Consumer Bankruptcy: the Role of Financial Frictions

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Work in Progress

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Introduction

Motivation — Insurance-Efficiency Trade-Off

- Welfare implication of bankruptcy laws hinges upon the trade-off between smoothing "across states" and "over time" (Zame, 1993)
  - Across states $\rightarrow$ Partial insurance by defaulting
  - Over time $\rightarrow$ Borrowing costs (default premium)
- Mostly focus on credit-demand factors and assuming "frictionless" financial intermediation on top of incomplete market
  - E.g., Athreya (2002), Livshits et al., (2007), Gordon (2015)

Motivation — Credit Supply Matters

- Financial frictions exist prevalently and do affect intermediation
  - E.g., Gertler and Karadi (2011), Gertler and Kiyotaki (2015)
- Solely default premium cannot explain borrowing premium on revolving credit card debts in data (Dempsey and Ionescu, 2021)
- Countercyclical shock to intermediation cost can help match business cycles of unsecured credit and number of bankruptcy (Nakajima and Ríos-Rull, 2014; Fieldhouse et al., 2016)

Research Questions

- What is the role of financial frictions when filing for bankruptcy is allowed in an incomplete market setting?
- Through what channels could financial frictions affect the welfare implication of a bankruptcy code?
- To what extent does the welfare conclusion of bankruptcy laws vary with the presence of financial frictions?

What I Do

- Incorporate financial frictions (FFs) into a consumer default model
  - HHs are allowed to file for bankruptcy to insure against shocks
  - Agency problem between banks and depositors introduces leverage constraint, thus limiting banks' loan granting ability
- Borrowing price captures not only individual-level default premium but also aggregate-level leverage premium
- Preliminary results suggest:
  - FFs affect the welfare implication of bankruptcy regimes via leverage and divestment channels
  - A stricter regime is favored with FFs, and vice versa

Related Literature — Optimal Bankruptcy

- Abolishing bankruptcy entirely: Athreya (2002), Li and Sarte (2006)
- Removal of flag: Chen and Corbae (2011)
- Means-testing: Athreya (2002), Chatterjee et al. (2007)
- Repayment plan: Livshits et al. (2007), Exler (2020)
- Wage garnishment: Exler (2019)

- All discuss welfare implications of various (forms of) bankruptcy strictness, albeit with “frictionless” financial intermediation

Model

Model Environment

- Time is discrete
- Incomplete market
- Production economy with idiosyncratic labor productivity
- Households, banks, firms

Households

- Simplified version of Chatterjee et al. (2007)
- A unit continuum of infinitely-lived risk-averse HHs
- Three idiosyncratic shocks (e, ν):
  - Persistent and transitory labor productivity $e = e_p + e_t$ [AR(1)/i.i.d.]
  - Patience/Preference ν [i.i.d.]
- Consume c, save/borrow a' at q, and supply labor inelastically $w\exp(e)$
- If filing for bankruptcy:
  - Debt discharge $a = 0$
  - Wage garnishment $(1-\eta)w\exp(e)$
  - Temporary exclusion $a' = 0$
- Retain the banking access next period (Livshits et al., 2007)

Household's Optimization

- Choose to default $d = 1$:

$$V^d\left(a, e, v\right) = u\left((1-\eta)w\exp(e)\right) + v\beta\mathbb{E}V\left(a' = 0, e', v'\right)$$

- Choose not to default $d = 0$: Discount price and borrowing amount

$$V^{nd}(a, e, v) = \max_{a'}\left[u\left(w\exp(e) + a - q(a', e)a'\right) + v\beta\mathbb{E}V\left(a', e', v'\right)\right]$$

- Hence, what to do depends on:

$$V(a, e, v) = \max_{d\in\{0,1\}}\left[dV^d(a, e, v) + (1-d)V^{nd}(a, e, v)\right]$$

Firms

- Perfect competition
- Homogeneous goods with Cobb-Douglas production technology

$$F(K,E) = K^{\alpha} E^{1-\alpha}$$

where aggregate labor endowment: $E = \int \exp(e)\, d\mu$ and μ denotes the cross-sectional distribution of HHs
- Rates of return on physical capital and labor:

$$r_k = F_K(K,E)$$
$$w = F_E(K,E)$$

Banks

- Modification of Gertler and Kiyotaki (2015)
- Owned by foreign investors and fixed saving rate r_f
- Perfect competition, risk-neutrality, full information of HHs' types
- Maximize the sum of discounted future dividends
- Invest in physical capital K' and issue one-period defaultable unsecured loans L' using deposits D' and net worth N
  - Physical capital depreciates at δ
  - Loan issuance subject to transaction costs τ
  - Earn profits π and face exogenous retention policy ψ
  - Accumulate N via retained earnings $\psi\pi$ net of dividends $(1-\psi)\pi$

Agency Problem b/w Banks and Depositors

- Banks can divert fraction θ of assets after determining K' and L', and then sell them in a frictionless secondary market
- For depositors to participate, the continuation value of banks $W(N)$ must be greater than or equal to the diverting gain $\theta(K' + L')$
- Incentive constraint:

$$W(N) \geq \theta(K' + L') \rightarrow \xi N \geq \theta(K' + L') \rightarrow \frac{\xi}{\theta} \geq \left(\frac{K' + L'}{N}\right) \equiv LR'$$

where $W(N) = \xi N$ has been widely shown in the literature

- This translates to an "endogenous leverage ratio constraint"

Bank's Optimization

$$
\begin{aligned}
W(N) = \max_{K', \mathcal{A}'} & \left[\beta_f(1-\psi)\pi' + \beta_f W\left(N'\right)\right] && \text{(lifetime dividends)} \\
\text{s.t.} \quad & N' = \psi\pi' && \text{(retained earnings)} \\
& \pi' = (1 + r_k' - \delta)K' + (1 + r_l')L' - (1 + r_f)D' && \text{(profit)} \\
& K' + (1+\tau)L' = D' + N && \text{(balance sheet)} \\
& W(N) \geq \theta\left(K' + L'\right) && \text{(incentive constraint)}
\end{aligned}
$$

- $\beta_f(1 + r_f) = 1$ (small open economy)
- r_l': Rate of return on one-period defaultable unsecured loans ‣ Definition

No-Arbitrage Conditions

- Excess returns are equal: FOCs

$$r_k' - (\delta + r_f) = r_l' - (\tau + r_f) = \iota \equiv \frac{\lambda\theta}{\Lambda'} \geq 0$$

ι: Leverage premium, λ: IC multiplier, Λ': Adjusted discount factor

- ι is determined by whether and how much IC is binding
    - $\iota = 0$ when IC is slack
    - $\iota > 0$ when IC is binding $\longrightarrow \iota \gg 0$ if IC becomes more binding

Discount Bond Price

- For each loan contract $\mathcal{A}'(a' < 0, e)$,

$$q(a', e) = \frac{\int_{e'} \left[(1 - d'(a', e')) + d'(a', e') \left(\frac{\eta w' \exp(e')}{a'} \right) \right] dF(e'|e)}{1 + \tau + r_f + \boldsymbol{\iota}}$$

$$= \frac{1 - \text{individual-level default premium}}{\text{opportunity cost} + \textbf{aggregate-level leverage premium}}$$

- $\theta = 0$ resembles the frictionless case (only default premium)

Parameterization

Suggestive Parameterization

Parameter		Value	Source
β	HH discount factor	0.94	Livshits et al. (2007)
η	Wage garnishment rate	0.355	Livshits et al. (2007)
τ	Transaction cost	0.04	Livshits et al. (2007)
β_f	Bank discount factor	0.96	$r_f = 4.17\%$
σ	CRRA coefficient	2	common value
α	Capital share	0.33	common value
δ	Depreciation rate	0.08	common value
θ	Diverting fraction	0.381	Gertler and Karadi (2011)
ψ	Retention ratio	0.972	Gertler and Karadi (2011)
ρ_p	AR(1) of persistent labor productivity	0.963	Nakajima and Ríos-Rull (2014)
σ_p	S.D. of persistent labor productivity	0.13	Nakajima and Ríos-Rull (2014)
σ_t	S.D. of transitory labor productivity	0.35	Nakajima and Ríos-Rull (2014)
$\nu_{impatient}$	Impatient scale	0	Nakajima and Ríos-Rull (2014)
$\mathbb{P}_\nu$	Prob. of being impatient	0.01	1 % impatient HHs

Data v.s. Model Moments

Moment	Data	Model
default rate (%)	0.99	0.32
debt-to-income ratio	0.35	0.23
average loan rate (%)	12.87	14.51
share in debt (%)	10.43	15.89

- Data moments taken from Chatterjee et al. (2020)
- Uncalibrated; yet, aligned roughly with data moments

Results

Intuition

- Bankruptcy leniency $\longrightarrow$ Increased borrowing costs

  $\longrightarrow$ Less borrowing (more saving) in equilibrium

  $\longrightarrow$ Banks become more leveraged

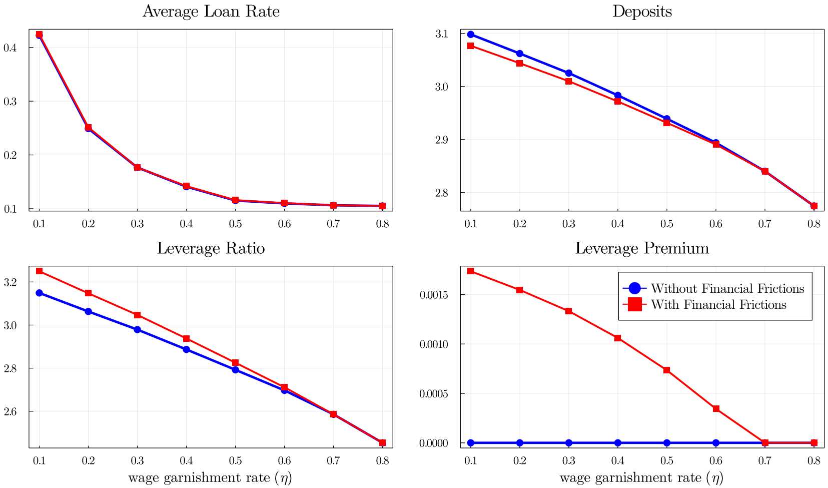
  $\longrightarrow$ Banks more likely to divert assets

  $\longrightarrow$ Higher leverage premium incurred

  $\longrightarrow$ Borrowing costs increase further

- Bankruptcy strictness governed by wage garnishment rate η
  - Lower $\eta \rightarrow$ Less punishment $\rightarrow$ More lenient

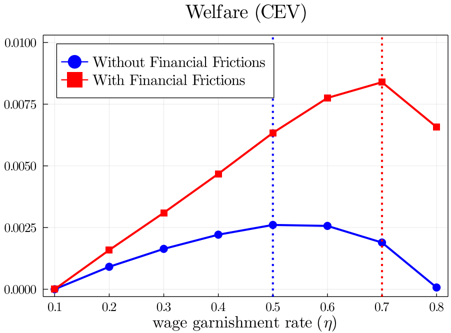
Bankruptcy Leniency leads to Higher Leverage



Stricter Code is Favored with Financial Frictions

- CEV Relative to $\eta = 0.1$
- Dotted vertical line: Highest case

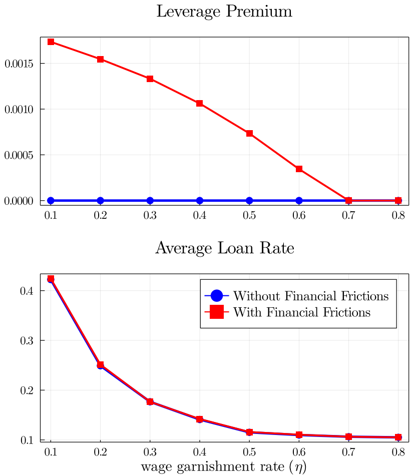
- Welfare conclusions are distinct
  - $\eta = 0.70$ is preferred w/ FFs
  - $\eta = 0.50$ is preferred w/o FFs



Leverage and Divestment Channels

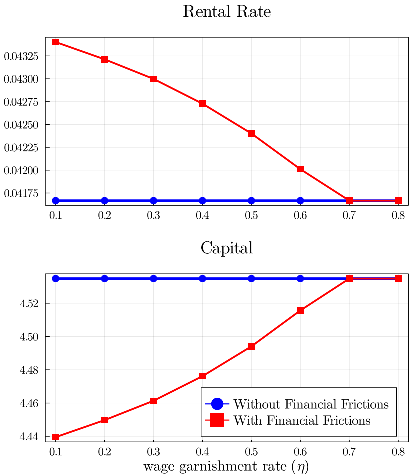
- **[Direct] Leverage channel**
  - $\eta \downarrow \rightarrow LR' \uparrow \rightarrow \iota \uparrow \rightarrow q \downarrow$
  - Increased borrowing costs
  - Harder to smooth "over time"

- **[Indirect] Divestment channel**



Leverage and Divestment Channels (cont.)

- [Direct] Leverage channel
- **[Indirect] Divestment channel**
  - $\eta \downarrow \rightarrow \iota \uparrow \rightarrow r_k' \uparrow \rightarrow K' \downarrow \rightarrow w \downarrow$
  - Earnings decrease "across states"
  - Only can banks invest in K'



Conclusion

Concluding Remarks

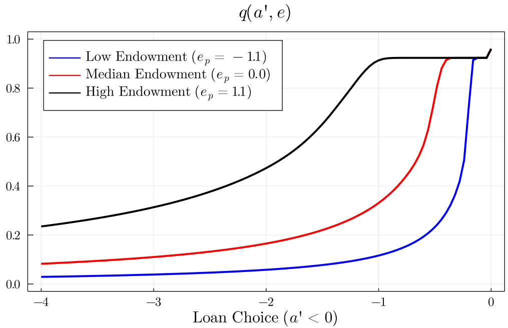
- Build a framework featuring consumer default and leverage frictions
- Welfare outcome of bankruptcy regimes depends additionally on leverage and divestment channels
- In this setting, a lenient bankruptcy regime is not necessarily optimal even when households face significant idiosyncratic risks

Appendix

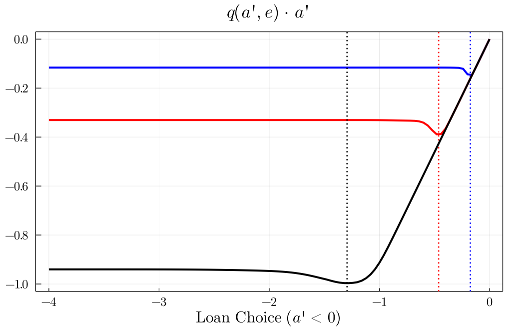
Appendix: Bankruptcy Regimes in US

- Chapter 7
  - Most unsecured debts are discharged in exchange for non-exempt assets
  - Filers do not have to use future income to repay debts
  - Filers must pay filing and legal fees
  - Such record stays on credit report for 10 years
  - In 2017, the non-business bankruptcy filings under Ch. 7 $\approx$ 60%
- Chapter 13
  - It involves reorganization
  - Filers have to make a plan to repay debtors over 3 to 5 years
  - Filers can keep property
  - Such record stays on credit report for 7 years

Appendix: Higher Earner has Greater Credit Access



(a) Discount Bond Price



(b) Discounted Borrowing Amount

◂ Back

Appendix: Return on Unsecured Loans

- It is defined as:

$$1 + r_l' = \frac{-\sum_{a'<0,e} \left[\int_{e'} R(a',e')\, dF(e'|e)\right] \mathcal{A}'(a',e)}{L'}$$

- Numerator consists of full repayment and wage garnishment

$$R(a',e') = (1 - d'(a',e'))a' + d'(a',e')\eta w' \exp(e')$$

- Denominator denotes aggregate discount loans

$$L' = -\sum_{a'<0,e} \left[q(a',e)a'\right] \mathcal{A}'(a',e)$$

Back

Appendix: FOCs

- Necessary and sufficient conditions are:

$$
\begin{aligned}
\Lambda' \left[r_k' - \left(\delta + r_f\right)\right] &= \lambda\theta \\
\Lambda' \left[\int_{e'} R(a', e')\, dF(e'|e) \right] &= \left[\Lambda'(1 + \tau + r_f) + \lambda\theta\right] q(a', e) \\
\lambda \left[\xi N - \theta\left(K' + L'\right)\right] &= 0
\end{aligned}
$$

where $\Lambda' = \beta_f\left(1 - \psi + \psi\xi'\right)$ is the adjusted discount factor and λ denotes the multiplier on the incentive constraint

Back

Appendix: Effects of Strategic Default

	Good Faith	Baseline w/o FFs	Baseline w/ FFs
leverage ratio	1.90	2.93	2.99
default rate (%)	1.32	0.29	0.32
average loan rate (%)	7.86	14.17	14.51
share in debt (%)	36.51	16.04	15.89
debt-to-income ratio	1.73	0.23	0.23

- Good Faith: Only involuntary default (empty budget set) allowed
- Inclusion of strategic default pushes up borrowing prices
- Such effects amplified by financial frictions