

Personal Bankruptcy and the Accumulation of Shadow Debt*

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Abstract

The average debtor waits almost two years from their first severe delinquency to file for bankruptcy. During this period of distress borrowers access credit via informal credit markets, incurring “shadow debt” - debt disclosed at bankruptcy that is not captured on credit reports. Using liability-level data from personal bankruptcy filings, we document a new empirical fact: 44% of filers’ unsecured debt reported at bankruptcy is “shadow debt,” making this an important source of liquidity for distressed individuals. Distressed filers respond to a quasi-exogenous \$100 decrease in wage garnishment by delaying filing by an average of one month and by increasing shadow debt by \$6,000.

Keywords: personal bankruptcy, unsecured debt, shadow debt

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1 Introduction

Over 10% of U.S. households have filed for bankruptcy at least once (Stavins, 2000 and Keys, 2018). Average total debt at the time of filing is approximately \$240,000, which includes more than \$95,000 in unsecured debt and nearly \$110,000 in mortgage debt.¹ Moreover, the average borrower waits almost two years from the time of a first delinquency until they file. These figures translate to an equivalent of \$832 per U.S. adult discharged through personal bankruptcy each year, making bankruptcy one of the largest social insurance programs offered by the government.

The magnitudes of debt discharged, and the length of time borrowers languish in distress before they file, seem to be at odds with the notion that distressed borrowers are credit constrained. Once severely delinquent, it is unlikely that an individual can easily obtain credit from lenders who can observe their credit report. This raises the question of how consumers are able to obtain large amounts of debt which get discharged in bankruptcy, and how they access liquidity during lengthy period of distress. In this paper we document a new and important empirical fact that helps to answer these questions. Roughly 44% of filers' unsecured liabilities are not on credit reports at the time of filing.² We calculate this statistic through a systematic comparison of liabilities listed on the credit registry with debt disclosed on bankruptcy filings, yielding a new measure of undocumented consumer "shadow debt." Examples of shadow debt include unpaid utilities, healthcare bills, unpaid rent, some payday loans, unpaid taxes, or unpaid business-related debt.³ Though distressed consumers are likely constrained in formal credit markets, the existence of shadow debt indicates that informal credit markets – where lenders are less likely to be informed of the consumer's delinquent status – play some role in relieving credit constraints, simultaneously prolonging filing delay and increasing the debt discharged at filing.

Figures 1 and 2 illustrate the central empirical facts of the paper. Figure 1 shows that distressed creditors formal borrowing – defined as total debt reported to credit bureaus – peaks around one year prior to filing, declining thereafter. The trend for revolving debt is similar and more pronounced, as shown in Panel B of Figure 1. These trends are consistent with distressed individuals being

¹The average mortgage debt amount is averaged over about half of bankruptcy filers that have no mortgage debt.

²As credit bureaus are designed to tabulate the debts that are reported to them, we interpret these results as evidence that the debt of distressed borrowers captured by credit bureaus is an incomplete picture of household liabilities rather than as commentary on the accuracy of credit-bureau data.

³Shadow debt is similar to the concept of overdue trade credit in the corporate sector. Trade credit makes up 22.5% of total liabilities for large corporations that enter bankruptcy (Ivashina, Iverson, and Smith, 2016).

credit constrained from formal credit markets as they approach bankruptcy. Figure 2 shows that while that formal debt *decreases* leading into bankruptcy, outstanding shadow debt *increases* into bankruptcy. The credit report of the median borrower reports \$22,258 of unsecured debt six months prior to bankruptcy, compared to only \$16,881 at bankruptcy. In contrast, the bankruptcy filing of the median borrower reports \$31,291 of unsecured debt originated six months prior to filing, compared to \$47,902 at the time of filing.⁴ The increase in shadow debt leading up to bankruptcy suggests borrowers increasingly rely on informal debt markets in the period proceeding bankruptcy.

Why does the existence of informal consumer credit markets matter? Information asymmetries can increase the cost of credit for all borrowers. While corporations only pay an extra 23 basis points for unsecured credit relative to secured loans (Luck and Santos, 2021), the secured-unsecured spread in consumer credit is roughly an order of magnitude larger.⁵ The large secured-unsecured spread in consumer credit likely stems at least in part from high default costs to unsecured lenders, with the large amount of debt discharged in bankruptcy playing a fundamental role. Consistent with this intuition, Gross et al., (2021) document that discharged credit card debt ultimately increases the cost of credit for consumers.

The overall magnitude of shadow debt can be estimated using nationally-representative, administrative data. The Administrative Office of the U.S. Courts reports total liabilities from consumer bankruptcies annually, and these figures can be compared to debt on credit reports as reported in Razeto and Romeo (2019). Aggregate amounts of reported *secured* debt are essentially identical from the two sources, but we estimate that the average bankruptcy has \$36,500 of *unsecured* shadow debt at the time of filing, amounting to \$40.2 billion of discharged shadow debt annually.

To more fully understand how borrowers manage debt levels prior to bankruptcy, we require detailed microdata on filer balance sheets. Our principal dataset is obtained by downloading the Schedules of Assets and Liabilities and the Statement of Financial Affairs for individual bankruptcy filers from the U.S. Court’s Public Access to Court Electronic Records (PACER) websites for the Minnesota, Utah, Florida Northern, and Florida Southern Bankruptcy Courts. Our data consist of borrower-level data from 606,120 personal bankruptcy filings with over 15 million individual debts

⁴We discuss precisely how Figures 1 and 2 are constructed in section 4.1.

⁵For example, holding fixed borrower credit score, loan maturity and loan amount, the current spread on Bankrate.com between the interest rates on an unsecured personal loan and a secured auto loan is about 300 basis points.

across these bankruptcy districts between the years 2001-2018. These schedules provide line-by-line descriptions of a filer’s itemized real estate assets, personal assets, secured debts, unsecured priority debts, unsecured non-priority debts, monthly income, and monthly expenses.

After anonymizing, we supplement the bankruptcy data with credit-bureau data for a subset of the bankruptcy filings in an effort to paint the broadest possible picture of the filer’s credit profile. Insights from this merged dataset offer an important contribution to our understanding of distressed household balance sheets. Comparing liabilities listed on the credit registry with debt disclosed on bankruptcy filings yields an individual-level measure of shadow debt. Disclosed debts are verified by a court-appointed trustee, and consumers have every incentive to accurately disclose all of their debts at the time of filing for bankruptcy in order to receive the maximum possible relief from discharge. Accordingly, a comparison of borrower liabilities listed on bankruptcy schedules to those reported to credit bureaus gives an accurate measure of the debt that is missed by estimates of consumer leverage that depend solely on data from credit reports. On average, consumers have about \$41,000 of unsecured shadow debt at the time of bankruptcy in our individual-level data, a figure that is quite similar to that derived from administrative-level aggregates discussed above.

Though Figures 1 and 2 are suggestive, data limitations prevent direct measures of the dynamics of shadow debt accumulation for many of the borrowers in our sample. We therefore evaluate how inframarginal filers interact with informal debt markets by examining policy changes to wage garnishment that exogenously decrease the benefits of filing for certain delinquent borrowers. Easing wage garnishment nudges some borrowers to delay filing for bankruptcy, thereby changing the dynamics of shadow debt accumulation for these borrowers.

To identify exogenous shocks to wage garnishment, we use pre-scheduled federal minimum wage increases. Garnished individuals are allowed to keep at least 30 hours of minimum wage earnings a week for subsistence, although this amount can vary by state (see Carter, 2020 for details). Accordingly, federal minimum wage changes induce quasi-random changes in wage garnishing for lower-wage debtors who earn close to this subsistence threshold. Meanwhile, borrowers who are far above and below the threshold are unaffected by changes to the minimum wage. During our sample period, the federal minimum wage increased three times, on July 24 of 2007, 2008, and 2009, resulting in lower garnishment for particular subsets of borrowers in our sample. Given the timing of the law changes and borrower incomes, minimum wage changes impact garnishment for

about 5%-10% of borrowers depending on the sample. Changes to the federal minimum wage allow for within-year comparisons of outcomes between otherwise similar borrowers with identical incomes but different levels of wage garnishing. In particular, we find that when wage garnishment exogenously decreases by \$100, treated borrowers accumulate nearly \$6,000 of additional shadow debt and delay filing for bankruptcy for an additional month. Meanwhile, we find no increase in secured or *non-shadow* unsecured debt for these borrowers who delay entering bankruptcy. This suggests that shadow debt markets play a fundamental role in providing liquidity for borrowers near bankruptcy.

There are several possible threats to the exclusion restriction of our experiment. For example, our estimates of debt accumulation could be biased if higher-debt borrowers' propensity to file is correlated with changes in wage garnishment, especially given our sample's selection conditioning on having filed. Importantly, we find that our wage garnishing shocks do not have any distinguishable effect on the propensity to enter bankruptcy, the level of secured debt at the time of filing, or the observable attributes of filers. Credit bureau data further show that the debt amounts of *non-filers* are not different before and after garnishment changes, indicating that changes to garnishment do not appear to induce an observably different type of borrower to file. The exclusion restriction could also be violated if minimum wage changes directly impact the amount of debt held by distressed individuals through an income effect. However, we find that our results continue to hold in Florida, where the state-level minimum wage was higher than the federal minimum wage and hence there was no direct income effect due to minimum wage changes. We discuss these and other possibilities in detail in Section 5.3.

Because we cannot observe borrower intentions, our results do not conclusively show that shadow debt accumulation by delaying filers reflects purposeful moral hazard behavior; borrowers may be incurring additional debt just to subsist or in an effort to avoid bankruptcy. However, we note that from a creditor's perspective, any additional debt that is discharged in bankruptcy is costly, and these costs are likely passed on to other borrowers in the form of higher borrowing costs and prices (Gross et al., 2021). In the case of shadow debt, this is likely reflected in higher prices of goods or services purchased on credit, including rent, medical services, and utilities. We conclude that even if filing delays and the associated additional debt accumulation are unintentional, such effects have significant scope to impose negative externalities on non-defaulting borrowers.

2 Related Literature

Our paper contributes to the vast literature on asymmetric information in consumer credit markets. Beginning with Akerlof (1970) and Stiglitz and Weiss (1981), the literature has argued that information asymmetries result in undersupplied credit overall, but create the potential for an over-provision of credit to “lemons.” Though we are unable to evaluate welfare effects in general equilibrium, our evidence supports the possibility that shadow debt markets over supply credit to distressed borrowers who are highly likely to default. This in turn could lead to higher prices and hence an underprovision of credit overall.

Our paper also contributes to the literature on personal bankruptcy. Much of the prior work on personal bankruptcy decision making focuses on the determinants of bankruptcy filing at the extensive margin, with a particular emphasis on strategic default. For example, Fay, Hurst, and White (2002) investigate whether borrowers file for bankruptcy for strategic reasons or because of negative financial shocks; they largely conclude that strategic motives play an important role. Similarly, Gross and Souleles (2002) show that some filers with similar risk composition to non-filers appear to be more willing to enter bankruptcy, suggesting some role for strategic default.⁶ Along those lines, Guiso, Sapienza, and Zingales (2013) demonstrate that views about fairness and morality affect strategic default in mortgages, and Gerardi et al. (2018) find that strategic motives are important in explaining mortgage defaults. However, Indarte (2020) finds only a small incidence of strategic bankruptcy filings, instead attributing most bankruptcies to liquidity shocks.⁷ In contrast to these papers, we take the decision to ultimately file as given, and provide evidence that monthly cash-flow shocks impact the timing of the filing decision and the amount of debt discharged. Regardless of the underlying bankruptcy motive, our findings on shadow debt are an unexplored margin important to our understanding of consumer credit markets.

Notably, only a few papers study how the *level* of household debt changes in response to the bankruptcy system. For example, Gropp, Scholz, and White (1997) and Severino and Brown (2017) both estimate that increases in state-level asset exemption limits (the amount of assets exempt from seizure by bankruptcy creditors) lead to increases in credit demand and simultaneous increases in

⁶Livshits et al. (2010) argue that a non-strategic framework with a decreasing cost of bankruptcy filing helps explain the rise in U.S. personal bankruptcies over time.

⁷Similarly, Ganong and Noel (2020) conclude moral hazard in mortgage default is scarce. On the other hand, Mayer et al. (2014) find evidence of mortgagors strategically missing payments to qualify for loan modifications.

interest rates. Meanwhile, Romeo and Sandler (2021) use individual level data and find very little reaction in credit demand or supply to changes in exemptions.⁸ Our study complements these studies by focusing explicitly on highly delinquent consumers for whom bankruptcy is likely more salient. As a result, we find that these individuals are very sensitive to garnishment laws, resulting in increased credit demand (especially in shadow debt) and filing delays when garnishment is lax.

A separate strand of the bankruptcy literature explores the types of debt most associated with triggering a bankruptcy filing. Domowitz and Sartain (1999) conclude that credit card and medical debt play a pivotal role. Dobkin et al. (2018) estimate that medical debt plays a statistically significant role in causing bankruptcy but that only 4% of personal bankruptcies are caused by hospitalizations.⁹ Complementary to this literature, we document that informal shadow debt is an important and yet undocumented category of debt for bankruptcy filers.

Although our work is primarily concerned with borrowers' debt decisions prior to filing, it is also relevant for recent work that studies the effects of bankruptcy on subsequent outcomes. Fisher and Lyons (2010) provide evidence that a bankruptcy flag on credit reports reduces borrowers' subsequent access to credit. Dobbie, Mahoney, Goldsmith-Pinkham, and Song (2020) document improved access to credit and credit utilization following the removal of a bankruptcy flag. Dobbie and Song (2015) report higher subsequent incomes, lower mortality, and lower foreclosure rates for borrowers randomly afforded more lenient access to Chapter 13 bankruptcy. Parra (2018) uses a regression-discontinuity design to show positive effects of Chapter 7 on entrepreneurship, homeownership, and financial distress. Similarly, Dobbie, Goldsmith-Pinkham, and Yang (2017) use quasi-random variation in chapter choice to show that filing under Chapter 13 leads to better future financial outcomes. More structural work also quantifies the optimality and welfare benefits of the current bankruptcy system (Livshits, MacGee, and Tertilt, 2007; Auclert et al., 2019; Davila, 2019). To be able to weigh the real benefits of a more lenient bankruptcy system documented by these papers against the potential costs of increased debt at the time of discharge, our work establishes that such costs are likely to be important and identifies filing delays and shadow debt as key channels through which they operate.

⁸Recent theoretical work by Exler et al. (2020) finds that over-optimistic consumers inefficiently borrow too much and file too late.

⁹See also Gupta et al. (2017), who find that cancer diagnoses increase bankruptcy incidence.

3 Conceptual Framework

Our empirical work operates under the null hypothesis that observably distressed borrowers would be excluded from credit markets as they approach bankruptcy. With perfect information, credit constraints should increase as a borrower’s financial condition worsens. Thus, we would expect seriously delinquent borrowers to essentially maintain or decrease debt amounts nearing bankruptcy when lenders are informed of the debtor’s financial condition.¹⁰ Figure 1 is suggestive of this point.

An alternative hypothesis is the possibility that informal credit markets exist in which lenders are uninformed. The fact that the average (median) bankruptcy petitioner files for bankruptcy 22.3 (15.3) months after first being 90 days past due on a debt suggests that financially constrained borrowers are able to access some credit, at least informally. “Accidental creditors,” such as health-care providers, utility companies, and landlords do not always observe a borrower’s financial distress. After all, informal lenders have only weak instruments to screen borrower’s credit quality, nor the institutional framework to do so. Figure 2 is consistent with this intuition.

A separate question that we do not test in this paper is *why* shadow debt lenders do not become informed. Intuitively, we expect this is for two reasons. First, if consumers place a relatively high value on the ability to purchase goods and services on credit, they may be willing to bear higher prices due to a small fraction of consumers who default. Informal lenders may find this less costly than paying credit bureaus to become informed. Second, many shadow debt lenders, such as hospitals, may feel morally obliged to provide services regardless of a consumer’s willingness to pay. For these lenders, there is no real benefit of becoming informed as they will provide the service regardless.

Our empirical analysis focuses on establishing the existence of shadow debt and documenting how it responds to nudges to delay bankruptcy. We do not evaluate the consequences of increases in bankruptcy-filer indebtedness on demand, prices, quantities, the welfare of non-defaulting buyers (buyers who know they will not declare bankruptcy and will thus pay full price), and overall economic efficiency. Conceptually, as more individuals discharge shadow debt in bankruptcy, equilibrium prices should rise due to the haircut that sellers take from defaulting buyers, consistent with empirical evidence in Gross et al. (2021). The higher prices paid by non-defaulting consumers

¹⁰One notable exception would be the possibility that fines and fees associated with delinquencies could be capitalized into outstanding debts (Di Maggio, Ma, and Williams (2020))

would reduce welfare for non-defaulters and create an aggregate deadweight loss as some consumers would be priced out of the market by higher prices. Regardless of whether debtors intentionally or unintentionally increase debt before bankruptcy, equilibrium prices should rise (and welfare of non-defaulters fall) as long as defaulting borrowers increase debt levels prior to bankruptcy. Overall, our empirical results establish that delinquent borrowers increasingly turn to shadow debt markets as they approach bankruptcy, suggesting that this behavior could affect equilibrium prices and create negative externalities on non-defaulting consumers.

4 Data and Institutional Details

This section overviews our data sources, data processing procedures, and summary statistics.¹¹

Our main dataset consists of data processed from filings obtained from the U.S. Court’s Public Access to Court Electronic Records (PACER) website. We obtained academic fee waivers that allow us to download data from four bankruptcy court districts: the Northern District of Florida, the Southern District of Florida, the District of Minnesota, and the District of Utah.¹² We selected these districts to give geographical diversity across the United States. For each bankruptcy case in these districts, we search the court docket for the Schedules of Assets and Liabilities and the Statement of Financial Affairs. These documents are required filings for all bankruptcy petitioners and are typically filed either jointly with the bankruptcy petition or within the first week of the bankruptcy filing.

The Schedules of Assets and Liabilities and the Statement of Financial Affairs that constitute the basis of our data contain a rich set of petitioner attributes. Each document contains a summary of the household’s total real estate assets, personal assets, secured debt, unsecured priority debt, unsecured non-priority debt, monthly income, and monthly expenses. In subsequent schedules, petitioners list individually all assets and all liabilities, detailed monthly income and expense budgets, and information on the petitioner’s employment, number of dependents, and marital status. Additionally, individuals list their income over the previous three years in the Statement of Financial Affairs, lawsuits they are a party to, and any businesses they own (among other items). We scrape these PDF documents for the relevant information and reformat it into a standardized dataset.

¹¹See Appendix A for background on the U.S. personal bankruptcy code and bankruptcy court procedures.

¹²Our fee waiver petition to the Florida Middle District was denied.

PACER contains very few electronic PDF documents before 2004. Accordingly, we begin our sample in January 2004 and end in September 2018. In the first two years of our sample, as courts were still adopting electronic filings, coverage ramps up from just over 50% of cases to close to 90% by the end of 2006. Following this time, a small percentage of schedules are handwritten documents that we are unable to process, leaving us with about 90% coverage of all bankruptcy cases through the remainder of the sample.

The resulting dataset contains 606,120 individual bankruptcy filings. Of these, we drop 50,712 cases that are missing portions of either the Schedules of Assets and Liabilities or the Statement of Financial Affairs, which prevent calculating control variables such as employment status or whether the individual owns a business. We also exclude extreme income observations outside the 1st and 99th percentile. Our final sample contains 554,942 observations. Florida Northern, Florida Southern, Minnesota, and Utah make up 7.7%, 34.9%, 32.6%, and 24.8% of the total sample, respectively.

Table 1 reports summary statistics. The average bankruptcy petitioner in our sample declares a current monthly income after required deductions of \$2,973. Calculating the garnishable wages for each petitioner based on the applicable state statute and federal minimum wage, the average petitioner has \$727 in monthly wages potentially subject to wage garnishing by creditors. Average total assets are approximately \$134,000, although this varies widely across the sample with a standard deviation of over \$200,000 and the bottom of the distribution having essentially zero assets. Average total debt is approximately \$240,000, which includes more than \$95,000 in unsecured debt and nearly \$110,000 in mortgage debt, the latter averaging across almost half of the sample with no mortgage. Total indebtedness also varies significantly in the cross section of filers with a long right tail, especially for unsecured debt, which has a standard deviation of \$570,000. On average, bankruptcy filers reported 53% of their liabilities as unsecured debt. The Chapter 7 share of filers in our data is 74%, 56% of the sample are homeowners, and 24% are business owners. Looking at demographics, 33% of bankruptcy petitions were joint filings by a married couple, the average number of dependents is around one (although over half of the sample reports zero dependents), about 12% are unemployed, and very few filers are retired or disabled.

Debt Categories The average debtor has over 30 individual loans reported in their schedules, resulting in over 15 million individual liabilities in our data. To summarize the composition of liabilities at bankruptcy, we categorize these loans by processing the text in the loan description provided. We begin with simple keyword searches for easily-categorized loans with search terms such as “credit card,” “mortgage,” or “auto.” We then use Latent Dirichlet Allocation (LDA) as a topic modeling technique to assign hard-to-categorize loans.¹³ This combined process allows us to classify about 85% of all loans (94% of the total dollar amount of debt) into specific categories. The remaining 15% is placed in an “unknown” category; these unknown loans all have vague descriptions (e.g., “Collections” or “Loan”) that do not allow us to clearly categorize them. Table 2 displays the distribution of debt across these loan categories. Looking across categories, mortgages (63%) and auto loans (29%) comprise the majority of secured debt reported by bankruptcy filers, and around half of bankruptcy filers have a mortgage and around half have an auto loan. Other forms of secured debt are less common among bankruptcy filers and make up less than 3% of total liabilities. Credit card debt is the most common type of unsecured debt—77% of filers report credit-card debt, which makes up 30% of their unsecured debt on average. Unsecured personal loans and retail debt are also common, making up 13% and 11% of unsecured debt, respectively, with each held by a majority of filers in our sample. Student loans are held by almost 25% of the sample, and comprise 8% of unsecured liabilities on average. Several categories of debt are constituted by “unintentional lenders” who are unlikely to report these debts to credit bureaus. This includes medical debt, which is held by over half of our sample and is similar in size to student loans, and unpaid utility bills, which appear in 41% of filings. In addition, debts that are housing related (such as unpaid rent or HOA fees) are likely not reported to credit bureaus, as well as large portions of the unknown category. We discuss these unreported “shadow debts” in the next section. Finally, despite being under acute financial distress, only 9% of filers in our data report outstanding debts identifiable as payday loans or debts to check cashers, comprising less than 0.4% of total debt.

¹³LDA looks for common usage of words across loans and places those loans together in the same “topic.” For example, if “hospital” and “medical” often appear together in a loan description, LDA would then group other loans with the word “hospital” into the medical category even if they do not contain the word “medical.” See Appendix B for further details.

4.1 Shadow Debt

Before using our detailed, individual-level data described above, we use nationally-representative administrative data to document the existence of shadow debt. We define shadow debt as the difference between total debt amounts reported in bankruptcy filings and the amount reported in credit registries. We obtain debt amounts reported on bankruptcy filings from the Administrative Office of the U.S. Courts (AOUSC), which has released aggregate statistics on the total liabilities reported in consumer bankruptcy filings since 2007.¹⁴ To measure total debt reported in credit registries at bankruptcy, we use data from Razeto and Romeo (2019), who identify bankruptcy filers from a nationally-representative sample of five million de-identified credit records.¹⁵ A comparison of these two sources reveals that unsecured shadow debt is quite large, while it is essentially non-existent for secured debt. From 2007 to 2018, AOUSC data reports an aggregate of \$442.3 billion (2001 dollars) more in unsecured debt on bankruptcy filings than what is recorded on credit registries from the same time period. This translates to \$36,500 in unsecured shadow debt per bankruptcy case on average. Meanwhile, secured debt amounts from the two sources are nearly identical, with the average bankruptcy case having about \$200 more secured debt reported in the credit registry than what is reported on the bankruptcy filing. This is expected, as nearly all secured debt is originated by formal lenders that report to credit bureaus.

The difference in unsecured liabilities between credit reports and bankruptcy filings reflect the fact that credit bureaus can only collect information on debts that are reported to them, typically by formal lending institutions, retail institutions with formal lending arms such as store brand credit cards and, in some cases, debt collectors. By contrast, bankruptcy filings reveal a wide array of liabilities that would not generally appear on a credit report, including bounced checks, unpaid medical, utility, or telecommunications bills, and fines and fees. In search of maximal relief from creditors, an individual filing for bankruptcy has strong incentives to list all of their debts, such that we view the liabilities listed in the Schedules of Assets and Liabilities to represent a complete

¹⁴Data available at <https://www.uscourts.gov/statistics-reports/caseload-statistics-data-tables>. Accessed 14 October 2021.

¹⁵We thank Charles Romeo and the CFPB for sharing aggregate numbers from this report with us. For confidentiality, we have been asked not to share the numbers in this paper, but the data are those used to create Figures 5 and 6 in their report, rounded to the nearest \$1,000.

view of their total indebtedness.¹⁶ Since such debt is not administratively reported anywhere else, bankruptcy potentially offers the only opportunity to characterize the size and scope of such informal credit markets.

Having established that shadow debt is large in administrative data, we merge a set of bankruptcy filers from our individual level data to credit-bureau records to better understand shadow debt and its dynamics. The credit-bureau data available to us contain only individuals who have had or currently have a mortgage serviced by one of the top twenty mortgage servicers, and details of the merging process are available in Appendix C.¹⁷ Given that there is little to no secured shadow debt, we focus only on unsecured shadow debt. Indeed, we verify in our data that a relatively small portion of our sample have second mortgages, home equity lines of credit, or auto loans that do not appear in the credit report. Such secured shadow debt likely reflects a reporting issue in the credit registry. Meanwhile, unsecured debt varies widely between the bankruptcy schedules and credit records. The average borrower in our sample has \$41,680 in shadow debt, a figure remarkably similar to the \$36,500 we estimate based on nationally-representative administrative data. Shadow debt makes up 7% and 11% of the average and median bankrupt individual’s total listed debt, respectively, and composes 44% of the average individual’s total unsecured debt at the time of bankruptcy. Informal credit markets constitute a material portion of total liabilities for individuals in acute financial distress.

The accuracy of our shadow debt estimates relies on the accuracy of each dataset and the fidelity of the merge between them. The similarity of the shadow debt estimate between national administrative data and our individual-level dataset is reassuring that our estimates are not being affected by a low-quality merge. Even so, we note that, because we do not have unique identifiers, the merge between the datasets will necessarily be imperfect. We examine whether incorrectly merged records are affecting our results by alternatively focusing on the set of observations for which there is only a single bankruptcy filing in a 5-digit zip \times filing-month cell. In these cases, we have a one-to-one merge between the two datasets and are confident that close to 100% of

¹⁶There is very little incentive for a filer to inflate their filing with exaggerated debt, and debts are also verified, whenever possible, by the court-assigned trustee.

¹⁷The limited sample of credit bureau data available has the potential to introduce some selection concerns, and some of our findings on shadow debt will be limited only to mortgagors. However, we note that whenever possible in our analysis (for tests that do not use credit bureau data), we use the full sample of bankruptcy filers and find similar results. We discuss sample selection below as we proceed through the analysis.

these matches are correct.¹⁸ For these 6,046 observations, we find that the 25th, 50th, and 75th percentiles of shadow debt levels are \$11,100, \$28,400, and \$60,800, respectively—a distribution almost identical to the distribution estimated using the full sample of matches. Furthermore, in contrast to the mean-zero differences that would be expected under a low-quality-merge data generating process, we find that the total amount of unsecured debt on credit records only rarely exceeds the total amount of unsecured debt on bankruptcy filings for a given individual. The average and median unsecured debt on credit-bureau records are \$57,800 and \$14,700, respectively, while on the bankruptcy schedules, the comparable figures are much larger at \$94,700 and \$44,500. Finally, shadow debt summary statistics are similar for single and joint filers, suggesting that misattributing debt to one spouse instead of another is not driving our shadow-debt findings.

A second potential concern is that debt amounts reported in the bankruptcy filings are fraudulently inflated, making it appear that there is a large amount of shadow debt. This is unlikely to be the case because the schedules are most often prepared by a bankruptcy lawyer and are always reviewed by a trustee, both of whom require documentation of loans so that creditors can be notified and an official record of debt discharge created. A final concern is that debt amounts in the credit reports are lower simply due to a lag in reporting or differences between the timing of the bankruptcy filing and when the credit report is pulled in our data. However, we find essentially identical amounts of shadow debt regardless of whether we use the credit report from a month prior to or a month after the bankruptcy filing. Timing differences between bankruptcy filing and credit records cannot explain the preponderance of shadow debt that we detect.

Shadow debt constitutes a large proportion of total liabilities for bankrupt individuals. We cannot precisely determine which loans in the bankruptcy schedules are not in credit reports because our credit-bureau data do not contain loan-level detail. However, we note that loan categories that are likely to contain shadow debt are large. In particular, medical debt, unpaid rent or utility bills, deficiency balances on repossessed vehicles, legal costs, bounced checks, and other fees are, for the most part, not reported to credit bureaus. These categories alone amount to \$45,400 for the average bankrupt borrower in our dataset.

To further unpack our shadow debt measure, we estimate the correlation between the unsecured

¹⁸To verify this assumption of high match-quality for this subsample, we note that outstanding first mortgage amounts in the two datasets are within \$2,000 of each other for the vast majority of these matches even though we are not using the mortgage amount for the match.

shadow debt share of total debt and the unsecured debt categories in Table 2 at the individual level. Figure 3 plots the resulting correlation coefficients in descending order. The types of unsecured liabilities that are most correlated with shadow debt are housing-related (e.g., unpaid rent), unknown unsecured (e.g., debt in collections without other identifying information), miscellaneous unsecured (e.g., unpaid insurance premia and bounced checks), unsecured auto (e.g., the negative-equity portion of a car loan), medical, and business-related. Utilities, payday loans, and priority unsecured liabilities (e.g., unpaid taxes) are also positively correlated with shadow debt. Meanwhile, unsecured liabilities that are usually well captured by credit reports are not correlated with shadow debt (student loans) or are negatively correlated with shadow debt (personal loans, retail, and credit card debt). Combining these correlations with the overall debt share statistics in Table 2, we estimate that the largest components of informal shadow debt are medical debt and debt in the unknown category. Examining word frequencies in the unknown category, the most common words are related to debt that is in collections, with the original creditor or purpose unspecified.

We reiterate that credit bureaus are not designed to collect data on such liabilities (and in some cases are legally prohibited from doing so). Accordingly, rather than an indictment on the accuracy of credit records, these descriptive statistics show that informal credit markets are large and important sources of credit for distressed borrowers. In our analysis below, we seek to better understand how debtors accumulate shadow debt in the run-up to bankruptcy by estimating how shadow debt responds to changes in the costs and benefits of entering bankruptcy.

5 Estimation

Basic descriptive statistics establish that shadow debt is an important source of credit for distressed households. In the remainder of the paper, we further explore the usage of shadow debt as individuals approach bankruptcy. This is difficult from a data perspective, as shadow debt is unobservable except at the time of bankruptcy. We begin with Panel A of Figure 1, which displays the average total formal debt held by individuals over the course of three years prior to filing for bankruptcy, using all individuals in our credit bureau data with at least three years of data recorded prior to entering bankruptcy.¹⁹ From 36 to about 15 months prior to bankruptcy, formal debt increases

¹⁹For this figure, we use all individuals in the credit bureau data who file for bankruptcy across the U.S.; we do not limit to the Utah, Florida, and Minnesota bankruptcy districts.

by about \$17,000 for the average filer. However, at this point formal debt plateaus for a period of time, and then actually decreases starting about nine months before bankruptcy. We see a similar pattern in Panel B, which shows total unsecured debt before bankruptcy. The decline in credit registry debt leading into bankruptcy is consistent with either a reduction in credit supply or credit demand. In particular, if formal lenders who report to credit bureaus are informed, they will likely decrease the supply of credit for highly delinquent borrowers. Alternatively, credit demand by distressed borrowers may decline as they approach bankruptcy, potentially as they delever in an effort to ease their financial distress. While both of these hypotheses are plausible, our analysis below suggests that the decline in formal debt balances likely reflects contracting credit supply, as distressed borrowers shift their borrowing into shadow debt markets. Further, since severely distressed borrowers are likely also cash constrained, one would anticipate that their demand for liquidity would likely remain high. It is therefore puzzling how they are able to avoid bankruptcy for nearly two years without access to liquidity.

We hypothesize that shadow debt is a significant portion of this liquidity, but we cannot dynamically measure shadow debt borrowing in a similar way, as shadow debt is by definition not recorded in any credit registry. For a small subset of filers, the precise date of incursion for individual liabilities is reported on their Schedules of liabilities. Using this information, we construct Figure 2. This figure shows the distribution of total unsecured debt outstanding as reported in the credit registry and on the bankruptcy filing at two points in time: six months prior to filing and at the time of bankruptcy. We observe that median debt on the credit registry declines by \$5,377 in the six months leading up to bankruptcy, but debt recorded on bankruptcy schedules rises by \$16,611 in the six months prior to bankruptcy. The \$22,000 gap between these two sources indicates that distressed individuals turn to shadow debt as a significant source of liquidity after being shut out of formal lending markets.

Figures 1 and 2 are suggestive evidence in favor of the hypothesis that distressed borrowers rely on shadow debt. However, liabilities listed on the bankruptcy filing only contain debt outstanding at the time of bankruptcy. This limits the interpretation of Figure 2 because we may be missing some shadow debt that was outstanding six months prior to bankruptcy that was subsequently paid off. For example, suppose that a distressed borrower has \$10,000 of shadow debt at month $t-6$, and that she pays off \$5,000 of this prior to filing for bankruptcy. In our data, we would only observe

\$5,000 of shadow debt at time $t-6$ because the other \$5,000 was paid off prior to bankruptcy. Thus, while Figure 2 is suggestive of consumers relying on shadow debt as they approach bankruptcy, it does not prove it.

Given this data limitation, we turn to a natural experiment that illuminates how the infra-marginal bankruptcy filer interacts with shadow debt markets using more comprehensive data. In particular, we exploit federal minimum-wage changes that affect the amount of wage garnishing a delinquent borrower could experience.²⁰ When an individual files for bankruptcy, this halts any wage garnishment. Hence, decreases in wage garnishment reduce the benefits of bankruptcy, leading marginal filers to potentially delay filing. If borrowers rely on shadow debt to fund these delays, we would expect to see that borrowers with exogenously lower wage garnishment simultaneously have more shadow debt and longer periods until entering bankruptcy. Further, we would not anticipate that they would have higher formal debt if they are credit constrained by these lenders.

We identify quasi-exogenous variation in wage garnishment from changes to the federal minimum wage, which occurred on July 24th in 2007, 2008, and 2009 during our sample period. The statutory maximum amount of income per month that can be garnished for an individual is

$$Garnishable\ Wages_{it} = \begin{cases} 0 & \text{if } Inc_i \leq 4.33\omega_s MinWage_t \\ Inc_i - 4.33\omega_s MinWage_t & \text{if } 4.33\omega_s MinWage_t < Inc_i < 5.8\omega_s MinWage_t \\ 0.25 \cdot Inc_i & \text{if } Inc_i \geq 5.8\omega_s MinWage_t \end{cases} \quad (1)$$

for borrower i filing in bankruptcy district court s on date t . For each individual, we measure Inc_i as the income they report on their bankruptcy filing after withholding taxes, and $MinWage_t$ is the prevailing minimum wage on the date when the individual enters bankruptcy. Individuals earning below the subsistence amount $4.33\omega_s MinWage_t$ are not garnished at all. We multiply $\omega_s \cdot MinWage_t$ by 4.33 to convert it to a monthly figure. The prevailing federal minimum wage $MinWage_t$ is measured on the date when the individual enters bankruptcy.

This statutory structure results in three possible income regions, plotted in Figure 4. For higher-income individuals with $Inc_i > 5.8 \cdot \omega_s \cdot MinWage_t$, maximum garnishable wages are simply 25% of income. For low-income individuals whose income is below a given subsistence level $4.33 \cdot \omega_s \cdot MinWage_t$, there is no allowable wage garnishing. In Florida and Utah, the subsistence allowance

²⁰See Appendix D for more details on wage garnishment.

ω_s is the federally mandated minimum of 30 hours of federal minimum wage earnings, while in Minnesota $\omega_s = 40$.²¹ In the middle region, when $4.33 \cdot \omega_s \cdot MinWage_t < Inc_i < 5.8 \cdot \omega_s \cdot MinWage_t$, every marginal dollar of income above $4.33 \cdot \omega_s \cdot MinWage_t$ is garnishable. Importantly, the boundaries between these regions depend directly on $MinWage_t$. When the federal minimum wage increases, a) individuals just above the lower boundary are pushed into the no-garnishing region, b) all individuals in the middle region are garnished less, and c) individuals just above the upper boundary move to the middle region and are garnished less. For this reason we refer to the middle region of income as the treated region in our experiment.

For example, as illustrated in Figure 4, prior to July 24, 2007 when $MinWage_t = \$5.15$, an individual in Utah with a monthly income of \$750 has garnishable wages of $\$750 - 4.33 \cdot 30 \cdot \$5.15 = \$81.02$, or 10.8% of their income. On July 24, 2007, the federal minimum wage increased to \$5.85. Beginning with this date, a debtor with an income of \$750 will no longer face any wage garnishing. The foundation of our identification strategy is that such federal minimum wage increases alter the incentives for otherwise identical debtors who haven't filed before the minimum wage increase to delay bankruptcy because they have discontinuously lower garnishable wages and thus higher take-home pay. We address the possibility that federal minimum wage changes affect distressed-borrower indebtedness in other ways in section 5.3 below.

We estimate the effect of a change in wage garnishment on debt amounts at bankruptcy or delays in entering bankruptcy (generically denoted Y_{ist}) by estimating equations of the form

$$Y_{ist} = \pi_1 \cdot Treatment_i \times Garnishable\ Wages_{ist} + \pi_2 \cdot Treatment_i + \pi_3 \cdot Garnishable\ Wages_{ist} + \pi_4 \cdot Treat_i \times Income_i + X_i' \pi_5 + \psi_s + \theta_t + v_{ist}. \quad (2)$$

Our objective is to isolate within-year variation in garnishable wages for borrowers with identical incomes.²² This objective is complicated by the fact that income and garnishable wages are perfectly collinear for anyone with income exceeding $5.8 \cdot \omega_s \cdot MinWage_t$. By contrast, in the middle income

²¹Florida household heads earning less than \$750/week may file an affidavit for exemption from wage garnishing if they contribute more than half of the support for a dependent family member. Minnesotans eligible for public assistance in the last six months are exempt from wage garnishing. For a detailed overview of state-level wage garnishing statutes, see Carter (2020).

²²It is possible that wage garnishment changes only affect bankruptcy filings gradually, in which case including year fixed effects might force comparisons between treated and control samples before garnishment impacts the treated sample. Our results are essentially unchanged if we allow for broader comparisons by using two-year fixed effects instead of one-year.

region defined by $4.33 \cdot \omega_s \cdot \text{MinWage}_t < \text{Inc}_i < 5.8 \cdot \omega_s \cdot \text{MinWage}_t$, income and garnishable wages are no longer collinear because of within-year changes in MinWage_t . To isolate this treated region of incomes from a control region of incomes where wage garnishment is not impacted by changes in the minimum wage, we define $\text{Treatment}_i = 1$ for monthly incomes between \$600 and \$1,300.²³ In specifications utilizing merged credit bureau and bankruptcy filing data, 5% of bankruptcy filers have incomes in the treatment region. In the specifications that do not require the credit-bureau merge, treated borrowers represent 10% of the sample.

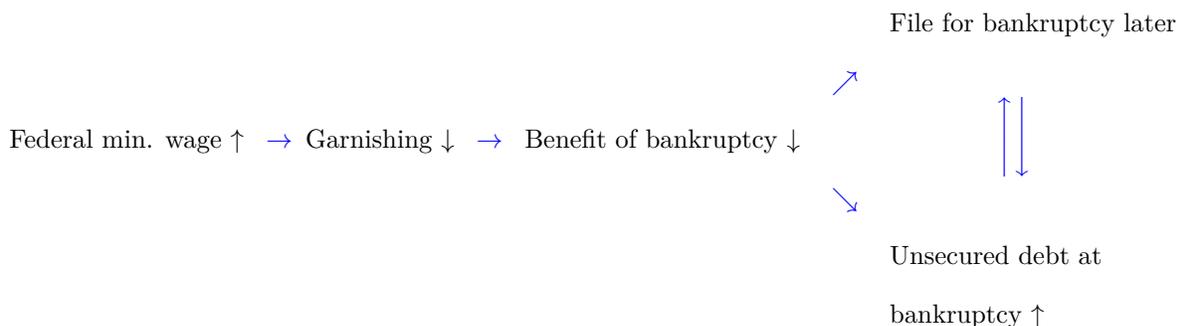
Equation (2) estimates the impact of an additional \$100 of wage garnishment on Y_{ist} for borrowers of identical income with the $\text{Treatment} \times \text{Garnishable Wages}$ interaction. Controlling for $\text{Treatment} \times \text{Income}$ allows the effect of income to differ in the treated region and means that the only residual variation in $\text{Treatment} \times \text{Garnishable Wages}$ will be due to within-year minimum-wage changes. Outside the treated region, income and garnishment are perfectly collinear such that the income main effect is absorbed by the garnishable wages main effect. Filer controls X_i improve our precision in subsample tests and include other plausible shifters of outcomes: the number of dependents and indicators for bankruptcy chapter choice, marital status, homeownership, business ownership, credit score, retired status, and disability status.²⁴ To allow for time shocks or fixed differences across courts in average filing timing, we control for court-district fixed effects ψ_s and year fixed effects θ_t . Subsequent robustness checks control for unobservable geographic variation over time by including court-district \times year fixed effects and allow for time-varying income elasticities through income \times year fixed effects and income quartile controls. Conditional on this rich set of controls, the coefficient π_1 will be identified from filers that have identical incomes and filed in the same year but faced different potential wage garnishing levels because they filed before or after a federal minimum wage change.

We focus on two sets of outcome variables Y_{ist} . The first set are debt amounts at the time of bankruptcy, with a particular emphasis on shadow debt. Second, we test whether changes to wage garnishment induce individuals to delay entering bankruptcy, where the delay is measured as the time from their first 90-day delinquency on any debt until they enter bankruptcy. We test

²³We expand the treatment region outside the sharp kinks shown in Figure 4 and implied by the expression in equation (1) ($4.33 \cdot \omega_s \cdot \text{MinWage}_t < \text{Inc}_i < 5.8 \cdot \omega_s \cdot \text{MinWage}_t$) to allow for income volatility and measurement error (if unobserved garnishing from alimony or taxes affected income, for example).

²⁴All of our results are also robust to not including additional controls and fixed effects.

for these two outcomes because we hypothesize that delinquent borrowers respond to a decrease in wage garnishment by accumulating more shadow debt and delaying entering bankruptcy. These two actions are likely jointly determined. Consumers need time to accumulate shadow debt, and in this sense the delay leads to more shadow debt. At the same time, if shadow debt markets did not exist, it is likely that these borrowers would not be able to delay filing for a full month in response to a \$100 liquidity shock due to decreased wage garnishment. Thus, the causal chain we have in mind is:



5.1 The Accumulation of Shadow Debt

We first focus on how changes to wage garnishment affect the amount of shadow debt held at the time of bankruptcy. In particular, we estimate Equation 2 with the outcome variable $Y_{ist} = \frac{Shadow\ Debt_{ist}}{Total\ Debt_{ist}}$, where $Shadow\ Debt_{ist}$ is defined as the difference between unsecured debt reported on the bankruptcy filing and unsecured debt in an individual's credit report. In Section 5.2 below we will show that individuals with lower wage garnishment also delay filing for bankruptcy.

The summary statistics in section 4.1 show that shadow debt represents a large and meaningful segment of the consumer credit complex, at least for distressed borrowers. Distressed borrowers may be most likely to accumulate shadow debt because shadow debt lenders (such as utility companies or hospitals) are unlikely to check credit reports before providing goods or services on credit. Table 4 shows that when *Garnishable Wages* declines due to a change in the federal minimum wage, treated individuals enter bankruptcy with more shadow debt. This holds true across various fixed effect structures and flexible controls for the income of the filer. The estimates indicate that when *Garnishable Wages* decline by \$100, shadow debt comprises a 1.8 to 2.1 percentage point higher share of total debt. Even taking the most conservative estimate, this translates to an additional \$6,900 of shadow debt at the time of bankruptcy. For context, note that \$100 is roughly the average

decrease around a minimum wage increase for a treated debtor in our sample.²⁵

We next examine how overall unsecured debt responds to changes in wage garnishment by using $\frac{Unsecured\ Debt_{ist}}{Total\ Debt_{ist}}$ as the dependent variable. Table 5 displays the results. We find that unsecured debt as a fraction of total debt rises by 0.8 to 1.2 percent of total debt in response to a \$100 decline in *Garnishable Wages*. In dollar terms, this equates to about \$4,000 more of unsecured debt. The point estimates in Tables 4 and 5 indicate that the filing delays induced by minimum wage increases have a larger effect on shadow debt than total unsecured debt. These coefficients are not statistically different from one another, and we cannot reject the hypothesis that the increase in unsecured debt is completely comprised of an increase in shadow debt. It is also possible that some borrowers use shadow debt to pay back some formal unsecured debt. Regardless, it is clear that essentially all of the increase in unsecured debt comes in the form of shadow debt, consistent with the hypothesis that severely distressed borrowers rely on informal lenders to provide liquidity.

The first four columns of Table 5 use only the credit-bureau matched sample to be comparative to results in Table 4. However, we do not need credit bureau data to estimate the impact of wage garnishment on total unsecured debt, and hence we can check whether we continue to find an increase in unsecured debt in the full sample of bankruptcy filers. The final column of Table 5 displays this result, showing that unsecured debt increases by 0.46% of total debt (in dollar terms, about \$1,200) in response to a \$100 decline in *Garnishable Wages*. Hence, we find the same directional effect in the full sample as the credit-bureau matched sample, although it is smaller in magnitude. This suggests that wage garnishing effects are stronger for treated bankruptcy filers in our mortgagor-heavy credit-bureau sample, potentially because they have higher expenses and more debt overall. Regardless, we continue to find an economically and statistically significant increase in unsecured debt in the full sample.

5.2 Bankruptcy Timing

When wage garnishment declines the immediate benefit of entering bankruptcy is reduced and treated borrowers may delay filing for bankruptcy. We test this hypothesis by putting a measure of the time interval between when borrowers are at risk to file and when they actually file, *months*

²⁵Each minimum wage increase in our data was \$0.70/hour. For a debtor on the relevant part of the garnishing schedule defined by equation (1) and plotted in Figure 4, this decreases maximum garnishable wages by \$90.93/month for Florida and Utah filers and \$121.24/month for Minnesota filers.

to file, on the left hand side of Equation 2. *Months to file* is defined as the number of months from when a borrower first becomes 90 days delinquent on any debt in their credit file until the month in which they file for bankruptcy.

Table 6 shows that delinquent borrowers who are treated with lower wage garnishment tend to delay filing for bankruptcy. The estimated coefficient in column 1 of -1.12 months indicates that a \$100 decrease in monthly garnishable wages increases the number of days between the first 90-day delinquency and bankruptcy filing date by an average of 1.03 months. Columns 2-4 repeat the estimation with different combinations of fixed effects, with coefficient estimates all close to a one-month delay in entering bankruptcy.²⁶

The analysis shows that when borrowers have marginally lower incentives to enter bankruptcy, they tend to simultaneously incur around \$6,000 additional shadow debt and delay filing for a month. As explained above, these two outcomes are likely co-determined: borrowers would not be able to delay bankruptcy without accessing additional liquidity via shadow debt, and they would not incur more shadow debt without having time to do so by delaying bankruptcy. A testable implication of this connection between shadow debt accumulation and bankruptcy timing is that treated borrowers should incur a higher share of their unsecured debt closer to their bankruptcy filing. We estimate this relationship using the timing of newly originated debt, measured in a limited sample of liabilities listing precise origination dates. About 14% of the full bankruptcy sample has debt incursion dates available. Using these dates, we calculate the fraction of total debt at bankruptcy that was originated within six months of the filing date. In Table 7, we find that a decrease in garnishable wages is associated with a statistically significant 28 bp increase in debt accumulated within the six months before filing. While we can only perform this exercise on a limited subsample of our data, the pattern of increased debt accumulation just prior to filing is consistent with borrowers incurring more debt as they delay their filing. This additional result also helps to rule out alternative explanations of our results such as sample selection. In the next section we directly address these concerns.

²⁶Some individuals transition in and out of being at least 90 days past due several times before entering bankruptcy. All of our results are robust to defining *months to file* using 120 days past due or using the last month before bankruptcy in which a consumer becomes 90 days past due on a debt.

5.3 Exclusion Restriction and Selection Concerns

The core hypothesis of our empirical specification is that changes to wage garnishment affect the timing and amount of shadow debt individuals have when they file, thereby helping to better map out the dynamics and consequences of delinquent borrowers turning to shadow debt markets prior to filing for bankruptcy. The exclusion restriction requires that the estimated changes are the result of changes to wage garnishment and not through some other channel. One possible violation of the exclusion restriction would be selection concerns. Because we can only observe shadow debt for individuals who actually file for bankruptcy, we are forced to condition the sample on the endogenous outcome of bankruptcy, potentially resulting in a selected sample. For example, varying the level of wage garnishing could affect average-filer indebtedness by changing the composition of who files for bankruptcy. In particular, our estimates could be biased by selection effects if a decrease in garnishable wages causes debtors with low unsecured debt to not file altogether or if borrowers with low garnishable wages have consistently larger unsecured debt shares regardless of when they do file.

We evaluate such selection concerns empirically along several dimensions; overall, we find no evidence that sample-selection concerns are biasing our results. First, we consider whether wage garnishment affects the overall number of individuals that enter bankruptcy. If selection is at play, we should see changes in the prevalence of bankruptcy filings after minimum wage changes. Figure 7 plots total weekly personal bankruptcy filings in Florida, Minnesota, and Utah per 10,000 people in event time, where the event is any of the three changes in the federal minimum wage. We estimate these counts in event time after controlling for the state-level unemployment rate and state and week-of-year fixed effects from 25 weeks prior to the minimum wage change to 26 weeks after the change, covering one year in total. We do not see any change in the filing rate around minimum-wage induced changes in wage garnishing. For contrast, we note that bankruptcy filing rates can respond dramatically to filings incentives, as the Bankruptcy Abuse Prevention and Consumer Protection Act of 2005 caused a dramatic increase and decline in filings at its passage. As is apparent in Figure 7, minimum wage changes have no such effect; all point estimates are statistically indistinguishable across the year of a minimum wage change. Further, the differences in point estimates are very small, with post-minimum wage change estimates being only three more

filings per million people than pre-minimum wage changes.

In the same spirit, we test directly whether the distribution of filer incomes changed around the three minimum wage changes. Figure 6 plots several percentiles of the filer income distribution by month of filing. In most months, bankruptcy filers at the second percentile or below report zero income. As illustrated in Figure 4, borrowers whose wage garnishing was affected by minimum wage changes have incomes in the \$600–1,300 range. The income percentiles in this range evolve smoothly following each minimum wage change, exhibiting the typical time-series volatility evident in other months, and in parallel with incomes outside this range from unaffected borrowers. Confirming this, Figure 7 shows that the income distribution of filers before and after each minimum wage change is identical in the control and treated regions. In particular, each figure uses two full years of bankruptcy filing data surrounding the minimum wage change, and plots the income histogram both before (semi-transparent bars) and after (solid bars) the minimum wage increase. Blue bars indicate income regions where wage garnishment was not affected by the minimum wage increase; green bars indicate the treated region. If changes to wage garnishment changed filing rates on the extensive margin, we would anticipate that in the post period the histogram of filers in the treated region would be higher or lower than the pre period. However, we find that the two histograms are identical in all three cases. Kolmogorov-Smirnov tests for equivalence of the pre and post distributions for each of the 2007, 2008, and 2009 minimum wage changes are 0.013 ($p = 0.40$), 0.011 ($p = 0.46$), and 0.008 ($p = 0.64$), respectively. In all cases, we do not see significant selection in or out of bankruptcy around the event dates.

At the individual level, we can use credit-bureau data combining bankruptcy filers and non-filers to test whether the likelihood of entering bankruptcy changes after the federal minimum wage increases. Our credit bureau data does not contain the income of the individual, but we can observe the debt-to-income of the individual at the time they originated their mortgage to impute income.²⁷ Using this as a proxy for income, we estimate regressions testing whether the likelihood of entering bankruptcy changes in the treated region after minimum wage increases. We first identify all individuals in the full, nationwide credit bureau data who become 90-days delinquent on at least one loan. We then calculate the fraction of these already-delinquent borrowers who file for bankruptcy within two years of becoming delinquent. In Table 8, we test whether the

²⁷Debt-to-income comes from McDash, which was merged to the credit bureau data.

2-year likelihood of entering bankruptcy changes among treated individuals after minimum wage increases. In all cases, we find precisely-estimated zero effects. Based on this nationwide sample, it does not appear that minimum-wage induced changes in wage garnishing has any effect on the likelihood that an individual enters bankruptcy. In Appendix Figure A1 we provide additional evidence against selection using the credit-bureau data, showing that the propensity to file across *all* delinquent borrowers (not just those in the treated income region) does not change after a minimum wage increase. Further, Appendix Figure A1 shows that the total debt of *non*-filers does not change after minimum wage increases, ruling out a compositional effect in which shocks to wage garnishment induce filers with more debt to enter bankruptcy while those with less debt do not. Appendix Table A1 further rules out compositional changes to filer observables as a function of the instrument as we see no response to the instrument in filer characteristics. Moreover, all three national minimum wage changes were decided in advance as part of the Fair Minimum Wage Act of 2007 such that the policy changes themselves were not endogenous to shocks to the indebtedness of debtors in the treated income band. Finally, if a material change in filer composition occurred, it would be reasonable to expect a change in both unsecured and secured debt amounts; we see no such response in secured debt amounts (Appendix Table A2).

Our findings that there is no selection in response to wage garnishment are also consistent with Severino and Brown (2017), who argue that bankruptcy generosity does not effect the extensive margin of filing, and papers showing no relationship between foreclosure delays and mortgagors' ultimate default behavior (Gerardi et al., 2013; Cordell et al., 2016).

A remaining possibility is that the minimum wage change itself directly affected the demand for debt (i.e. an income effect) or mechanically affected the payback of outstanding debts by reducing the amount of wages garnished to pay down debt (i.e., a mechanical effect). The mechanical effect of decreased wage garnishment leading to higher debt is unlikely to be driving our findings as we estimate a \$6,000 increase in shadow debt when wage garnishment declines by only \$100. The magnitude of the mechanical effect is not large enough to explain the overall effect. We rule out income effects by focusing on Florida, where the state-level minimum wage was *higher* than the federal minimum wage during this time period. Because of this, the federal minimum wage increases in 2007, 2008, and 2009 did not have any direct income effect on minimum-wage workers in Florida. But, because wage garnishment limits are set by the federal minimum wage, their

wage garnishment is effected. As shown in Appendix Tables A3 and A4, when we limit the sample to Florida bankruptcies we continue to find that treated filers increase shadow debt and delay bankruptcy.

6 Conclusion

As borrowers miss debt payments and enter delinquency, informed lenders will reduce credit supply in an effort to minimize their losses. This paper documents that as formal credit supply contracts, delinquent borrowers turn to informal shadow debt as an important source of liquidity as they delay entering bankruptcy. Shadow debt for an average bankruptcy filer totals about \$40,000 at the time of bankruptcy, and filers wait an average of 22 months after their first serious delinquency before filing for bankruptcy. While the existence of shadow debt can be established with descriptive statistics from national-level administrative data, it is impossible to observe in current datasets the extent to which consumers increase shadow debt as they approach bankruptcy. Our analysis utilizes new and uniquely detailed bankruptcy filing data and an identification strategy that isolates quasi-exogenous variation in the incentive to delay filing for bankruptcy to document how consumers accumulate shadow debt leading up to filing for bankruptcy.

Borrowers facing decreased wage garnishing due to minimum wage increases accumulate an additional \$6,000 of shadow debt while simultaneously delaying filing an average of one month relative to otherwise similar borrowers. These same borrowers do not appear to accumulate any additional debt from formal lenders, suggesting that they are constrained in these credit markets. Instead, distressed borrowers turn to “unintentional creditors,” including sellers of goods and services who become creditors only after buyer nonpayment. A series of robustness checks provide evidence that our results cannot be explained by selection effects or by direct effects of the minimum wage increases.

Shadow debt markets clearly provide important financing options to many borrowers, especially for large and unexpected costs such as medical bills. At the same time, shadow debt lenders have a significant information disadvantage, resulting in an equilibrium in which highly distressed borrowers incur large amounts of shadow debt just before entering bankruptcy. Regardless of whether these distressed borrowers are intentionally running up the tab or simply seeking to stave

off bankruptcy as long as possible, discharged shadow debt creates losses for these unintentional lenders. In a typical year, aggregate shadow debt discharged in bankruptcy amounts to about \$40 billion dollars.²⁸ These losses are likely passed on to non-defaulting consumers in the form of higher prices for goods and services that are typically financed with shadow debt.

Large amounts of shadow debt do not necessarily mean that bankruptcy should be made less generous in an effort to reduce losses in shadow debt markets. Instead, a social planner might optimally encourage potential defaulters to enter bankruptcy more quickly to free up cash flows to fund future consumption. In this way, bankruptcy could still provide insurance against bad luck and encourage socially valuable risk taking while still minimizing the deadweight losses associated with delinquent borrowers incurring additional debt in uninformed shadow debt markets.

²⁸From 2007 to 2018, total unsecured debt reported on bankruptcy filings amounted to \$442 billion more than unsecured debt reported in credit reports (Razeto and Romeo (2019)), or \$40.2 billion per year.

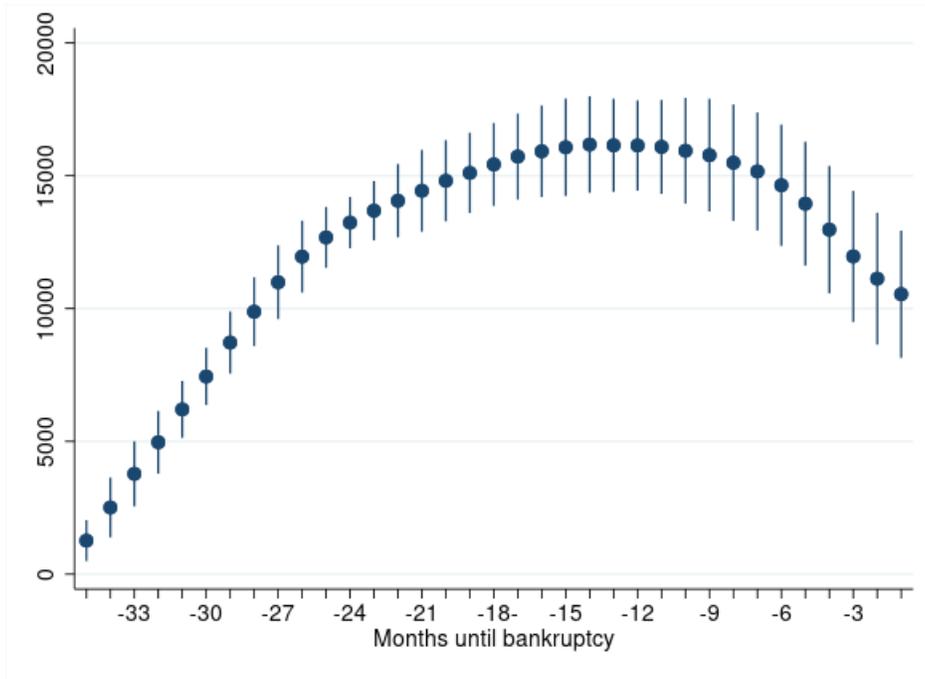
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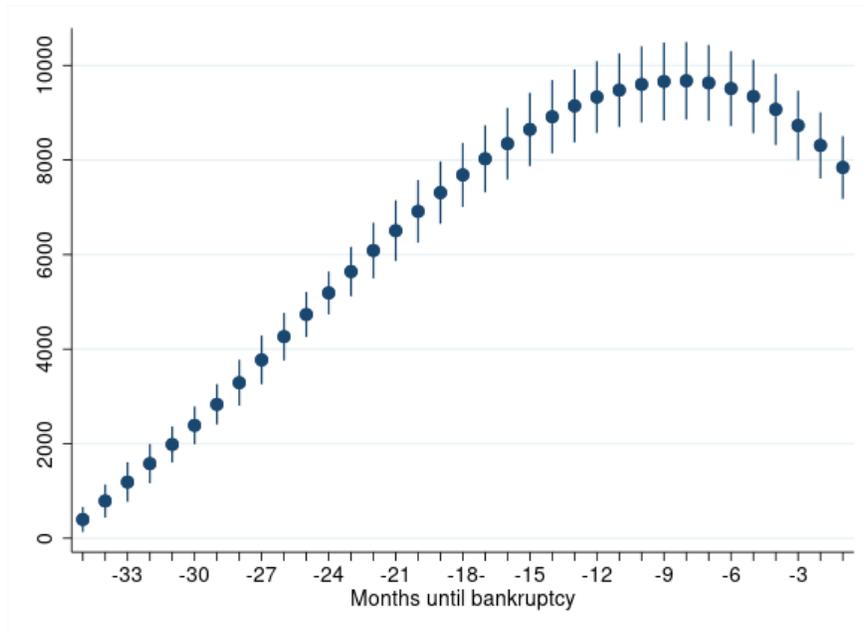
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Figure 1: Evolution of Debt on Credit Report Before Bankruptcy



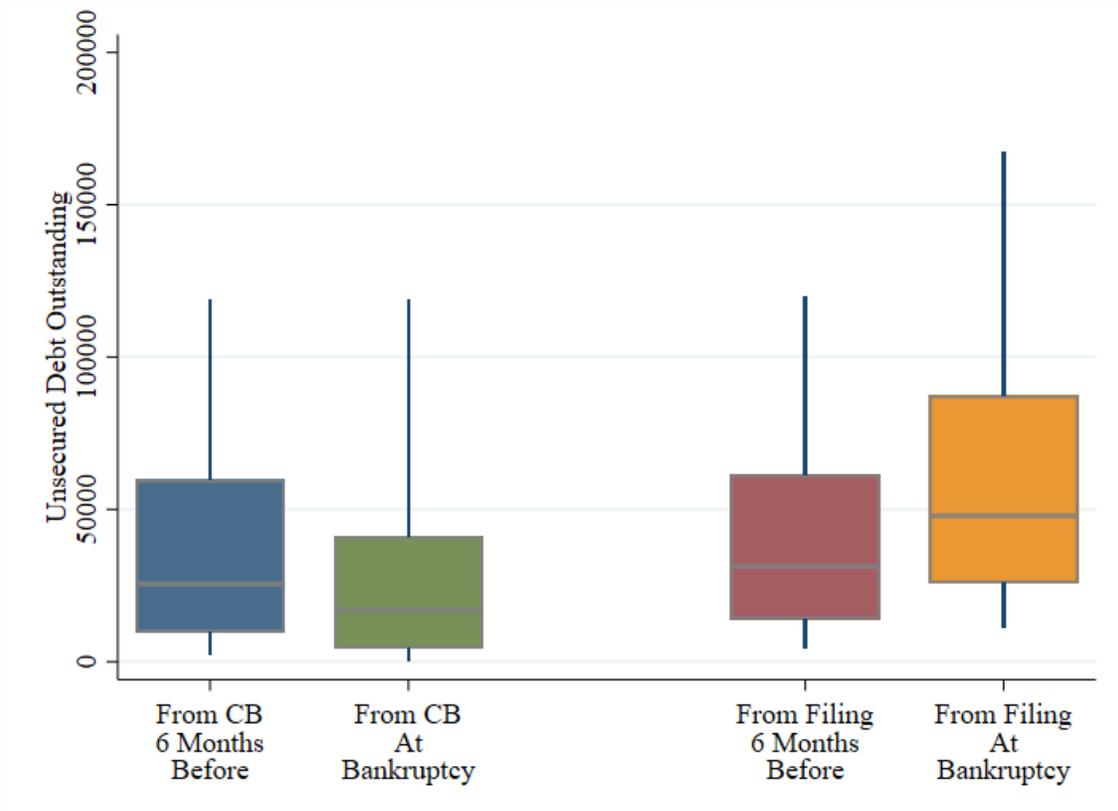
Panel A: Total Debt



Panel B: Unsecured Debt

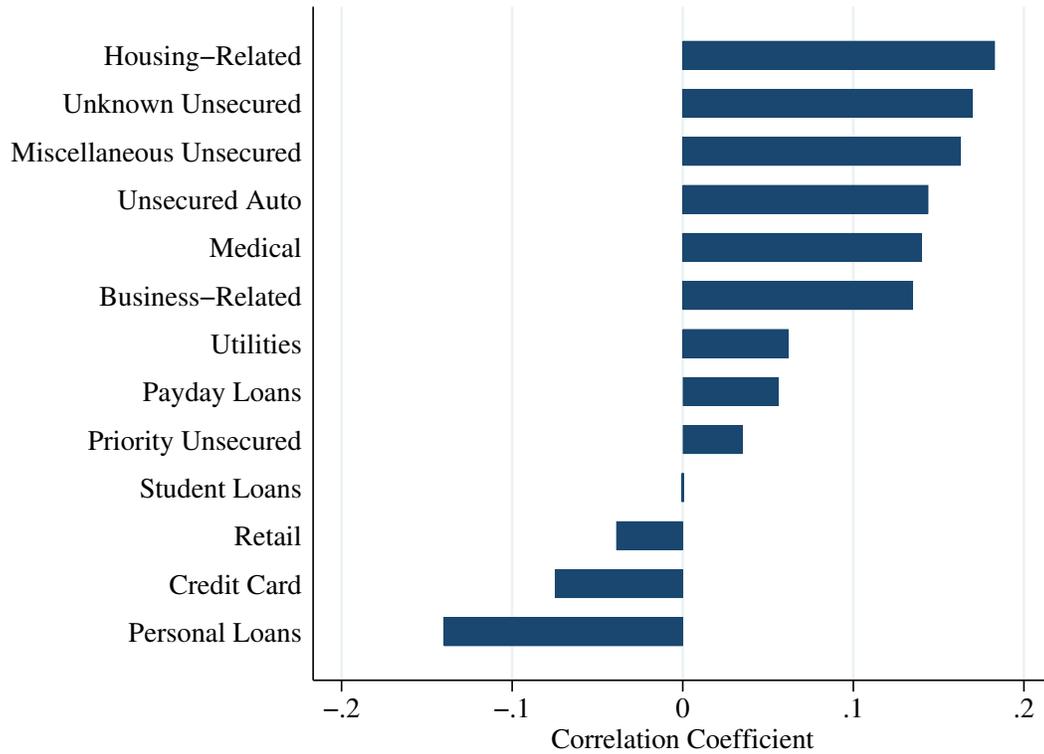
Notes: Figure plots the evolution of debt levels as recorded in credit registries for three years prior to bankruptcy. Point estimates and standard errors are displayed after removing year-month fixed effects. Sample includes all individuals in the nationwide credit bureau data who enter bankruptcy with at least three years of data prior to filing. All displayed coefficients are relative to month $t - 36$, the omitted time period. Panel A displays total debt balances and Panel B displays total unsecured debt.

Figure 2: Comparison of Credit Bureau and Bankruptcy Schedule Unsecured Debt Prior to Bankruptcy



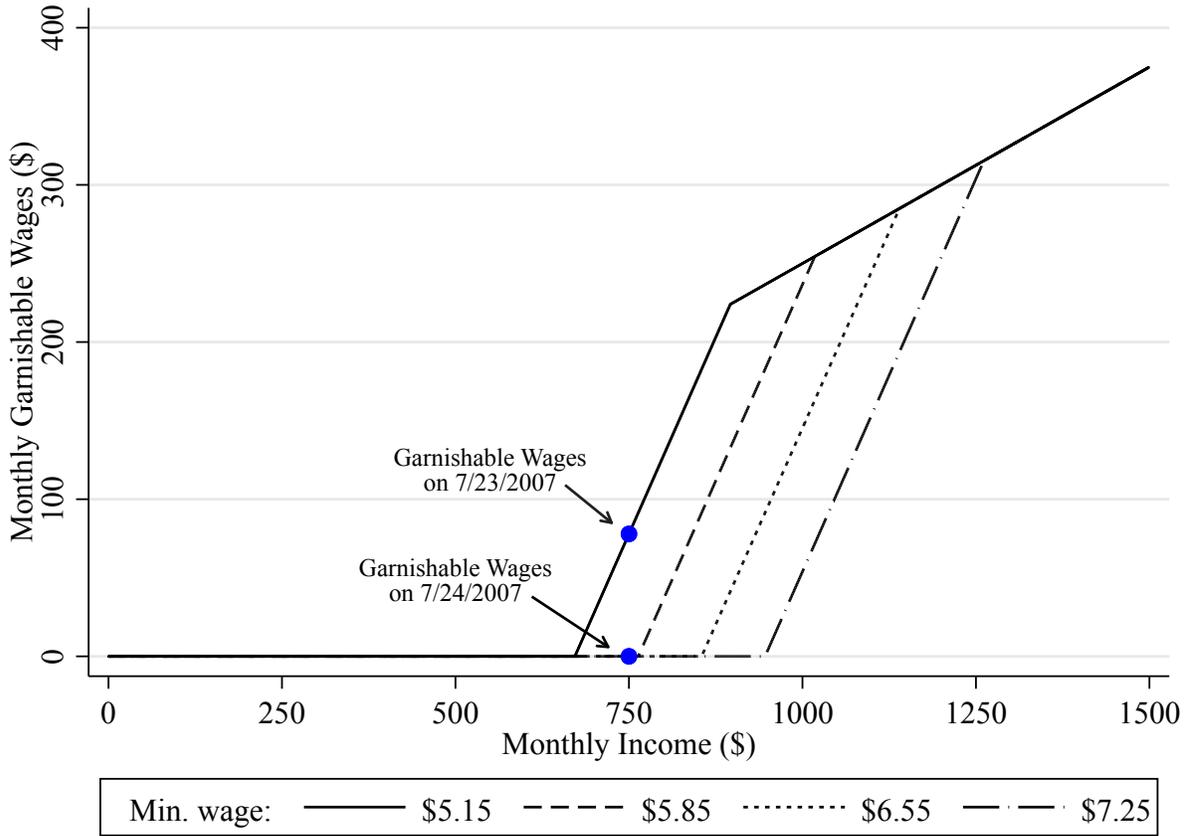
Notes: Figure shows box-and-whisker plots of total unsecured debt reported by the credit bureau (left columns) and in the bankruptcy schedules (right columns). Box-and-whisker plots for 6 months prior to bankruptcy and at the time of bankruptcy are shown for each source. The extremities of the whiskers display the 10th and 90th percentiles; the top of each box is the 75th percentile and the bottom is the 25th percentile. The line reflects the median amount of debt. Sample includes all individuals in the match credit bureau sample who also have specific debt incursion dates recorded in their bankruptcy schedules.

Figure 3: Correlations Between Shadow Debt Share and Unsecured Debt Category Shares



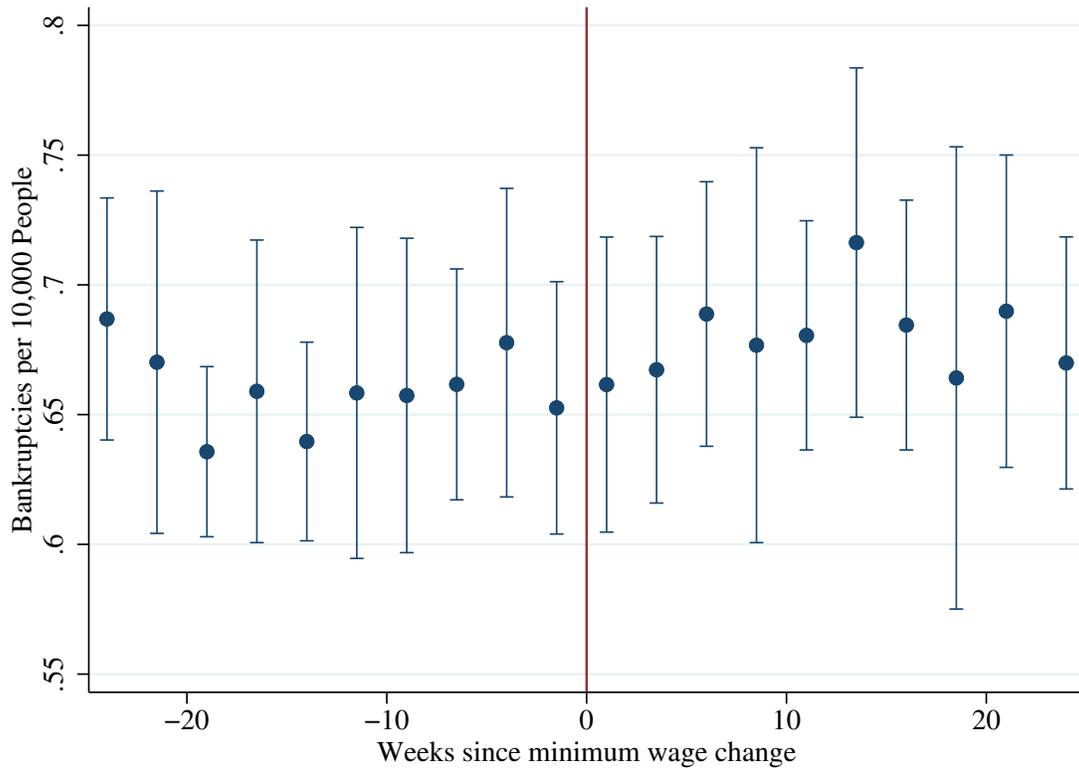
Notes: Figure plots the bivariate correlation coefficient between each listed unsecured debt category's share of total debt and the unsecured shadow debt share of total debt of at the individual level. The shadow debt share is the share of unsecured debt discharged in bankruptcy not reported in credit-bureau data. Unsecured liabilities are allocated to unsecured debt categories from textual descriptions using the LDA procedure described in Appendix B.

Figure 4: Monthly Garnishable Wages by Federal Minimum Wage Level



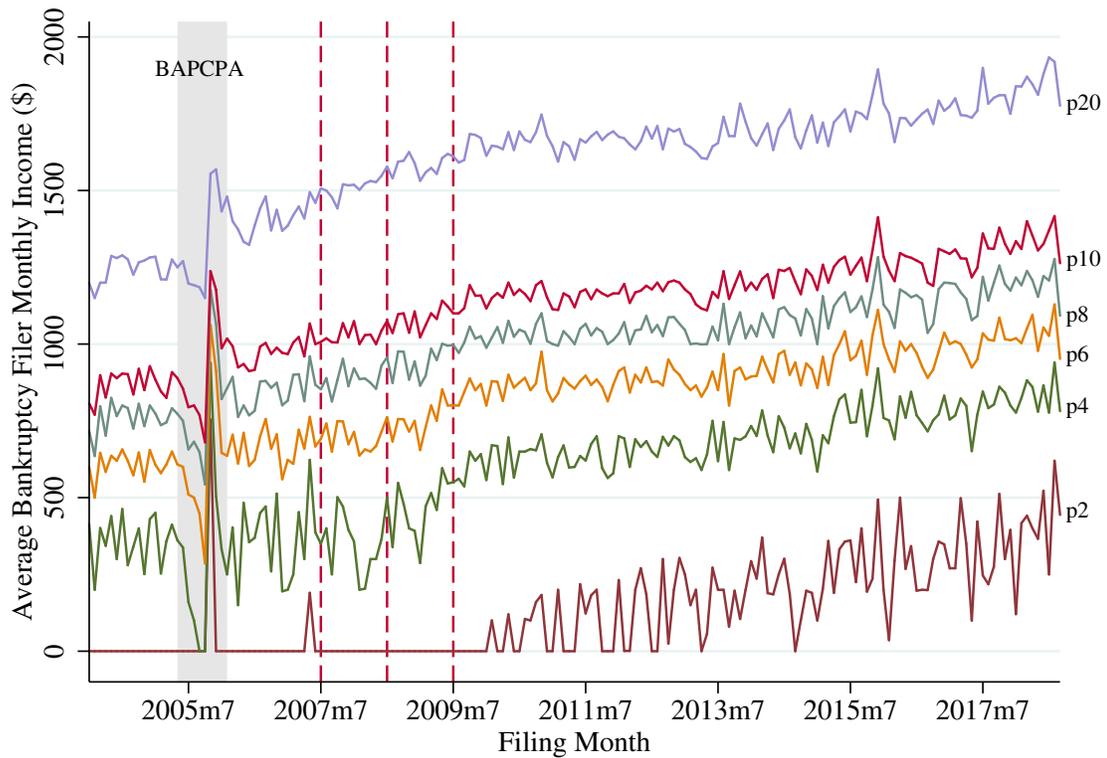
Notes: Figure plots the maximum level of monthly wages that are eligible for wage garnishing as a function of a household's monthly income for each of four federal minimum wage regimes according to equation (1) with $\omega_s = 30$, corresponding to the Florida and Utah statutes.

Figure 5: Bankruptcy Counts Around Minimum Wage Changes



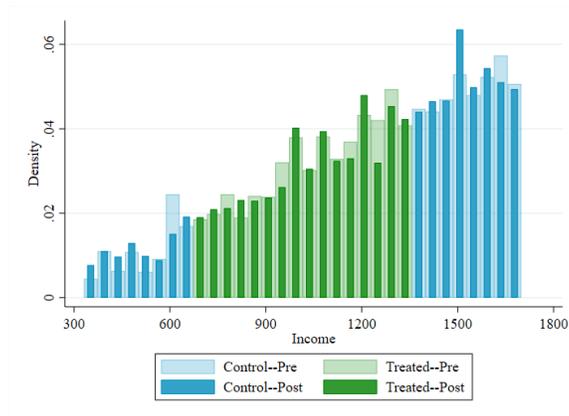
Notes: Figure plots the weekly average number of bankruptcies per 10,000 people across Florida, Minnesota, and Utah after controlling for the local unemployment rate and state and week-of-year fixed effects. Graph displays the six months before and the six months after the changes in minimum wage laws along with 95% confidence intervals.

Figure 6: Distribution of Bankruptcy Filer Income

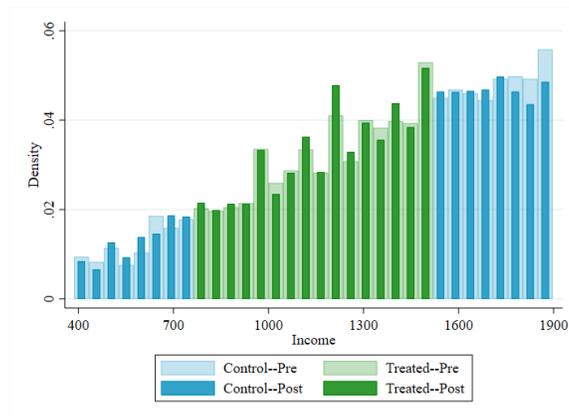


Notes: Figure plots percentiles of bankruptcy filer incomes by the month of filing. Dashed vertical lines indicate the timing of three federal minimum wage changes that affected wage garnishing for treated filers in our sample. Gray shaded area marks the announcement and passage of the Bankruptcy Abuse Prevention And Consumer Protection Act of 2005 that Gross et al. (2021) show had a large effect on personal bankruptcy filing.

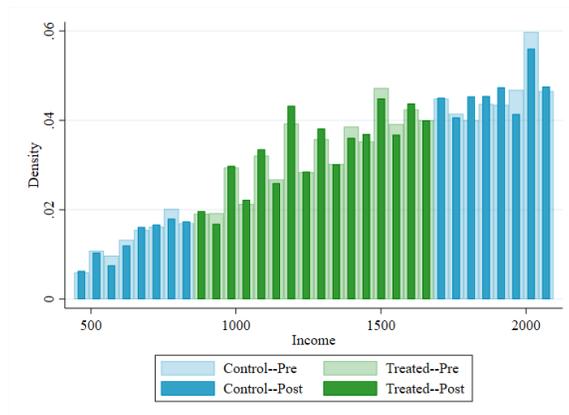
Figure 7: Income Histogram of Bankruptcy Filers Around Minimum Wage Changes



Panel A: July 2007 Minimum Wage Change



Panel B: July 2008 Minimum Wage Change



Panel C: July 2009 Minimum Wage Change

Notes: Figure plots the income histogram of bankruptcy filers one year before and one year after the three minimum wage changes during our sample period. Blue bars show the control regions where wage garnishment was not affected by the minimum wage change. Green regions are the treated regions where wage garnishment was affected. Transparent bars show the histogram from the pre-period, and solid bars are the same distribution in the post-period.

Table 1: Summary Statistics: Full Sample of Bankruptcy Filings

Variable	Mean	Std. Dev.	Percentile		
			25th	50th	75th
Monthly Income (\$)	2,973.3	1,682.3	1,786.8	2,700	3,902.2
Monthly Garnishable Wages (\$)	727.03	442.81	446.7	675	975.55
Total Assets (\$)	133,738.0	207,304.2	10,380.9	84,265.3	197,556.9
Total Debt (\$)	238,809.2	673,127.3	52,545.6	148,959.6	282,618.1
Mortgage Debt (\$)	108,291.2	171,334.7	0	64,074	169,900
Unsecured Debt (\$)	96,502.3	570,631.5	24,502	44,835.5	82,656.4
Unsecured Debt Share	0.53	0.36	0.19	0.46	0.94
Chapter 7 Indicator	0.74	0.44	0	1	1
Married Indicator	0.34	0.47	0	0	1
Divorced Indicator	0.11	0.32	0	0	0
Separated Indicator	0.04	0.19	0	0	0
Single Indicator	0.21	0.41	0	0	0
Widowed Indicator	0.02	0.13	0	0	0
Unknown Marital Status Indicator	0.28	0.45	0	0	1
Homeowner Indicator	0.56	0.50	0	1	1
Business Owner Indicator	0.24	0.43	0	0	0
Filing Jointly Indicator	0.33	0.47	0	0	1
Number of Dependents	0.98	1.27	0	0	2
Unemployed Indicator	0.12	0.33	0	0	0
Retired Indicator	0.06	0.24	0	0	0
Disabled Indicator	0.03	0.16	0	0	0

Notes: Table reports summary statistics for the universe of bankruptcy schedules. Monthly income is the self-reported current income from the filing schedules. Monthly garnishable wages is the dollar amount of monthly wage income that is exposed to garnishing according to the applicable state statute at the time of bankruptcy filing. N = 554,942.

Table 2: Share of Debt by Loan Category

Category	% of (Un)Secured	% of Total	% with Loan Type
<i>I. Secured Debt</i>			
Mortgage	63.29%	35.59%	51.62%
Auto Loan	29.18%	6.73%	47.74%
Miscellaneous Secured	3.10%	1.36%	7.16%
Unknown Secured	2.43%	0.79%	5.58%
Household Goods	1.39%	0.18%	5.37%
Other Vehicle	0.61%	0.20%	2.22%
Secured Debt Total	100.00%	44.84%	
<i>II. Unsecured Debt</i>			
Credit Card	30.41%	14.76%	76.60%
Personal Loan	12.50%	6.55%	52.55%
Retail Debt	10.87%	5.39%	71.00%
Unknown Unsecured	8.79%	5.18%	58.06%
Student Loan	7.77%	4.92%	24.72%
Medical	7.43%	4.46%	55.69%
Unsecured Auto	6.00%	3.91%	24.96%
Miscellaneous Unsecured	5.84%	3.42%	38.78%
Unsecured Priority Claims	3.25%	1.80%	22.91%
Housing Related	3.22%	2.50%	9.99%
Utilities	1.92%	1.00%	41.42%
Business Debt	1.31%	0.75%	4.80%
Payday Loans/Check Cashers	0.70%	0.39%	8.82%
Unsecured Debt Total	100.00%	55.03%	

Notes: Table reports the average share of secured debt that falls into each of 6 secured loan categories (panel I), the average share of unsecured debt that falls into each of 13 unsecured loan categories (panel II), and each category's share of total debt. The final column reports the share of bankruptcy filers that have at least one loan in each category. The miscellaneous category include smaller categories such as unpaid insurance premia, non-priority tax liabilities, bad checks, fees, legal fees, and loans against retirement accounts or certificates of deposit. Unknown categories include all loans that did not provide enough information to be categorized. Unsecured Priority Claims include tax, child support, and alimony claims reported in Schedule E for each bankruptcy filer. See Appendix B for a detailed description of our categorization algorithm. N = 554,942.

Table 3: Summary Statistics: Credit-Bureau-Matched Sample

Variable	Mean	Std. Dev.	Percentile		
			25th	50th	75th
<i>I. Bankruptcy Filing Variables</i>					
Monthly Income (\$)	3,577.5	1,785.1	2,320.9	3,360	4,586.4
Monthly Garnishable Wages (\$)	886.12	459.83	580.24	840	1,146.61
Total Assets (\$)	245,021.2	251,136.2	125,937.0	190,834.6	286,408.5
Total Debt (\$)	394,914.6	499,685.4	194,233.9	283,777.9	442,075.2
Mortgage Debt (\$)	212,206.9	220,722.8	106,900	164,600	249,000
Unsecured Debt (\$)	97,317.1	222,097.8	29,602	54,137.5	97,809.2
Unsecured Debt Share	0.26	0.20	0.12	0.21	0.34
Chapter 7 Indicator	0.68	0.47	0	1	1
Married Indicator	0.51	0.5	0	1	1
Divorced Indicator	0.12	0.32	0	0	0
Separated Indicator	0.04	0.19	0	0	0
Single Indicator	0.19	0.39	0	0	0
Widowed Indicator	0.02	0.13	0	0	0
Unknown Marital Status Indicator	0.13	0.34	0	0	0
Homeowner Indicator	0.94	0.23	1	1	1
Business Owner Indicator	0.31	0.46	0	0	1
Filing Jointly Indicator	0.44	0.50	0	0	1
Number of Dependents	1.09	1.29	0	1	2
Unemployed Indicator	0.12	0.33	0	0	0
Retired Indicator	0.06	0.23	0	0	0
Disabled Indicator	0.02	0.14	0	0	0
<i>II. Credit-Record Derived Variables</i>					
Total Debt (\$)	259,044.9	227,790.7	133,086.5	211,034	317,250
Unsecured Debt (\$)	55,636.9	139,892.6	5,527.5	19,013	47,623.5
Mortgage Debt (\$)	195,899.9	152,242.2	103,000	172,000	255,000
Revolving Debt (\$)	19,226.7	38,177.8	981	6,260.5	20,467
Shadow Debt (\$)	41,680.2	247,231.9	3,553	27,750.5	66,775.4
Shadow Debt Share of Total Debt	0.07	0.38	0.01	0.11	0.23
Months to File	22.3	20.9	6.8	15.3	31.1
Credit Score	508.0	77.4	454	508	563

Notes: Table reports summary statistics for bankruptcy filings that merged with our credit-bureau sample. Panel I reports statistics on the same variables as Table 1 for comparison—see notes to Table 1 for further details. Panel II reports statistics on variables derived from credit records. Revolving debt is the total amount of debt listed on the filer’s credit report at the time of bankruptcy that was revolving (i.e., as opposed to installment payments for a fixed loan size). Shadow debt is the amount of unsecured debt reported on bankruptcy filings but not on credit reports. Months to file is the number of days divided by 30 that elapsed between an individual’s first 90-day delinquency on any debt in the credit report and the bankruptcy filing date. Credit score is a proprietary risk measure from our credit bureau for the bankruptcy petitioner as of the month of bankruptcy filing. N = 47,960.

Table 4: Effect of Wage Garnishing on Shadow Debt Share of Total Debt

	(1)	(2)	(3)	(4)
Treatment \times Garnishable Wages	-0.0205** (0.0094)	-0.0185* (0.0093)	-0.0175* (0.0096)	-0.0186** (0.0091)
Filer Controls	✓	✓	✓	✓
Year Fixed Effects	✓		✓	✓
District Fixed Effects	✓		✓	✓
District \times Year Fixed Effects		✓		
Income \times Year Controls			✓	
Income Quartile Controls				✓
R^2	0.51	0.51	0.50	0.51
Observations	47,960	47,960	47,960	47,960

Notes: Table reports reduced-form regression results using the credit-bureau-matched sample. Dependent variable is shadow debt, defined as the dollar difference between total unsecured debt discharged in bankruptcy and the total unsecured debt reported in credit-bureau data as a share of total debt reported on bankruptcy filing. Dependent variable mean is 0.07. Garnishable wages are the dollar amount (measured in \$100s) of monthly income exposed to garnishing by creditors according to federal statute at the time of bankruptcy filing. Treatment is an indicator for the treated monthly income range (\$600 to \$1,300). All specifications control for main effects for treatment, garnishable wages, and treatment \times income. Filer controls include income, number of dependents, Vantage credit score, log(total assets), and indicators for filing chapter, marital status, homeownership, business ownership, retired status, employment status, and disabled status. Robust standard errors in parentheses are double clustered by filing month and 3-digit zip code. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 5: Effect of Wage Garnishing on Unsecured Debt Share of Total Debt

Sample:	(1)	(2)	(3)	(4)	(5)
	Credit-bureau matched				Full
Treatment \times Garnishable Wages	-0.010*** (0.003)	-0.008** (0.003)	-0.012*** (0.003)	-0.008** (0.003)	-0.0046*** (0.0014)
Filer Controls	✓	✓	✓	✓	✓
Year Fixed Effects	✓		✓	✓	✓
District Fixed Effects	✓		✓	✓	✓
District \times Year Fixed Effects		✓			
Income \times Year Controls			✓		
Income Quartile Controls				✓	✓
R^2	0.60	0.61	0.61	0.61	0.75
Observations	48,186	48,186	48,186	48,186	554,942

Notes: Table reports reduced-form regressions of the effect of wage garnishment on unsecured debt in the credit-bureau matched sample (Columns (1)-(4)) and the full sample (Column (5)). Dependent variable is the fraction of total debt disclosed in bankruptcy that is unsecured. Dependent variable mean is 0.26 for the credit-bureau matched sample and 0.53 in the full sample. Garnishable wages are the dollar amount (measured in \$100s) of monthly income exposed to garnishing by creditors according to federal statute at the time of bankruptcy filing. Treatment is an indicator for the treated monthly income range (\$600 to \$1,300). All specifications control for main effects for treatment, garnishable wages, and treatment \times income. Filer controls include income, number of dependents, Vantage credit score, log(total assets), and indicators for filing chapter, marital status, homeownership, business ownership, retired status, employment status, and disabled status. Robust standard errors in parentheses are double clustered by filing month and 3-digit zip code. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 6: Effect of Wage Garnishing on Bankruptcy Filing Timing in Months

	(1)	(2)	(3)	(4)
Treatment \times Garnishable Wages	-1.12*** (0.37)	-0.78** (0.38)	-1.03** (0.45)	-1.19*** (0.38)
Filer Controls	✓	✓	✓	✓
Year Fixed Effects	✓		✓	✓
District Fixed Effects	✓		✓	✓
District \times Year Fixed Effects		✓		
Income \times Year Controls			✓	
Income Quartile Controls				✓
R^2	0.60	0.61	0.60	0.60
Observations	47,960	47,960	47,960	47,960

Notes: Table reports regression results using the credit-bureau-matched sample. Dependent variable is the number of months between the first 90-day delinquency and the bankruptcy filing date, defined as the number of days to file divided by 30. Dependent variable mean is 22.3. Garnishable wages are the dollar amount (measured in \$100s) of monthly income exposed to garnishing by creditors according to federal statute at the time of bankruptcy filing. Treatment is an indicator for the treated monthly income range (\$600 to \$1,300). All specifications control for main effects for treatment, garnishable wages, and treatment \times income. Filer controls include income, number of dependents, Vantage credit score, $\log(\text{total assets})$, and indicators for filing chapter, marital status, homeownership, business ownership, retired status, employment status, and disabled status. Robust standard errors in parentheses are double clustered by filing month and 3-digit zip code. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 7: Effect of Wage Garnishing on Debt Origination Timing

	(1)
Treatment \times Garnishable Wages	-0.0028** (0.0013)
Filer Controls	✓
Year Fixed Effects	✓
District Fixed Effects	✓
R^2	0.521
Observations	76,909

Notes: Table reports reduced-form regressions using the sample of filings that have precise debt origination date information. Dependent variable is the fraction of total debt disclosed in bankruptcy that is originated in the 6 months directly before filing. Dependent variable mean is 0.0504. Garnishable wages are the dollar amount (measured in \$100s) of monthly income exposed to garnishing by creditors according to federal statute at the time of bankruptcy filing. Treatment is an indicator for the treated monthly income range (\$600 to \$1,300). Filer controls include income, number of dependents, Vantage credit score, log(total assets), and indicators for filing chapter, marital status, homeownership, business ownership, retired status, employment status, and disabled status. Robust standard errors in parentheses are double clustered by filing month and 3-digit zip code. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 8: Effect of Wage Garnishing on 2-year Bankruptcy Propensity

	(1)	(2)	(3)	(4)
Treatment × Garnishable Wages (\$00s)	-0.00002 (0.00002)	-0.00002 (0.00001)	-0.00002 (0.00001)	-0.00002 (0.00001)
Filer Controls	✓	✓	✓	✓
Year FEs	✓		✓	✓
District FEs	✓		✓	✓
District × Year FEs		✓		
Income × Year Controls			✓	
Income Quintile Controls				✓
R^2	0.50	0.50	.50	0.50
Observations	879,897	879,897	879,897	879,897

Notes: Table reports reduced-form regressions using all individuals who become 90-days delinquent in the credit bureau data. Dependent variable is an indicator of whether the individual files for bankruptcy within two years of becoming 90-day delinquent. Dependent variable mean is 0.117. Garnishable wages are the dollar amount (measured in \$100s) of monthly income exposed to garnishing by creditors according to federal statute at the time of bankruptcy filing. Treatment is an indicator for the treated monthly income range (\$600 to \$1,300), and income is imputed based on the individuals debt-to-income reported in matched McDash data at the time of their most recent mortgage origination. Filer controls include income, Vantage credit score, and indicators for filing chapter. Robust standard errors in parentheses are double clustered by filing month and 3-digit zip code. *** p<0.01, ** p<0.05, * p<0.1

Appendix

A Personal Bankruptcy Background

Individuals filing for bankruptcy in the U.S. can choose to file under Chapter 7 or Chapter 13 of the bankruptcy code. In Chapter 7, the debtor can protect certain exempt assets from creditors, including some home equity or a vehicle as well as personal property such as food, clothing, and furniture, but remaining assets must be turned over to a trustee to help pay creditors.²⁹ In our sample, 87% of all Chapter 7 filers do not have assets above the exemption limit and thus keep all of their personal property. Regardless, after turning over all non-exempt property, nearly all debt is discharged and the individual has no further obligation to repay these debts. Liabilities that are not discharged include secured claims in which the debtor retains the asset (e.g., a mortgage is not discharged if the debtor keeps the home), alimony and child support, some taxes, court fees, and student loans.

While this discharge can be highly beneficial for the debtor, bankruptcy comes with a variety of costs. The total cost of court filing fees, attorney fees, and mandatory debt counseling fees average about \$1,400 (GAO, 2008). While this fee is small compared to the average amount of discharged debt, Gross, Notowidigdo, and Wang (2014) show that liquidity constraints prevent a large number of individuals from filing. In addition, an individual can only obtain a Chapter 7 discharge every eight years such that filing for bankruptcy comes at the cost of losing the option to discharge debt in the medium term. Other consequences include having a bankruptcy flag on one's credit report for ten years after filing, which limits access to credit (Dobbie, Goldsmith-Pinkham, Mahoney, and Song, 2020) and imposes possible negative stigma.

Individuals who file for Chapter 13 bankruptcy propose a three- to five-year plan to repay some of their unsecured debt. Dobbie, Goldsmith-Pinkham, and Yang (2017) estimate that Chapter 13 filers propose to repay an average of 36% of their unsecured debt with the rest discharged. In exchange, debtors are allowed to keep non-exempt assets. Due to additional legal filing requirements, Chapter 13 is considerably more expensive than Chapter 7, costing the average filer about \$3,400 (GAO, 2008). Debtors who discharge debt in Chapter 13 cannot file for Chapter 7 for six years and cannot re-enter Chapter 13 for two years. Chapter 13 bankruptcy flags stay on the filer's credit report for seven years after the filing. While many prospective bankruptcy filers can choose either Chapter 7 or Chapter 13, individuals with relatively high income may not pass the required means test and would be deemed ineligible to file for Chapter 7.

For our purposes, important aspects of bankruptcy law are whether debtors can pay back debt immediately before bankruptcy and whether debt incurred immediately prior to the bankruptcy is still dischargeable. In order to ensure equal treatment of like creditors in a bankruptcy proceeding, the U.S. Bankruptcy Code instructs bankruptcy trustees to reverse any payment by already insolvent bankruptcy filers to creditors close to a bankruptcy filing that meets certain conditions so that (11 U.S. Code § 547(b)). In the case of personal bankruptcy filers, these conditions depend on whether the paid creditor was an insider or outsider. Trustees are to undo a payment exceeding \$600 to an outside creditor made within 90 days of filing and to an inside creditor made up to one year before filing that resulted in the creditor receiving more than would have been received from the bankruptcy proceeding provided the payment was not part of the "ordinary financial affairs" of the debtor and (11 U.S. Code § 547(c)).

If debt incurred in the months prior to filing cannot be discharged, then individuals would obviously have no incentive to strategically increase debt levels prior to entering bankruptcy. The

²⁹While bankruptcy law is set at the federal level, exemption limits are set by states individually.

U.S. Bankruptcy Code prevents discharge of debts incurred under “false pretenses, a false representation, or actual fraud” (11 U.S. Code § 523(a)(2)(A)). The Code specifically outlines that debts incurred for luxury goods or services within 90 days of bankruptcy or cash advances within 70 days of bankruptcy are presumed to be nondischargeable. However, the burden of proof is on the creditor to prove actual fraud by the debtor. Specifically, a creditor must prove to the court that the debtor made a representation which they knew at the time was false with the intention to deceive the creditor (*In re Apte*, 96 F.3d 1319, 1322 and *In re Kirsh*, 973 F.2d 1454, 1457). Debts arising from reckless negligence are still dischargeable because the debtor was not intentionally deceiving the creditor. Due to this high bar, very few nondischargeability actions are filed by creditors and debtors can likely discharge nearly all debts incurred in the run-up to a bankruptcy filing.³⁰

B Loan Categorization Details

We use both keyword searches and Latent Dirichlet Allocation (LDA) to categorize loans into categories, and this breakdown is displayed in Table 2. While most category labels are self-explanatory, a few categories benefit from further explanation. Retail debt contains store-brand credit cards as well as unsecured debt used to purchase big-ticket items such as furniture or jewelry. Unsecured auto debt is mostly made up of loan deficiency claims after an automobile has been repossessed but also contains loans taken out for car maintenance (e.g., tire purchases). Unsecured priority claims are reported separately in Schedule E of the bankruptcy filings and contain unpaid taxes, child support, and alimony. Housing-related unsecured liabilities include unpaid rent and homeowners association fees. Finally, we combine some smaller categories into catch-all miscellaneous groups. Miscellaneous secured debts include secured tax liens, insurance claims, 401(k) loans, timeshare and association fees, loans against certificates of deposit, secured business debt, secured utilities, and secured credit cards. Miscellaneous unsecured debts include bad checks, fees, non-priority taxes, legal fees, and insurance dues.

C Credit-Bureau Merge

Our second data source is a sample of credit-bureau records. The credit-bureau data available to us contain only individuals who have had or currently have a mortgage serviced by one of the top twenty mortgage servicers by size during our time period. Acknowledging this restriction, 56% of the bankruptcy filers in our sample report owning real estate, and this number is only slightly lower (51%) for chapter 7 filers. In this credit-bureau data, there are 188,975 individuals with a bankruptcy filing in Florida, Minnesota, or Utah between 2004 and 2018. However, because the bankruptcy data does not contain the Middle District of Florida our maximum number of matches is strictly less than this. We anonymously match the two datasets using a series of merges that take advantage of common information in both datasets. In particular, we have the 3- or 5-digit ZIP code, the month of bankruptcy filing, and specific debt amounts in each dataset. We merge the datasets by looking for matches that are unique on sets of these characteristics. For example,

³⁰There is no systematic evidence on the number of nondischargeability claims filed in bankruptcy cases. However, David Sime, the clerk of court for the Bankruptcy District of Utah, estimated in an interview that the total number of nondischargeability actions filed in a year in Utah is at most in the hundreds and that such actions are not generally contesting debt strategically incurred just before bankruptcy, but instead relate to other nondischargeable debt such as alimony and child support. For context, we estimate that in an average year, Utah has about 11,000 personal bankruptcy cases with an average of 30 unsecured debts per case. We conclude that only a tiny portion of all unsecured debts are contested—even if there are 1,000 nondischargeability claims filed in Utah in a year (an order of magnitude above Sime’s estimate), they would only comprise 0.3% of all unsecured claims.

if there is a single bankruptcy filing in a given month-3-digit zip cell in both the bankruptcy and credit-bureau datasets, we consider this a match. When there are multiple entries in the same month-zip, we use loan amounts to detect matches, such as matching mortgage amounts. In all cases, we require that first mortgage amounts between the two datasets are within 10% of each other to ensure that the matches are correct. In 53% of cases, loan amounts are within 1% of each other, suggesting very high match fidelity. This process results in a total of 55,357 bankruptcy filings that are matched to credit-bureau records. We require at least 30 days between the first 90 day delinquency and the bankruptcy filing and filter on income similar to the broader sample. This results in 47,960 merged observations.

The matched credit-bureau sample is somewhat different from the overall sample since all matched individuals must have or have had a mortgage in order to appear in our credit-bureau data. For comparison, Panel I of Table 3 reports summary statistics for this merged sample on the same set of bankruptcy filing characteristics described in Table 1. The share of unsecured debt is lower in this sample; total assets, debt, and income are higher; and the percentage that own a home at the time of filing is near 100%. Meanwhile, other characteristics are very similar, including the number of dependents, the percentage that filed a Chapter 7 bankruptcy, the share that are retired, and the share that are disabled. Panel II of Table 3 reports statistics on variables that we only observe by virtue of the match between bankruptcy filings and credit records. Total debt and unsecured debt observed on the credit records is much less than total debt listed on bankruptcy filings, which we discuss at length in section 5.1. Mortgage debt is very similar between bankruptcy filings and credit-bureau records, consistent with our intuition above that secured debt is most likely to be formally registered with credit bureaus. Average revolving debt—mostly consisting of credit card debt—is approximately \$19,000 for the matched sample. Total shadow debt—including formal and informal flavors as defined in section 5.1—averages \$41,680 or 7% of total debt on average. Besides detecting shadow debt, one of our primary uses of the credit-bureau data is to calculate the days between when an individual first becomes 90 days past due on any debt and when they enter bankruptcy, a key measure to document the validity of our identification strategy. Our *months to file* variable averages 22.3 months, with significant variation between the 25th percentile (just over one month) and the 75th percentile (just over two years). Like other credit bureaus, the credit bureau that provided our data has a proprietary credit risk score comparable to a FICO score. For the merged sample, the average bankruptcy filer has a credit score of 508 in their month of filing—in line with their widespread delinquencies.

We note potential external-validity concerns for the empirical tests that rely on the merging of a sample of low-income bankruptcy filers with a sample of borrowers that had a mortgage in the last six months. Because the full bankruptcy sample differs from the matched credit-bureau sample, we present empirical results for both datasets wherever possible, reporting reduced-form estimates (which do not require the time to bankruptcy measure) for the full sample and 2SLS estimates for the credit-bureau-merged sample. The merged sample essentially trades off the benefits of providing positive evidence for the intervening mechanism of filing delays against the cost of potentially limited application to the broader population. However, homeownership among low-income bankruptcy filers is surprisingly common—roughly 35% of our treated sample own mortgaged real estate—suggesting our results are representative of a sizable share of bankruptcy filers.

D Wage Garnishment Background

While many factors affect if and when an individual files for bankruptcy, our identification strategy focuses on the role of wage garnishing. Wages can be garnished by any creditor who secures a

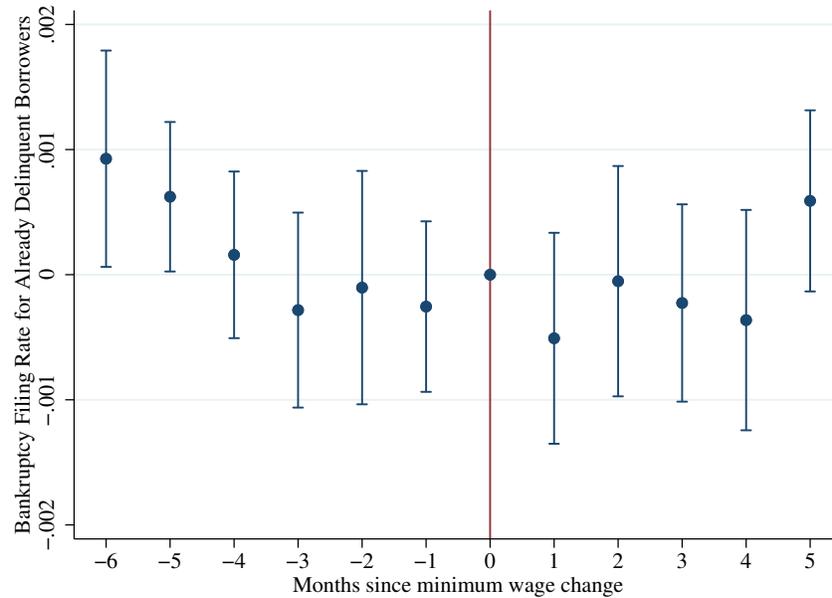
court order.³¹ Federal law limits wage garnishing to 25% of disposable earnings or the amount by which weekly disposable earnings exceeds 30 times the federal minimum wage, whichever is lower.³² For the states in our sample, these federal limits are effective in both Florida and Utah; in Minnesota, wage garnishing is limited to 25% of disposable earnings or the amount by which weekly disposable earnings exceeds 40 times the federal minimum wage, whichever is lower. Because of these limits, the amount of wage garnishing a low-income delinquent borrower faces will change discontinuously when the federal minimum wage changes. This is the basis of our identification strategy, as explained in the body of the paper. During our sample period, the federal minimum wage changed three times, on the 24th of July in 2007, 2008, and 2009. These three changes moved the minimum wage from \$5.15 per hour to \$5.85, then \$6.55, and then \$7.25 per hour. With each of these changes, the maximum amount of wage garnishing decreases for certain individuals, as illustrated by Figure 4. Importantly, wage garnishment ceases when an individual files for bankruptcy, such that higher wage garnishing presumably increases the incentive for an individual to file for bankruptcy earlier. We also note that even if a debtor is not currently being garnished, a creditor may use garnishing as a threat in their debt collection efforts, making it possible for wage garnishing to affect a large number of debtors. Intuitively, decreases in the amount of wage garnishment nudge debtors towards delaying filing by relieving some of the financial pressure caused by wage garnishment. Supporting this, Lefgren and McIntyre (2009) show that wage garnishing laws are important determinants of the bankruptcy decision.

³¹Garnishing actions by creditors for child support, back taxes, and student loans do not require a court order.

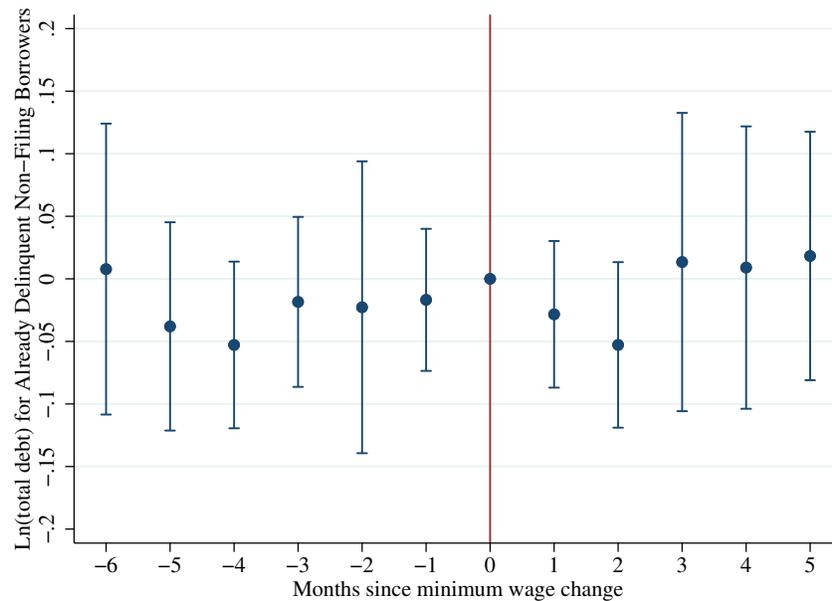
³²Disposable income is total income less required deductions such as federal and state taxes, involuntary pension contributions, and health insurance premiums.

Figure A1: Selection Tests Using Delinquent Borrower Outcomes Around Minimum Wage Changes

I. Delinquent Borrower Bankruptcy Rates Around Minimum Wage Changes



II. Delinquent Borrower Total Debt Around Minimum Wage Changes



Notes: Panel I plots the likelihood of filing for bankruptcy in event time for the six months before and after federal minimum wage increases. The sample in panel I consists of individuals that first became 90 days delinquent on at least one credit-bureau account at least 12 months prior to a given event-time month. Panel II plots log total debt in event time for the six months before and after federal minimum wage increases. The sample in panel II consists of borrowers in the credit-bureau data that do *not* eventually file for bankruptcy and first became 90 days delinquent on at least one credit-bureau account at least 12 months prior to a given event-time month. Estimates in both panels have been adjusted for month-of-year fixed effects and year fixed effects with the bankruptcy rate normalized to zero in the month of the minimum wage change. Plotted 95% confidence intervals are clustered by Zip3 \times calendar month.

Table A1: Balance Tests of Filer Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
	Home Owner	Business Owner	Retired	Number of Depen- dents	Disabled	Credit Score
Treatment \times Garnishable Wages	-0.004 (0.004)	-0.007 (0.012)	0.007 (0.008)	-0.019 (0.030)	-0.001 (0.006)	-0.883 (1.445)
Filer Controls	✓	✓	✓	✓	✓	✓
Year FEs	✓	✓	✓	✓	✓	✓
District FEs	✓	✓	✓	✓	✓	✓
R^2	0.67	0.52	0.52	0.55	0.50	0.53
Observations	47,960	47,960	47,960	47,960	47,960	47,960

Notes: Table reports reduced-form regressions of borrower characteristics. Home Owner is a dummy for home ownership. Business Owner is a dummy for business ownership. Retired is a dummy for retirement status. Number of Dependents is the number of dependents in the household at time of filing. Disabled is a dummy for disabled status. Credit Score is the Vantage score at time of filing. Garnishable wages are the dollar amount (measured in \$100s) of monthly income exposed to garnishing by creditors according to federal statute at the time of bankruptcy filing. Treatment is an indicator for the treated monthly income range (\$600 to \$1,300). All specifications control for main effects for treatment, garnishable wages, and treatment \times income. For each column, filer controls exclude the dependent variable from the list of controls reported in Table 6. Robust standard errors in parentheses are double clustered by filing month and 3-digit zip code. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A2: Effect of Wage Garnishing on Log Unsecured and Secured Debt

Dependent Variable	(1) log(1 + Unsecured Debt)	(2) log(1 + Secured Debt)
Treatment × Garnishable Wages	-0.0353*** (0.0100)	-0.0248 (0.0270)
Filer Controls	✓	✓
Year Fixed Effects	✓	✓
District Fixed Effects	✓	✓
R^2	0.53	0.68
Observations	554,942	554,942

Notes: Table reports reduced-form regressions using the full sample of bankruptcy filings. Dependent variable is the natural log of 1 + the level of unsecured debt (column 1) and the natural log of 1 + the level of secured debt (column 2). Garnishable wages are the dollar amount (measured in \$100s) of monthly income exposed to garnishing by creditors according to federal statute at the time of bankruptcy filing. Treatment is an indicator for the treated monthly income range (\$600 to \$1,300). All specifications control for main effects for treatment, garnishable wages, and treatment × income. Filer controls include income, number of dependents, Vantage credit score, log(total assets), and indicators for filing chapter, marital status, homeownership, business ownership, retired status, employment status, and disabled status. Robust standard errors in parentheses are double clustered by filing month and 3-digit zip code. *** p<0.01, ** p<0.05, * p<0.1

Table A3: Effect of Wage Garnishing on Shadow Debt Share of Total Debt

	(1)	(2)	(3)	(4)
Treatment \times Garnishable Wages (\$00s)	-0.051*** (0.016)	-0.051*** (0.017)	-0.034** (0.016)	-0.050*** (0.016)
Filer Controls	✓	✓	✓	✓
Year FEs	✓		✓	✓
District FEs	✓		✓	✓
District \times Year FEs		✓		
Income \times Year Controls			✓	
Income Quintile Controls				✓
R^2	0.51	0.51	0.51	.51
Observations	28,348	28,348	28,348	28,348

Notes: Table reports reduced-form regression results similar to those in Table 4, but limiting the sample to Florida, where the state minimum wage was higher than the federal minimum wage, so there is no direct income effect of the minimum wage change. Dependent variable is shadow debt, defined as the dollar difference between total unsecured debt discharged in bankruptcy and the total unsecured debt reported in credit-bureau data as a share of total debt reported on bankruptcy filing. Dependent variable mean is 0.07. Garnishable wages are the dollar amount (measured in \$100s) of monthly income exposed to garnishing by creditors according to federal statute at the time of bankruptcy filing. Treatment is an indicator for the treated monthly income range (\$600 to \$1,300). All specifications control for main effects for treatment, garnishable wages, and treatment \times income. Filer controls include income, number of dependents, Vantage credit score, log(total assets), and indicators for filing chapter, marital status, homeownership, business ownership, retired status, employment status, and disabled status. Robust standard errors in parentheses are double clustered by filing month and 3-digit zip code. *** p<0.01, ** p<0.05, * p<0.1

Table A4: Effect of Wage Garnishing on Bankruptcy Filing Timing in Months - Florida Only Sample

	(1)	(2)	(3)	(4)
Treatment × Garnishable Wages (\$00s)	-1.57* (0.91)	-1.57* (0.92)	-1.73 (1.19)	-1.62* (0.92)
Filer Controls	✓	✓	✓	✓
Year FEs	✓		✓	✓
District FEs	✓		✓	✓
District × Year FEs		✓		
Income × Year Controls			✓	
Income Quintile Controls				✓
R^2	0.63	0.64	0.63	0.63
Observations	28,348	28,348	28,348	28,348

Notes: Table reports reduced-form regression results similar to those in Table 6, but limiting the sample to Florida, where the state minimum wage was higher than the federal minimum wage, so there is no direct income effect of the minimum wage change. Dependent variable is the number of months between the first 90-day delinquency and the bankruptcy filing date, defined as the number of days to file divided by 30. Dependent variable mean is 22.3. Garnishable wages are the dollar amount (measured in \$100s) of monthly income exposed to garnishing by creditors according to federal statute at the time of bankruptcy filing. Treatment is an indicator for the treated monthly income range (\$600 to \$1,300). All specifications control for main effects for treatment, garnishable wages, and treatment × income. Filer controls include income, number of dependents, Vantage credit score, log(total assets), and indicators for filing chapter, marital status, homeownership, business ownership, retired status, employment status, and disabled status. Robust standard errors in parentheses are double clustered by filing month and 3-digit zip code. *** p<0.01, ** p<0.05, * p<0.1