Online Appendix for "Liquidity Constraints and Consumer Bankruptcy: Evidence from Tax Rebates"

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1 Alternative Standard Errors

In this section we discuss the sensitivity of our main results to the way in which we calculate the standard errors. These results are reported in Online Appendix Table OA1. We find that the precision of our results is very similar when we use heteroskedasticity-robust standard errors, cluster by week, or cluster by the check date. In theory, it is more conservative to cluster by check date rather than by two-digit SSN group, because there are only 9–10 check dates as opposed to 100 SSN groups. But we do not cluster on check dates, because of the small number of resulting clusters. Online Appendix Table OA1 demonstrates that our main results are very similar regardless of how the standard errors are computed.

2 The Long-Run Effect of Rebates

Online Appendix Table OA2 reports results of an alternative specification that attempts to estimate the long-run effect of the rebates. To do so, we pursue an alternative research design that compares bankruptcy rates across months in different years. The table reports results from a regression of log bankruptcies on an indicator function for the period between June, 2001 and March, 2002 (inclusive). This window captures bankruptcies two months before the 2001 tax rebates and six months after the tax rebates. The sample includes the months between January, 1998 and December, 2004 (inclusive), and the unit of observation is month-year. The regressions include a polynomial in the number of months since the start of the sample period. The polynomials are intended to capture long-run trends in bankruptcy filings.

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The test assumes that the long-run effect of the rebates can be estimated by comparing the total number of bankruptcies in the months during and after the rebates with the number of bankruptcies in the same months in other years, controlling for within-year seasonality in bankruptcy filings and long-run, across-year trends in bankruptcy filings.

An important weakness of this strategy is that it assumes that the timing of the rebate programs was exogenous. This is unlikely to be true; the rebate programs themselves were a political response to macroeconomic conditions that likely affected overall bankruptcy filings. Nevertheless, we are reassured by the similarity between the time-series results and the furthest lagged coefficients in the paper's event-study figures. Consistent with the event-study figures, Online Appendix Table OA2 also suggests no long-run effect of the 2001 tax rebates. We note, however, that because of the limited precision of these results, we cannot rule out large, long-run effects. Additionally, we can only estimate the long-run effect of the 2001 tax rebates, because we possess too little data following the 2008 rebates.

3 Conceptual Framework

This section describes the details of the simple model summarized in the main text.[1] The purpose of the model is to describe how an increase in liquidity from tax rebates can affect bankruptcy rates. The key feature of the model is the existence of entrance fees that households must pay to receive bankruptcy protection.

The model consists of three periods, and all households are ex-ante identical. In period 0, households are endowed with a pre-determined amount of debt, B.[2] In period 1, households' wealth, $W \sim f(w)$, is realized. In addition, households anticipate receiving rebates of value I in period 2. Households can decide to file for bankruptcy in period 1, in period 2, or not at all. Households consume all of their wealth net of debt and bankruptcy costs at the end of period 2.[3]

Households file for bankruptcy when it is financially beneficial to do so, even if they have the ability to repay their debts (Fay et al., 2002). Specifically, households maximize consumption at the end of period 2 subject to liquidity constraints. If a household declares bankruptcy, it pays a fixed filing fee, c, and loses a share $1 - e$ of its wealth. The parameter e captures the generosity of the exemptions provided by the bankruptcy court.[4] Once the

[1]Our model is related to the work of Wang and White (2000).

[2]This assumption is meant to closely match our empirical setting. All households eventually receive the rebate within a short period of time, so neither the amount nor maturity of their debt should depend on the precise timing of the tax rebates.

[3]Including consumption in period 1 would not qualitatively change our results. It would, however, introduce another mechanism whereby some low-wealth households that could technically afford to file would choose to file for bankruptcy in period 2 rather than in period 1 due to the high marginal utility of consumption in period 1.

[4]In practice, exemptions are governed by both federal and state bankruptcy law. Exemption levels vary widely by state and have been relatively stable at the state level since the early twentieth century (Mahoney, 2010; Gropp et al., 1997).

household has filed for bankruptcy, it is absolved of its debt.[5] Households must pay filing fee c in advance, so they must have $W > c$ to declare bankruptcy in period 1 and $W + I > c$ to declare bankruptcy in period 2.[6] Given these assumptions, consumption in period 2 is equal to $e \cdot (W + I - c)$ if a household decides to file for bankruptcy and $W + I - B$ otherwise.

A key assumption involves how the bankruptcy court treats the filers' tax rebates. We assume that the tax rebate is treated the same whether the household files in period 1 or in period 2, and that the rebate is treated identically to the rest of the household's wealth. This assumption implies that households will not strategically manipulate their filing date to try to shield their rebate from the courts. As described in the main text of the paper, the relevant case law strongly supports this assumption. As we discuss in more detail below, if some households nonetheless choose to file before receiving their rebates in an attempt to prevent them from becoming part of their assets, then we will underestimate the share of households that are liquidity-constrained.

Online Appendix Figure OA1 illustrates how households' filing behavior depends on their realized wealth. "Non-filers" have sufficient wealth that they prefer to pay their debts rather than file for bankruptcy:

$$W + I - B \geq e \cdot (W + I - c) \Rightarrow \quad W \geq \frac{B - e \cdot c - I \cdot (1 - e)}{1 - e}.$$

In contrast, households with intermediate levels of wealth can both afford to file for bankruptcy and find it financially advantageous to do so. We call households "unconstrained filers" if they file for bankruptcy and can afford to pay the filing fee in either period 1 or period 2. Unconstrained filers are thus those filers for whom

$$c < W < \frac{B - e \cdot c - I \cdot (1 - e)}{1 - e}.$$

We assume that B is large relative to c, which is consistent with the characteristics of a typical bankruptcy. This ensures that unconstrained filers exist. Unconstrained filers are indifferent between filing in periods 1 and 2, and so we assume that they are equally likely to file in periods 1 and 2.

Finally, households with wealth below c would benefit from filing for bankruptcy but do not have enough wealth to file in period 1. We call such households "constrained filers." Constrained filers have wealth between $c - I$ and c. They cannot afford to declare bankruptcy in period 1, but do file for bankruptcy in period 2, once they receive the tax rebate.[7]

[5] Bankruptcy in this model is a composite of Chapter 7 and Chapter 13 bankruptcy. In practice, Chapter 13 filers repay their debts based on a three- to five-year schedule; our framework can capture this by setting the present value of repayments to $1 - e$ times wealth net of legal fees.

[6] This assumption is particularly relevant for Chapter 7 filings. Court fees of approximately $300 are paid in advance for both Chapter 7 and 13 filings. Legal fees for Chapter 7 are almost always paid in advance, while those for Chapter 13 are often paid gradually, through the filer's payment plan.

[7] The value $c - I$ is non-negative as long as the costs of filing are greater than the value of the rebates. The value of the rebates were, at most, $600 in 2001 and $1,200 in 2008. In contrast, we estimate average

A final type of household is of little interest, given our empirical setting. Households with wealth $W < c - I$ have so little wealth that they cannot afford the filing fee in either period 1 or period 2. These households will remain constrained and unable to file. They will be unaffected by the rebates and we will not observe them in the data.

This model yields a direct interpretation of our empirical estimates. Let X be the number of unconstrained filers, and let Y be the number of constrained filers:

$$\begin{aligned} X &\equiv \int_{c}^{\frac{B - e\cdot c - I(1-e)}{1-e}} f(W)dW \\ Y &\equiv \int_{c-I}^{c} f(W)dW. \end{aligned}$$

Consider filing decisions after the tax rebates are sent and period 2 begins. Constrained filers can finally afford to file. Therefore, the change in the number of bankruptcies after the tax rebates are sent is equal to Y. Since our regressions measure the change in bankruptcies after the tax rebates are sent, then in the simple case where all households receive tax rebates, our empirical estimate, $\hat{\beta}$, is simply equal to the number of unconstrained filers; $\hat{\beta} = Y$.

If only a fraction λ of households receive tax rebates, then as we discuss in main text of paper, we can re-scale our empirical estimate by dividing $\hat{\beta}$ by λ in order to report a treatment effect for the population that is treated by the rebates; $Y = \hat{\beta}/\lambda$.

This model suggests several predictions regarding how our estimates ought to differ across rebate years. In particular, our framework predicts that the empirical estimates would be larger in 2008 than in 2001. This prediction is driven by two changes. First, the costs of filing for Chapter 7 bankruptcy increased by over 60 percent between 2001 and 2008.[8] Given a well-behaved distribution of wealth, it can be shown that $\partial\beta/\partial c > 0$.[9] Second, the tax rebates were larger on average in 2008 than in 2001, and larger tax rebates would mean larger estimates of β. Increasing I both increases the fraction of constrained filers and decreases the fraction of unconstrained filers, so $\partial\beta/\partial I > 0$. Therefore, for both of these reasons, we expect β to be higher in 2008 than in 2001. Table 3 in the main text suggests that this is the case.

A concern described in the paper is that unconstrained households may time their bankruptcies to hide their rebates from the court. Such a phenomenon is ruled out in the model above. We believe that households are unlikely to behave in such a manner, for the reasons described in the paper.

Still, this framework describes what such a phenomenon would imply for the empirical estimates. If unconstrained households disproportionately file in period 1, then the number of unconstrained filers in period 1 would be equal to $\gamma \cdot X$, where $\gamma > \frac{1}{2}$ represents the shift

bankruptcy costs to be \$945 in 2001 and \$1,564 in 2008.

[8]We estimate this number from the analysis in Section 5. Lupica (2010) document a similar change for Chapter 13.

[9]This result requires that $f(W)$ is increasing in the region of constrained filers. This assumption is supported empirically; filers tend to have lower income than the general population.

amongst unconstrained households to file early. In this case, the empirical estimates would equal:

$$\beta = Y - (2 \cdot \gamma - 1) \cdot X < Y.$$

That is, our empirical estimates would be a lower bound for the number of filers who are constrained.

Finally, in the main text we discuss which filers have the most to gain from bankruptcy, and which suffer the most due to an increase in costs. Households' utility gain from filing for bankruptcy is a decreasing function of wealth. We assume that all households have identical utility functions $u(\cdot)$ which are increasing and concave. Thus, a household's gain from bankruptcy is:

$$\Delta_b \equiv u(e \cdot (W + I - c)) - u(W + I - B).$$

Hence,

$$\frac{\partial \Delta_b}{\partial W} = e \cdot u'(e \cdot (W + I - c)) - u'(W + I - B).$$

Since $e < 1$ and $e \cdot (W + I - c) > W + I - B$ for all filers, $\partial \Delta_b / \partial W < 0$. Constrained filers are those filers with the least wealth. Thus, constrained filers have the most to gain from bankruptcy.[10]

A filing household's utility loss from an increase in bankruptcy costs is:

$$\Delta_c \equiv \frac{\partial}{\partial c} u(e \cdot (W + I - c)) = -e \cdot u'(e \cdot (W + I - c))$$

As W increases, Δ_c decreases, because:

$$\frac{\partial \Delta_c}{\partial W} = -e^2 \cdot u''(e \cdot (W + I - c)).$$

Hence, constrained filers also suffer the greatest utility loss from increases in bankruptcy costs.

[10]Similarly, $\partial \Delta / \partial B > 0$, so the utility gain from bankruptcy is also an increasing function of debt.

References

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Online Appendix Table OA1: Alternative Standard Errors, 2001 Tax Rebates

Dependent Variable: Level or logarithm of total bankruptcy filings per SSN group per week

	(1)	(2)	(3)	(4)	(5)	(6)
	Chapter 7		Chapter 13		All	
	Levels	Logs	Levels	Logs	Levels	Logs
			A. Standard Errors Clustered by SSN group (100 clusters) [Baseline]			
After	6.266	0.036	- 0.778	- 0.014	5.488	0.023
Check	(1.107)	(0.007)	(0.592)	(0.010)	(1.189)	(0.005)
Sent	[0.000]	[0.000]	[0.192]	[0.157]	[0.000]	[0.000]
			B. Standard Errors Clustered by Week (80 clusters)			
After	6.266	0.036	- 0.778	- 0.014	5.488	0.023
Check	(0.897)	(0.005)	(0.597)	(0.010)	(0.743)	(0.003)
Sent	[0.000]	[0.000]	[0.197]	[0.158]	[0.000]	[0.000]
			C. Standard Errors Clustered by Check Date Group (10 clusters)			
After	6.266	0.036	- 0.778	- 0.014	5.488	0.023
Check	(1.145)	(0.007)	(0.554)	(0.009)	(1.379)	(0.006)
Sent	[0.000]	[0.001]	[0.194]	[0.158]	[0.003]	[0.003]
			D. Heteroskedasticity-Robust Standard Errors (Not Clustered)			
After	6.266	0.036	- 0.778	- 0.014	5.488	0.023
Check	(1.031)	(0.006)	(0.636)	(0.011)	(1.179)	(0.005)
Sent	[0.000]	[0.000]	[0.222]	[0.186]	[0.000]	[0.000]
			E. OLS Standard Errors (Not Robust, Not Clustered)			
After	6.266	0.036	- 0.778	- 0.014	5.488	0.023
Check	(1.106)	(0.006)	(0.634)	(0.011)	(1.270)	(0.005)
Sent	[0.000]	[0.000]	[0.220]	[0.182]	[0.000]	[0.000]
R^2	0.804	0.813	0.530	0.536	0.801	0.819

Note: N = 7,100. The sample consists of counts of bankruptcies by two-digit SSN group and week, covering 30 weeks before and 40 weeks after groups were sent their tax rebate checks. The standard errors in parentheses and are indicated in heading of each panel. The associated *p*-values are in brackets. SSN-group fixed effects and week fixed effects not shown.

Online Appendix Table OA2: The Long-Run Effect of the 2001 Rebates
Dependent Variable: Logarithm of Chapter 7 bankruptcies by month

	(1)	(2)	(3)	(4)
After 2001 Tax Rebates	0.000	- 0.004	- 0.017	0.006
	(0.039)	(0.050)	(0.050)	(0.030)
	[1.000]	[0.937]	[0.743]	[0.844]
R^2	0.660	0.661	0.666	0.908
N	84	84	84	84
Cubic polynomial in time	✓			
Quartic polynomial in time		✓		
Quintic polynomial in time			✓	✓
Month fixed effects				✓

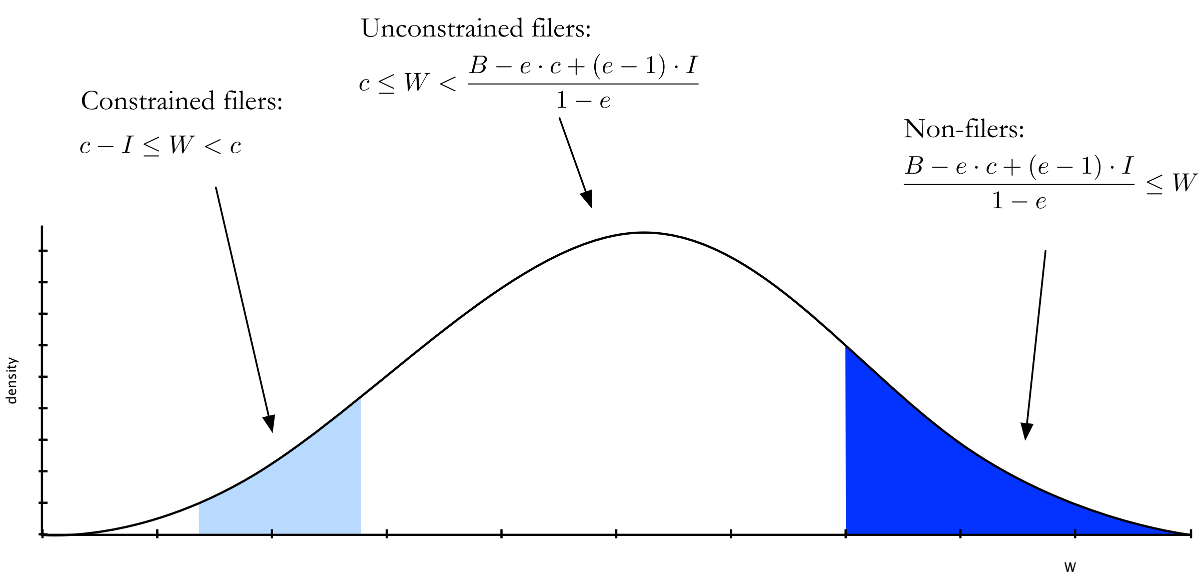
Note: This table reports results from a regression of log bankruptcies on a dummy for the period between June, 2001 and March, 2002 (inclusive). This captures two months before the 2001 tax rebate and six months afterwards. The sample includes the months between January, 1998 and December, 2004 (inclusive), and the unit of observation is month-year. The time polynomials are functions of the number of months since the start of the sample period, and are intended to capture long-run trends in bankruptcy filings. Heteroskedasticity-robust standard errors are in parentheses, and p-values are in brackets.

Online Appendix Table OA3: Changes in Characteristics of Filers After Tax Rebates

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:	Log of Liabilities	Log of Liabilities-to-Income Ratio	Log of Annual Income	Log of Liabilities	Log of Liabilities-to-Income Ratio	Log of Annual Income
			A. 2001 Tax Rebates			
After Check Sent	0.155	0.111	0.044	0.318	0.260	0.059
	(0.045)	(0.039)	(0.028)	(0.107)	(0.084)	(0.059)
	[0.001]	[0.005]	[0.119]	[0.003]	[0.002]	[0.317]
R^2	0.105	0.084	0.100	0.126	0.108	0.127
			B. 2008 Tax Rebates			
After Check Sent	- 0.020	0.020	- 0.041	- 0.103	- 0.080	- 0.023
	(0.053)	(0.042)	(0.030)	(0.078)	(0.066)	(0.045)
	[0.702]	[0.630]	[0.175]	[0.186]	[0.228]	[0.601]
After Direct Deposit	0.107	0.025	0.082	0.151	0.059	0.092
	(0.054)	(0.043)	(0.031)	(0.210)	(0.149)	(0.151)
	[0.048]	[0.566]	[0.009]	[0.472]	[0.693]	[0.541]
Total Effect	0.086	0.045	0.041	0.048	- 0.021	0.069
	(0.032)	(0.029)	(0.021)	(0.227)	(0.167)	(0.160)
	[0.007]	[0.126]	[0.046]	[0.832]	[0.901]	[0.667]
R^2	0.156	0.104	0.080	0.170	0.118	0.091
Fixed Effects						
SSN group FEs	✓	✓	✓	✓	✓	✓
Office FEs	✓	✓	✓	✓	✓	✓
Week FEs				✓	✓	✓

Note: The sample consists of Chapter 7 filings randomly selected from ten court districts: 2,132 bankruptcies in 2001 and 4,355 bankruptcies in 2008. The standard errors in parentheses are robust to autocorrelation between observations from same SSN group, and associated p-values are in brackets.

Online Appendix Figure OA1. Types of Households



Note: This figure shows the graphical solution to the model developed in Online Appendix Section 2. The variable W corresponds to the realization of wealth that the household has drawn from the known distribution, $f(w)$, B corresponds to the pre-determined level of debt, and e corresponds to the generosity of the bankruptcy system. The shaded regions correspond to areas of wealth distribution where individuals make similar decisions. Constrained filers and Unconstrained filers both represent individuals who find it financially advantageous to declare bankruptcy; however, only Unconstrained filers are able to pay the fixed cost c to file for bankruptcy in the absence of the tax rebate, I. Non-filers are those with sufficiently high wealth who do not wish to file for bankruptcy, regardless of whether or not they receive a rebate check.