

The Impact of Personal Bankruptcy on Labor Supply Decisions

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Question

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How much does a Chapter 7 personal bankruptcy (“fresh start”) increase labor supply?

- Answer: Using a structural job search model, I find

- A fresh start on average increases labor supply by 3.5%.
- 2/3 from the extensive margin (labor participation rate).
- 1/3 from the intensive margin (hours of work).

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Overview of the U.S. Bankruptcy System

- Individuals can discharge debt by filing for Chapter 7 or Chapter 13 bankruptcy.

	Chapter 7 ("fresh start")	Chapter 13
Income restrictions	0 (pre 2005) or Median	Have a job
Wage garnishment	Exempt	3-5 years
Credit history (FCRA)	10 years	7 years

Motivation

- Over 1.5 million individuals receive a fresh start each year.
- A fresh start is justified on the grounds that it can improve debtors' work incentives as summarized in a 1934 Supreme Court ruling.

"From the viewpoint of the wage earner, there is little difference between not earning at all and earning wholly for a creditor."

- Why is the answer uncertain?

Wealth effect	-
Access to borrowing	+
Net Effect	?

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Outline

1 Reduced form evidence (Han and Li 2007)

- Methodology (ATET)
- Data issues
- Endogeneity

2 Structural evidence

- Model
- Equilibrium
- ATET Counterfactuals
- Model pseudopanel comparison to reduced form results

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Labor Supply given Bankruptcy Choices

- Notation:
 - Let $d \in \{0, 7, 13\}$ be the possible bankruptcy choice.
 - Let d^* be the observed bankruptcy decision.
 - Let $l(d^*, d)$ be the labor supply response.
- Average annual working hours from NLSY79 (1979-2004).

$d^* \setminus d$	0	7	13	# Obs.
0	2039.16 (4.29)			34,220
7		2005.94 (86.61)		107
13			2078.60 (107.86)	58

- Equilibrium outcomes are observed (when $d^* = d$, shaded cells), while counterfactual outcomes are not (when $d^* \neq d$).

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How to Measure Impact? ATET

$d^* \setminus d$	0	7	13
0			
7	(2)	(1)	
13			

- If a Ch7 bankruptcy is considered as a “treatment”, average treatment effect on the treated (ATET) is calculated as

$$E[I(7, 7) - I(7, 0)].$$

Specifically, (1)-(2) from the table.

- The comparison requires the knowledge of what we do not observe (the value in (2)), so we must run a counterfactual experiment.

Selection into Treatment

$d^* \setminus d$	0	7	13
0	(3)		
7		(1)	
13			

Why can't we simply measure ATET by taking (1)-(3)? Selection.

- Ch7 filers are more likely to experience job loss or have low wealth, which can potentially make them behave differently.

Why Might Micro Level Estimates be Troublesome?

- Data limitations
- Endogeneity of bankruptcy decisions
- Han and Li (2007 JFSR) find the ATET to be negative from PSID data (opposite to the stated goal). ▶ HL

Key Model Features

- Labor market participation
 - McCall (1970 QJE) sequential job search.
 - Labor supply decisions on both extensive (labor market participation) and intensive margins (hours).
- Credit market with limited commitment
 - Bankruptcy chapter choices as in Li and Sarte (2006 JME).
 - Menu of loan contracts with endogenous borrowing constraints as in Chatterjee et. al. (2007 ECMA)

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▶ Why not Micro Est?

Model Environment

- Time is discrete and infinite.
- A unit measure of agents participates in labor and asset market. Agents survive to next period with probability ρ . Newborns replace those who die.
- Competitive financial intermediaries offer deposit and loan contracts.
- The government taxes labor income and provides social benefits.

People

- Agents value consumption $c \geq 0$ and dislike work $h \in [0, 1]$. The utility function is $u(c, h)$.
- Agents discount future at rate $\beta \in [0, 1]$.
- Agents are heterogeneous in
 - Employment status $e \in \{0, 1\}$
 - Wage rate $w \in \mathbf{R}_{++}$ if employed
 - Social welfare benefits $y \in \{y_L, y_H\}$ if non-employed
 - Assets $a \in \mathbf{R}$
 - Bankruptcy flag status $b \in \{0, 7, 13\}$
 - Unanticipated expense shock $\zeta \in \{0, \bar{\zeta}\}$ (e.g., medical shocks, lawsuits, harassment).

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Labor Participation Decisions

- Agents enter a period in employment status $e \in \{0, 1\}$.
- Employed agents ($e = 1$)
 - Job terminated exogenously with probability κ .
 - if not separated, make job continuation decision $l \in \{0, 1\}$.
- Non-employed agents ($e = 0$)
 - With probability ϕ^b , receive a wage offer w from a lognormal distribution $G(w)$ with mean μ_w and standard deviation σ_w
 - Make job acceptance decision $l^w \in \{0, 1\}$ when they receive a wage offer w .
- Agents can also choose hours worked $h \in [0, 1]$.
- Non-employed can receive UI (y_H) or floor benefit (y_L). • SW

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Credit Market Activities

- Agents enter a period with assets $a \in \mathbf{R}$ and unanticipated expense shocks ζ . The net worth of an agent is $a - \zeta$.
- If $b = 0$ (no bankruptcy on record), then
 - They can default ($d \in \{7, 13\}$) if $a - \zeta < 0$.
 - Can not save or borrow in the period of default ($a' = 0$).
 - Start carrying a bankruptcy flag ($b' = d$) after default.
 - If repay ($d = 0$), can make asset choice $a' \in \mathbf{R}$ with price q .
- If $b = \{7, 13\}$ (bankruptcy on record), then
 - Can only default if repayment results in $c < 0$.
 - Excluded from borrowing with flags attached ($a' \geq 0$).
 - A fraction of earnings γ^b is garnished.
 - Flags are removed ($b' = 0$) with probability δ^b .

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Timing of the Model within a Period

1 Subperiod 1 [Job Search]

- Enter in state $s = (e, b, a, w, y, \zeta)$.
- Workers receive separation shocks. If not separated, choose whether to stay or quit.
- Nonworkers receive job offer and choose to accept or reject.
- Nonworkers learn whether they lose UI eligibility.

2 Subperiod 2 [Bankruptcy]

- Update employment related state $\tilde{s} = (\tilde{e}, b, a, \tilde{w}, \tilde{y}, \zeta)$.
- Make bankruptcy decisions.
- Make labor-leisure decisions. Receive earnings or transfer.
- Make asset choice decisions and consume.
- Learn new bankruptcy flag status b' and expense shocks ζ' .

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Employment Decisions in First Subperiod

- Let $V(s)$ and $W(\tilde{s})$ be value functions in subperiod 1 and 2.
- For agents with a job ($e = 1$),

$$V(1, b, a, w, 0, \zeta) = \kappa \cdot W(0, b, a, \emptyset, \bar{y}, \zeta) \\ + (1 - \kappa) \cdot \max_{l \in \{0,1\}} W(l, b, a, w, (1-l)\bar{y}, \zeta)$$

- For agents without a job ($e = 0$),

$$V(0, b, a, \emptyset, y, \zeta) = (1 - \phi^b) E_{y'|y} W(0, b, a, \emptyset, y', \zeta) \\ + \phi^b \cdot \int_{\omega} \max_{l \in \{0,1\}} [l \cdot W(1, b, a, \omega, 0, \zeta) + (1-l) \cdot E_{y'|y} W(0, b, a, \emptyset, y', \zeta)] G(d\omega)$$

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Bankruptcy Decisions in Second Subperiod

$$W(e, b, a, w, y, \zeta) = \max\{W^{d=0}(e, b, a, w, y, \zeta), \\ W^{d=7}(e, b, a, w, y, \zeta), W^{d=13}(e, b, a, w, y, \zeta)\}$$

- If agents pay back ($d = 0$),

$$W^{d=0}(e, b, a, w, y, \zeta) = \max_{(h, a')} \{u(c, h) + \beta \rho E_{(b', \zeta')} V(e, b', a', w, y, \zeta')\}$$

$$\text{where } c = (1 - \tau)(1 - \delta^b)wh + y + a - \zeta - q(a', \bar{s})a' \geq 0$$

- If agents default ($d \in \{7, 13\}$),

$$W^{d \neq 0}(e, b, a, w, y, \zeta) = \max_h \{u(c, h) + \beta \rho E_{\zeta'} V(e, d, 0, w, 0, \zeta')\}$$

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Model Parameterization

- Model period is one quarter.
- Parameterize the benchmark to pre 2005.
- The utility function is

$$u(c, h) = \frac{(c^{1-\eta}(1-h)^\eta)^{1-\alpha} - 1}{1-\alpha}$$

Description	Parameter	Value	Target
Survival rate	ρ	0.99375	40 years (age 25-65)
CRRA coefficient	α	2.5	Hansen et. al. (1992)
Mean of log wage rate offer	μ_w	0	Normalization
Layoff rate	κ	0.06	JOLTS (2004)
Prob. of losing UI eligibility	ν	0.5	6 months
Ch7 flag removal rate	γ^7	0.025	10 years (FCRA)
Ch13 flag removal rate	γ^{13}	0.05	5 years
Ch7 wage garnishment rate	δ^7	0	Fresh Start
Risk free interest rate	r	0.01	Annual est.of 0.04

Table: Benchmark Parameters Determined Independently

Mapping the Model to Data

- The following parameters are chosen jointly such that the equilibrium model moments match observed data moments.

Description	Parameter	Value
Discount rate	β	0.96
Utility share of leisure	η	0.6
Job offer arrival rate if good credit	$\phi^{b=0}$	0.40
Job offer arrival rate if bad credit	$\phi^{b \neq 0}$	0.25
Standard deviation of log wage rate offer	σ_w	0.18
Unemployment insurance	y_H	0.235
Floor benefits	y_L	0.0005
Level of expense shock	$\bar{\zeta}$	10
Probability of expense shock	$z(\bar{\zeta})$	0.0004
Chapter 13 wage garnishment rate	δ^{13}	0.05

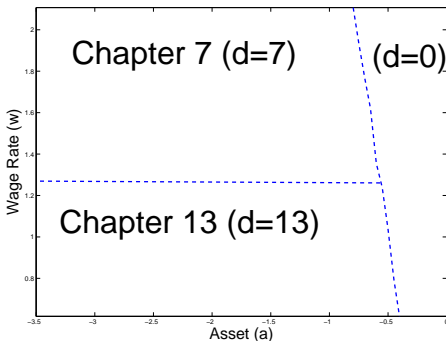
Table: Benchmark Parameters Determined Jointly

Data Statistics and Model Prediction

- Target both labor market and credit market statistics.
- Debt and default statistics are adjusted to account for 52% of defaults due to earnings risk and 34% due to expense shocks.

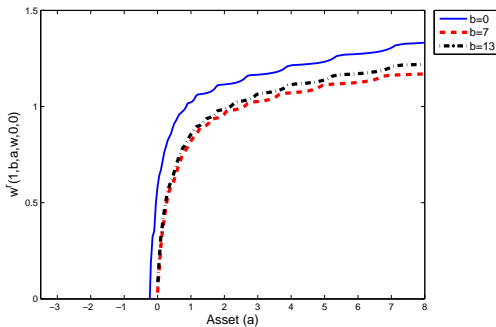
Target Statistics	Data	Model	Source
Employment rate	0.75	0.76	BLS (2004)
Income gini	0.44	0.30	Quadrini (2000)
mean to median wage rate	1.30	1.01	Heathcote et. al. (2010)
UI replacement ratio	0.50	0.51	OECD (2004)
Food stamps to average earnings ratio	0.0015	0.0014	SNAP
Bankruptcy rate	0.0016	0.0015	U.S. Courts (2004)
Bankruptcy due to expense shock	0.0006	0.0006	PSID (1996)
Debt to income ratio	0.023	0.020	Chatterjee et. al. (2007)
Chapter 7 fraction	0.72	0.70	U.S. Courts (2004)
Chapter 13 recovery rate	0.57	0.53	U.S. GAO (1983)

Equilibrium Default Decisions for Workers



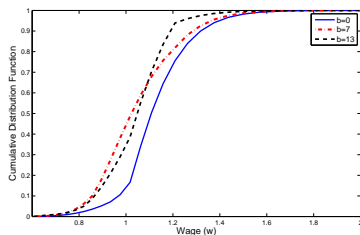
- Agents self select into bankruptcy treatment. Defaulters have lower wages and more debt.
- To avoid wage garnishment, debtors with higher wage rates prefer Chapter 7 bankruptcy. [▶ d0](#) [▶ dat](#)

Equilibrium Reservation Wages for Workers



- Reservation wages affect labor market participation decisions (extensive).
- Agents with more wealth have higher reservation wages.
- Agents with bankruptcy flags have lower reservation wages (can not borrow). [▶ rw](#) [▶ rw0](#) [▶ distw](#)

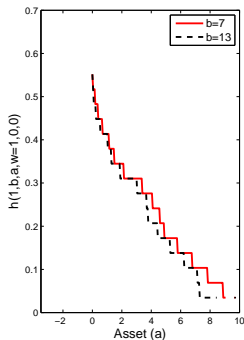
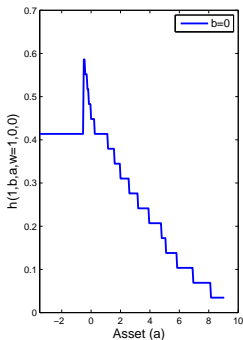
Equilibrium Wage Distributions



b	Model		Data	
	Mean (Std)	% to Mean for $b = 0$	Mean (Std)	% to Mean for $b = 0$
0	1.1509 (0.1543)	—	\$11.82 (\$8.64)	—
7	1.0712 (0.1772)	0.9307	\$11.00 (\$8.04)	0.9306
13	1.0633 (0.1389)	0.9239	\$10.71 (\$6.78)	0.9061

- F^0 FOSD F^7 and F^{13} (Higher mean for $b = 0$ than $b \neq 0$).
- F^{13} SOSD F^7 (Larger variance for $b = 7$ than $b = 13$).

Equilibrium Hours Worked



- Wealthier agents work less (intensive margin).
- Ch7 filers work for more hours than Ch13 filers.
- When agents default, hours of work lie flat at 0.4138 (static problem, can not save or borrow in period of default).

Labor Supply in Extensive Margin at Bankruptcy

$d^* \setminus d$	Repayment ($d = 0$)	Chapter 7 ($d = 7$)	Chapter 13 ($d = 13$)
Repayment ($d^* = 0$)	0.7533	0.7666	0.7666
Chapter 7 ($d^* = 7$)	0.3367	0.3443	0.3443
Chapter 13 ($d^* = 13$)	0.7894	0.9400	0.9400

Table: Employment Rates

- Ch7 bankruptcy on average increases employment rate by 2%.
- OLS estimates downward bias the effect (-0.4090 vs true 0.0076)

Labor Supply in Intensive Margin at Bankruptcy

$d^* \setminus d$	Repayment ($d = 0$)	Chapter 7 ($d = 7$)	Chapter 13 ($d = 13$)
Repayment ($d^* = 0$)	0.3965	0.5694	0.5489
Chapter 7 ($d^* = 7$)	0.5596	0.5660	0.5475
Chapter 13 ($d^* = 13$)	0.4068	0.5682	0.5351

Table: Hours Worked given Employment

- Ch7 bankruptcy on average increases hours worked by 1%.
- OLS estimates upward bias the effect (0.1695 vs true 0.0064)

Combining Extensive and Intensive Margins

$d^* \setminus d$	Repayment ($d = 0$)	Chapter 7 ($d = 7$)	Chapter 13 ($d = 13$)
Repayment ($d^* = 0$)	0.2986	0.4365	0.4208
Chapter 7 ($d^* = 7$)	0.1884	0.1949	0.1885
Chapter 13 ($d^* = 13$)	0.3211	0.5340	0.5129

Table: Total Hours Worked

Ch7 bankruptcy on average increases labor supply by 3.5% over repayment and 3.4% over Ch13 bankruptcy for Ch7 filers. [▶ tab](#)

Introduction
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Model
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Equilibrium
○○

Calibration
○○○

Results
○○○○○○●

Regressions
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Reconciling Reduced Form Results with Model Results

Econometric Model

- Bankruptcy decision:

$$d = 1[\gamma_1 x + \gamma_2 z + \epsilon > 0]$$

- Labor supply decision (log annual working hours):

$$h = \psi x + \Delta d + v$$

Reduced-Form Estimation from Simulated Data

- Simulate a pseudo panel of 50,000 agents from the equilibrium invariant distribution.
- Estimate the treatment effect model using financial benefits and its square term as instruments (as in HL).

	Coeff.	Sd Error
Ch7 Filing	0.2273***	0.0226

- I get a positive result on the quarterly basis.

Integrated Information Induces Opposite Results

- Combine quarterly information into annual variables.
- Time aggregation results in a negative result.

	Coeff.	Sd Err.
Ch7 Filing	-0.3225**	0.0095

- Results are sensitive when wealth are assumed to be the same over five years.

	Coeff.	Sd Err.
Ch7 Filing	-0.8978***	0.1854

Future Research

- To evaluate the following policy implications on aggregate labor supply, we need to endogenize the wage offer distribution,
 - Mean testing
 - Elimination of Ch7 bankruptcy
 - Elimination of bankruptcy

Summary and Conclusion

- To answer the question of how much a fresh start increases labor supply, I construct a dynamic structural model with both job search and bankruptcy choices.
- With a quarterly calibrated model, I run counterfactual experiments for Chapter 7 bankruptcy filers.
- I obtain a positive result. Ch7 bankruptcy on average increases labor supply by 3.5%.
- Using regressions on simulated data, I reconcile the opposite result with reduced-form estimation taken to PSID annual dataset.

Government Budget

- Government finances social welfare programs using linear labor income tax.
- The total tax revenues are

$$\sum_{(b,\zeta)} \int_{(a,w)} \tau(1 - \delta^b) wh(1, b, a, w, 0, \zeta) \cdot \tilde{m}(1, b, da, dw, 0, \zeta)$$

- The total social benefits payouts are

$$\sum_{(b,y,\zeta)} \int_a y \cdot \tilde{m}(0, b, da, \emptyset, y, \zeta)$$

- The balance budget requires that the tax revenues equal the benefit payouts.

Distribution

- Subperiod 1 measure $m(s)$ for agents in state s :

$$m(1, b', A, w, 0, \zeta') = \rho z(\zeta') \sum_{\zeta} 1_{\{a'(\tilde{s}) \in A\}} B(b', b, d(\tilde{s})) \tilde{m}(e, b, a, w, 0, \zeta).$$

$$m(0, b', A, \emptyset, y, \zeta') = \rho z(\zeta') \sum_{\zeta} 1_{\{a'(\tilde{s}) \in A\}} B(b' | b, d(\tilde{s})) \tilde{m}(0, b, a, \emptyset, y, \zeta) \\ + (1 - \rho) z(\zeta') 1_{\{b'=0, \{0\} \in A, y=0\}}.$$

- Subperiod 2 measure $\tilde{m}(\tilde{s})$ for agents in state \tilde{s} :

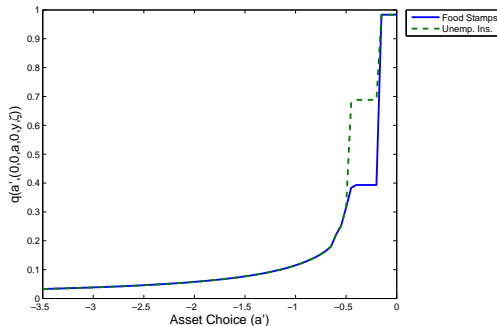
$$\tilde{m}(1, b, a, w, 0, \zeta) = l(1, b, a, \tilde{w}, 0, \zeta) m(1, b, a, w, 0, \zeta) \\ + \sum_y \left[l^w(0, b, a, \emptyset, y, \zeta) \phi^b g(w) m(0, b, a, \emptyset, y, \zeta) \right]$$

$$\tilde{m}(0, b, a, \emptyset, \tilde{y}, \zeta) = 1_{\{\tilde{y}=y_H\}} \int_w \kappa + (1 - \kappa) (1 - l(1, b, a, w, 0, \zeta)) m(1, b, a, dw, 0, \zeta) \\ + \sum_y p(\tilde{y}|y) \int_w \left[(1 - l^w(0, b, a, \emptyset, y, \zeta)) \phi^b m(0, b, a, \emptyset, y, \zeta) \right] G(dw)$$

Equilibrium Default Decisions for Non-Workers

- Non-workers can choose $d \in \{0, 7\}$ (ineligible for Chapter 13).
- Agents who receive less government transfers default at lower debt level. Specifically,
 - Floor benefits recipients file for Chapter 7 if $a < -0.2$.
 - UI recipients file for Chapter 7 if $a < -0.5$.

Equilibrium Loan Prices for Non-Workers



- Agents who receive more government transfers have better prices (lower interest rates). [▶ Back](#)

Definition for Reservation Wages

- The model implicitly implies reservation wages such that agents feel indifferent between employment ($e = 1$) and non-employment ($e = 0$).
- For workers,

$$W(1, b, a, w^r, 0, \zeta) = W(0, b, a, \emptyset, \bar{y}, \zeta)$$

- For non-workers,

$$W(1, b, a, w^r, 0, \zeta) = E_{y'|y} W(0, b, a, \emptyset, y', \zeta)$$

Equilibrium Reservation Wages for Non-Workers

- Reservation wages increase in wealth and government transfer.
- Similar with workers, agents with bankruptcy flags have lower reservation wages, and Ch7 filers have lower reservation wages than Ch13 filers. [▶ Back](#)

Econometric Model in Li and Han (2007 JFSR)

- Bankruptcy decision:

$$d = 1[\Phi(\gamma_1 x + \gamma_2 z + \epsilon) > 0]$$

- Labor supply decision (log annual working hours):

$$h = \psi x + \Delta d + v$$

- Data: PSID 1968-1996, 35,178 observations (with 167 filings).
- x include demographics, divorce event, health status, and employment information.
- z include lagged state bankruptcy rate and wealth change from bankruptcy.

Table: Table 7 from Han and LI (2007 JFSR)

Indep. variable	With IVs	
	Coeff	s.e.
Bankruptcy filing	-0.09	0.27

Labor Supply by Gender

$d^* \setminus d$	Male			Female		
	0	7	13	0	7	13
0	2194.99 (5.78)			1864.45 (6.09)		
7		2196.65 (137.08)			1844.81 (106.63)	
13			2399.00 (142.99)			1818.28 (143.18)

Table: Annual Working Hours

	Male	Female	Total
Repayment	18,088	16,132	34,220
Chapter 7	49	58	107
Chapter 13	26	32	58

Table: Number of Observations

Extensive and Intensive Labor Supply by Gender

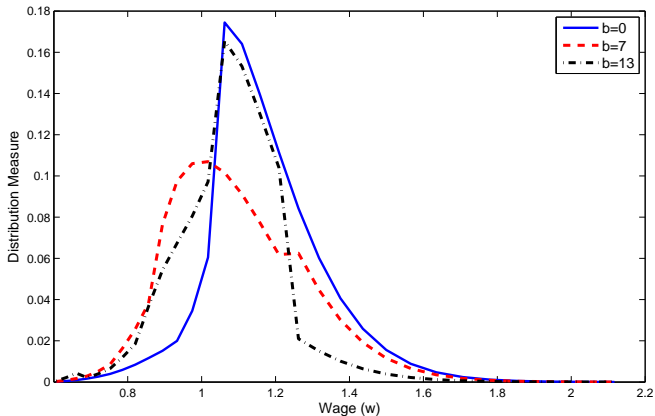
$d^* \setminus d$	Male			Female		
	0	7	13	0	7	13
0	48.01 (0.06)			46.60 (0.08)		
7		47.61 (1.30)			45.09 (1.65)	
13			47.85 (1.66)			46.22 (1.57)

Table: Number of Weeks Worked (Extensive)

$d^* \setminus d$	Male			Female		
	0	7	13	0	7	13
0	45.79 (0.11)			39.89 (0.12)		
7		46.48 (2.58)			42.09 (2.30)	
13			50.33 (2.40)			39.57 (3.26)

Table: Number of Hours Worked Per Week (Intensive)

Equilibrium Wage Distributions



Data Description

- Source: Combined cross-sectional dataset from NLSY79 (1979-1994) with 39,194 observations.
- Sample selection criteria:
 - 1 Individuals who are least 25 years old [90,087 del].
 - 2 Report whether they have filed for bankruptcy [42,489 del].
 - 3 Report working hours, weeks worked, wages [11,406 del].
 - 4 Chapter 7 or Chapter 13 bankruptcy if filing [742 del].
 - 5 Report the date of bankruptcy if applicable [252 del].
 - 6 Wages not top coded [114 del].
 - 7 Annual hours no greater than 5096 hours [3,962 del].
 - 8 Hours per week no greater than 98 hours [0 del].
 - 9 Real wage rate (in 2004\$) less than 100 [192 del].
 - 10 Wage rate more than half minimum wage [1,837 del].
- Label bankruptcy flag status to samples
 - If file for Ch7 bankruptcy in past 10 years: $b = 7$
 - If file for Ch13 bankruptcy in past 5 years: $b = 13$
 - Otherwise: $b = 0$

Average Wage Rate for Bankruptcy Filers

- The model predicts that debtors with higher wage rates file for Chapter 7.

	Mean	Std.
Chapter 7	\$10.49	\$7.10
Chapter 13	\$9.63	\$5.86

Extensive and Intensive Margins of Labor Supply

$d^* \setminus d$	0	7	13
0	47.34 (0.05)		
7		46.24 (1.07)	
13			46.95 (1.14)

Table: Weeks Worked (Extensive)

$d^* \setminus d$	0	7	13
0	43.01 (0.08)		
7		44.10 (1.73)	
13			44.40 (2.20)

Table: Hours Per Week (Intensive)

Compared with non-filers, Ch7 filers work for less weeks (extensive) but work more hours per week (intensive).

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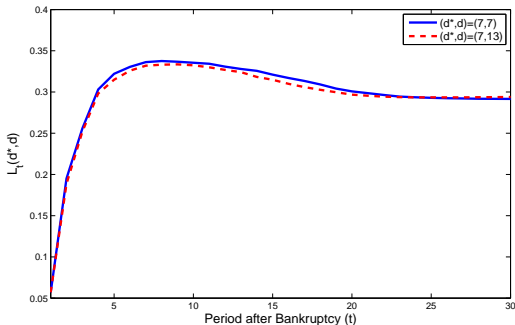
Computational Procedure

- 1 Guess a labor tax rate τ^n .
- 2 Guess a price function $q(a', \tilde{s})$.
- 3 Solve for value functions by value function iteration to get decision rules in labor and credit markets.
- 4 Update the price functions to satisfy zero profit conditions. Iterate until the price functions converge.
- 5 Solve for the invariant distribution.
- 6 Update the tax rate such that the government runs a balanced budget. Iterate until the tax rate converges.

Long Term Effect on Counterfactual Outcomes

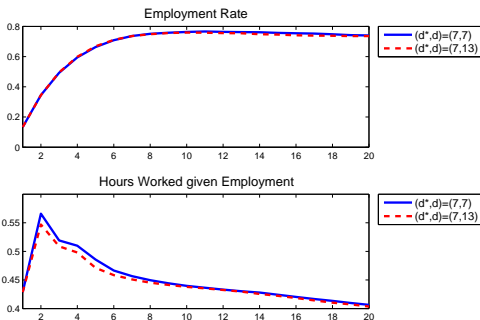
- 1 Create two pseudopanel starting with the equilibrium invariant cross-sectional distribution for Ch7 filers at time $t = 0$.
- 2 Panel 1: calculate avg labor supply for time $t = 1, 2, \dots$ by keeping track of agents following their equilibrium bankruptcy choice $d^* = 7$ at time 0.
- 3 Panel 2: impose the counterfactual bankruptcy choice $d = 13$ at time 0, calculate avg labor supply for time $t = 1, 2, \dots$ by keeping track of agents.

Labor Supply after Bankruptcy



- Labor supply for Chapter 7 filers is increased by an average of 1.58% for the first five years from having a fresh start.

Labor Supply on Extensive and Intensive Margins after Bankruptcy



- The difference in labor supply on the equilibrium and counterfactual paths comes mainly from the intensive margin.

Estimation Results on Quarterly Basis

<i>Ch7 filing</i>	Coeff.	Sd Err.
Wage	61.9629***	16.3809
Wage Square	-24.1237***	6.4112
Income	-3.1897***	1.0456
Income Square	6.1040***	1.6855
Income Change	-0.3273	0.4127
Experience Job Loss	39.9090***	10.4651
Financial Benefits	4.2009	3.6438
Financial Benefits Sq.	3.3186	8.2045
<i>Log Working Hours</i>	Coeff.	Sd Error
Ch7 Filing	0.2273***	0.0226
Inverse Mills Ratio	0.0250	0.0072
Wage	-0.5673***	0.0160
Wage Square	-0.1351***	0.0068
Income	-0.9127***	0.0052
Income Square	2.8807***	0.0074
Income Change	0.0440***	0.0014
Experience Job Loss	-0.5425***	0.0096
ρ	0.4484	
σ	0.0558	

Test of Exogeneity for Instrumental Variables

	No Ch7 Filing		Ch7 Filing	
<i>Log Hours</i>	Coeff.	Sd Error	Coeff.	Sd Error
Wage	-0.4631***	0.0157	0.5091***	0.0039
Wage Square	-0.1775***	0.0067	-0.2090***	0.0017
Income	-0.8825***	0.0051	-0.0071***	0.0020
Income Square	2.8495***	0.0073	0.0529***	0.0028
Income Change	0.0314***	0.0014	-0.0023***	0.0005
Experience Job Loss	-0.4774***	0.0094	0.2983***	0.0022
Financial Benefits	0.9530***	0.0300	-0.0615***	0.0300
Financial Benefits Sq.	-2.1694***	0.0094	0.1012***	0.0300

Estimation Results on Annual Basis

	Part A: No Measurement Error		Part B: Measurement Error	
<i>Ch7 filing</i>	Coeff.	Sd Error	Coeff.	Sd Error
Wage	0.8276***	0.2830	0.8264***	0.2775
Wage Square	-1.1260***	0.2197	-1.1177***	0.2176
Income	-1.1046***	0.2140	-1.2195***	0.2078
Income Square	0.7136***	0.0710	0.7283***	0.0698
Income Change	-0.0835*	0.0472	-0.0123	0.0448
Experience Job Loss	0.6310***	0.0769	0.6139***	0.0759
Financial Benefits	4.0905	6.9883	0.2098	3.0075
Financial Benefits Sq.	5.0251	15.9417	-4.1553	14.0710
<i>Log Working Hours</i>	Coeff.	Sd Error	Coeff.	Sd Error
Ch7 Filing	-0.3225**	0.0095	-0.8978***	0.1854
Inverse Mills Ratio	0.1659	0.0492	0.3325***	0.0584
Wage	-0.1785***	0.0146	-0.1765**	0.0146
Wage Square	0.2544***	0.0099	0.2524	0.0099
Income	-0.1697***	0.0136	-0.1758***	0.0137
Income Square	0.0221***	0.0043	0.0248***	0.0043
Income Change	0.1624***	0.0026	0.1624***	0.0026
Experience Job Loss	-0.2928***	0.1535	-0.2918***	0.0033
ρ	0.3735		0.7469	
σ	0.4442		0.4452	

Why Might Micro Level Estimates be Troublesome?

- Data limitations:
 - PSID (1996): surveys wealth every 5 years.
 - NLSY (1979): minimal bankruptcy information.
- Endogeneity of bankruptcy decisions:
 - Reverse causality violates conditional independence assumption.
 - Lack of valid instrumental variables:
 - 1 Stigma regarding bankruptcy: unobservable.
 - 2 Financial benefit (net debt): has a direct effect on labor supply.
- Han and Li (2007 JFSR) find the ATET to be negative from PSID data (opposite to the stated goal). [▶ HL](#)

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Social Welfare Programs

- Two types of government transfers $y \in \{y_L, y_H\}$.
- “Floor benefit” y_L and UI y_H are financed through linear labor income taxes τ .
- Workers receive UI if transit to non-employment.
- Non-employed agents lose UI with probability ν .
- Non-employed agents who are ineligible for UI receive y_L .

Procedure for Counterfactual Experiments

- 1 Start with the equilibrium invariant cross-sectional distribution.
- 2 Calculate the avg equilibrium labor supply conditional on equilibrium bankruptcy choices (diagonal).
- 3 Calculate the avg counterfactual labor supply conditional on counterfactual bankruptcy choices (off-diagonal).

Price Schedules for Deposit and Loan Contracts

1 Deposit contracts

$$q(a', \tilde{s}) = \rho / (1 + r), \quad \text{if } a' \geq 0$$

2 Loan contracts

$$q(a', \tilde{s}) = \rho R(a', \tilde{s}) / (1 + r), \quad \text{if } a' < 0$$

where

$$R(a', \tilde{s}) = E_{\tilde{s}' | (a', \tilde{s})} [1_{\{d(\tilde{s}')=0\}} \cdot 1 + 1_{\{d(\tilde{s}')=7\}} \cdot 0 + 1_{\{d(\tilde{s}')=13\}} \cdot \Phi(\tilde{s}')]]$$

is the expected recovery rate.

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is the expected recovery rate.

Recovery Rate for Chapter 13 Bankruptcy

- The total wage garnishment amount is

$$\Gamma(\tilde{s}) = \gamma^{13} w(\tilde{s}) h(\tilde{s}) + \frac{E_{\tilde{s}'|\tilde{s}} [1_{\{b(\tilde{s}')=13, d(\tilde{s}')=0\}} \Gamma(\tilde{s}')]]}{1+r}$$

which depends on labor supply decisions after bankruptcy.

- The recovery rate for Chapter 13 bankruptcy is therefore

$$\Phi(\tilde{s}') = \Gamma(\tilde{s}') / (-a' + \zeta(\tilde{s}'))$$

assuming shared rights of repayments with creditors for expense shocks.

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$$\Phi(\tilde{s}') = \Gamma(\tilde{s}') / (-a' + \zeta(\tilde{s}'))$$

assuming shared rights of repayments with creditors for expense shocks.

Stationary Equilibrium

- A competitive equilibrium with bankruptcy consists of a set of value functions, agent decision rules, a price function, a cross-sectional distribution of agents over assets, employment status, earnings, social welfare benefits, and bankruptcy flag status, a labor tax rate such that
 - 1 Decision rules solve agent decision problems;
 - 2 Loan prices are such that intermediaries make zero profits;
 - 3 The government budget is balanced; [▶ More](#)
 - 4 The cross-sectional distribution reproduces itself. [▶ More](#)
- To find equilibrium, I solve a big fixed point problem numerically. [▶ alg](#)

Introduction
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Model
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Equilibrium
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Calibration
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Results
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Regressions
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▶ param

Equilibrium Wage Distributions

b	Model		Data	
	Mean (Std)	% to Mean for $b = 0$	Mean (Std)	% to Mean for $b = 0$
0	1.1509 (0.1543)	–	\$11.82 (\$8.64)	–
7	1.0712 (0.1772)	0.9307	\$11.00 (\$8.04)	0.9306
13	1.0633 (0.1389)	0.9239	\$10.71 (\$6.78)	0.9061

- F^0 FOSD F^7 and F^{13} (Higher mean for $b = 0$ than $b \neq 0$).
- F^{13} SOSD F^7 (Larger variance for $b = 7$ than $b = 13$).

Instruments Fail the Test of Exogeneity

- Valid instruments are uncorrelated with labor supply responses regardless of treatment status.
- We can test the exogeneity directly because we know all potential outcomes (not in real data).

	No Ch7 Filing		Ch7 Filing	
<i>Log Hours</i>	Coeff.	Sd Error	Coeff.	Sd Error
Financial Benefits	0.9530***	0.0300	-0.0615***	0.0300
Financial Benefits Sq.	-2.1694***	0.0094	0.1012***	0.0300

- Coefficients are significantly different from zero. Instruments fail the test.

Data Issues

- Data limitations
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