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A SIMPLE TEST OF ADVERSE EVENTS AND STRATEGIC TIMING THEORIES OF CONSUMER BANKRUPTCY

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ABSTRACT

A test of adverse events and strategic timing theories can be conducted by determining whether some relevant financial decision variables, such as financial benefit from filing for bankruptcy, or debt discharged in bankruptcy are endogenous with the bankruptcy decision or not. For the strategic timing theory such decisions are endogenous, while for the adverse events theory they are not. Hausman tests for endogeneity show that financial benefit, unsecured debt, and non-exempt assets are exogenous with the bankruptcy decision, consistent with the adverse events theory.

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1. Introduction

Among the several theories put forth to understand the determinants of a household's decision to file for bankruptcy, two have received particular attention: the adverse events theory and the strategic timing theory.

The adverse events theory postulates that consumers file for bankruptcy mainly because they experience adverse events, and financial stresses associated with such events. Adverse events occur, for example, in the form of a job loss, medical problems, and particular family issues such as divorce. Financial stresses associated with such events arise, for example, in the form of income interruption, income reduction, or debt increase.

The strategic timing theory postulates that a rational consumer incorporates in her decision-making, the bankruptcy option available under law, and its associated costs and benefits, and making the best use of her economic environment, chooses an optimal time to file for bankruptcy. In particular, if the best choice includes a strategic, and lawful, use of debt and the bankruptcy system, then that is reflected in consumer choice.

Both theories are emblems of long-standing debates to derive an optimal bankruptcy law; one that balances rights of a creditor against misfortune of a debtor, one that protects a creditor from a dishonest debtor, and one that trades-off losses in bankruptcy against increases in expected economic growth from greater risk-taking arising from wealth insurance. In the United States, examples of such debates are found in early conventions regarding the U.S. Constitution, as can be seen in Warren (1935).

It is important to understand which theory is correct, because each theory is based on different assumptions on consumer behaviors, and therefore, each theory implies potentially different policy responses to reduce bankruptcy filings. For example, if adverse events theory is correct, and if it is determined that bankruptcy filings are too high, then policies to reduce bankruptcy filings could include, among others, those that minimize the impact of adverse events, or increase financial literacy for planning for such events. On the other hand, if strategic timing theory is correct, then policies to reduce filings could include, among others, those that tighten access to bankruptcy courts, or make bankruptcy more expensive, perhaps by lowering exemptions, diverting more debtors to longer repayment plans, lengthening minimum time between repeat filings, or requiring debt management programs outside of bankruptcy.

In deriving a test of these theories, a simple model for the strategic timing theory is easy to formulate using a standard economic model of consumer decision-making. A comparable model for the adverse events theory is not available, and a simple model is formulated here using a standard economic model and incorporating some basic ingredients of consumer behavior consistent with the adverse events theory.

Using these models, this paper formulates a simple test of these two competing theories. Essentially, this test determines whether a consumer's decision to file for bankruptcy and her decision regarding some variables relevant for filing (for example, unsecured debt, or financial benefit, or non-exempt assets) are both endogenously determined, or not. For the strategic timing theory, it is easy to see that these decisions are endogenously and simultaneously determined. For the adverse events theory, the model here implies that decisions regarding unsecured debt or financial benefit are exogenous to the filing decision.

The dataset used here is a combined cross section and time series sample of PSID households over the period 1984-95; the same dataset is used in Fay, Hurst, and White (2002).[1] The model specifications are similar to their work as well. In each of two models of interest, two estimations are conducted – one using least squares specification, and the other using log-normal specification.[2] In all four cases, the results are consistent with adverse events theory.

The paper proceeds as follows. Section 2 discusses the relevant literature. Section 3 formulates simple models of these two theories, and a prediction based on these models. Section 4 presents test results.

2. Related Literature

There is a long literature that tries to understand household bankruptcy decisions. Early work is presented in Stanley and Girth (1971), based on a study of bankruptcy cases closed in 1964.

Results of studies of bankrupt debtors in 1981, in 1991, and their comparison are provided in Sullivan, Warren, and Westbrook (1989, 2000, 1994), respectively. These authors relate bankrupt debtors to the population, and conclude that bankruptcy is mainly due to adverse events. Moreover, Domowitz and Sartain (1999), combining data from filings in the early 1980s and the Survey of Consumer Finances, present evidence of the role of credit card debt and adverse events (especially medical debt) in bankruptcy decisions.

Using comprehensive data aggregated by bankruptcy district, White (1987) provides evidence of economic incentives in bankruptcy by showing that bankruptcy filings are positively related to exemption levels. Moreover, using data from the Panel Study of Income Dynamics, Fay, Hurst, and White (2002) (henceforth denoted FHW) show strong evidence that financial benefit from bankruptcy affects a household's decision to file for bankruptcy. As mentioned in their work, a distinction between adverse events and strategic timing theories is not clear, but for the most part, direct inclusion of variables for adverse events (such as health problems, divorce, and length of unemployment) does not significantly affect the bankruptcy decision. Additional aspects of these incentives are explored in White (1998), and in Fan and White (2003). Further, using the same dataset

[1] We are grateful to Erik Hurst for making this dataset available to us.
[2] As mentioned below, additional estimators such as the least absolute deviations (LAD) estimator and the robust estimator could not be applied successfully to this dataset.

as FHW, Han and Li (2004) study how the bankruptcy decision is jointly determined with labor supply decision.

Gross and Souleles (2002), using credit card data, provide evidence of growing bankruptcies over 1995-97, after controlling for changes in risk composition of borrowers; a finding consistent with their hypothesis of declining social costs or declining bankruptcy stigma. A related dynamic is reported in FHW, and it is further consistent with an impact of local legal culture on bankruptcy decisions. Additional empirical studies are discussed in Sullivan, Warren, and Westbrook (2000).[3]

Ausubel (1991) investigates the nature of competition in the credit card industry, sticky credit card interest rates, and relatively high returns on credit card operations, and presents some theoretical explanations for such observations. Ausubel (1997) provides additional information on the counter-cyclical nature of credit card delinquencies and defaults, and combining this with credit card profitability, considers the dynamic from high rates to high defaults.

Some theoretical models for default and bankruptcy with competitive and incomplete markets are considered in Dubey, Geanakoplos, and Shubik (2003), Zame (1993), Geanakoplos and Zame (1997), Modica, Rustichini, and Tallon (1999), Araujo and Pascoa (2002), Sabarwal (2003), and Dubey, Geanakoplos, and Shubik (2005), among others.

3. Two Models and a Prediction

This section develops different models of personal bankruptcy that reflect household decisions regarding filing for bankruptcy based on (1) the occurrence of adverse events, or on (2) an endogenous choice of variables relevant for bankruptcy filing (such as debt, or financial benefit). These models yield a prediction that is testable with observed data.

Adverse Events Theory

In recent years, frequent support for the adverse events theory has been advanced by Sullivan, Warren, and Westbrook (1989, 1994, 2000), among others. Using data from bankruptcy filings in 1981 (for Illinois, Pennsylvania, and Texas), and in 1991 (for Illinois, Pennsylvania, Texas, California, and Tennessee), these authors paint a rich portrait of consumers in bankruptcy, they present statistics that indicate similarities between bankrupt debtors and the general population, especially middle-class families, and they present a variety of cases and statistics to conclude that while some cases of abuse of bankruptcy law may exist, bankruptcy is predominantly due to adverse events. As they put it succinctly,[4] "No one plans to go bankrupt."

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[3] Several other reports have informed discussions of reforms in bankruptcy law; an analysis of some of these reports is provided in General Accounting Office (1998, 1999).
[4] Sullivan, Warren, and Westbrook (2000), page 73.

A scenario of the path to bankruptcy may be as follows: a person (or a couple), with demographic characteristics usually associated with somewhat stable middle class families, experiences some adverse events that compel this person to file for bankruptcy. Such events could include, for example, a job loss, a reduction in number of hours worked, a change from a higher-paying job to a lower-paying job, a medical condition, divorce, and so on. In addition to their direct effects on household earnings, such events have indirect effects on household financial well-being as well. For example, job-related adverse events can lead to lower levels of health insurance or lower pension plan contributions; medical conditions and other adverse events can lead to higher levels of expensive credit card debt; and any adverse event can lead to greater probability of default on a home mortgage, or on other debt. Against a backdrop of increasing health-care costs, increasing rates of health uninsurance, a noticeable incidence of job skids[5] and associated losses in fringe benefits, and deepening debt markets via subprime lending (whether in the form of high loan-to-value mortgages, or credit card debt for borrowers with greater probability of default, or increasing maturity of automobile loans), the impact of adverse events on household finances may be large enough for a consumer to file for bankruptcy.

In terms of formulating a model for this theory, it is useful to keep in mind that a pattern that emerges consistently in this theory is that there are some events for which consumers do not plan (even if they may, in principle, be aware of the existence of such events), and if such an event occurs, then they may be compelled to file for bankruptcy. If such an event does not occur, consumers do not consider filing for bankruptcy. For a statement like this to be true in a model of this theory, it is important to answer at least two questions. First, why don't consumers plan for some events? Second, even if they don't plan for some events, why do they not include a bankruptcy option in the events for which they do plan?

Consumers might not plan for some events if they assign an event a subjective probability of zero. For example, we observe that in surveys of individual mortality, some consumers list as zero their probability of next-period mortality (Gan, Hurd, and McFadden, 2005). Such an assignment can arise if the cost of making very fine probability distinctions is relatively high, or it can arise as a mistake that has a miniscule impact. For example, in the PSID data, the probability of bankruptcy is 0.003017, as reported in FHW. Moreover, such an assignment could arise from effectively incomplete markets. For example, there are limits to coverage for virtually all types of standardized insurance contracts, whether auto, health, or unemployment, and of course, with some positive probability, an event could occur where coverage is inadequate. Thus, subjective probability may be zero, but objective probability may be positive.

It is somewhat harder to justify theoretically why, in events for which consumers otherwise plan, they do not include a bankruptcy option that is legally, and in principle,

[5] Sullivan, Warren, and Westbrook (2000) present some evidence from the 1992 Worker Displacement Survey, and the Census Bureau that of the workers who were laid-off during 1990-92, and who had worked full-time for at least three years before their lay-off, about one-quarter had regained full-time work at the time of the survey, but were working at a lower wage than earlier.

widely available. One explanation for this is that ex ante, the benefit from a bankruptcy filing is low relative to costs; for example, as reported in FHW, for families that can gain from a bankruptcy filing, the mean benefit from filing is $7,813, and the probability of filing is 0.003017, for an ex-ante filing benefit of about $25. This is less than the cost of a planning session with a bankruptcy lawyer, or the resources expended to purchase and plan with a book on how-to-file. Another explanation can be provided in terms of utility penalties arising from future reputation losses from filing; for example, see Dubey, Geanakoplos, and Shubik (2005). Such losses can arise from a combination of restricted future access to debt markets, credit score impact (for severity of credit score impact, see Musto 2004,) and loss of option to re-file for some period (six years for a Chapter 7 filing). If such losses are very high when consumers file in the absence of adverse events, and such losses outweigh benefits of filing, then in non-adverse events, consumers may optimally decide to not consider a bankruptcy option. For example, a bankruptcy flag on a consumer credit report is one of the worst derogatories on a credit report, and it stays there for ten years, but the legal system allows a Chapter 7 re-filing after six years. Consequently, the longer memory of a bankruptcy filing by financial institutions increases the cost of filing by increasing future costs of accessing debt markets.

Therefore, as a first approximation, we may view adverse events consumers as taking decisions sequentially; in period 1, they plan for some events, and in such events, they do not plan to file for bankruptcy, but they do not plan for other events (termed adverse events). In period 2, if a planned-for event occurs, they consume as planned, and if an adverse event occurs, they include a bankruptcy option in their decision-making and re-optimize accordingly. In other words, in period 1, "no one plans to go bankrupt."

Notably, the explanations given above are based on the currently realized situation, and may be taken as an approximation that may hold for small changes in the current situation. Such an approximation may not necessarily hold, if the economic and legal environment is very different; whether in the same economy under consideration, or in a different economy. As shown by FHW, the bankruptcy decision is significantly affected by financial benefit from filing. Therefore, if large changes are considered to a legal or economic system, or a very different system is considered, additional justification would be useful before applying this version of adverse events theory.

This simple version of adverse events decision-making is sufficient to derive a test for the theories under consideration. Consider a standard, two-period decision-making framework. In the first period, there is one decision node. In the second period, one of three states of the world prevail; a good state, indexed g, a bad state, indexed b, and a terrible state, indexed t. Each state corresponds to a decision node, and the probability of each state is π_g, π_b, and π_t, respectively, with $\pi_g + \pi_b + \pi_t = 1$.

As usual, a consumer has to decide how much to consume at each node; his consumption is indexed c_0, c_g, c_b, and c_t. Moreover, lending markets are available to him at a one-period, risk-adjusted, market interest rate r. As usual, a single consumer takes interest rates as given. His endowment in consumption units at each node is denoted w_0, w_g, w_b, and w_t. (For convenience, suppose $w_0 = 0$, and $0 < w_t < w_b < w_g$.) Moreover, he has to decide how much debt to take, subject to some exogenously specified debt limit; indexed $\bar{d} > 0$. His twice continuously differentiable von Neumann-Morgenstern utility is denoted $u(c)$ with $u' > 0, u'' < 0, \lim_{c \to 0} u'(c) = \infty, \lim_{c \to \infty} u(c) = \infty.$ His expected utility is $U = u(c_0) + \delta[\pi_g u(c_g) + \pi_b u(c_b) + \pi_t u(c_t)].$

An adverse events consumer takes decisions sequentially. In period 1, he plans for states *g, b*, and he plans to remain solvent in these states, but he does not plan for state *t*. In period 2, if *g* or *b* occurs, he consumes as planned, but if *t* occurs, he considers the option to file for bankruptcy. There are some costs of filing for bankruptcy; usually some loss of assets, court fees, lawyer fees, limited future participation in debt markets, and so on. Benefits of filing include, among others, discharge of debt, fresh start, and accompanying wealth insurance. Adapting a simple form of a Chapter 7 filing,[6] it is assumed that a filer gives up all his assets except any exemptions from forfeiture provided by law, and his debt is discharged.[7] Exemptions specified under law are summarized by *e*. For the clearest distinctions between the two theories, suppose $0 < w_t < w_b \le e < w_g$. (That is, exemptions are sufficiently high to have non-negative financial benefit from filing in bad and terrible states, but not necessarily in a good state.) Consequently, an adverse events consumer solves the following problem.

$$\begin{aligned}
&\textit{Stage I}: \max_{d, c_0, c_g, c_b} u(c_0) + \delta[\pi_g u(c_g) + \pi_b u(c_b)] \\
&\textit{subject to} \quad c_0 = d \\
&\qquad c_g = w_g - (1+r)d \\
&\qquad c_b = w_b - (1+r)d \\
&\qquad d \le \bar{d} \\
&\textit{Stage II}: \textit{If} \quad t, \quad \textit{then} \quad \textit{set}: \\
&\qquad c_t = \max(w_t - (1+r)d, \min(w_t, e))
\end{aligned}$$

In Stage I, a consumer decides optimal debt and consumption (d, c_0, c_g, c_b), and by assumption, he does not file in *g, b*. Given $d > 0$, and $w_t < e$, in Stage II, if *t* occurs, optimal choice is to file and consume $c_t = w_t$. The appendix shows existence of a solution for this problem, and some comparisons with a strategic timing consumer.

Strategic Timing Theory

A strategic timing consumer is a standard rational consumer who includes the bankruptcy option in her maximization problem. Assumptions regarding decision nodes,

[6] Chapter 7 bankruptcies account for about 70 percent of all bankruptcies.

[7] The other main personal bankruptcy category, Chapter 13 bankruptcy, accounting for about 29 percent of all cases, can be viewed in this formulation as follows. In this type of filing, a repayment plan proposed by the debtor is confirmed by the Court, and a discharge of remaining debt is provided on successful completion of the plan. In this case, net assets saved and debts discharged depend on the repayment plan, and can be mapped to this model after an appropriate discounting for period of plan. Exemptions provided under law are the same in both cases.

endowments, utility functions, and expected utility are the same as in the previous case. Moreover, it is assumed that the bankruptcy process is the same as in the previous case. Of course, the difference is in the optimization problem. In each state in the second period, a strategic timing consumer has an option to file for bankruptcy, and solves the following problem.

$$
\begin{aligned}
&\max_{d,c0,cg,cb,File,Not} u(c_0) + \delta[\pi_g u(c_g) + \pi_b u(c_b) + \pi_t u(c_t)] \\
&\textit{subject to} \quad c_0 = d \\
&\qquad c_g = \max(w_g - (1+r)d, \min(w_g, e)) \\
&\qquad c_b = \max(w_b - (1+r)d, \min(w_b, e)) \\
&\qquad c_t = \max(w_t - (1+r)d, \min(w_t, e)) \\
&\qquad d \le \overline{d}
\end{aligned}
$$

The maximum operator for decision nodes in the second period corresponds to the bankruptcy decision. For example, if a consumer decides not to file in *g*, her constraint is $w_g - (1+r)d$, and if she decides to file, her constraint is $\min(w_g, e)$, where, as before, *e* captures exemptions permitted in bankruptcy. Recall that $0 < w_t < w_b \le e < w_g$, as before.

In this case, it is easy to see that a strategic timing consumer files in *b* and *t*, and therefore, more frequently than an adverse event consumer. Moreover, depending on the economic environment, a strategic timing consumer might or might not file in *g*, but an adverse events consumer does not file in *g*. The appendix characterizes the solution for this problem, and provides comparisons with an adverse events consumer.

A Prediction

One clear distinction between the strategic timing and adverse events theory is that for strategic timing consumers, the bankruptcy decision and the debt decision (and consequently, financial benefit) are jointly determined, whereas for adverse events consumers, the debt decision (and consequently, financial benefit) is exogenous to the filing decision.

Notice that the test here is, in principle, independent from conclusions in FHW. The insignificance of coefficients on variables for adverse events can be viewed as negating a strong version of the adverse events theory; that is, there is little evidence that ceteris paribus, (in particular after controlling for financial benefit,) consumers file for bankruptcy on the occurrence of an adverse event, such as a medical problem, or unemployment, or divorce. Of course, as described in Sullivan, Warren, and Westbrook (2000), another channel for the operation of adverse events is through their impact on consumer debt and consumer wealth, (and consequently, on financial benefit from bankruptcy,) and on earned income, (and consequently, on repayment ability.) In particular, an increase in financial benefit could arise from an occurrence of adverse events or from strategic timing. For example, financial benefit increases when unsecured debt increases, whether due to an adverse event, such as unemployment, or due to a strategic increase in credit card debt before filing for bankruptcy. Therefore, it is possible that increased financial benefit could increase the probability of filing based on occurrence of adverse events. Nevertheless, a distinction between these two theories can be derived by investigating whether financial benefit is endogenous to the bankruptcy decision or not.

4. Data and Results

The dataset used here is a combined cross section and time series sample of PSID households over the period 1984-95; the same dataset is used in FHW. We consider three specifications, close to FHW as well, as follows:

$$\Pr(\text{file}) = \Phi(X\beta + \gamma_1 fb) \quad (1)$$

$$\Pr(\text{file}) = \Phi(X\beta + \gamma_2 d + \gamma_3 ne) \quad (2)$$

$$\Pr(\text{file}) = \Phi(X\beta + \gamma_4 d + \eta AE) \quad (3)$$

In all three specifications, the independent variable, *file* or *not*, indicates whether a household files for bankruptcy or not. The variable *fb* is financial benefit from filing, and is defined as $fb = \max(d - ne, 0)$, where *d* is debt discharged in bankruptcy, and *ne* is non-exempt assets given up in bankruptcy, defined as $ne = \max(w - e, 0)$, where *w* is wealth, and *e* measures exemptions. The vector *AE* represents adverse events, and includes a dummy for divorce, length of unemployment in weeks, and a dummy for health problems. The explicit assumption here is that adverse events are exogenous to the bankruptcy decisions. In other words, people do not intentionally experience these adverse events for the purpose of filing for bankruptcy. The variable *X* is a vector of control variables, including demographic variables, a proxy for local trends, a proxy for legal fees for filing, and state-level variables.[8]

The key coefficients are γ_1, γ_2, γ_3, γ_4, and η. An interpretation in FHW is that a positive γ_1 and γ_4, a positive γ_2, and a negative γ_3 are consistent with strategic behavior, and positive coefficients η are consistent with adverse events behavior. As mentioned above, the test here is different, because it allows for an impact of adverse events on debt, on wealth, and on financial benefit, and consequently, on probability of filing via the γ coefficients. Therefore, the interpretation here is that although directional results for the γ coefficients may possibly be consistent with either theory, a distinction still emerges from the endogeneity or exogeneity of variables such as financial benefit, non-exempt assets, and debt.

[8] Demographic variables include age and squared age of head of household, years of education of head, family size, a dummy for household owning home, and a dummy for household owning a business. The proxy for local legal trends is the one-year-lagged aggregate bankruptcy rate in the household's bankruptcy district. The (inverse) proxy of legal fees is the per capita number of lawyers. A higher number of per capita lawyers indicate more competitions and hence lower legal fees. State-level variables include growth of average income in household's state, county level unemployment rate, and standard deviation of income per capita in the state. These variables are used in FHW as well.

Let the null hypothesis be the adverse events theory. In particular, for the specification in (1), the null hypothesis is H_0: *fb* is exogenous. For the specification in (2), the null hypothesis is H_0: *d* and *ne* are exogenous. The specification in (3) is no longer appropriate for our test since the vector *AE* now serves as exogenous variables for the Hausman endogeneity test, and can no longer enter directly as factors to explain bankruptcy decisions.

The Hausman test is a two-stage process. At the first stage, we estimate *fb*, or *d* and *ne* using the set of exogenous variables *AE* and additional controls *Z*. The predicted values of *fb*, or *d* and *ne* are then used in the second stage to predict a household's decision to file for bankruptcy. Since *fb* is a function of *d* and *ne*, while *ne* is a function of *w* and exogenous exemption value *e*,[9] we need only to estimate *d* and *w* in the first stage. The predicted values of *fb* and *ne* can be calculated using the predicted *d* and *w* from the first stage.

As a benchmark, consider first a least square estimator of wealth and debt, as follows:

$$\begin{aligned} w &= X\delta_w + \mu_w AE + \varepsilon_w \\ d &= X\delta_d + \mu_d AE + \varepsilon_d \end{aligned}, \qquad (4)$$

where *X* is the vector of control variables. First stage regression results for both *w* and *d* are reported in the "Least Square" panel in Table 1.

Consider next an estimator that assumes both *w* and *d* are log-normally distributed. Wealth and income are often considered to be log-normally distributed (see, for example, Crow and Shimizu, 1988). A nonparametric density of *d* reveals that *d* also has a distribution that is close to log-normal. However, a log-normal density requires all observations are positive. Since 7.56 percent of observations of *w* are negative, and an additional 7.01 percent of observations of *w* are zero, it is necessary to make a transformation of *w*. We assign a wealth of $1 to those households with negative or zero wealth. The negative value of *w* is included as part of debt. We then assign a debt of $1 to those households with zero debt. The new debt, denoted as d_1, now includes the negative part of wealth with minimum level of debt of $1. Similarly, the new wealth, denoted as w_1, is now all positive, with minimum level of wealth of $1. Therefore, equation (4) becomes:

$$\begin{aligned} \log(w_1) &= X\delta_w + \theta_1 1_{w<0} + \theta_2 1_{w=1} + \mu_w AE + \varepsilon_w \\ \log(d_1) &= X\delta_d + \lambda_1 1_{w<0} + \lambda_2 1_{d_1=1} + \mu_d AE + \varepsilon_d \end{aligned}, \qquad (5)$$

[9] Historically, exemption levels were affected by political constituencies; in states with large farmlands and farming communities, higher exemption levels can be observed. This is reflected in a special procedure, Chapter 12, for family farmer bankruptcies as well. However, data available from 1986 to present show that annually, Chapter 12 bankruptcies are a miniscule proportion (less than 0.01 percent) of total bankruptcies. As mentioned above, this paper focuses more on consumer bankruptcies, in which case, exemptions are reasonably assumed to be exogenous.

where ε_w and ε_d have normal distributions. It is expected that w and d may be correlated. The raw correlation coefficients between the w and d, between w_I and d_I, and between $\log(w_I)$ and $\log(d_I)$ are .0842, .0644, and -.0577, respectively. Therefore, the error terms ε_w and ε_d are allowed to be correlated.

In principle, negative wealth can affect a household decision differently from unsecured debt. Negative wealth comes from negative net worth of real estate, farms/businesses, and vehicles. Loans on these are usually secured by the assets themselves. In the case of default, (or bankruptcy,) these assets are repossessed by creditors, (or sold by the trustee of the estate,) likely making it costlier for the debtor to provide a good substitute for such an asset. But unsecured debt does not carry this additional loss of an asset. Unsecured household debt includes credit card charges, student loans, medical, or legal bills, or loans from relatives. To distinguish between these two types of debts, dummies are included in the wealth equation to indicate if a household's wealth was originally negative, or zero. Similarly, dummies are included in the debt equation to indicate if a household's debt includes negative wealth, and if a household's debt is zero. Finally, the log of household income for last period is used, instead of the level itself, to minimize the effect of income outliers. Households with zero income are assigned an income of $1. A dummy for zero income is included in the model. Maximum likelihood is used to jointly estimate equations (5). The second panel in Table 1, denoted as "log-normal", illustrates estimation results.

In stage 1, adverse events are represented by four variables – a dummy for divorce, period of unemployment in weeks, squared period of unemployment, and a dummy for health problems. These four variables enter the first stage regression only. As shown in Table 1, for the least square estimator, the coefficients for adverse events are not significantly estimated. For the lognormal estimator, in the debt equation, the coefficients for adverse events are not statistically significant, but in the wealth equation, both divorce and health problem would significantly reduce a household's wealth. Divorce would reduce a household's wealth by 14.4%, while the health problem would reduce a household's wealth by 23.3%.

For both estimators, the coefficients for many control variables are significantly estimated. In some cases, both estimators yield similar results. For example, a household with a higher labor income has more wealth and more debt, while a household with a larger income reduction at the last period has lower wealth and lower debt. More years of education of head of the household increases both wealth and debt, while a larger household has less wealth but more debt. A household who owns business has higher wealth and higher debt. In other cases, the two estimators may yield different results. For example, owning a house appears to have no impact on a household's unsecured debt, if the least square estimator is used, but a household's debt increases by 8.1%, if the lognormal estimator is used. The difference between the two estimators may come from the different specifications in independent variables, and the different assumptions in error distributions.

For the log-normal estimation, the dummy for negative wealth is statistically significantly estimated, indicating that the unsecured portion of secured debt (negative wealth) is indeed different from unsecured debt. The dummies for zero wealth or debts are also significantly estimated, indicating that zeros may be systematically different from non-zeros. The dummy for zero labor income is statistically significant, indicating that non-labor income may differ systematically from those households with labor income and those households without labor income. Finally, the correlation coefficient between the log of wealth and the log of debt is statistically insignificant from zero.

Let the predicted wealth and debt from the first stage be $\hat{w}$ and $\hat{d}$. The predicted non-exempt assets *ne* and financial benefits *fb* are calculated by:

$$\hat{ne} = (\hat{w} - e) \times 1_{(\hat{w} > e)}$$

$$\hat{fb} = \left(\hat{d} - \hat{ne}\right) \times 1_{\left(\hat{d} > \hat{ne}\right)}$$

The predicted $\hat{fb}$ and $\hat{ne}$ now enter into the second stage to form the Hausman test. Table 2 reports the result for specification (1), and table 3 reports the result for specification (2).

In table 2, first, a probit is conducted for whether a household files for bankruptcy, using observed financial benefit *fb*. Then predicted financial benefit $\hat{fb}$ is used to conduct the same probit. As wealth and debt are slightly different in the two estimations, (because of transformation,) the *fb* variable is slightly different in these estimations as well. Therefore, two probits are reported for each estimation, one using the observed data (denoted as "observed" in table 2), and the other using the predicted $\hat{fb}$, denoted as either "least square" or as "log-normal" depending on the estimation method at the first statge.

In table 2, when observed data are used, financial benefit positively affects probability of filing bankruptcy.[10] However, if predicted $\hat{fb}$ from least square estimator is used, $\hat{fb}$ now has a negative effect on the probability of filing bankruptcy. If the predicted $\hat{fb}$ from the lognormal estimator is used, the coefficient for $\hat{fb}$ is no longer significant.

Similarly, in table 3, first, a probit is conducted for whether a household files for bankruptcy, using observed *d* and *ne*, and then their predicted values are used to conduct the same probit. In table 3, the level of *d* positively, and the level of *ne* negatively affect the bankruptcy decision.[11] However, the effect of $\hat{d}$ and $\hat{ne}$ on the bankruptcy decision is no longer as clear. The $\hat{d}$ from the least square estimator has a significant but negative

[10] For reference, coefficients in the first column of Table 2 can be compared to those reported in the comparable specification in FHW.
[11] For reference, coefficients in the first column of Table 3 can be compared to those reported in the comparable specification in FHW.

effect on the bankruptcy decision, but $\hat{d}$ from the lognormal estimation has no statistically significant effect.

Another interesting observation from tables 2 and 3 is about the coefficients of control variables *X*. No matter using the observed *fb*, *d*, and *ne*, or using the predicted $\hat{fb}$, $\hat{d}$ and $\hat{ne}$ from different estimation methods, their corresponding coefficients and their standard errors are all very close.

The Hausman test statistic has a χ^2 distribution with 58 degrees of freedom. The 5% critical value is 76.8, and the 10% critical value is 72.1. In all cases, the Hausman test statistics are relatively much smaller than the 10% critical value. For specification (1) in table 2, the Hausman test statistic is 9.62 for the least square estimator and 11.7 for the lognormal estimation. For specification (2) in table 3, the Hausman test statistics are negative: -7.00 for the least square estimator and -.94 for the lognormal estimator. In these two cases, we calculate generalized Hausman test statistic.[12] For the least square estimator, the generalized Hausman test statistic is 58.3. For the lognormal estimator, the generalized Hausman test statistic is 59.5.[13] In both cases, we fail to reject the H_0 hypothesis. The tests here favor the adverse event theory.

Notice that there are several limitations of this work.

As is well-known, wealth data in the PSID are not available with the ideal frequency and detail for several aspects of bankruptcy research. (Additional data limitations and their effects are described in FHW.)

Moreover, it would be good to have results from additional empirical specifications of the models. For reference, two additional tests for stage 1 results were tried on these data – one using least absolute deviation, (and censored least absolute deviation for financial benefit,) and another using robust regression. The LAD estimator failed to converge, and the robust regression estimator predicted wealth poorly enough to yield too many zeroes for predicted non-exempt assets, and led predicted non-exempt assets to be dropped in the second stage, and consequently, a drop of the variable squared non-exempt assets, and the interaction term.

Furthermore, the model of adverse events formulated here is one model of adverse events theory. We are not aware of another model of adverse events that can be compared directly with a standard economic model. The model formulated is designed to capture an important aspect of adverse events theory ("no consumer plans to go bankrupt"), and designed to capture this effect in the simplest possible manner. No doubt, other models

[12] Consider two estimates: $\hat{\beta}_0$ and $\hat{\beta}_a$. Under H_0, $\hat{\beta}_0$ is consistent and efficient, while $\hat{\beta}_a$ is only consistent. The Hausman test statistic is calculated as $(\hat{\beta}_0 - \hat{\beta}_a)'\left[Var(\hat{\beta}_0)^{-1} - Var(\hat{\beta}_a)^{-1}\right](\hat{\beta}_0 - \hat{\beta}_a)$ while the generalized Hausman test statistic is given by: $(\hat{\beta}_0 - \hat{\beta}_a)'Var^{-1}(\hat{\beta}_0 - \hat{\beta}_a)(\hat{\beta}_0 - \hat{\beta}_a)$.

[13] The generalized Hausman test statistics for specifications (1) are: 55.3 for least square estimator and 63.5 for lognormal estimator. Again, the adverse event theory is favored.

may yield different testable predictions, and additional research would be very helpful to shed more light on the problem of which theory is borne out more in the data.

Appendix

Solution to optimization problem for an adverse events consumer

Notice that the first-order condition for the consumer's stage I problem is:
$MU^{AE}(d) = u'(d) - \delta(1+r)\pi_g u'(w_g - (1+r)d) - \delta(1+r)\pi_b u'(w_b - (1+r)d) = 0.$
Moreover, as $\lim_{d\downarrow 0} u'(d) = \infty$, for d small enough, $MU^{AE}(d)>0$, and for d sufficiently large, w_g - $(1+r)d$, and w_b - $(1+r)d$ are sufficiently small, and hence, $MU^{AE}(d)<0$. Therefore, there is unique $d^* \equiv d^{*AE} > 0$ such that $MU^{AE}(d^{*AE})=0$. Furthermore, it is easy to check that $\partial MU^{AE}(d)/\partial d < 0$, and consequently, if $d \le d^{*AE}$, then $MU^{AE}(d) \ge MU^{AE}(d^{*AE})$, and if $d>d^{*AE}$, then $MU^{AE}(d)<MU^{AE}(d^{*AE})$. Comparisons with strategic timing consumers are provided below.

Solution to optimization problem for a strategic timing consumer

For the state g, the optimal decision of a strategic timing consumer can be characterized as follows. Notice that utility of filing in g, when debt is d, is
$U(\text{file}, d) = u(d) + \delta[\pi_g u(e) + \pi_b u(w_b) + \pi_t u(w_t)]$, and utility of not filing is
$U(\text{not}, d) = u(d) + \delta[\pi_g u(c_g) + \pi_b u(w_b) + \pi_t u(w_t)]$.

Consider the action of not filing. Then marginal utility is:
$MU^{ST}(not, d) = u'(d) - \delta(1+r)\pi_g u'(c_g)$. Notice that marginal utility is decreasing in debt, because $\partial MU^{ST}(not, d)/\partial d = u''(d) + \delta(1+r)^2 \pi_g u''(c_g) < 0$. Moreover, $\lim_{d\downarrow 0} u'(d) = \infty$, implies that for d small enough, $MU^{ST}(not,d)>0$, and for d sufficiently large, w_g-$(1+r)d$ is sufficiently small, and hence, $MU^{ST}(\text{not}, d) < 0$. Therefore, there is a unique $d^* > 0$ such that $MU^{ST}(\text{not}, d^*) = 0$. Furthermore, $\partial MU^{ST}(\text{not}, d)/\partial d < 0$ implies that if $d < d^*$, then $MU^{ST}(\text{not}, d) \ge MU^{ST}(\text{not}, d^*)$, and if $d>d^*$, then $MU^{ST}(\text{not}, d) < MU^{ST}(\text{not}, d^*)$. Consequently, if a consumer considers not filing, then maximum utility possible when debt limit is $\bar{d}$ is as follows: if $\bar{d} \le d^*$, then maximum utility is $U(\text{not}, \bar{d}) = u(\bar{d}) + \delta[\pi_g u(w_g - (1+r)\bar{d}) + \pi_b u(w_b) + \pi_t u(w_t)]$, and if $\bar{d} > d^*$, then maximum utility is:
$U(\text{not}, d^*) = u(d^*) + \delta[\pi_g u(w_g - (1+r)d^*) + \pi_b u(w_b) + \pi_t u(w_t)]$.

Consider the action of filing. Then marginal utility is $MU^{ST}(\text{file}, d)=u'(d)>0$, and consequently, the optimal debt choice is to set $d = \bar{d}$. Therefore, if a consumer considers filing, the maximum utility when debt limit is $\bar{d}$ is:
$U(\text{file}, \bar{d}) = u(\bar{d}) + \delta[\pi_g u(e) + \pi_b u(w_b) + \pi_t u(w_t)]$.

In order to characterize the optimal decision, it is useful to define the level of debt at which the consumer is financially indifferent between filling or not. That is, let $\hat{d}$ solve $w_g - (1+r)\hat{d} = e$. In other words, let $\hat{d} = (w_g - e)/(1+r)$.

Suppose $\bar{d} \le \hat{d}$. That is, debt limit is small relative to $\hat{d}$. (In other words, $e = w_g - (1+r)\hat{d} \le w_g - (1+r)\bar{d}$. That is, exemptions are small relative to net wealth after maximum possible debt payoff.) Then the consumer's optimal decision is not to file in *g*. This can be seen by separately considering two cases: $\bar{d} \le d^*$, and $\bar{d} > d^*$.

If $\bar{d} \le d^*$, then maximum utility from not filing is:
$U(\text{not}, \bar{d}) = u(\bar{d}) + \delta\left[\pi_g u\left(w_g - (1+r)\bar{d}\right) + \pi_b u(w_b) + \pi_t u(w_t)\right]$,
and maximum utility from filing is $U(\text{file}, \bar{d}) = u(\bar{d}) + \delta\left[\pi_g u(e) + \pi_b u(w_b) + \pi_t u(w_t)\right]$.
Moreover, $\bar{d} \le \hat{d}$ implies that $e = w_g - (1+r)\hat{d} \le w_g - (1+r)\bar{d}$, and consequently, $U\left(\text{not}, \bar{d}\right) \ge U\left(\text{file}, \bar{d}\right)$.

If $\bar{d} > d^*$, then maximum utility from not filing is:
$U(\text{not}, d^*) = u(d^*) + \delta\left[\pi_g u\left(w_g - (1+r)d^*\right) + \pi_b u(w_b) + \pi_t u(w_t)\right]$,
and maximum utility from filing is $U(\text{file}, \bar{d}) = u(\bar{d}) + \delta\left[\pi_g u(e) + \pi_b u(w_b) + \pi_t u(w_t)\right]$.
Moreover, $\bar{d} \le \hat{d}$, and the optimality of d^* imply that
$u\left(d^*\right) + \delta\pi_g u\left(w_g - (1+r)d^*\right) > u\left(\bar{d}\right) + \delta\pi_g u\left(w_g - (1+r)\bar{d}\right) \ge u\left(\bar{d}\right) + \delta\pi_g u(e)$, and consequently, $U\left(\text{not}, d^*\right) \ge U\left(\text{not}, \bar{d}\right) \ge U\left(\text{file}, \bar{d}\right)$.

Consider now the case $\bar{d} > \hat{d}$. That is, debt limit is large relative to $\hat{d}$. (In other words, $e = w_g - (1+r)\hat{d} > w_g - (1+r)\bar{d}$. That is, exemptions are large relative to net wealth after maximum possible debt payoff.) Then the filing decision is a little more nuanced, and it depends on the tradeoff between exemptions and net wealth after paying off endogenously determined debt use. This can be seen by separately considering the following cases: when $\hat{d} \le d^*$ (that is, exemptions are large relative to net wealth after paying off optimal debt in the case of not filing) and when $\hat{d} > d^*$ (that is, exemptions are small relative to net wealth after paying off optimal debt in the case of not filing).

Suppose $\hat{d} \le d^*$. (In other words, exemptions are large relative to wealth after paying off d^*.) Then the optimal decision is to file, and it can be seen by considering the following two cases. If $\bar{d} \le d^*$, then maximum utility from not filing is: $U(\text{not}, \bar{d}) = u(\bar{d}) + \delta\left[\pi_g u\left(w_g - (1+r)\bar{d}\right) + \pi_b u(w_b) + \pi_t u(w_t)\right]$, and maximum utility from filing is $U(\text{file}, \bar{d}) = u(\bar{d}) + \delta\left[\pi_g u(e) + \pi_b u(w_b) + \pi_t u(w_t)\right]$. Moreover, $\bar{d} > \hat{d}$ implies that $e = w_g - (1+r)\hat{d} > w_g - (1+r)\bar{d}$, and consequently, $U\left(\text{file}, \bar{d}\right) > U\left(\text{not}, \bar{d}\right)$. If

$\bar{d} > d^*$, then maximum utility from not filing is
$U(\text{not}, d^*) = u(d^*) + \delta\left[\pi_g u\left(w_g - (1+r)d^*\right) + \pi_b u(w_b) + \pi_t u(w_t)\right]$,
and maximum utility from filing is $U(\text{file}, \bar{d}) = u(\bar{d}) + \delta\left[\pi_g u(e) + \pi_b u(w_b) + \pi_t u(w_t)\right]$.
Moreover, $\hat{d} \le d^*$ implies that $e = w_g - (1+r)\hat{d} > w_g - (1+r)\bar{d}$, and consequently, $U\left(\text{file}, \bar{d}\right) > U\left(\text{not}, \bar{d}\right)$.

Suppose $\hat{d} > d^*$. (Exemptions are small relative to d^*.) Then there is a unique $\bar{d}^*$, $\hat{d} < \bar{d}^*$, such that if $\hat{d} < \bar{d} < \bar{d}^*$, then optimal decision is to not file, and if $\bar{d}^* < \bar{d}$, then optimal decision is to file. This case highlights an interesting dynamic. In this case, relatively high debt limits additionally affect a consumer's decision to file. That is, even when exemptions are relatively small as compared to a consumer's desired debt (when not filing), she may decide to file, if her debt limit is sufficiently high to make the intertemporal consumption tradeoff valuable. This sufficiently high threshold is characterized by $\bar{d}^*$. Recall from a previous case that if $\hat{d} = \bar{d}$ and $\hat{d} > d^*$, then $U(\text{not}, d^*) > U(\text{file}, \bar{d})$. In other words, if exemptions are the same as net wealth after maximum debt payoff, but consumer's optimal use of debt is smaller than maximum debt allowed, then it is beneficial for the consumer to not file, essentially because the additional consumption in period 1 from additional debt does not compensate for the decrease in consumption in state *g* that results from filing. Therefore, for $\bar{d}$ slightly larger than $\hat{d}$, $U(\text{not}, d^*) > U(\text{file}, \bar{d})$. However, in the region $\left[d^*, \infty\right)$, $\partial U(\text{not}, d)/\partial d^* = 0$, and, $\partial U(\text{file}, \bar{d})/\partial \bar{d} = u'\left(\bar{d}\right) > 0$. In other words, maximum utility from filing is strictly increasing in $\bar{d}$, while maximum utility from not filing is constant. Moreover, u is unbounded above. Consequently, there is a unique $\bar{d}^*$, $\hat{d} < \bar{d}^*$, such that for each $\bar{d}$, if $\hat{d} < \bar{d} < \bar{d}^*$, then optimal choice is to not file, and if $\bar{d}^* < \bar{d}$, then optimal choice is to file.

Some Comparisons

The models above shed more light on the behavior of these different consumers. These differences can yield testable predictions, and can help understand some otherwise puzzling results.

One clear distinction between the strategic timing and adverse events theory is that for strategic timing consumers, the bankruptcy decision and the debt and consumption decisions are jointly determined, whereas for adverse events consumers, the debt decision is exogenous to the filing decision.

A second distinction is that adverse events consumers may file less frequently than strategic timing consumers. This can complement other arguments for why households filing for bankruptcy form only a small fraction of households that would gain from bankruptcy, (see, for example, FHW, or White (1998).)

Another intuitive comparative statics result that can be seen formally here is that debt use by adverse events consumers is sometimes less, and never more than that for strategic timing consumers. Of course, when debt limits are sufficiently low, both types might decide to use maximum possible debt, and in this case, debt levels are the same. But notice that the optimal debt level for adverse events consumers can be lower than that for strategic timing consumers, because

$$\begin{aligned} MU^{AE}(d) &= u'(d) - \delta(1+r)\pi_g u'\left(w_g - (1+r)d\right) - \delta(1+r)\pi_b u'\left(w_b - (1+r)d\right) \\ &< u'(d) - \delta(1+r)\pi_g u'\left(w_g - (1+r)d\right) && \left[= MU^{ST}(\text{not}, d)\right] \\ &< u'(d) && \left[= MU^{ST}(\text{file}, d)\right] \end{aligned}$$

In particular, $MU^{AE}\left(d^{*AE}\right) < MU^{ST}\left(\text{not}, d^{*ST}\right) = 0$ implies $d^{*AE} < d^{*ST}$.

Table 1: First Stage Regression Results

	Least Square		Log-normal	
	Wealth	Debt	log(wealth)	log(Debt)
Divorce Dummy	-16,896	235	-.144	.047
	(-1.80)*	(.53)	(-3.92)	(1.53)
Period of Unemployment	-5,708	274	-.0072	.017
	(-.68)	(.79)	(-.35)	(1.07)
(Period of Unemployment)^2	95.3	-28.3	-1.17e-4	-.0012
	(.19)	(-1.46)	(-.09)	(-1.27)
Health Problem Dummy	7,673	614	-.233	-.0098
	(.68)	(1.47)	(-7.72)	(-.47)
Lagged Bankruptcy Rate	-5.62e+5	24,311	-2.74	.917
	(-1.78)	(1.71)	(-2.69)	(1.24)
Household Income or	4.07	.061	.254	.108
log(household income) at t-1	(10.6)	(2.35)	(28.0)	(18.2)
Income Reduction at t-1	-6.37	-.074	-1.05e-5	-2.58e-6
	(-6.31)	(-1.76)	(-8.54)	(-3.82)
Age of Head	612	79.3	.028	.0029
	(.57)	(2.21)	(9.03)	(1.39)
(Age of Head)^2	49.4	-1.04	-3.44	-4.3e-5
	(4.36)	(-2.36)	(-1.10)	(-2.10)
Years of Education	2,249	138	.033	.010
	(3.76)	(4.25)	(9.12)	(5.09)
Family Size	-6,359	193	-.031	.043
	(-3.56)	(1.75)	(-6.17)	(11.5)
Own Business	2.82e+5	2,333	.871	.173
	(15.6)	(3.64)	(38.2)	(10.0)
Own House	75,999	-338	1.88	.081
	(12.2)	(-.94)	(85.9)	(6.42)
Lawyers per capita	50,909	-4,704	1.15	-.097
	(.93)	(-1.10)	(6.30)	(-.73)
County unemployment rate	-25,474	-1,480	-.073	-.017
	(-2.56)	(-3.69)	(-2.94)	(-.89)
State Income Growth	97,473	-18,478	-.029	-.349
	(.63)	(-3.36)	(-.07)	(-1.13)
State Income Deviation	17,873	42.6	-.0026	.045
	(3.26)	(.09)	(-.11)	(2.55)
Dummy for zero income			2.29	.94
			(25.6)	(16.1)
Dummy for negative wealth			-9.42	1.54
			(-362)	(49.8)
Dummy for zero wealth or			-8.89	-7.66
zero debt			(-296)	(-624)
Constant	-1.04e+6	4,306	5.58	6.14
	(-1.78)	(1.69)	(26.8)	(40.1)
Std dev of log of the density			1.26	.984
			(162)	(166)
Correlation coefficient			-.0077	
			(-1.37)	
Time Fixed Effect	Yes	Yes	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes
No of observations	58,466	58,464	56,179	56,179

* t-statistic calculated from the robust standard error is in parenthesis.

Table 2: Results from Probit Regressions for Specification (1)
(Independent variable: file for bankruptcy or not)

First stage method	Least Square		Log-normal	
	Observed	Least square	Observed	Log-normal
Financial Benefit	4.67e-5	-8.41e-5	2.67e-5	1.84e-5
	(4.44)*	(-2.15)	(4.41)	(1.21)
$(\text{Financial Benefit})^2$	-7.51e-10	8.42e-9	-2.38e-10	4.28e-11
	(-2.30)	(1.57)	(-2.30)	(.06)
Lagged Bankruptcy Rate	5.82	6.18	5.91	5.72
	(2.66)	(2.27)	(2.21)	(2.12)
Household Income at t-1	-5.04e-6	-6.01e-6	-4.86e-06	-4.80e-06
	(-3.56)	(-4.32)	(-3.52)	(-3.49)
Reduction in Income at t-1	-2.14e-6	-1.86e-6	-2.14e-06	-2.16e-06
	(-3.60)	(-3.19)	(-2.13)	(-3.67)
Age of Head	.029	.031	.029	.030
	(2.14)	(2.27)	(2.13)	(2.22)
$(\text{Age of Head})^2$	-4.87e-04	-5.34e-4	-4.88e-04	-5.02e-04
	(-3.10)	(-3.39)	(-3.11)	(-3.20)
Years of Education	-.031	-.026	-0.030	-.028
	(-2.70)	(-2.25)	(-2.63)	(-2.42)
Family Size	.038	.051	.049	.042
	(2.25)	(3.11)	(2.42)	(2.60)
Own Business	.041	-.046	.032	.019
	(0.45)	(.049)	(.35)	(.21)
Own House	-.140	-.224	-.138	-.129
	(-1.88)	(-2.89)	(-1.84)	(-1.69)
Lawyers per capita	-.784	-.857	-.773	-.759
	(-1.05)	(-1.16)	(-1.04)	(-1.04)
County unemployment rate	.095	.109	.091	.105
	(.92)	(1.05)	(.88)	(1.01)
State Income Growth	-2.35	-2.37	-2.39	-2.17
	(-1.95)	(-1.95)	(-1.99)	(-1.82)
State Income Deviation	-.127	-.127	-.122	-.121
	(-1.47)	(-1.46)	(-1.41)	(-1.38)
Constant	-2.35	-2.29	-2.37	-2.47
	(-3.31)	(-3.15)	(-3.31)	(-3.42)
Time Fixed Effect	Yes	Yes	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes
No of observations	55,614	55,614	55,614	55,269
Hausman Test Statistic	9.62		11.71	
Generalized Hausman	55.3		63.5	
Degress of freedom	58		58	

* t-statistic calculated from the robust standard error is in parenthesis.

Table 3: Results from Probit Regressions for Specification (2)
(Independent variable: file for bankruptcy or not)

First stage method	Least Square		Log-normal	
	Observed	Least square	Observed	Log-normal
Debt	4.77e-5	-8.53e-5	2.74e-5	1.84e-5
	(4.52)*	(-2.16)	(4.53)	(1.22)
$Debt^2$	-7.49e-10	8.73e-9	-2.42e-10	5.07e-11
	(-2.31)	(1.61)	(-2.36)	(.07)
Non-exempt	-1.16e-5	5.78e-4	1.03e-5	.0011
	(-.57)	(2.42)	(.58)	(2.38)
Non-exempt^2	4.92e-9	-2.82e-8	4.49e-9	-4.44e-7
	(1.25)	(-.42)	(1.35)	(2.63)
Debt x Non-exempt	-4.08e-9	-6.13e-8	-4.22e-9	7.89e-9
	(-1.07)	(-.84)	(-1.31)	(.11)
Lagged Bankruptcy Rate	5.76	6.15	5.85	5.55
	(2.16)	(2.26)	(2.18)	(2.05)
Household Income at t-1	-5.04e-6	-6.02e-6	-4.87e-6	-4.76e-6
	(-3.57)	(-4.29)	(-3.52)	(-3.47)
Reduction in Income at t-1	-2.14e-6	-1.87e-6	-2.14e-6	-2.17e-6
	(-3.60)	(-3.22)	(-3.62)	(-3.68)
Age of Head	.029	.031	.029	.030
	(2.09)	(2.26)	(2.09)	(2.21)
$(\text{Age of Head})^2$	-4.80e-4	-5.33e-4	-4.81e-4	-5.00e-4
	(-3.05)	(-3.37)	(-3.07)	(-3.19)
Years of Education	-.031	-.026	-.031	-.028
	(-2.72)	(-2.33)	(-2.66)	(-2.39)
Family Size	.037	.051	.039	.042
	(2.19)	(3.10)	(2.36)	(2.52)
Own Business	.048	-.040	.038	.021
	(.52)	(-.43)	(.41)	(.23)
Own House	-.134	-.221	-.131	-.124
	(-1.80)	(-2.86)	(-1.75)	(-1.61)
Lawyers per capita	-.766	-.828	-.757	-.748
	(-1.02)	(-1.12)	(-1.02)	(-1.02)
County unemployment	.100	.112	.096	.106
rate	(.95)	(1.07)	(.91)	(1.01)
State Income Growth	-2.34	-2.36	-2.39	-2.20
	(-1.94)	(-1.94)	(-1.98)	(-1.82)
State Income Deviation	-.127	-.129	-.123	-.123
	(-1.47)	(-1.48)	(-1.41)	(-1.39)
Constant	-2.36	-2.31	-2.37	-2.47
	(-3.30)	(-3.15)	(-3.31)	(-3.41)
Time Fixed Effect	Yes	Yes	Yes	Yes
State Fixed Effect	Yes	Yes	Yes	Yes
No of observations	55,614	55,614	55614	55269
Hausman Test Statistic	-7.00		-.94	
Generalized Hausman	58.3		59.5	
Degrees of freedom	58		62	

* t-statistic calculated from the robust standard error is in parenthesis.

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