Keys (2018), the two models are not necessarily conflicting, as individuals may strategically respond to adverse events.

bankruptcy and informal default. Section 8 concludes by discussing limitations of the welfare analysis.

2. Institutional Background

When debtors default, a complex combination of state and federal laws determines the actions that creditors can take to collect on debt. There are restrictions on the behavior of debt collectors, wage garnishment limits, statutes of limitations on debts, and regulations on the repossession of collateral (see Hynes and Posner (2002) for an overview). One major type of debtor protection is the asset exemption, which protects specific assets from seizure for the payment of unsecured debt, such as credit cards or unsecured personal loans. 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, from less than $10,000 to several hundred thousand dollars in total exemptions (Online Appendix Figure A1).

These state exemptions influence the debt collection process in both the formal bankruptcy system and outside of bankruptcy in informal default. Inside of bankruptcy, almost all consumers file under Chapter 7 or Chapter 13.[10] In Chapter 7, which accounts for 70% of consumer bankruptcies, exemptions determine the debtor's non-exempt assets, which the court sells and 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.[11]

When debtors default informally outside of bankruptcy, the same exemptions apply to protect debtors' assets from seizure. First, almost all exemptions legally protect debtors' assets from seizure by unsecured creditors through the state courts as well as bankruptcy (Hynes and Posner, 2002; Gilles, 2006; Hynes, 2008; Dawsey et al., 2013).[12] If an unsecured creditor sues in state court, the creditor can obtain a judgment allowing additional collection

[10] 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 (in 2016).

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

[12] The National Consumer Law Center's report, "No Fresh Start," provides more detail on the operation of exemptions outside of the bankruptcy system (Carter and Hobbs, 2013). In 41 states, the same exemptions apply in and outside of bankruptcy. Nine states have separate bankruptcy and non-bankruptcy exemptions, but only two states (MI and WV) have substantial differences in the homestead exemption, and the homestead exemption is the primary source of the variation used in this paper. Also, the federal homestead exemptions apply only in bankruptcy, but the federal homestead exemption exceeds the state exemption in only four states (MI, NJ, PA, and RI). Thus, for filers in at least 45 states, the maximum available homestead protections in and outside of bankruptcy are equal.

actions, including the right to seize non-exempt assets as payment. Such court judgments are common. In a large sample of state court caseloads, 37% of contract cases were from debt collectors (Agor et al., 2015), and almost 5% of all credit reports contain a record of a court judgment (Avery et al., 2003). Asset exemptions restrict the ability of these judgment creditors to seize the property of debtors.

Second, asset exemptions determine the debtor's potential cost of filing for bankruptcy and what they would lose if sued in state court, which can influence informal negotiations between debtors and creditors. The potential to lose assets in bankruptcy or the state courts operates indirectly as a threat-point in negotiations. The main impact of exemption changes may be through this role as a threat or determinant of bargaining power. Assets are rarely seized in bankruptcy (Flynn et al., 2003; Jiménez, 2009) or through the state courts (Hynes, 2008). There is, however, anecdotal and empirical evidence that exemptions influence negotiations between debtors and creditors outside of bankruptcy. 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 their 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 bankruptcy system. 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)). Given that the same exemptions generally apply both inside and outside of bankruptcy, the main analysis of this paper does not distinguish between bankruptcy and non-bankruptcy default. In Section 7, however, I separately examine the impact of exemptions in Chapter 7, Chapter 13, and informal bankruptcy.

3. Model of Default and Exemptions

This section adapts the sufficient statistic model of Dávila (2019) and introduces the formula for the welfare impact of increasing debtor protections. While I focus on asset exemptions, the model can apply to any debtor protection that reduces the amount borrowers repay when they default. With this simple model, the aim is to identify the objects that govern the costs and benefits of raising debtor protections in order to guide the empirical analysis. Although derived in this simple setting, the resulting Baily-Chetty formula holds in a broad class of more realistic models incorporating multiple periods, additional choice variables, and many features common in quantitative models of bankruptcy and default (Chetty, 2006; Dávila, 2019).

3.1. Setup

There are two periods, $t = 0, 1$, a single consumption good, and a representative agent. Period 0 corresponds to a time when the representative agent first takes out a consumer loan. In period 0, income y_0 is certain and the borrower chooses how much to borrow, b_0, to finance current consumption. In period 1, there is a continuum of possible states $\omega \in [\underline{\omega}, \overline{\omega}]$ with distribution $F(\omega)$. In this baseline model, the state determines only the borrower's period 1 resources $y_1(\omega)$, where $y_1(\cdot)$ is continuous and increasing in ω. However, the model can be extended so that the state incorporates any information needed for the borrower to make consumption, borrowing, and default decisions. After observing the state of the world in period 1, the borrower optimally chooses to repay the debt or to default and be subject to collection actions. The exemption level m affects the interest rate and the amount that creditors recover in default.

3.1.1. Borrower's Problem

The borrower chooses b_0 to maximize expected utility

$$\max_{b_0} u(c_0) + E_\omega \left[\max\{u(c_1^N(\omega)), u(c_1^D(\omega))\}\right]$$

where

$$\begin{aligned}
c_0 &= y_0 + b_0, \\
c_1^N(\omega) &= y_1(\omega) - (1 + R(m, b_0))b_0 \\
c_1^D(\omega) &= y_1(\omega) - S(m, b_0, y_1).
\end{aligned}$$

In period 0, the borrower consume the income endowment, y_0, plus the amount borrowed, b_0. In period 1, borrowers who repay consume $c_1^N(\omega)$, which is the income that remains after repaying the debt plus interest $(1+R(m, b_0))b_0$. If the borrower defaults, he consumes $c_1^D(\omega)$, which is the income less the costs of default. The cost of default, $S(m, b_0, y_1)$, potentially depends on the exemption level, the level of debt, and the borrower's resources. Default costs, specified below, are an increasing, continuous function of income ($\frac{\partial S(m,b_0,y_1)}{\partial y_1} \geq 0$) and are such that repayment is preferred at the highest income draw and default is preferred at the lowest income draw, i.e., $S(m, b_0, y_1(\underline{\omega})) < (1 + R(m, b_0))b_0 < S(m, b_0, y_1(\overline{\omega}))$. The optimal default rule is for the borrower to default if $\omega < \omega^*$, where ω^* satisfies $c_1^N(\omega^*) = c_1^D(\omega^*)$ and depends on the exemption level and the outstanding debt. With this rule, the borrower's indirect utility as a function of the exemption level m can be written

$$V(m) = \max_{b_0} u(c_0) + \int_{\underline{\omega}}^{\omega^*} u(c_1^D(\omega))dF(\omega) + \int_{\omega^*}^{\overline{\omega}} u(c_1^N(\omega))dF(\omega)$$

subject to the budget constraints.

3.1.2. Interest Rates and Repayment in Default

The exemption level m affects the borrower's problem by influencing the interest rate $R(m, b_0)$ and repayment in default $S(m, b_0, y_1)$. Lenders and debt collection are not explicitly modeled, but their actions are reflected in these repayment and interest rate responses. Greater protection restricts debt collection and reduces repayments in default ($\frac{\partial S(m,b_0,y_1)}{\partial m} < 0$). To compensate for additional losses, lenders raise interest rates ($\frac{\partial R(m,b_0)}{\partial m} > 0$). I assume that changes in asset exemptions do not affect lenders' profits. This simplifies the welfare analysis by allowing the social planner to consider only borrower welfare.[13] The model also assumes that lenders respond to the reduction in recovery rates only by raising interest rates. If lenders respond by increasing loan denials, increasing fees, or altering other loan terms, the welfare gain formula will not capture these additional costs and, as a result, will understate the true costs of exemption increases.[14]

Mapping the interest rate and repayment responses to the empirical counterparts requires additional restrictions. I assume that

$$(1 + R(m, b_0))b_0 = (1 + r(m))b_0,$$

which imposes that interest rates do not depend on the amount borrowed. This restriction is necessary because the empirical strategy estimates $\frac{dR(m,b_0)}{dm}$, while the appropriate empirical object for the welfare impact is the partial derivative $\frac{\partial R(m,b_0)}{\partial m}$. These are equal when interest rates do not depend on the amount borrowed (or other borrower choices). In robustness checks, I examine changes in the amount borrowed and evaluate an alternative formula that circumvents this issue by inferring the rate response from changes in default rates.

Exemptions also affect the costs of default in default, which I assume to be

$$S(m, b_0, y_1) = \phi y_1 + s(m)b_0.$$

Borrowers pay ϕy_1 with $\phi > 0$, a default cost that depends on their income and reflects legal or hassle costs, stigma, reduced access to future credit, or other costs that are not directly paid to creditors. This default cost ensures that high-income borrowers prefer to repay. The term $s(m) < 1$, the creditor's recovery rate, is a stylized representation of exemptions' impact on debt collection. When exemptions increase, defaulters repay a lower share of their debt $s'(m) < 0$. This reflects, in addition to the direct application of exemptions in state court and bankruptcy, any effect exemptions have on the overall number and effort of debt collectors,

[13] Consistent with this, the empirical analysis indicates that interest rise just enough to offset losses in default.

[14] Online Appendix B.2 includes an extension where exemptions affect credit limits.

collection strategies (e.g., acceptable offers, probability of lawsuits), and settlement outcomes. This functional form assumes that the recovery rate is not a function of the borrower's actions. I discuss the implications of relaxing this assumption in Section 5.

3.2. Social Planner's Problem

The social planner adjusts m to maximize the borrower's expected utility in period 0, taking into account changes in borrowing and default behavior and lenders' responses through $s(m)$ and $r(m)$. I derive a money-metric welfare gain by computing the value of raising exemptions relative to the marginal utility of consumption in the repayment state.

3.2.1. Welfare Gains Formula

Let $\pi = F(\omega^*)$ be the probability of default and $E\{u'(c^N)\} = \int_{\omega^*}^{\overline{\omega}} u'(c^N)dF(\omega)$ be the average marginal utility of consumption in states of the world where the borrower repays. Holding borrower behavior constant, a one-unit increase in the exemption level generates an expected transfer of $T = -\pi s'(m)b_0$ dollars to defaulters. To compute a money-metric measure of the welfare gain, I divide the utility gain from this exemption increase by the gain from transferring the same amount T to those who repay, i.e., $\frac{dW}{dm} = \frac{dV/dm}{E\{u'(c^N)\}T}$.[15] The effect of a change in exemptions on welfare is summarized by the following proposition:

Proposition 1. *The money-metric welfare gain from a marginal increase in asset exemptions is*

$$\frac{dW}{dm} = \left(\frac{E\{u'(c^D)\}}{E\{u'(c^N)\}} - 1\right) - \left(-\frac{(1-\pi)}{\pi}\frac{r'(m)b_0}{s'(m)b_0} - 1\right). \tag{1}$$

where $E\{u'(c_1^N)\}$ and $E\{u'(c_1^D)\}$ equal the average marginal utility of consumption in repayment states ($\omega \geq \omega^*$) and default states ($\omega < \omega^*$), respectively.
Proof: *See Online Appendix B.1.*

This formula weighs the borrower's willingness to pay for additional default insurance against the cost of generating default insurance using asset exemptions. The ratio of average marginal utilities in default and repayment captures the insurance value of transferring resources from states of repayment to states of default. This ratio can be interpreted as the percentage markup over the actuarially fair rate that borrowers are willing to pay for default insurance. The second term is the actual cost of the default insurance that is generated by increasing asset exemptions. The numerator $(1-\pi)r'(m)b_0$ reflects the expected increase

[15] This normalization compares the utility from two transfers of the same size. Alternatively, one could compute $\frac{dV/dm}{E\{u'(c^N)\}}$, which is the value of a one-unit (e.g., \$1) increase in exemptions relative to the value of raising consumption in repayment by \$1. I find that a \$1 exemption increase transfers much less than \$1 to defaulters, so this alternative normalization would compare the value of two transfers of very different magnitudes.

in interest payments when the borrower repays and the denominator $\pi s'(m)b_0$ reflects the expected reduction in debt payments if the borrower defaults.[16]

To incorporate the empirical estimates, I use the following approximation for the welfare gains formula:

Corollary 1. *If third-order and above utility terms (e.g., u''') are small relative to the lower order terms, the welfare gain of a marginal increase in exemptions is approximately*

$$\frac{dW}{dm} \approx \underbrace{\gamma\frac{\Delta C}{C}}_{WTP} - \underbrace{\left(-\frac{(1-\pi)}{\pi}\frac{r'(m)}{s'(m)} - 1\right)}_{Cost}. \tag{2}$$

The term $\gamma = -\frac{u''(\bar{c}_N)}{u'(\bar{c}_N)}\bar{c}_N$ is the coefficient of relative risk aversion evaluated at $\bar{c}_N$ and $\frac{\Delta C}{C} = \frac{\bar{c}_N - \bar{c}_D}{\bar{c}_N}$, where $\bar{c}_N$ and $\bar{c}_D$ equal the mean consumption in repayment states ($\omega \geq \omega^*$) and default states ($\omega < \omega^*$), respectively.
Proof: *See Online Appendix B.1.*

In this equation, the borrower's willingness to pay is approximated as the coefficient of relative risk aversion multiplied by the percentage change in consumption between times of repayment and times of default. As shown in Chetty (2006), this formula can be expanded to account for non-zero third-order utility terms, in which case it would also depend on the coefficient of relative prudence and the coefficient of variation for consumption within default and repayment, respectively. I discuss this extension when evaluating the welfare formula in Section 6.

3.2.2. The Role of the Default Distortion

Changes in borrowers' default decisions are a key determinant of the cost component in equation (1). To demonstrate, assume lenders are competitive and risk neutral, so that returns from lending satisfy the zero-profit condition

$$(1-\pi(m))(1+r(m)) + \pi(m)s(m) = (1+\tilde{r}),$$

where $\tilde{r}$ is the risk-free rate of return and $\pi(m)$ reflects that the probability of default depends on the exemption level. Differentiating this zero-profit condition with respect to m gives the following alternative formula for the cost:

$$\underbrace{-\frac{(1-\pi)}{\pi}\frac{r'(m)}{s'(m)} - 1}_{\text{Cost}} = \underbrace{-\frac{\pi'(m)[1+r-s]}{\pi s'(m)}}_{\text{Behavioral Cost / Mechanical Cost}} \tag{3}$$

[16] I retain b_0 in the numerator and the denominator because the model of formal bankruptcy, discussed below, replaces the term $s'(m)b_0$ with the share of defaulters holding non-exempt assets.

With competitive lenders, the cost term equals the additional creditor losses from the behavioral distortion to default decisions ($\pi'(m)[1+r-s]$) relative to the additional losses from the mechanical effect of exemptions on recovery rates ($\pi s'(m)$). In the absence of behavioral distortions (i.e., $\pi'(m) = 0$), the cost would be zero and (in a competitive market) exemptions would generate actuarially fair insurance. Alternatively, if the behavioral response (π') is large, exemptions generate costly insurance.[17] Thus, one can also evaluate the welfare impact by comparing willingness to pay to this behavioral-mechanical cost ratio

$$\frac{dW}{dm} \approx \gamma \frac{\Delta C}{C} - \frac{\pi'(m)[1+r-s]}{\pi s'(m)}. \tag{4}$$

This equation parallels the Baily-Chetty formula (Baily, 1978; Chetty, 2006), which has been the focus of a large literature on unemployment insurance (UI) and has been extended to other social insurance programs (Bronchetti, 2012; Chetty and Finkelstein, 2013; Meyer and Mok, 2018). Within government-funded social insurance, the welfare cost of additional benefits equals the taxes needed to offset behavioral distortions (e.g., longer unemployment durations) within the government's balanced budget constraint. Here, the welfare cost of raising exemptions equals the interest revenue needed to offset behavioral distortions within the lenders' zero-profit constraint. Different assumptions about the government's or lender's budget constraint can significantly alter the costs (e.g., Lawson (2017)). An advantage of equation (2) is that, rather than assuming a specific constraint on lenders, the net effect of any constraints and behavioral distortions is incorporated into the interest rate response $r'(m)$. Within the balanced-budget UI setting, the parallel would be directly measuring the effect of UI benefit changes on tax rates.

3.2.3. Dynamics and Heterogeneity

Following Chetty (2006), Online Appendix B.2 derives a similar formula in the dynamic version of this model, allowing for other endogenous choices and additional constraints. In the dynamic model, period 0 corresponds to a period when an individual first gains access to credit markets and takes out a consumer loan. Additional exemption protection generates insurance that transfers resources fro all future times and states where the individual repays to all future times and states where she defaults. In this setting, the probability of default π can be interpreted as the share of a borrower's life that she expects to spend in default, given information available in period 0, and the consumption change $\frac{\Delta C}{C}$ reflects the average consumption difference between repayment and default across future states and times. Thus, a similar formula also applies in the dynamic setting. One difference is that since the costs

[17] While the default distortion generates this first-order welfare cost in equation (3), there is no corresponding first-order welfare benefit. This is because the individuals who were induced into defaulting by a marginal increase in m are, to first-order, indifferent between repayment and default.

and benefits of exemptions are proportional to outstanding debt and the amount of debt may vary over the lifecycle, the average consumption change $\frac{\Delta C}{C}$ and the probability of default are replaced with debt-weighted averages.

Both the two-period model and the dynamic model feature a single representative agent, abstracting from heterogeneity across borrowers. With a representative agent, the welfare impact is solely due to the insurance value of transferring resources across potential states of the world within an individual. With heterogeneous agents, debtor protections may also redistribute resources across individuals, though redistribution is limited by the ability of creditors to group borrowers into risk categories based on observable characteristics. The model in this paper corresponds to a setting where observable (to the creditor) characteristics fully account for heterogeneity so that, at the time a loan is taken out, all borrowers within a risk category are identical. If there is heterogeneity within a risk category (e.g., private information about default risk), a complete welfare analysis would incorporate the value of transfers both within and across individuals in the same risk category. Additionally, I assume a single interest rate faced by a representative borrower throughout his life, but with heterogeneity, borrowers may face different interest rates as their risk category evolves over the lifecycle. Given the limitations of the data, I abstract from such heterogeneity and focus on the insurance value of consumption, though the redistributive value of debtor protections is an important area for future work.

3.2.4. Bankruptcy vs. Informal Default

I also consider a model where exemptions apply in bankruptcy and exemption increases only benefit the subset of bankruptcy filers holding non-exempt assets. For example, a $1 increase in the homestead exemption reduces repayment by $1 for those with non-exempt equity, but has no effect on filers who rent or whose home equity is already fully exempt. Online Appendix B.4 derives the welfare gains formula for this setting. Reflecting the dollar-for-dollar impact of exemptions on defaulters with non-exempt assets, the effect on repayment in default, $s'(m)b_0$ in equation (1), is replaced with $\pi_{m|D}$, the probability of holding non-exempt assets conditional on defaulting. This functional form is most similar to that of Dávila (2019), which focuses on exemptions in bankruptcy, and is present in many models of exemptions where bankruptcy is the only option for default (e.g., Fay et al. (2002); Athreya (2006); Hintermaier and Koeniger (2016)).

This version of the model accurately reflects how exemptions formally apply in Chapter 7 bankruptcy (and with judgment liens from state court). Additionally, if creditors have complete bargaining power and individually negotiate with informal defaulters, it may reflect Nash bargaining outcomes if defaulters' outside option is Chapter 7 bankruptcy. However, as argued earlier, exemptions influence debt collection in ways which may also affect defaulters without non-exempt assets. For example, in the models of Kovrijnykh and Livshits (2017) and Drozd and Serrano-Padial (2017), lenders commit to debt collection strategies that apply to groups of borrowers instead of individually bargaining with each one. Additionally, borrowers may hold some bargaining power, have an outside option that is not Chapter 7, or have private information about their assets, thereby limiting the impact of exemptions in settlement outcomes. Given the potential ways exemptions can affect repayment, I both estimate exemptions' impact on actual recovery rates and, in a separate strategy, calculate exemptions' impact based on the formula applied in bankruptcy and state courts. Also, in Section 7, I discuss and evaluate a model that allows heterogeneity between exemptions' role in bankruptcy and informal default.

4. Changes in Consumption around Default

This section uses the Panel Study of Income Dynamics (PSID) to estimate $\frac{\Delta C}{C}$, the average consumption difference between states of repayment and states of default. The empirical strategy examines changes in consumption around instances of default, following a large literature estimating consumption changes around shocks (e.g., job loss or illness) as an input to a Baily-Chetty formula (Cochrane, 1991; Gruber, 1997; Baily, 1978; Chetty, 2006).

4.1. Data

The Panel Study of Income Dynamics (PSID) is well-suited for this analysis, as it contains information about instances of default and a measure of consumption. In 1996, the PSID asked families about financial distress that occurred in the previous 5 years. Each family reports the years that they missed a bill payment, communicated with a debt collector, dealt with judicial collection actions (repossession, garnishment, lien), or filed for bankruptcy. In the main analysis, I count the occurrence of any of these events as default, but I examine alternative definitions in robustness checks.

Following Gruber (1997), I measure consumption as the sum of in-home food expenditure (including food stamps) and away-from-home food expenditure, deflated by the corresponding component of the CPI for the month of the interview.[18] While focusing on food consumption seems limiting, Chetty (2006) shows that the change in consumption for a single good is sufficient to calculate the value of additional insurance, provided it is combined with a measure of risk aversion for that good. In robustness checks, I examine changes in nondurable consumption imputed from the Consumer Expenditure Survey, as well as changes in broader measures of consumption that are available in more recent years of the PSID.

[18] 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).

The main sample consists of annual observations of household heads that do not report default in periods $t-1$ and $t-2$. Following the literature, I exclude households that report a change in food consumption over 300%.[19] Table 1 reports means for the sample. Column 1 reports the means for the full sample, columns 2 and 3 split the sample by whether the head defaulted in year t, and column 4 reports means for bankruptcy filers. The first row shows the average change in log food consumption from the prior year. In the sample of non-defaulters, the average change in food consumption is -0.6%. In the defaulter sample, however, the average change in food consumption is -4%. For bankruptcy filers, consumption increases by 9% in the year of a bankruptcy filing, consistent with the 8% increase in consumption upon filing for formal bankruptcy found by Filer and Fisher (2005) using a slightly different PSID sample. The second row shows that there is a much smaller change in the family's food needs, the PSID's measure of food requirements based on family size and composition, indicating that the decline in consumption upon default is not driven by changes in family structure, such as divorce or death of a spouse. The remaining rows of Table 1 show defaulters tend to be younger and are more likely to be female, non-white, and unmarried.

4.2. Empirical Strategy

This section aims to estimate $\frac{\Delta C}{C}$, the expected percentage change between consumption in states of the world $\omega \sim F(\omega)$ leading to default (D) or repayment (N) for a given borrower or household.[20] The distribution $F(\omega)$ reflects the borrower's expectations in period 0, which corresponds to a period in the borrower's life when she first takes out a consumer loan. The empirical strategy seeks to recover the distribution of potential shocks for a given borrower from the distribution of consumption changes across borrowers (households) in the PSID.

In the model, a representative household's (log) consumption is determined by the realized state of the world ω. To accommodate heterogeneity across households, the empirical specification allows consumption to also depend on household characteristics, so that observed consumption of household i and period t is assumed to be

$$\log(c_{i,t}) = D(\omega_{i,t})\log(\tilde{c}_D(\omega_{i,t})) + (1-D(\omega_{i,t}))\log(\tilde{c}_N(\omega_{i,t})) + \alpha_i + g(X_{i,t}) + \epsilon_{i,t},$$

The term $D(\omega_{i,t})$ is an indicator for default and reflects a household's default decision rule, which is a function of the state of the world and is assumed to be common across households. As in the model, $\tilde{c}_N(\omega_{i,t})$ and $\tilde{c}_D(\omega_{i,t})$ denote consumption during states of repayment (N) and

[19] Including households that do not default in $t-1$ and $t-2$ requires dropping observations from 1991 and 1992, since defaults are only reported from 1991-1996. Following Zeldes (1989) and Gruber (1997), I drop households where $log(c_t/c_{t-1}) > 1.1$ or < -1.1. Including these households does not affect the results. I also drop households with imputed food consumption or that are missing the age of the household head.

[20] I assume a unitary model of household decision making and use the terms borrower or household interchangeably.

default (D), respectively. Log consumption also depends on fixed (α_i) and time-varying ($X_{i,t}$) household characteristics, which affect consumption similarly in all states. The representative household in Section 3 corresponds to a household with these characteristics normalized to zero. The error term $\epsilon_{i,t}$ is independent with mean zero and can reflect measurement error or idiosyncratic shocks that affect consumption in all states of the world.

I assume the realized distribution of states across households equals $F(\omega)$, the expected distribution of states for a given household. This will be true if households have common, rational expectations over states and face no aggregate risk.[21] Following Gruber (1997) and the subsequent literature, I approximate the percentage change $\frac{\Delta C}{C}$ with the difference in mean log consumption. For each household, the expected percent change in consumption is

$$-\frac{\Delta C}{C} \approx E\left[\log(\tilde{c}_D(\omega))|D(\omega)=1\right] - E\left[\log(\tilde{c}_N(\omega))|D(\omega)=0\right].$$

In a cross-sectional sample, however, each household is only observed in one state. Simply comparing the average consumption of households that default and repay would lead to bias from selection into default since, conditioning on $X_{i,t}=x$,

$$E\left[\log(c_{i,t})|D(\omega_{i,t})=1\right] - E\left[\log(c_{i,t})|D(\omega_{i,t})=0\right] \approx -\frac{\Delta C}{C} + \underbrace{E\left[\alpha_i|D(\omega_{i,t})=1\right] - E\left[\alpha_i|D(\omega_{i,t})=0\right]}_{\text{Selection bias}}.$$

Instead, I follow the literature and examine consumption changes within households around instances of default, using households that repay to control for lifecycle patterns that are common between defaulters and repayers.

For the sample of households with no default in periods $t-1$ and $t-2$, the main specification is

$$\Delta_k \log c_{i,t} = \alpha + \beta D_{i,t} + X_{i,t}\delta + \varepsilon_{i,t}, \tag{5}$$

where $\Delta_k \log c_{i,t}$ is the change in household i's log consumption between year t and year $t-k$. The baseline specification uses $k=3$ and I discuss the choice of k below. I include a cubic in the household head's age and year fixed effects in $X_{i,t}$, and sometimes include additional controls for changes in family size, demographics, and economic conditions.

The coefficient β captures the average change in log consumption between the default year and k years prior to default relative to the change in consumption among non-defaulting

[21] Since the data consist of a cross-section of households at various ages and states of the world, it best corresponds to the dynamic model in which $\frac{\Delta C}{C}$ is the percentage change between average consumption in repayment and default across both the lifecycle and potential states of the world. In the dynamic version of the model, the consumption changes are weighted by the amount of outstanding unsecured debt. I estimate debt-weighted regressions in a robustness check.

households over the same period. Conditioning on $X_{i,t} = x$, one can write the parameter as

$$\beta = \underbrace{E\left[\log(\tilde{c}_D(\omega_{i,t}))|D(\omega_{i,t})=1\right] - E\left[\log(\tilde{c}_N(\omega_{i,t}))|D(\omega_{i,t})=0\right]}_{-\frac{\Delta C}{C}} \\ - \underbrace{\left(E\left[\log(\tilde{c}_N(\omega_{i,t-k}))|D(\omega_{i,t})=1\right] - E\left[\log(\tilde{c}_N(\omega_{i,t-k}))|D(\omega_{i,t})=0\right]\right)}_{\text{Bias from prior consumption differences}}, \tag{6}$$

As seen in this equation, using first differences removes the selection bias, but introduces potential bias from prior consumption differences (Hendren, 2017). In period $t-k$, all households are repaying their debt (hence $\tilde{c}_N(\omega_{i,t-k})$). The estimator will be unbiased if the average consumption in period $t-k$ of future defaulters (households that default in period t) equals that of future repayers (households that repay in year t). If, however, the information and shocks revealed between period 0 and $t-k$ differ systematically between future defaulters and repayers, consumption across these groups may differ in advance. For example, households defaulting in period t may be systematically more likely to have lost a job or become ill in the years before, reducing their consumption in period $t-k$. In this case, β would be biased, understating the full consumption difference $-\frac{\Delta C}{C}$.

Within the theoretical framework, the ideal lag would be to choose k_i for each borrower so that $t-k_i$ corresponds to period 0, when the borrower takes out her first consumer loan. By assumption, all borrowers share the same expectations in period 0 about future states of the world $\omega \sim F(\omega)$. So, after controlling for the household fixed effects and demographic characteristics, the average period 0 consumption of future defaulters and repayers would be equal, eliminating the bias.[22] In practice, I do not observe period 0 consumption for all households, so the baseline specification approximates this ideal with the lag $k = 3$ and I investigate the robustness to using longer lags.

With the lag $k = 3$, β will be biased if the average consumption of future defaulters and repayers has already diverged three years prior to default. To assess this, I estimate the gap in consumption between defaulters and repayers for the ten years prior to default. Specifically, for $j = -10, \ldots, 6$, I estimate the following regression:[23]

$$\Delta_3 \log c_{i,t+j} = \alpha_j + \beta_j D_{i,t} + \delta_j X_{i,t} + \varepsilon_{i,t}. \tag{7}$$

The dependent variable is the difference in the log of food consumption between $t+j$ and consumption in year $t-3$ and $D_{i,t}$ is an indicator for whether household i defaulted in period

[22] This assumes borrowers have no private information about credit risk at period 0. Private information would introduce heterogeneity among borrowers, discussed in Section 3.2.3.

[23] The regressions use food consumption data from the 1981-2002 PSID. Missing data, the lack of food consumption questions in 1988 and 1989, and the fact that the PSID is biannual after 1997 cause the sample to differ slightly in each regression.

t. The coefficient β_j reflects the average log consumption gap in year $t+j$ between defaulters and repayers, with the gap in year $t-3$ normalized to zero.

Figure 1 plots the coefficients β_j along with 95% confidence intervals. Consumption is stable between $t-10$ and $t-3$, but falls by almost 3% in the two years before default. This drop suggests that borrowers realize negative shocks or information in the two years preceding default, causing consumption to drop in advance.[24] As a result, using a one or two year lag would understate the full consumption decline. The coefficients before $t-2$ show parallel trends, consistent with future defaulters and repayers facing the similar distributions of states ω in these years, though it is still possible the groups realized systematically different shocks before period $t-10$. If future defaulters and repayers do face similar shocks in $t-3$ and earlier, choosing any $k \geq 3$ would eliminate the bias in equation (6). The baseline specification uses $k=3$, but I also examine the sensitivity to different choices of k.

4.3. Results

This section reports the baseline estimates, then discusses their robustness to alternative measures of consumption and to additional controls. I then examine heterogeneity in the consumption drop across types of defaulters and exemption levels.

4.3.1. Baseline Results

Table 2 reports the results from specification (5). The estimated coefficient on default in column 1 indicates that consumption drops by an average of 6.5% over this period, and the change is statistically significant at the 1% level. For comparison, the mean drop in consumption upon unemployment is 7-10% (Gruber, 1997; Kroft and Notowidigdo, 2016). Column 2 adds controls for changes in family size over this period, and the consumption drop decreases slightly to 5.6%. Column 3 includes observations with more than a 300% change in consumption over this period, and the estimate remains similar. The baseline definition of consumption includes spending from food stamps. Column 4 excludes food stamp expenditure in the measure of food consumption, and the estimate remains similar. Columns 5-7 replace the baseline dependent variable, the change in log consumption from $t-3$ to t, with the change from $t-3$ to $t+1$, $t+2$, and $t+4$, respectively, and the estimated decline in consumption remains significant and is between 3.3% and 6.2%. Finally, column 8 approximates lagging to period 0 by using a household-specific lag k_i such that $t-k_i$ is the year when the household head was 25. It is estimated using data from 1979-1996 on the subsample of households where consumption at age 25 is observable. Overall, the results of Table 2 show a consistent decline in consumption upon default, indicating that some borrowers are not fully smoothing consumption over the shocks that cause default.

[24] This timing is also supported by external evidence that default often occurs in the couple years following job loss or a health shock (Keys, 2018; Dobkin et al., 2018; Gupta et al., 2018).

This consumption drop creates a potential consumption smoothing role for additional debtor protections.

4.3.2. Alternative Measures of Consumption

The PSID only measures food consumption during the 1991-1996 waves. Broader measures of consumption may provide a more complete characterization of households' ability to smooth consumption around instances of default. Table 3 examines changes in nondurable consumption by imputing consumption from the Consumer Expenditure Survey (CEX) and by examining broader consumption measures available in more recent years of the PSID. Column 1 reports the baseline change in food consumption (controlling for changes in family size). Columns 2-3 separate food consumption into in-home and away-from-home consumption. In-home consumption falls by a smaller amount (3.9%) while out of home consumption falls by more (11%). Columns 4 and 5 impute nondurable consumption from the CEX data following the procedures of Guo (2010) and Meyer and Sullivan (2003), respectively, with declines in nondurable consumption of 4.7% and 4.1%.[25] The estimated changes in nondurable consumption are slightly smaller than the overall change for food consumption, but larger than the change for in-home consumption.

Columns 6-8 examine broader measures of consumption that are available in the PSID every two years beginning in 1997. These consumption measures do not overlap with the 1991-1996 measures of default, but beginning in 2009 the PSID asks about missed mortgage payments and foreclosure. I estimate equation (5), using observed mortgage defaults in the 2007-2011 waves of the PSID, and consumption data from 2003-2013. Column 6 indicates that, similar to the estimate from the main sample in column 6, food consumption in the more recent waves of the PSID falls by 5.5% (relative to $t-4$) during the year that a household misses mortgage payments. Columns 7 and 8 replace the dependent variable with the change in the log of nondurable consumption, where nondurable consumption is defined as the sum of expenditure on food (in-home and away-from-home), vehicle loan and lease payments, other non-repair vehicle and transportation expenditure, childcare, clothing, trips and vacations, and other recreation or entertainment expenditure. Upon mortgage default, consumption declines by 4.9% between $t-4$ and t (column 7) and 8.1% between $t-4$ and $t+2$ (column 8). These consumption declines for food and nondurable consumption are similar in magnitude to the 5-7% declines in food consumption using the more comprehensive measure of default reported in the 1991-1996 PSID. Given the 2005 bankruptcy reform, which decreased access to bankruptcy, and the severity of the Great Recession, one may expect the consumption declines

[25] Online Appendix Section C provides more detail about the imputation procedures. Nondurable consumption is defined as the sum of (deflated) expenditures on food (home and away), alcohol, tobacco, clothing and personal care, utilities, domestic services, nondurable transportation, airfare, nondurable entertainment, net gambling receipts, business services, and charitable giving.

in more recent years to be larger, but there are several potential explanations. Most defaulters do not file for bankruptcy and so may be relatively unaffected by the bankruptcy reform. Additionally, while economic conditions were worse in the Great Recession, the impact on average consumption declines may have been blunted by the expansion of unemployment insurance benefits, homeowner support programs (HARP and HAMP), or changes in the types of defaulters.

4.3.3. Robustness to Demographic and Economic Controls

A potential concern is that consumption is trending differently along demographic, economic, or geographic dimensions, and these dimensions are also correlated with the probability of default. Online Appendix Table A1 reports estimates from specification (5) with additional controls for demographic, economic, and geographic characteristics. The estimated decline in consumption change remains similar after adding demographic controls (head's sex, an indicator for white, years of education, marital status, and homeownership), state-level economic controls for log of median income and the unemployment rate, and state-by-year fixed effects.

4.3.4. Heterogeneity in the Consumption Change

Consumption changes upon default provide an estimate of a borrower's willingness to pay for any debtor protection that increases consumption in default, such as garnishment restrictions, debt collector regulation, or asset exemptions. This subsection investigates heterogeneity that is relevant for evaluating asset exemptions specifically: heterogeneity in the consumption decline across types of defaulters, by the amount of outstanding debt, and across low or high exemption levels. The relatively small sample of defaulters, however, limits the precision with which I can estimate differences in consumption declines.

Exemptions may affect some defaulters more than others. The largest exemptions are for home equity, which protects homeowners more than renters. Exemptions also may be more likely to affect formal defaulters. Figure 2 reports the estimates of the average consumption drop upon default from estimating specification (5) on subgroups of defaulters. The first estimate shows the average drop in consumption among all debtors (5.6%). The consumption drop is smaller for homeowners (3.1%) and those with non-exempt home equity (5.2%) than for renters. Consumption falls upon severe informal default (defined to include repossession, liens, garnishment, and debt collector contacts) by 4.8% on average, but increases for those filing bankruptcy by 3.7%, though imprecise. An increase in consumption upon bankruptcy is consistent with Filer and Fisher (2005), which found an 8.1% increase in consumption (relative to $t-1$) upon bankruptcy and is plotted for comparison. The difference between homeowners and renters has a p-value of .115, and both the difference between homeowners and renters and the difference between bankruptcy filers and informal defaulters is significant at the 5% level when examining consumption differences between $t-1$ and t (Online Appendix Table

A2).[26] The drop in consumption upon default and increase in consumption upon bankruptcy is also consistent with legal research that documents years of informal debt collection and financial struggle prior to most bankruptcy filings (Mann, 2007; Mann and Porter, 2010), as well as recent empirical research showing that access to bankruptcy alleviates financial distress (Dobbie and Song, 2015; Dobbie et al., 2017). If exemptions tend to protect homeowners and formal defaulters, these estimates suggest that using the average consumption decline of 5.6% will overstate the value of exemption protection.

Additionally, since the effect of exemptions is proportional to the amount of outstanding debt, exemptions may be more valuable if households with large consumption declines also hold high levels of debt. Indeed, in the dynamic version of the model, the consumption changes should be weighted by the amount of outstanding unsecured debt. Online Appendix Table A6 reports estimates of the consumption decline, weighting households by the amount of unsecured debt as reported in the 1989 or 1994 PSID. The debt-weighted point estimates are generally similar or slightly smaller than the unweighted estimates, though not statistically different. Overall, many groups likely to benefit from exemption increases - formal defaulters, bankruptcy filers, homeowners, and those with higher levels of outstanding debt - tend to experience smaller consumption declines upon default.

Finally, I examine heterogeneity in the consumption drop by exemption protection. I estimate specification (5), but interact the default indicator with an indicator for whether a household faces above-median exemption protection, as determined by their state, marital status, and homeownership.[27] Table 4 column 1 indicates that, for households facing below-median exemptions, consumption drops by an average of 7.8%, but the consumption decline is smaller for households facing above-median exemptions. This estimate reflects the cumulative effect of exemptions on consumption and compositional differences between households facing different exemption levels. The remaining columns add controls for the direct effect of these compositional differences. Column 2 adds state fixed effects and the estimate remains similar. Columns 3 and 4 add controls for marital and homeownership status, and the coefficient on the high-exemption interaction shrinks. Thus, the larger coefficients on the high-exemption interaction in columns 1 and 2 are driven, in part, by the greater ability of homeowners and

[26] The Online Appendix contains a number of additional tests of the difference between informal default and bankruptcy. Table A3 reports corresponding the estimates and standard errors from Figure 2. Table A4 examines the consumption change around bankruptcy and confirms the consumption increase between $t-1$ and t found in Filer and Fisher (2005). Table A5 conducts an Oaxaca-Blinder decomposition, finding that the difference in the consumption decline upon informal default and bankruptcy is partially, but not fully, due to differences in observable characteristics. Figure A2 plots the densities in consumption changes for informal defaulters and bankruptcy filers, and also the densities when bankruptcy filers are re-weighted to be observably similar to informal defaulters.

[27] For each household, I assign the personal property exemptions available in the state during the year, and also the homestead exemption if the household owns a home. If the household head is married and lives in a state that allows married couples to double their exemptions, I double the exemption value.

married couples to smooth consumption, perhaps due to greater liquid wealth or added worker effects. Finally, given the prominence of exemptions for home equity, columns 5 and 6 estimate the specification separately for renters and homeowners. In these specifications, the coefficient on the high-exemption interaction is small but imprecise. Although some estimates suggest households protected by higher exemptions face smaller consumption drops, the estimates of this table do not isolate the causal effect of exemptions. Much of the difference is explained by the fact that households facing high exemptions tend to be married or homeowners. The next section uses a separate strategy to isolate the causal effect of exemptions on consumption in repayment and default.

5. Causal Effects of Asset Exemptions

This section estimates the causal effect of exemptions on interest rates $r'(m)$ and repayment in default $s'(m)$. First, with data on interest rates and repayment on charged-off debt from Credit Union Call Reports, I estimate the effect of exemptions using difference-in-difference and event study regressions. Recoveries of charged-off debt reflect the amount creditors actually receive from defaulters, and so capture the effect of exemptions through both formal and informal default. If, however, the response of recovery rates is partially due to changes in borrower behavior, the credit union estimates would misstate the benefits to debtors by ignoring the utility impact of these behavioral responses. For example, exemption changes may lead debtors to adjust the effort used to negotiate with creditors or hide assets. I develop a second strategy that uses information on delinquent households' assets and debts to estimate changes in the legally required repayment amount, holding borrower behavior constant.

5.1. Approach 1: Credit Union Call Reports

The section uses data from Credit Union Call Reports to estimate the effect of exemptions on interest rates and recoveries on charged-off debt using within-state exemption changes.

5.1.1. Data

This approach requires data on exemption levels, interest rates, and repayment in default. I collect each state's homestead and personal property (vehicle, financial assets, and wildcard) exemptions from 1985-2015 from various editions of Elias et al. (1989-2013) and historical state statutes. My primary exemption coding is at the state-year level and is the sum of the homestead and property exemptions available to an unmarried bankruptcy filer under the age of 65 for each state and year.[28] Between 1994 and 2004, there were 57 changes among 28

[28] 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 set the homestead

states, and the median change is $2,200 (nominal, mean change of $15,195) or 7 log points (mean change of 17.5 log points). In the Online Appendix, Figure A3 shows the exemption changes in each state and Figure A4 shows the size and annual number of exemption changes.

Data on interest rates and repayment in default are from Credit Union Call Reports. Credit unions are a major source of consumer credit in the United States. Gissler et al. (2019) reports that credit unions make 28% of new car loans, 26% of personal unsecured loans, and 13% of mortgages. Each quarter, credit unions submit a Call Report with financial information such as balance sheets and income statements, along with information on the collection of defaulted debt and consumer loan interest rates. One advantage of using credit union data, as argued in Fedaseyeu (2020), is that credit unions are local lenders, so their lending practices reflect state laws. Over 92% of credit unions, as of 2013, had branches in only one state and over 98% had branches in two or fewer states.[29] A drawback, however, is that the lending practices of credit unions may differ from those of larger banks. I discuss and provide evidence for the external validity of the credit union estimates later in this section.

From 4th-quarter Call Reports, I construct annual recovery rates on charged-off non-real 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 (since they do not prevent the recovery of collateral), so I construct each credit union's recovery rate on charged-off non-real estate debt.[31] Credit Union Call Reports

exemption level to $550,000 in unlimited exemption states. I ignore lot size restrictions. I assume the filer is not a senior citizen. Although some states allow doubling of exemptions for a married debtor, the main specification uses the log of the exemption level and so the estimates would not be affected by doubling. For personal property exemptions, I sum the wildcard (including unused home equity), cash, and vehicle exemptions. I thank Jeffrey Traczynski for generously sharing data on exemptions from Traczynski (2011) for comparison.

29 I drop two major national credit unions, Navy Federal Credit Union and the Pentagon Federal Credit Union, from the sample. In robustness checks, I show that the main results hold in the subsample of credit unions operating in only one state.

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 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% and 0.56%. Since

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. Table 5 presents the descriptive statistics. The mean interest rate on credit card debt is 12.30% and the average recovery rate on charged-off non-real estate debt is 17.73%.[32]

The main sample consists of data from 1994, when credit union data are first available, to 2004. After 2004, two shocks, a major bankruptcy reform in 2005 and the Great Recession, raise concerns for the difference-in-differences strategy used in this paper. Both shocks created time-varying changes in credit markets that differed across higher and lower exemption states. The bankruptcy reform generated large, temporary spikes in bankruptcies and changes in interest rates and defaults that correlate with asset exemption levels (Ashcraft et al., 2007; Morgan et al., 2012). Then, the recession interacted with cross-sectional variation in exemptions, with higher exemption states experiencing smaller declines in employment and increased charge-offs (Auclert et al., 2019).[33] Since exemptions change more frequently in lower exemption states (although high-exemption states have larger increases), the bankruptcy reform and recession introduce time-varying shocks that bias difference-in-differences estimates. In robustness checks, I estimate the effect of exemptions in more recent periods.

5.1.2. Empirical Strategy

The empirical strategy uses changes in asset exemption levels to estimate the causal effect of exemption on interest rates and repayment in default. For state s at time t, the regressions are of the following form:

$$y_{st} = \alpha + \eta \log(E_{st}) + X_{st}\beta + \delta_s + \tau_t + u_{st}. \tag{8}$$

where $\log(E_{st})$ is the log of the exemption level. The outcome variable y_{st} is either the interest rate, the recovery rate, or the default rate in state s during year t. The coefficient η captures the effect of a 100 log point increase in a state's exemption level. The economic 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

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. Unsecured loans also include overdraft advances, but these likely make up a small share. As of 2005, total unfunded overdraft commitments made up approximately 8% of total unfunded commitments for unsecured loans (credit cards and personal loans).

[32] The recovery rate is similar to that of Visa, which reports that the average recovery rate on debt charged-off without a bankruptcy is 18% and 3% when a bankruptcy is filed (NBRC, 1997).

[33] Additionally, falling home prices erased a substantial amount of home equity, reducing the impact of the largest exemption, the home equity exemption. In 2010, 55-65% of homeowners were completely protected by exemptions (Dobbie and Goldsmith-Pinkham, 2015).

year fixed effects (τ_t) in all specifications.[34] The error term, u_{st}, represents the unobserved state-year factors that affect interest or recovery rates.

The level-log functional form imposes that the effect of a dollar increase in exemptions diminishes as the exemption level rises. This reflects the fact that most delinquent borrowers have little wealth and exemption increases become less important once their wealth is fully protected.[35] Thus, while an increase in Virginia's \$5,000 homestead exemption would likely benefit many delinquent homeowners, an increase in Minnesota's \$390,000 homestead exemption would affect few. Using log exemptions captures this effect, but I also estimate specifications that include exemptions linearly and allow different slopes for above- and below-median exemption states (based on the state's average exemption). I investigate how well the log and piecewise linear specifications approximate the relationship between exemptions and repayment using the empirical distribution of home equity and personal property. Online Appendix Figures A5 and A6 show that average repayment and average repayment rates are approximately linear in log exemptions, and also that the piecewise linear specification provides a good approximation, particularly in below-median exemption states.

Unlike the analysis in Section 4, I argue that these difference-in-difference 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' exemptions and the federal bankruptcy exemptions are altered at predetermined intervals to adjust for inflation. Additionally, Severino and Brown (2017) 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. States have multiple exemption increases, so a standard event study specification is not appropriate. I use a multiple event study

[34] In unreported results, I find that the point estimates are similar, though less precise, when Census division-by-year fixed effects are included. One could consider including controls for state-specific trends, but the frequency of exemption changes (Online Appendix Figures A3 and A4) combined with some dynamics in the treatment effects (Figure 3) prevents separating pre-existing trends from dynamic effects of exemption changes. See Wolfers (2006) and Meer and West (2016) for discussions of this issue in the context of changes in divorce law and minimum wages.

[35] In the 1996 and 2001 Survey of Income and Program Participation, 47% of delinquent households are renters, and the median equity conditional on owning is \$28,400. Additionally, Mankart (2014) highlights the point that exemptions matter much more at lower levels, and their effect fades out quickly as exemption levels increase.

framework, similar to those in Dube et al. (2010) and Sandler and Sandler (2014), which allows the effects of multiple changes to potentially overlap. For state s in year t,[36]

$$y_{st} = \alpha + \sum_{k=-5,k\neq-1}^{5} \eta_k \Delta \log(E_{s,t-k}) + X_{st}\beta + \delta_s + \tau_t + u_{st}. \tag{9}$$

The one-period difference operator, Δ, produces coefficients η_k that represent the cumulative effect of a 100 log point increase in the exemption level k years later. The specification omits the one-year lead term, so the coefficients capture cumulative differences in the outcome relative to differences that exist one year before an exemption increase.[37]

5.1.3. Results

Table 6 reports the estimates of the effect of exemptions on interest rates (Panel A), recovery rates (Panel B), and default rates (Panel C) from the difference-in-differences equation (8). Column 1 includes only state and year fixed effects and column 2, the preferred specification, adds controls for local economic conditions affecting credit markets, namely states' log of median income, unemployment rate, and changes in home values. The estimates from column 2 indicate that a 10% increase in exemptions raises credit card interest rates by 4.5 basis points (0.045 percentage points) and reduces recovery rates on charged-off non-real estate debt by 35.7 basis points. These estimates demonstrate the insurance provided by exemptions; higher exemptions raise interest rates while reducing payments when a borrower defaults. I also estimate the effect on default rates. Panel C column 2 indicates that a 10% increases in exemptions raises the credit card charge-off rate by 3.55 basis points, a 1.6% increase over the average charge-off rate of 2.16%, suggesting a behavioral response to increased generosity in default (possibly due to both moral hazard and adverse selection into borrowing). Online Appendix Table A7 and event study Figure A7 shows a similar response for another measure of default: Chapter 7 bankruptcy filings.

The remaining columns investigate the robustness of these estimates. Column 3 adds region-by-year fixed effects for the four Census regions, and the estimates are similar. Columns 4-7 use individual credit union data and include fixed effects for the individual credit unions, with little change to the estimates. Thus, the effect represents changes that occur within individual credit unions rather than changes in the composition of credit unions.

Figure 3 plots the event study coefficients from equation (9). For all three outcomes, the

[36] To produce a balanced panel in this regression, I use exemption data from 1989-2015 even though y_{st} is from 1994-2004.

[37] The difference operators for $k = -5$ and $k = 5$ are inclusive, in that they take the difference between 2015 and year $t+5$ and between year $t-5$ and 1989, respectively. If they were not inclusive, the reference group would be both 1-year before an exemption increase and any year outside of the event window (Sandler and Sandler, 2014).

coefficients in the years before an exemption increase are small and insignificant, consistent with the parallel trends assumption. In period t, when exemptions increase, recovery rates on charged-off non-real estate loans begin to fall and interest rates rise. Differences emerge in the year exemptions increase, and the magnitudes of the effects increase slightly over time and persist over the following six years.

5.1.4. Extensions and Robustness

In the Online Appendix, I report several additional extensions and robustness checks. The results are robust to alternative codings of the exemption levels and other samples of credit unions. The estimates remain significant if exemptions are included linearly, and a specification interacting exemptions with an indicator for low-exemption (below-median) states confirms that exemptions matter more at lower levels (Tables A8 and A9). Table A10 shows that the results are similar if only the homestead exemption is used, rather than both home and personal property exemptions. Table A11 shows that the estimated effects are similar if the sample is constructed from credit unions operating in only one state.

I examine exemptions' impact on other loan types in Table A12 and the pattern of coefficients is consistent with the role of exemptions across the loan types. Exemptions shield assets from unsecured creditors, so the baseline analysis focuses on interest rates for the most common type of unsecured consumer credit, credit cards. Higher exemptions raise interest rates on unsecured personal loans though by slightly less than their impact on credit card rates, perhaps reflecting the lower credit risk for borrowers approved for these larger installment loans. Exemptions cause a smaller increase in auto loan rates - about half the magnitude for credit card rates - consistent with the fact that auto loans are (partially) secured.[38] Finally, exemptions, if anything, generate slight declines in mortgage interest rates, consistent with the fact that exemptions do not prevent foreclosure and high exemptions may actually improve mortgage repayment by allowing borrowers to easily default on non-mortgage debt (Berkowitz and Hynes, 1999).

Another set of tests investigates the external validity of the estimates for banks and in more recent periods. Exemptions' effect on recovery rates for single-state commercial banks is similar to that of credit unions (Table A13 and event study Figure A8). Commercial bank interest rates are not available in the Call Reports, but the interest rate estimates in this section are in line with the magnitudes of other estimates in the literature from commercial banks. Most closely related, the interest rate estimates for unsecured personal loans in Table A12 are very close to the estimate found for unsecured personal loans from banks in Severino

[38] Exemptions do not prevent the lender from repossessing collateral. However, a significant share of auto loans are underwater (Chakrabarti and Pattison, 2019), so the borrower can owe an unsecured debt even after the collateral has been seized. Exemptions apply to this remaining unsecured debt.

and Brown (2017), which uses a similar identification strategy and covers a similar period.[39] The estimates are also in the lower end of the range of estimates found in papers using cross-sectional variation in exemptions (e.g., Gropp et al. (1997)), which I discuss in detail in Online Appendix D. Table A14 compares the estimates from the 1994-2004 period to the post-2007 estimates. The estimates are smaller and statistically insignificant in the post-2007 period. Similarly, Severino and Brown (2017) finds no effect of exemptions on interest rates in the later period. As discussed earlier, the 2008 recession introduced large shocks to credit and housing markets that altered the supply of credit and potentially the impact of exemptions. The lack of an effect during this period may reflect cyclical variation in the importance of exemptions or time-varying heterogeneity during this period that biases the difference-in-difference estimator. In the most recent period, 2014-2017, Table A15 and the event study Figure A9 report estimates similar to those from 1994-2004. To summarize the evidence on external validity, I find similar effects on the recovery rates of commercial banks, and the interest rate estimates are in line with other estimates of the impact on commercial bank interest rates. I also find similar effects in a much more recent period, although additional research is needed to understand the impact of exemptions across the business cycle and in more recent years.

5.2. Approach 2: Holding Borrower Behavior Constant

If borrower choices affect the recovery rate, the credit union estimates could misstate the benefits of raising exemptions by ignoring the utility impact of changes in borrower behavior.[40] This section develops an alternative approach that holds borrower behavior constant. Combining exemption changes with data on delinquent households' assets and debts, I estimate exemptions' effect on the amount households would repay according to the formula used in Chapter 7 bankruptcy.

5.2.1. Data

This strategy uses information on delinquent households' assets and debts from the Panel Study of Income Dynamics (PSID) and the Survey of Income and Program Participation (SIPP) to calculate required repayment amounts based on households' non-exempt assets. In the PSID, I identify delinquent households as those with unsecured debt who report financial distress between 1991 and 1996 (discussed in Section 4.1). In the SIPP (1996 and 2001),

[39] Severino and Brown (2017) finds imprecise estimates for credit card rates, but this may be due to features of the data. I discuss these estimates further in Online Appendix D.

[40] Specifically, suppose the repayment rate for defaulters $s(m,a)$ depends on the exemption level m and also costly borrower actions a. The credit union analysis estimates $\frac{ds}{dm} = \frac{\partial s(m,a)}{\partial m} + \frac{\partial s(m,a)}{\partial a}\frac{da}{dm}$. For the welfare gain formula, however, the ideal empirical measure of the benefit of exemptions is the change in repayment with respect to the exemption level, holding borrower behavior constant, i.e., $\frac{\partial s(m,a)}{\partial m}$. This equals $\frac{ds}{dm}$ if borrower actions have no effect.

I identify delinquent households as those with unsecured debt who report missing a rent, mortgage, or utility payment in the last year. The cross-sectional PSID and SIPP samples consists of 834 and 3,280 delinquent households, respectively, all with complete asset and debt information.

For each household, I calculate its legally required repayment amount based on the formula used in Chapter 7 bankruptcy, similar to Fay et al. (2002) and Mahoney (2015). Let $\mathbf{w}_{is}$ denote the vector of assets and debts for household i in state s, and $\mathbf{e}_{jt}$ denote the exemptions available in state j in year t. I define a household's seizable assets as a function of $\mathbf{w}_{is}$ and $\mathbf{e}_{jt}$:[41]

$$\begin{aligned}\text{Seizable Assets}(\mathbf{w}_{is}, \mathbf{e}_{jt}) = max\big\{& max\left[\text{Home Equity}_{is} - \text{Homestead Exemption}_{jt}, 0\right] \\ &+ max\left[\text{Vehicle Equity}_{is} - \text{Vehicle Exemption}_{jt}, 0\right] \\ &+ max\left[\text{Financial Assets}_{is} - \text{Financial Exemption}_{jt}, 0\right] \\ &- \text{Wildcard Exemption}_{jt}, 0\big\}.\end{aligned}$$

The required repayment amount for delinquent household i in state s facing exemptions $\mathbf{e}_{jt}$ is its seizable assets, up to full repayment of the debt:

$$\text{Repayment Amount}(\mathbf{w}_{is}, \mathbf{e}_{jt}) = min\left\{\text{Seizable Assets}(\mathbf{w}_{is}, \mathbf{e}_{jt}), \text{Unsecured Debt}_i\right\}.$$

This equals the amount a household would be required to repay to unsecured creditors should they file Chapter 7 bankruptcy or if the creditor pursued asset seizure through the state court.

5.2.2. Empirical Strategy

The aim is to estimate how exemptions affect repayment, holding borrower behavior constant. Using the fixed cross-section of defaulters, I generate a panel of required repayment amounts based on the exemption levels for each year. For household i in state s, the required repayment in default in year t is

$$\text{repay}_{ist} = \text{Repayment Amount}(\mathbf{w}_{is}, \mathbf{e}_{st}) \qquad \text{for } t = 1994, \ldots, 2004.$$

By using the legally required repayment amount, rather than actual settlement outcomes, there is no role for changes in borrowers' negotiation effort or tactics. By using the same fixed sample of households' assets and debts ($\mathbf{w}_{is}$) and only varying exemptions across years ($\mathbf{e}_{st}$), borrowers' asset portfolios are being held constant. Thus, similar to a simulated instrumental variable (Currie and Gruber, 1996; Mahoney, 2015), this strategy isolates changes in

[41] I exclude retirement assets from the calculation because the majority of states have an unlimited exemption for retirement accounts and a Supreme Court ruling in *Patterson v. Shumate* (1992) excludes ERISA-qualified retirement plans from seizure in bankruptcy.

repayment due to exemption changes, holding borrowers' behavior fixed.

I conduct the analysis separately for the PSID and SIPP samples. To estimate the impact of the observed exemption changes on repayment, I use the following regression

$$\text{repay}_{ist} = \alpha + \eta \log(E_{st}) + X_{st}\beta + \delta_i + \tau_t + u_{ist}.$$

where the amount repaid is measured in dollars and E_{st}, the exemption level, is as defined in the last section.[42] The coefficient η reflects the impact of a 100 log point increase in exemptions on the amount repaid by a delinquent household. The specification also includes controls for states' log income, unemployment rate, and house price changes (X_{st}), household fixed effects (δ_i), and time fixed effects (τ_t).

I also report results for when exemptions are included linearly, rather than in logs

$$\text{repay}_{ist} = \alpha + \theta E_{st} + X_{st}\beta + \delta_i + \tau_t + u_{ist}. \tag{10}$$

Exemptions (E_{st}) are measured in thousands of dollars. The coefficient θ captures the effect of a \$1,000 increase in exemptions on the amount repaid by a delinquent household. Since exemptions generate a dollar-for-dollar benefit for delinquent households with the non-exempt assets, this coefficient (divided by 1,000) can also be interpreted as the share of defaulters benefiting from the observed exemption increases.[43]

5.2.3. Results

Table 7 reports the results. The first two columns indicate that a 10 log point increase in exemptions, holding borrower portfolios fixed, reduces the amount that would be repaid on debt by \$58.6, using the PSID, or \$77.7, using the SIPP. Columns 3 and 4, which include exemptions linearly, indicate that a \$1,000 exemption increase reduces repayment by only \$2-4 on average. Columns 5 and 6 add the interaction of the exemption level with "Low," an indicator for whether the state's average exemption over this period is below the median of \$36,000. Both columns indicate that exemptions have a larger impact in low-exemption states, although the estimates using the PSID are imprecise. The estimates in column 6 imply that a \$1,000 exemption increase reduces the amount repaid by \$3.63 in high-exemption states and by \$34.17 in low-exemption states.

The estimates imply that less than 0.5% of delinquent borrowers (2-4% in low-exemption

[42] In the reported results, I inflation-adjust the household assets and debts to the nominal level for each year using the CPI-U. The estimates are similar in magnitude if I do not adjust for inflation.

[43] Within the legally required repayment, an exemption increase generates a dollar-for-dollar repayment reduction for debtors with the non-exempt asset impacted by an exemption increase (e.g., vehicle or home equity) and no payment reduction otherwise. If a \$1,000 increase reduces average repayment by \$100, then 10% of filers held that non-exempt asset. The estimate θ is a (weighted) average determined by the share of filers with these non-exempt assets.

states) benefited from the observed exemption changes. This is largely because most exemption increases protect additional home equity, often in high exemption states where most households are already fully protected. Of the total dollar-value of exemption increases between 1994 and 2004, 88% raised protection for home equity in above-median exemption states where very few delinquent households hold non-exempt home equity (Online Appendix Figure A11). Exemptions for vehicle equity and financial assets, which benefit a larger share of delinquent households, are rare. Another reason for the small effect is that the value of some delinquent households' non-exempt assets exceeds their unsecured debt. These households will not be affected by exemption increases, since creditor recoveries are capped at full repayment of the debt.[44]

5.3. Discussion

The estimates holding borrower behavior constant are generally larger than those using credit union data, though both sources indicate that exemptions provide a relatively small benefit to most defaulters. Using the PSID, a 10% increase in exemptions reduces repayment by $58.6 while the preferred credit union estimate in column 2, evaluated at the PSID mean unsecured debt of $10,728, implies a repayment reduction of $38.2.[45] The larger estimates when holding borrower behavior constant may indicate that changes in borrower behavior offset exemption protection. For example, exemption increases may cause borrowers to worry less about avoiding collectors or hiding assets. On the other hand, it could reflect that the actual amount recovered by creditors differs from the legally required repayment amount assumed in the second empirical approach. Use the legally required amount may overstate the role of exemptions if their true effect on debt collection, much of which occurs outside of the formal legal system, is muted. Thus, I view the two strategies as complementary and use both sets of estimates within the welfare analysis.

The concern about borrower responses also applies to the interest rate estimates if the rate changes reflect adjustments to borrower behavior. Unlike the required repayment amount, I cannot calculate how interest rates would change holding borrower behavior constant. However, Online Appendix Table A17 empirically investigates the impact of exemptions on changes in borrowing behavior, finding that increases in exemptions cause minor reductions in the amount borrowed; a 10% increase in exemptions reduces the average amount borrowed by roughly $10 per card. Since interest rates fall as borrowing decreases, the interest rate

[44] One concern is households may underreport outstanding debts causing the repayment cap to bind too frequently. However, both surveys ask about unsecured debt from a broad set of accounts, namely credit card debt, unsecured loans from financial institutions, outstanding bills including medical bills, legal debts, loans from individuals, educational loans, and so on. Additionally, the estimated effect of exemption on repayment increases only slightly if I add $2,000 to each household's unsecured debt.

[45] Using the linear estimates, Table 7 indicates that a $1,000 exemption increase generates a $2-4 reduction in repayment, whereas the credit union estimates in Table A8 imply a $2 increase.

estimates may understate the cost of raising exemptions. Additionally, as shown in equation (3), the default rate response provides a method of calculating the welfare cost of exemptions that does not use the interest rate estimate. Going forward, I evaluate the welfare implications using both the direct estimate of interest rate changes and the cost implied by the changes in default.

The credit union interest rate estimate, evaluated at the mean PSID debt, indicates that a 10% increase in exemptions would increase annual credit card payments by \$4.81 while reducing payments in default by \$38-78, depending on the specification. Combining these estimates with the consumption decline upon default, Figure 4 illustrates how the estimates translate into consumption changes over the range of exemption levels.[46] Assuming the 5.5% consumption decline holds at the median exemption level, the figure shows how the interest rate and repayment rate estimates affect consumption in repayment and default (top) and the percentage change in consumption (bottom). Evaluated at the average debt, changing the exemption level from the 25^{th} percentile (\$13,000) to the 75^{th} percentile (\$91,000) would increase interest payments by \$108, but reduce collection payments by \$863 when the borrower defaults, generating a reduction in the consumption decline upon default from 6.9% to 4.5%. This few percentage point difference between the first and third quartile is consistent with the small differences in the consumption decline between borrowers facing low and high exemption levels after controlling for marital status and homeownership demographic differences (Table 4). While useful for interpreting the magnitudes of the estimates, Figure 4 assumes the estimated effects of exemptions hold globally. As I discuss in Section 6, the nature of exemptions' costs and benefits may change at very low exemption levels.

6. Welfare Impact of Exemption Increases

This section uses the estimates to evaluate the welfare impact of raising exemptions within the welfare gain formula of equation (2):

$$\frac{dW}{dm} \approx \underbrace{\gamma \frac{\Delta C}{C}}_{WTP} - \underbrace{\left(-\frac{(1-\pi)}{\pi} \frac{r'(m)}{s'(m)} - 1 \right)}_{\text{Cost}}.$$

[46] To form these back-of-the-envelope calculations, I assume that at the median exemption level of \$36,000, the consumption drop is the estimated 5.5%, set debt equal to the average among defaulters from the PSID (\$12,440 - 2010\$) and assume total consumption during repayment at the exemption of \$36,000 equals the average food expenditure in the PSID (\$7,895 - 2010\$) divided by food's share of total expenditure (18.1% from Chetty and Szeidl (2007)). These values determine consumption in repayment, default, and the percentage difference at the median exemption of \$36,000. I then apply the causal estimates on interest rates and default payments to generate consumption changes as a function of the exemption level.

6.1. Evaluating the Welfare Impact

For the WTP, I set the coefficient of relative risk aversion over food consumption $\gamma = 3$ and the change in average consumption upon default $\frac{\Delta C}{C} = 0.0556$, the estimate in Table 2 column 2. These values imply that debtors are willing to pay 16.7% above the actuarially fair rate in order to transfer resources from the repayment state to the default state. This approximation for willingness to pay assumes third-order and higher utility terms are negligible, and I examine the effect of non-zero third-order utility terms in Online Appendix E.[47]

The $Cost$ term reflects the cost of exemption-generated insurance (over the actuarially fair rate) and depends on three parameters: the probability of default π, the effect of exemptions on interest rates $r'(m)$, and the effect on repayment rates in default $s'(m)$. I evaluate the cost term using estimates from the credit union estimates, the estimates from the PSID and SIPP holding borrower behavior constant, and using the estimated default response within equation (3). Table 8 reports the marginal welfare gain dW/dm and the calculated $Cost$ for each of these specifications, along with 95% bias-corrected confidence intervals from a nonparametric bootstrap procedure. Online Appendix E provides full details of the formula and values used for each specification and the procedure used to construct the confidence intervals.

The first row uses estimates of $r'(m)$ and $s'(m)$ from the credit union analysis in column 2 of Table 6 and I set the probability of default to $\hat{\pi} = 0.022$, the mean charge-off rate for credit card debt in the sample (Table 5).[48] These values imply the $Cost$ markup is 4.69, so to transfer \$1 to defaulters using exemptions, expected interest payments rise by \$5.69, or 469% above the actuarially fair rate. The 95% confidence interval for the $Cost$ estimate is $[1.11, 33.35]$. Debtors are willing to pay 16.7% over the actuarially fair rate but the insurance generated by asset exemptions costs 469% over the actuarially fair rate. Thus, at current exemption levels, increasing asset exemptions enough to raise consumption in default by \$1 generates a welfare loss of \$4.52 per borrower with a 95% confidence interval of $[-34.26, -0.97]$. Online Appendix E also reports estimates and confidence intervals for another measure of the policy's impact, the ratio of borrowers' willingness to pay to the net interest cost. With the credit union estimates, this ratio is 0.21 with a 95% confidence

[47] Online Appendix E includes a formula that accounts for third-order utility terms, which depends on the coefficient of relative prudence and the variance of consumption in default in repayment in addition to γ and $\frac{\Delta C}{C} = 0.0556$. The formula produces willingness to pay estimates of 25.7% or 17%, depending on how I estimate the variance of consumption. Both calculations rely on rough estimates of consumption variance in each state.

[48] In the two-period model, π is the probability that the borrower defaults next period. In the dynamic model, π is the share of the borrower's life that he expects to spend in a state of default. I estimate π with the annual charge-off rate. Assuming that default lasts for one-year, the annual charge-off rate provides an estimate that is consistent with both interpretations.

interval of $[0.03, 0.55]$, indicating that, when exemptions increase, each dollar of additional interest payments delivers a benefit valued at \$0.21. In a hypothetical setting where these additional interest payments were funded by government spending, this ratio would reflect the marginal value of public funds (MVPF) of Hendren and Sprung-Keyser (2020).[49]

The next set of estimates replaces $s'(m)$ with the estimates holding borrower behavior constant from Table 7 columns 1 and 2 (or columns 5 and 6 for low-exemption states).[50] As discussed in the last section, the estimated effect on repayment is larger when holding borrower behavior fixed, resulting in smaller estimates of the *Cost* and welfare loss. Using all states, providing \$1 of exemption insurance generates a welfare loss of \$2.55 (PSID) and \$1.51 (SIPP). When using the interest rate and repayment rate (holding borrower behavior constant) estimates for states with below-median exemptions, the estimated welfare loss is larger at \$6.21 (PSID) and \$3.72 (SIPP).

The final row of Table 8 applies the estimate of the default distortion (Table 6 column 2) to evaluate the welfare cost using equation (3), yielding an estimated *Cost* of 4.35 and a welfare loss of \$4.18 per dollar of exemption-generated default insurance. The *Cost* estimate of 4.35 from the formula in equation (3) assumes competitively priced loans. Its similarity to the credit union *Cost* estimates of 4.69, which is based on observed interest rate changes, indicates that lenders raised rates just enough to offset their additional losses. This supports the critical assumption that lenders' profits are unaffected by exemption increases and shows that the magnitudes of the default rate, recovery rate, and interest rate responses are internally consistent.

6.2. Discussion

The estimates indicate that, at current levels, the cost of additional exemption protection exceeds what borrowers are willing to pay. The point estimates of dW/dm range from -1.51 to -6.21, with a positive welfare gain lying outside the 95% confidence interval in four of the six specifications (and outside the 90% confidence interval for all six).[51] Given that the exemption levels in the United States vary from less than \$10,000 to over \$500,000,

[49] The MVPF measures the amount of welfare delivered to beneficiaries per dollar of government spending on a policy, accounting for fiscal externalities from behavioral responses. With asset exemptions, however, the debtor protection policy is paid for by private borrowers or creditors instead of government expenditure.

[50] In these specifications, I multiply $r'(m)$ by the average debt in the PSID or SIPP to account for the fact that Table 7 estimates the change in required repayment amounts, rather than the recovery rate. Online Appendix E provides full details of the formula and values used.

[51] The large cost estimates are robust to functional form, using estimates of dynamic treatment effects, or using the estimates of more recent periods. Online Appendix E reports similar cost estimates from the linear specifications. If I use the values from the linear exemption specification in Online Appendix Table A8 columns 2 and 5, the cost estimate is 4.42. Appendix Figure A10 shows the cost for each year after an exemption change, calculated using the dynamic treatment effect estimates from event study Figure 3. Using the quarterly estimates from 2014-2017 (Online Appendix Table A15 columns 3 and 7) and the credit card charge-off rate from this period of 1.94%, the calculated cost is 1.92.

exemptions can generate meaningful differences in welfare. To illustrate, assuming the credit union estimates hold globally, doubling a state's exemption level would reduce welfare by \$50 per household.[52] Thus, lowering exemptions would benefit borrowers.

There are, however, several important qualifications. First, the analysis evaluates changes in asset exemptions, holding other aspects of the debtor protection system and social insurance system constant. The estimates primarily apply to homestead exemptions, which comprise most of the observed exemption changes. Notably, there is no variation in income exemptions, such as garnishment restrictions or exemptions for public assistance income, so the analysis is not informative about the benefits of protecting the income of delinquent debtors. Second, at current exemption levels, asset seizure is used as a threat in bargaining but rarely executed (see Section 2), so the model and analysis focus on the financial effect of exemptions on repayment. At very low levels of exemptions, however, actual asset seizures may become more common, generating large costs associated with foreclosures and repossessions that are not reflected in the collateral value of the assets. Therefore, despite the large cost estimates, the welfare implications apply locally around current exemption levels and are not directly applicable to significantly lower exemption levels. In the conclusion, I discuss additional limitations of the analysis.

7. Exemptions in Bankruptcy and Informal Default

This section extends the welfare analysis to allow for heterogeneity between bankruptcy filers and informal defaulters. I first discuss changes to the model then, using data on payments within Chapter 7 and Chapter 13 bankruptcy, estimate the effect of exemptions on bankruptcy filers. After discussing the results and additional evidence, I evaluate the welfare implications. Allowing for heterogeneity between bankruptcy filers and informal defaulters reduces the estimated willingness to pay for default insurance, reinforcing the policy implications of Section 6.

7.1. Model with Bankruptcy and Informal Default

Online Appendix B.5 extends the baseline model to allow for heterogeneity between bankruptcy and informal default. The Baily-Chetty welfare gains formula remains similar, except the willingness to pay approximation depends on a weighted average of the consumption declines between repayment and each type of default

$$WTP = \gamma \left(\mu_I \frac{\Delta C^I}{C} + \mu_B \frac{\Delta C^B}{C} \right) \tag{11}$$

[52] For a household with \$15,000 in unsecured debt, doubling exemptions raises expected protection in default by $-s'\pi(15,000) = \$11.77$. Multiplying this by the welfare impact of -4.52 gives the overall welfare change from a 100 log point increase in exemptions.

where γ is the coefficient of relative risk aversion and $\frac{\Delta C^i}{C}$ is the average percentage change in consumption between repayment and informal default ($i = I$) or bankruptcy ($i = B$). The weights μ_i equal the share of the total reduction in repayments that accrues to defaulters of type $i = I, B$. Specifically, let δ_i be the (endogenous) probability of default type i (conditional on defaulting) and $s'_i(m)$ be the effect of exemptions on recovery rates in default type i. The expected change in recoveries is $s'(m) = \delta_I s'_I + \delta_B s'_B$, and the weight $\mu_i = \frac{\delta_i s'_i}{s'}$ is the share of the change due to defaulters of type i. Online Appendix B.5 also includes extensions allowing additional types of default (e.g., minor delinquency or Chapter 13 bankruptcy) and discusses a dynamic version allowing transitions between types of default.

7.2. Exemptions in Bankruptcy and Informal Default

Equation (11) requires estimates of the weights μ_I and μ_B, which reflect the share of exemption-generated repayment reductions that accrue to informal defaulters and bankruptcy filers, respectively. This section estimates the impact of exemptions on average repayment separately for all charge-offs (including formal and informal default), Chapter 7 bankruptcy filers, and Chapter 13 bankruptcy filers. Combining these estimates with the share of charge-offs from each type of default provides estimates of μ_I and μ_B.

For Chapter 7 and Chapter 13 bankruptcies, I calculate the average amount repaid to unsecured creditors per bankruptcy filing using administrative data from the United States Trustee Program (USTP) Final Reports. These data contain the actual amount disbursed to unsecured creditors in all Chapter 7 and Chapter 13 bankruptcy cases (Online Appendix F details the data). For repayment in overall charge-offs, I construct a measure of the average amount recovered per charge-off from Credit Union Call Reports.[53] I then estimate a difference-in-difference regression of the effect of exemptions on repayment for each type. I report estimates from a specification that includes exemptions linearly as in equation (10) because the coefficient on the exemption level provides an estimate of the share of filers benefiting from the exemption increase. The estimates of μ_i are similar when using a specification with log exemptions.

Table 9 columns 1-3 report the estimated effect of exemptions on average recoveries from charge-offs, Chapter 7 bankruptcies, and Chapter 13 bankruptcies, respectively. A \$1,000 increase in exemptions reduces the average amount recovered per charge-off by \$0.96 (column 1), the average amount recovered in a Chapter 7 bankruptcy by \$0.47 (column 2), and the average amount recovered in a Chapter 13 bankruptcy by \$2.07 (column 3). Columns 4-6 repeat these specifications, but add the interaction of the exemption level with "Low," an indicator for whether the state's average exemption-level in 1994-2004 was below the median.

[53] Specifically, I estimate the number of charge-offs as a product of the non-real estate charge-off rate multiplied and the number of non-real estate loans. Recoveries per charge-off equals the total dollar value non-real estate recoveries divided by the estimated number of charge-offs.

Exemptions have a larger impact in low exemption states, with recoveries in charge-offs falling by an additional \$17.17 (column 4), an additional \$5.39 in Chapter 7 (column 5), and an additional \$13.41 in Chapter 13 (column 6).

Panel B uses these estimates to calculate the share of the total change in recoveries accounted for by each type of default. Columns 1-3 report these calculations using the estimates for all states, while columns 4-6 use the estimates for low-exemption states. Row (i) reports the estimated share of credit union charge-offs due to Chapter 7 and Chapter 13.[54] About 40% of charge-offs are due to bankruptcy, with 30% from Chapter 7 and 10% from Chapter 13. Row (ii) repeats the estimated effect of a \$1,000 exemption increase on average recoveries from each type of default, which is simply the coefficient in columns 1-3 and the sum of the coefficients in columns 4-6.

Using these values, row (iii) calculates the share of the total change in recoveries that is explained by each type of default.[55] When exemptions increase by \$1,000, average recoveries per charge-off fall by \$0.96. The calculations suggest that changes within Chapter 7 explain 15% of this decline, and changes within Chapter 13 explain 21%, with the remainder assigned to changes in recoveries from default outside of bankruptcy. Thus, the share of recoveries explained by bankruptcy is $\mu_B = 36\%$. In below-median exemption states in columns 4-6, the share of recoveries explained by bankruptcy filers is lower. Online Appendix Table A18 reports the estimates using the log specification, which generate similar estimates of the share of recoveries explained by Chapter 7 and Chapter 13.

7.3. Discussion and Additional Evidence

Before evaluating the welfare formula, this section summarizes additional evidence on exemptions' effects in bankruptcy and informal default. One implication of Table 9 is that much of the benefit of exemption protection accrues to informal defaulters. When exemptions increase, only 36% (20% in low exemption states) of the resulting decline in recoveries is accounted for by bankruptcy filers. As further evidence of an effect on informal default, exemption increases cause a statistically significant reduction in the payroll of debt collectors (Table F3), and event study regressions confirm that the timing of the payroll reduction

[54] To estimate the share of charge-offs from Chapter 7, I multiply the share of credit-union charge-offs from bankruptcy by the share of credit-union bankruptcies under Chapter 7. I construct the share of charge-offs from Chapter 13 similarly.

[55] Holding decisions about how to default constant, the overall change in the average amount recovered (columns 1 and 4), $\beta^{overall} = \sum_{i \in I} \pi^i \beta^i$ for $i = \{7, 13, \text{informal}\}$, where π^i is the share of charge-offs due to each type of default and β^i is the effect of exemptions on the amount recovered from the average defaulter of type i. Row (iii) reports the share of recoveries explained by each type of default, i.e., $\frac{\pi^i \beta^i}{\beta^{overall}}$. Consistent with holding default decisions constant, Online Appendix Table A16 shows that exemptions have little effect on whether borrowers default formally or informally.

coincides with the exemption increases (Figure F3).[56] As another test, I examine whether exemption increases alter the way that borrowers default. If exemptions primarily matter in bankruptcy, exemption increases should cause borrowers to shift from defaulting informally to filing for bankruptcy. In contrast, Online Appendix Table A16 finds that exemptions increase charge-offs inside and outside of bankruptcy at similar rates, which is consistent with exemptions affecting both types of default.

The second implication of Table 9 is that relatively few bankruptcy filers benefit from exemption increases. If all bankruptcy filers held non-exempt assets (of the type protected by exemptions), a $1,000 increase would generate a mechanical $1,000 reduction in payments to creditors. Instead, a $1,000 increase in exemptions reduces the amount recovered by $0.5-2 (or $6-18 in low-exemption states). These values indicate that, even in low-exemption states, only 0.6% of Chapter 7 filers and 7.7% of Chapter 13 filers would benefit from an exemption increase.[57] These small effects of exemptions, both inside and outside of bankruptcy, largely explain the opposite welfare implications of this paper and Dávila (2019), which concludes that higher exemptions would improve welfare. That paper focuses only on the role of exemptions in bankruptcy and assumes that exemption increases benefit 4.4% of Chapter 7 cases and 100% of Chapter 13 cases, based on the percentage of filers that distribute funds to unsecured creditors.[58] The higher share of filers assumed to benefit leads to larger gains from raising exemptions.

There are two reasons why exemptions benefit few filers. First, while over 99% of Chapter 13 filers report that they will distribute funds to unsecured creditors, the majority of these filers would be unaffected by an increase in asset exemptions. Many factors determine Chapter 13 payments to unsecured creditors: judicial or trustee preferences, informal practices, debtors' desire to repay, the "best effort" requirement that debtors pay all of their disposable income, and the "best interest of the creditors" test requiring that the creditors receive more than they would from the sale of non-exempt assets (Sullivan et al., 1994; Braucher, 1993; Whitford, 1994). Only the last of these factors is potentially affected by exemption changes, and surveys and analysis of Chapter 13 filers indicate that this "best interest of the creditors" is typically not a binding constraint.[59]

[56] I also estimate the impact on debt collector employment. The point estimates of the impact of exemptions are negative, but not statistically significant.

[57] For Chapter 13 cases, I multiply the annual payment reduction of $15.45 (Panel B, row ii column 6) by 5, since Chapter 13 plans last for 3-5 years, to arrive at an average payment reduction of $77.25, which suggests that exemptions are binding in 7.7% of Chapter 13 cases.

[58] These percentages are based on the share of bankruptcy filings in the Federal Judicial Center's Integrated Database that are coded as an "asset case," which indicates that the filer expects that there will some funds available for distribution to unsecured creditors after any exempt property is excluded.

[59] In a recent paper, using detailed data from 81,000 Chapter 13 cases filed in Cook County, Illinois, Morrison and Uettwiller (2017) found that 58% of filers in successful Chapter 13 cases and 77% of filers in unsuccessful (no discharge) Chapter 13 cases would have paid unsecured creditors nothing in Chapter 7.

Second, in both Chapter 7 and Chapter 13, there is often a mismatch between the types of assets covered by exemption increases and the non-exempt assets filers hold. Although 4-6% of Chapter 7 cases have non-exempt assets, the non-exempt assets are largely small-dollar items, commonly tax rebates (Flynn et al., 2003; Jiménez, 2009). Although these filers hold non-exempt assets, they would be unaffected by the 90% (dollar-weighted) of observed exemption changes that only protect home equity (Online Appendix Figure A11). Online Appendix F provides additional evidence and further discussion of exemptions' effects inside and outside of bankruptcy. Using case-level data on all closed Chapter 7 asset cases from 2000-2010, I find that less than 1% of Chapter 7 filers hold non-exempt assets of the type that exemptions protect, and far fewer hold non-exempt home equity. In Chapter 13 filings between 2008-2016, around one-third of Chapter 13 filers own no real property and another 45% have negative home equity (real property values less than secured debt).[60] These filers would not be affected by changes in homestead exemptions. I also use difference-in-difference regressions to examine the effect of exemptions on recoveries by unsecured creditors in Chapter 7 and Chapter 13, exploring the robustness to subsamples of defaulters and alternative timing of the impact of exemptions. The specifications find consistently small effects of exemptions on repayment in Chapter 7 and Chapter 13 bankruptcy consistent with the estimates reported in this section.

7.4. Evaluating the Welfare Impact

I evaluate equation (11) using estimates of the consumption change for informal defaulters and bankruptcy filers. As reported in Figure 2, the estimated consumption decline for informal defaulters is $\frac{\Delta C^i}{C} = 0.061$ and for bankruptcy filers is $\frac{\Delta C^i}{C} = -0.037$ (an increase in consumption). For the share of the total reduction in repayments due to reduced payments by defaulters of type $i = I, B$, calculations in Table 9 indicate that 36% is due to bankruptcy filers and 64% is due to informal default, so $\mu_B = 0.36$ and $\mu_I = 0.64$. Within equation (11), these parameters reduce the calculated value for borrowers' willingness to pay for exemption-generated default insurance from 16.7% to 7.72% over the actuarially fair rate (when $\gamma = 3$), which remains far below the estimated $Cost$ of 469%. Since bankruptcy filers experience smaller declines in consumption, accounting for heterogeneity between formal and informal defaulters supports the policy implication that lower exemptions would increase welfare.

Many still repay unsecured creditors in Chapter 13, however, because bankruptcy administers strongly encourage or require filers to repay at least 10%. In interviews with bankruptcy attorneys, Braucher (1993) reports that "[a]ccording to the large majority of the subject lawyers . . . most of their chapter 13 cases would be no-asset cases under chapter 7."

60 Author's calculations from Federal Judicial Center's Integrated Database containing all bankruptcy filings for fiscal years 2008-2017.

8. Conclusion

This paper estimates the borrowers' willingness to pay for debtor protections and the consumption smoothing benefits and costs of providing additional protection by raising the exemption level. 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 provide default insurance, the interest rate cost exceeds what debtors are willing to pay for the additional protection. As a result, a sufficient statistic analysis indicates that welfare would increase if states lowered exemption levels.

This welfare analysis captures the main trade-off in raising exemptions, but omitted costs or benefits, externalities, and redistribution would potentially alter the welfare implications. Exemptions may affect the set of loan contracts offered, credit limits, or loan denial rates, and this could make increasing asset exemptions even more costly. Alternatively, exemption increases may prevent non-financial costs and hardship associated with repossessions or foreclosures, generating benefits that are not captured in this analysis. The analysis focuses on a representative borrower and assumes the borrower makes decisions optimally, ignoring the welfare impact of any redistribution across borrowers or behavioral biases in financial decisions.

Debtor protections also exist alongside many other forms of social and private insurance programs. 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 et al., 2018; Mahoney, 2015). Changes in exemption policy may reduce or exacerbate externalities in these other social insurance programs, which this paper ignores. The interaction between debtor protections and social insurance programs is important since debtor protections affect consumers' ability to self-insure through credit markets. Finally, the main estimates of the credit responses are from before the Great Recession, but the costs and benefits may differ during downturns. For example, there is evidence that, by reducing foreclosures, exemption protections had positive general equilibrium effects during the Great Recession (Auclert et al., 2019). The business cycle, fluctuations in home prices, and differences in economic conditions may influence the effects of exemptions and affect the welfare analysis.

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Table 1: Consumption Sample Summary Statistics

	Full sample (1)	No default (2)	Default (3)	Bankruptcy (4)
Δ log consumption	-.0075	-.0059	-.04	.098
Δ log food needs	-.0027	-.0023	-.0079	-.0013
Food consumption (2010$)	7,895	7,935	7,116	8,065
Age	45	46	38	36
Female	.26	.25	.39	.27
Years of education	13	13	12	12
White	.66	.67	.47	.59
Family size	2.7	2.7	3	3
Number of children	.9	.88	1.2	1.2
Married	.6	.61	.43	.58
Observations	20,002	19,031	971	83

The sample consists of yearly observations of household heads who report no defaults in the prior two years. Column 1 reports means for the full sample, and columns 2 and 3 split the sample by whether the head reports a default in that year. For comparison, column 4 shows the means for formal bankruptcy filers, restricting the sample to those reporting no bankruptcies in the prior two years. Δ log consumption and Δ log food needs report the change from the prior year, excluding changes over 300%.

Table 2: Changes in Food Consumption upon Default

Dependent variable:	Change in log consumption between $t-3$ and t				Alt. Timing: Change in log consumption between			
	No controls (1)	Family size (2)	With outliers (3)	No food stamps (4)	$t-3$ and $t+1$ (5)	$t-3$ $t+2$ (6)	$t-3$ $t+4$ (7)	Lag to period 0 (8)
Default	-0.0652***	-0.0556***	-0.0661***	-0.0576***	-0.0331**	-0.0581***	-0.0623***	-0.0435*
	(0.0151)	(0.0145)	(0.0186)	(0.0165)	(0.0149)	(0.0175)	(0.0238)	(0.0248)
Observations	20,002	20,002	21,248	18,874	18,458	13,179	6,558	6,490
Households	6,664	6,664	6,811	6,408	6,460	5,875	4,119	2,385
Defaults	971	971	1,067	840	925	699	402	407
Control for Δfamily size		X	X	X	X	X	X	X
Include changes > 300%			X	X				

This table reports estimates of the changes in consumption in the years around default from specification (5). The sample consists of household heads that report no defaults in $t-1$ and $t-2$. All specifications include year fixed effects and a cubic in age of the household head. Standard errors are clustered by household. The dependent variable in columns 1-4 is the change in log of food consumption from $t-3$ to t. Column 1 presents the baseline specification. Column 2 adds controls for changes in family size. Column 3 adds the outliers with consumption changes greater than 300%. Column 4 replaces the dependent variable with changes in log food consumption excluding food stamps. Columns 5-7 investigate the sensitivity to alternative time periods. The dependent variables in columns 5-7 are the changes in log consumption between $t-3$ and $t+1$, $t+2$, and $t+4$, respectively. Column 8 uses a household-specific lag k_i such that $t-k_i$ is the year when the household head was 25.

Table 3: Alternative Measures of Consumption

				Imputed from CEX		Broad consumption in 2003-2013 PSID		
Dependent variable:	Food	Food (in-home)	Food (away-from-home)	Nondurable (Guo, 2010)	Nondurable (M&S, 2003)	Food ($t-4$ to t)	Nondurable ($t-4$ to t)	Nondurable ($t-4$ to $t+2$)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Default	-0.0556***	-0.0392**	-0.110***	-0.0469***	-0.0412***			
	(0.0145)	(0.0160)	(0.0354)	(0.0120)	(0.0129)			
Mortgage default						-0.0554**	-0.0492**	-0.0813***
						(0.0249)	(0.0248)	(0.0278)
Observations	20,002	19,878	16,755	20,002	17,798	13,770	13,370	12,104
Households	6,664	6,644	5916	6,664	6,192	8,216	8,028	7,280
Defaults	971	962	761	971	828	310	301	271

This table reports estimates of the changes in consumption in the years around default from specification (5) using alternative measures of consumption. All specifications include year fixed effects, a cubic in age of the household head, and the change in family size. Standard errors are clustered by household. The dependent variable in columns 1-5 is the change in consumption from the year $t-3$ to t and the sample consists of household heads in the 1991-1996 PSID that report no defaults in $t-1$ and $t-2$. Column 1 reports the change in total food consumption. Columns 2 and 3 separate food consumption into food consumed in the home and out of the home. The dependent variable in columns 4 and 5 is nondurable consumption, imputed from the Consumer Expenditure Survey following Guo (2010) and Meyer and Sullivan (2003), respectively. Columns 6-8 examine changes in food consumption and nondurable consumption in the years around mortgage default using data from the 2003-2013 PSID. The sample consists of observations of household heads from 2009 and 2011 that do not report a missed mortgage payment or foreclosure in year $t-2$. Nondurable consumption in columns 7 and 8 is the sum of food expenditure (in-home and out of home), vehicle loan and lease payments, other non-repair vehicle and transportation expenditure, childcare, clothing, trips and vacations, and other recreation or entertainment expenditure. Observations with consumption changes larger than 300% are excluded.

Table 4: Heterogeneity in Consumption Change upon Default

Dependent variable:	Change in log consumption between $t-3$ and t					
					Renters	Homeowners
	(1)	(2)	(3)	(4)	(5)	(6)
Default	-0.0780***	-0.0752***	-0.0676***	-0.0835***	-0.0763***	-0.0690*
	(0.0190)	(0.0191)	(0.0193)	(0.0229)	(0.0263)	(0.0414)
Default× High-exemption	0.0557**	0.0466*	0.0374	0.0124	-0.00551	0.0168
	(0.0275)	(0.0278)	(0.0280)	(0.0339)	(0.0570)	(0.0438)
Homeowner			-0.000294	-0.000852		
			(0.00763)	(0.00776)		
Married			0.0289***	0.0277***	0.0551***	-0.00290
			(0.00715)	(0.00730)	(0.0153)	(0.0144)
Default× Homeowner				0.0239		
				(0.0331)		
Default× Married				0.0324	0.0204	0.0403
				(0.0317)	(0.0491)	(0.0428)
Observations	19,985	19,985	19,985	19,985	6,964	12,571
State FE		X	X	X	X	X

This table examines heterogeneity in changes in consumption in the years around default from specification (5) between individuals in states with below or above-median exemptions. The dependent variable is the change in log of food consumption from the year $t-3$ to t. The sample consists of household heads that report no defaults in $t-1$ and $t-2$. All specifications include a cubic in age, controls for changes in family size between $t-3$ and t, and year fixed effects. Standard errors are clustered by household. High-exemption is an indicator for whether a household faces above-median exemption protection, as determined by their state, marital status, and homeownership. Below-median exemption households are protected by less than $26,700 in exemptions (604 defaulters), and above-median exemption households are protected by exemptions above $26,700 (366 defaulters). Columns 5 and 6 estimate the regression separately on renters and homeowners.

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 (2010$)	55,451	68,351	0	578,742	473

This table shows descriptive statistics of the state-year level credit union data from the 1994-2004 NCUA Call Reports. Observations are weighted by the credit union membership in that state-year. Credit card charge-offs are only available from 1998. The exemption statistics exclude the 7 states with unlimited exemptions.

Table 6: The Effect of Exemptions on Credit Union Rates

	State aggregate data			Individual credit union data			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A Dependent variable: Credit card interest rate (%)							
Log(exemption)	0.415***	0.448***	0.357**	0.423***	0.459***	0.457***	0.454***
	(0.129)	(0.125)	(0.158)	(0.124)	(0.126)	(0.140)	(0.141)
Observations	550	550	550	52,945	52,945	52,945	51,319
Panel B Dependent variable: Recovery rate on charged-off non-real estate debt (%)							
Log(exemption)	-1.987	-3.568***	-4.132***	-2.660	-3.547***	-3.239**	-3.108**
	(1.648)	(1.262)	(1.527)	(1.599)	(1.073)	(1.243)	(1.270)
Observations	550	550	550	52,945	52,945	52,945	51,319
Panel C Dependent variable: Credit card charge-off rate (%)							
Log(exemption)	0.0999	0.355***	0.397***	0.0818	0.265***	0.250**	0.252**
	(0.169)	(0.0900)	(0.112)	(0.161)	(0.0776)	(0.107)	(0.107)
Observations	350	350	350	33,547	33,547	33,547	32,843
Specification Controls							
Year FE	X	X	X	X	X	X	X
State FE	X	X	X	X	X		
Economic Controls		X	X		X	X	X
Region-by-year FE			X				
Credit union FE						X	X
Drop if rec. rate > 100%							X

This table reports estimates from specification (8). Panels A and B use data NCUA Call Report data from 1994-2004, while credit card charge-off rates in Panel C are only available from 1998. Columns 1-3 show estimates from the state-level aggregates, with observations weighted by credit union membership. Economic controls contain state's the log of median income, the log of the home price index from the Federal Housing Finance Agency, and the state unemployment rate. Columns 4-7 use individual credit union data. The sample of individual credit unions is restricted to those with a positive amount of credit card loans and observations are weighted by the amount of credit card loans. Some credit unions (less than 0.5% of the weighted sample) report recovery 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, I truncate the recovery rates at 100% in columns 4-6, and drop observations with recovery rates over 100% in column 7. All standard errors clustered at the state-level are in parentheses.

Table 7: The Effect of Exemption on Repayment Holding Borrower Behavior Constant

Dependent variable: Repayment amount for delinquent households ($)						
Sample:	PSID	SIPP	PSID	SIPP	PSID	SIPP
	(1)	(2)	(3)	(4)	(5)	(6)
Log(exemption)	-585.7**	-777.3***				
	(237.2)	(149.4)				
Exemption ($1,000s)			-2.371	-3.706***	-2.239	-3.631***
			(2.453)	(0.970)	(2.302)	(0.876)
Low×Exemption					-21.95	-30.54**
					(13.55)	(13.50)
Observations	9,009	36,080	9,009	36,080	9,009	36,080
Year FE	X	X	X	X	X	X
Household FE	X	X	X	X	X	X
Economic Controls	X	X	X	X	X	X
Mean of dep. var ($)	4,224	2,689	4,224	2,689	4,224	2,689
Mean unsecured debt ($)	10,728	10,264	10,728	10,264	10,728	10,264

The dependent variable is the legally required repayment amount for delinquent household i in state s according to the exemptions in year t. See the corresponding text in Section 5.2 on how these variables are constructed. Economic controls contain state's the log of median income, the log of the home price index from the Federal Housing Finance Agency, and the state unemployment rate. Standard errors are clustered by state. Columns 1 and 2 report results from the PSID and SIPP. Columns 3 and 4 repeat these regressions with exemptions included linearly, and columns 5 and 6 add the interaction of Exemptions and Low, an indicator for whether the average exemption level in the household's state is below the median.

Table 8: Estimates of Welfare Gain

Specification	dW/dm	95% CI	Cost	95% CI
Credit Union Estimates				
NCUA Call Reports	-4.52	[-34.26, -0.97]	4.69	[1.11, 33.35]
Estimates Holding Borrower Behavior Constant				
PSID (all states)	-2.55	[-36.62, -0.00]	2.72	[0.16, 36.73]
SIPP (all states)	-1.51	[-3.91, 0.26]	1.68	[-0.09, 4.06]
PSID (low-exempt. states)	-6.21	[$-\infty$, -0.40]	6.44	[0.64, ∞]
SIPP (low-exempt. states)	-3.72	[-9.31, -0.09]	3.94	[0.29, 9.53]
Estimates Using the Default Distortion				
Default distortion	-4.18	[-83.27, -1.78]	4.35	[1.93, 78.74]

Bias-corrected 95% confidence intervals are constructed from a nonparametric bootstrap procedure. Online Appendix E discusses the bootstrap procedure and provides full details on the formula and values used in each specification.

Table 9: The Effect on Recoveries by Type of Default

Panel A Dependent variable: Average amount recovered by unsecured creditors per default

	All Charge-offs (1994-2004) (1)	Chapter 7 (2000-2004) (2)	Chapter 13 (1994-2004) (3)	All Charge-offs (1994-2004) (4)	Chapter 7 (2000-2004) (5)	Chapter 13 (1994-2004) (6)
Exemption ($1,000s)	-0.962***	-0.468***	-2.072***	-0.921***	-0.449***	-2.039***
	(0.302)	(0.154)	(0.326)	(0.328)	(0.163)	(0.347)
Low×Exemption ($1,000s)				-17.17***	-5.392***	-13.41**
				(4.703)	(1.668)	(6.122)
Observations	550	238	528	550	238	528
Mean of dep. var	833.1	247.1	1,111	849.8	222	1,028
State FEs	X	X	X	X	X	X
Year FEs	X	X	X	X	X	X
Economic controls	X	X	X	X	X	X

Panel B: Accounting for the change in average recoveries

	All states			Low exemption states		
	Overall	Chapter 7	Chapter 13	Overall	Chapter 7	Chapter 13
(i) Estimated share of Credit Union charge-offs	100%	30.5%	9.5%	100%	31.1%	11.1%
(ii) Change in recoveries per default from $1,000 exemption increase	-0.96	-0.468	-2.072	-18.09	-5.84	-15.45
(iii) Share of overall change accounted for by default type	100%	15%	21%	100%	10%	9%

Observations are at the state-year level and the dependent variable in the average recoveries by unsecured creditors for different types of default. Observations are weighted by credit union membership and standard errors are clustered at the state level. Columns 1-3 report the effect of exemptions on average recoveries from non-real estate charge-offs (including bankruptcy and informal default), and average recoveries by unsecured creditors in Chapter 7 and Chapter 13 bankruptcies, respectively. Columns 4-6 repeat these regressions and add the interaction of Exemptions and Low, an indicator for whether the average exemption level in state s is below the median of $36,000. Data for Chapter 7 and Chapter 13 recoveries do not contain AL and NC, which are not under the jurisdiction of the United States Trustee Program. Chapter 7 data is available for 2000-2004. Panel B reports the share of charge-offs from each type of default and the share of the total change in recoveries that is explained by each type of default. See the corresponding text in subsection 7.2 for details of the calculations.

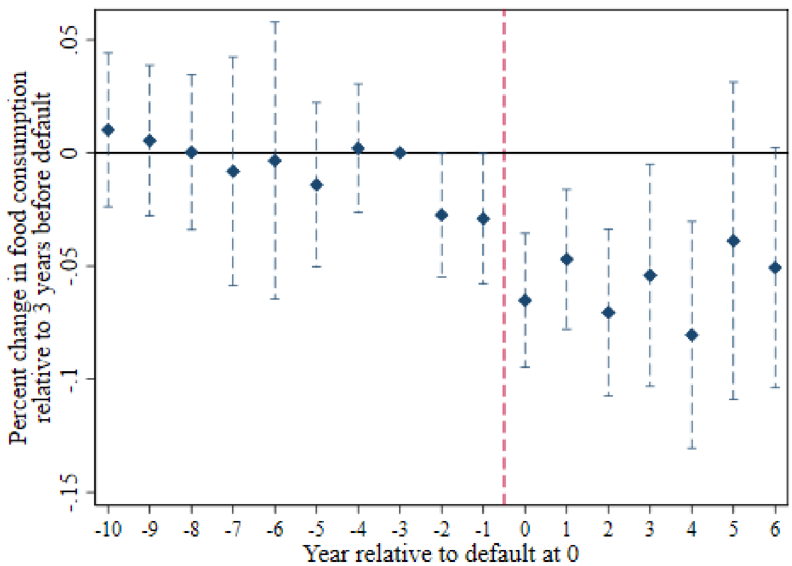


Figure 1: **Yearly Change in Log Consumption Around Default** This figure presents β_j coefficients and 95% confidence intervals from specification (7) for the years $j = -10, \ldots, 6$. Each coefficient reflects the percent difference in food consumption during year j for households that defaulted during year 0 relative to those that repay in year 0. Standard errors are clustered at the household level.

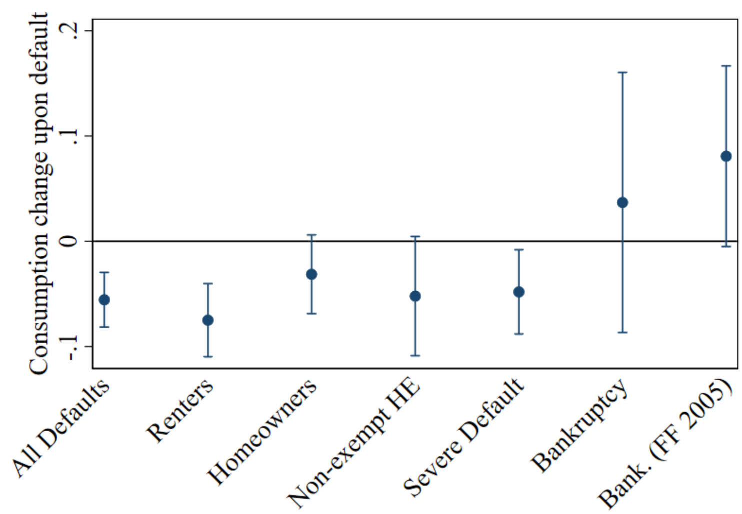
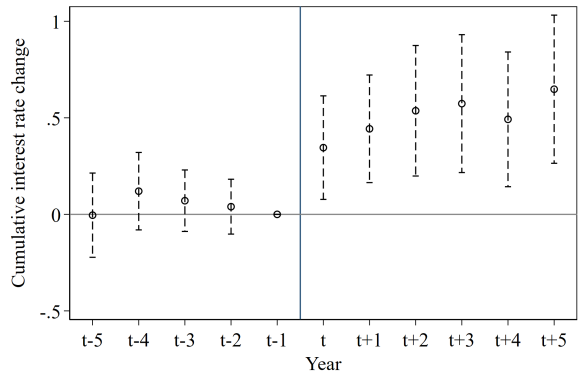
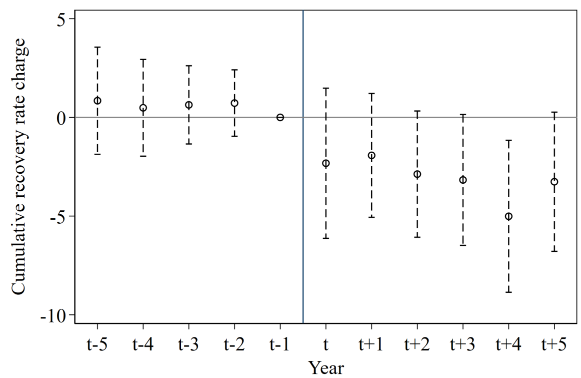


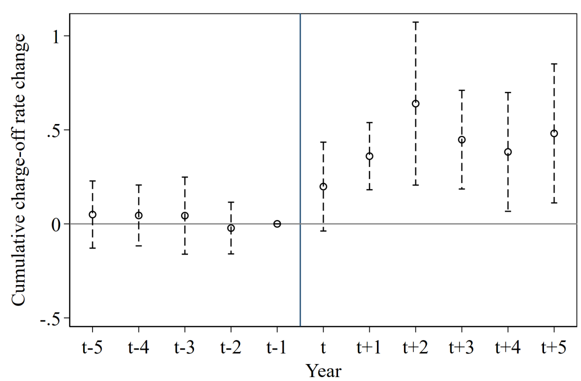
Figure 2: **Heterogeneity in the Consumption Change upon Default** This figure presents the coefficients on default and 95% confidence intervals from specification (5), estimated for different subsamples of defaulters. "Non-exempt HE" shows the drop for homeowners with non-exempt equity. "Strict Default" shows the change for those who report a repossession, lien, garnishment, or debt collection calls. "Bankruptcy" reports the consumption change for bankruptcy filers. For comparison, I also report the consumption change (relative to $t-1$) estimates and confidence intervals for bankruptcy filers from Filer and Fisher (2005) Table 4 column 1 as "Bank (FF 2005)." The estimates and standard errors are reported in Online Appendix Table A3.



(a) Credit Card Interest Rates



(b) Recovery Rates on Charged-Off Loans



(c) Charge-off Rates on Credit Cards

Figure 3: **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 (9). The sample period is 1994-2004, with exemption data used from 1989-2015 to allow for 5 leads and lags for each observation. Charge-off rate data is only available from 1998 for panel c. The dotted lines show 95% confidence intervals for standard errors clustered at the state-level.

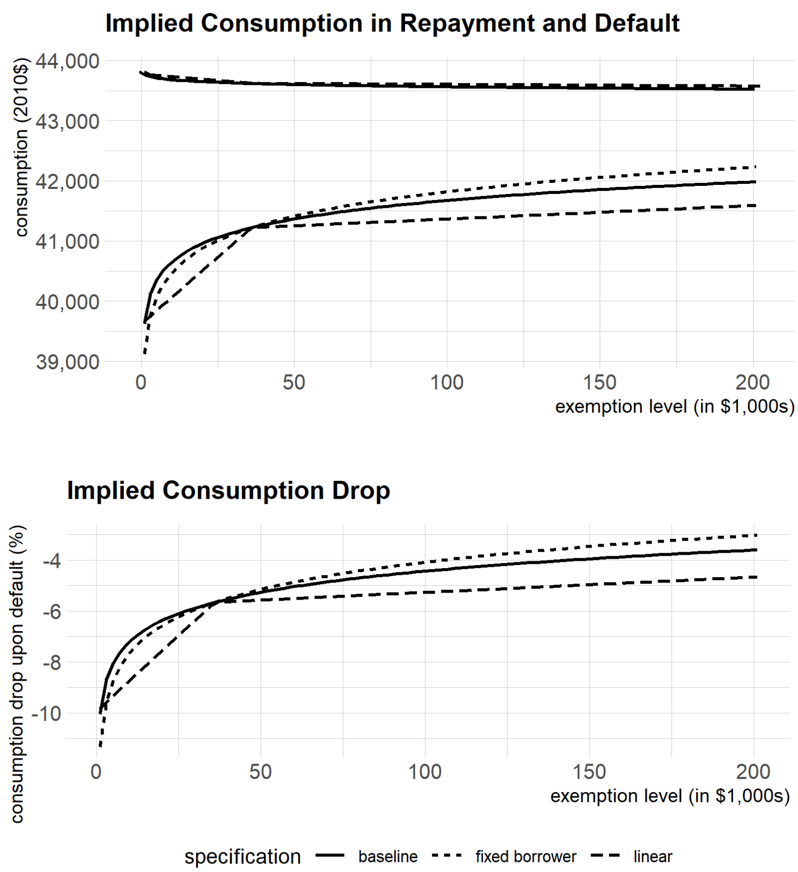


Figure 4: **Implied Consumption for an Average Household**

This figure illustrates the consumption changes implied by the estimates of Section 5 for a household with the average level of consumption and debt in the PSID. The baseline specification uses estimates from Table 6 column 2 of Panels A and B. The fixed borrower specification replaces the repayment effect with estimates from Table 7 column 1. The linear specification uses estimates from Table A9 columns 2 and 5. Details on the calculations are in Section 5.3.