

The Impact of Owner Characteristics & Policy on Small Firms: Using the SSBF

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Small Firms

In the US, small firms

- Produce more than 50% of non-farm output
- Employ 50% of workers
- Pay 45% of total private payroll

They are important to the macroeconomy.
There is risk but returns can be great.

Debate: Nature vs. Environment

- Do entrepreneurs have different innate characteristics?
 - More willing to bear risk
 - More optimistic
- How important is the business environment?
 - Bankruptcy & other institutions
 - Access to credit (liquidity constraints)
 - Return distribution

Research Agenda

- Examine data from the Survey of Small Business Finance (SSBF) 1993, 1998, 2003
- Construct a model to organize and explain the data
- Use HPC to solve the model and conduct policy experiments

Goal: Understand Small Firms & Policies that Promote Success

- Why do people become entrepreneurs?
- What policies promote or hinder entrepreneurship?
- Why do we observe differences in entrepreneurship across countries?

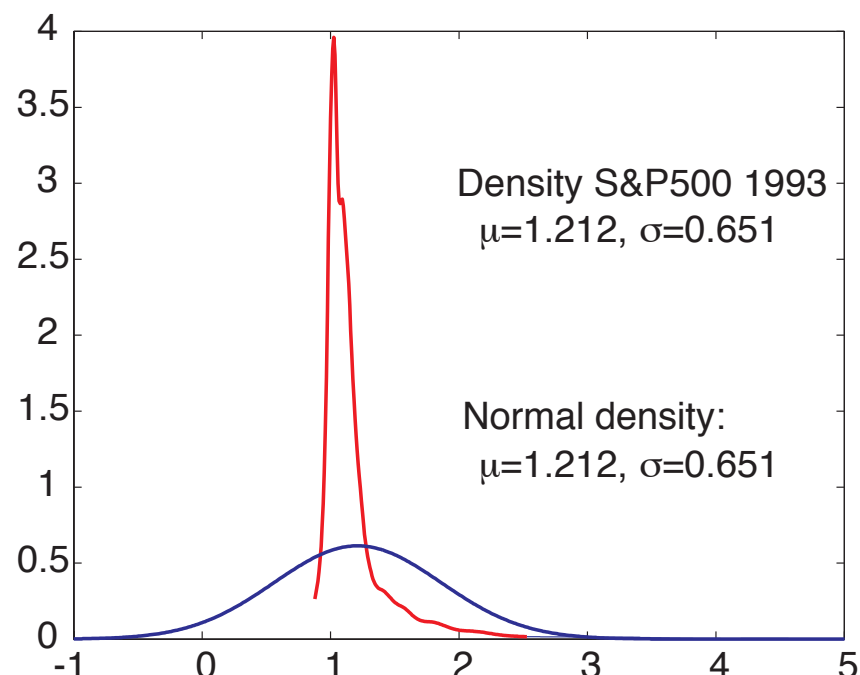
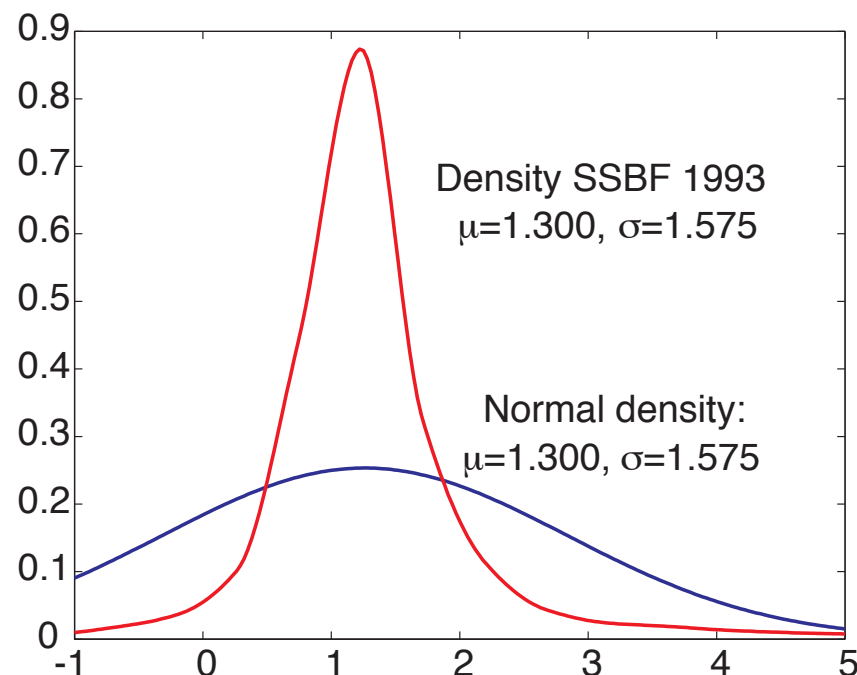
Survey Small Business Finance

- Conducted in 1987, 1993, 1998, 2003
- CS sample of non-farm, non-financial, non-real estate small businesses
- Represent about 5 million firms: about 4000 observations
- Data on firms & primary owners: age, gender, industry, firm type, financial info on firm & owner

SSBF Facts

- Small firm returns are risky
- All debt-equity ratios are equally likely
- Owners:
 - invest significant personal net-worth
 - More than 90% work at the firm
- 18-26% firms have negative equity
- Annual default rate is 3.5-4.5%

Real Firm Returns in 1993



moment	median	mean	standard dev.	skewness	kurtosis
1993 SSBF	1.094	1.30	1.57	13.2	290
95% conf.	[1.08, 1.11]	[1.22, 1.38]	[0.95, 2.13]	[2.3, 17.3]	[29, 488]
1993 S&P500	1.093	1.21	0.65	13.1	221
95% conf.	[1.07, 1.10]	[1.16, 1.28]	[0.28, 1.02]	[3.1, 14.6]	[20, 277]

Net-worth Invested

Entrepreneurs with positive equity in their firm:

% net-worth invested	$\geq 20\%$	$\geq 40\%$	$\geq 60\%$	$\geq 80\%$	mean	median
% of entrepreneurs	52%	25%	11%	3%	27%	21%

Negative Equity for Incorporated firms:

- * 18.4% in 1993

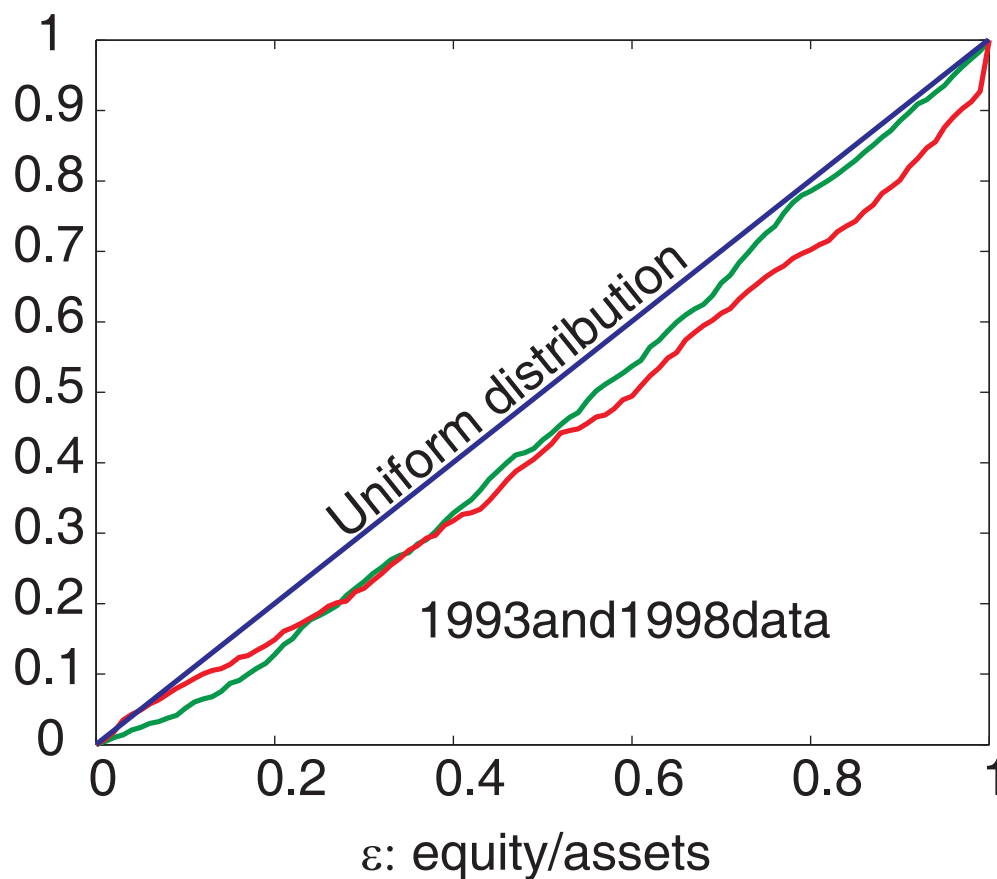
- * 26.3% in 1998

- * 23.4% in 2003

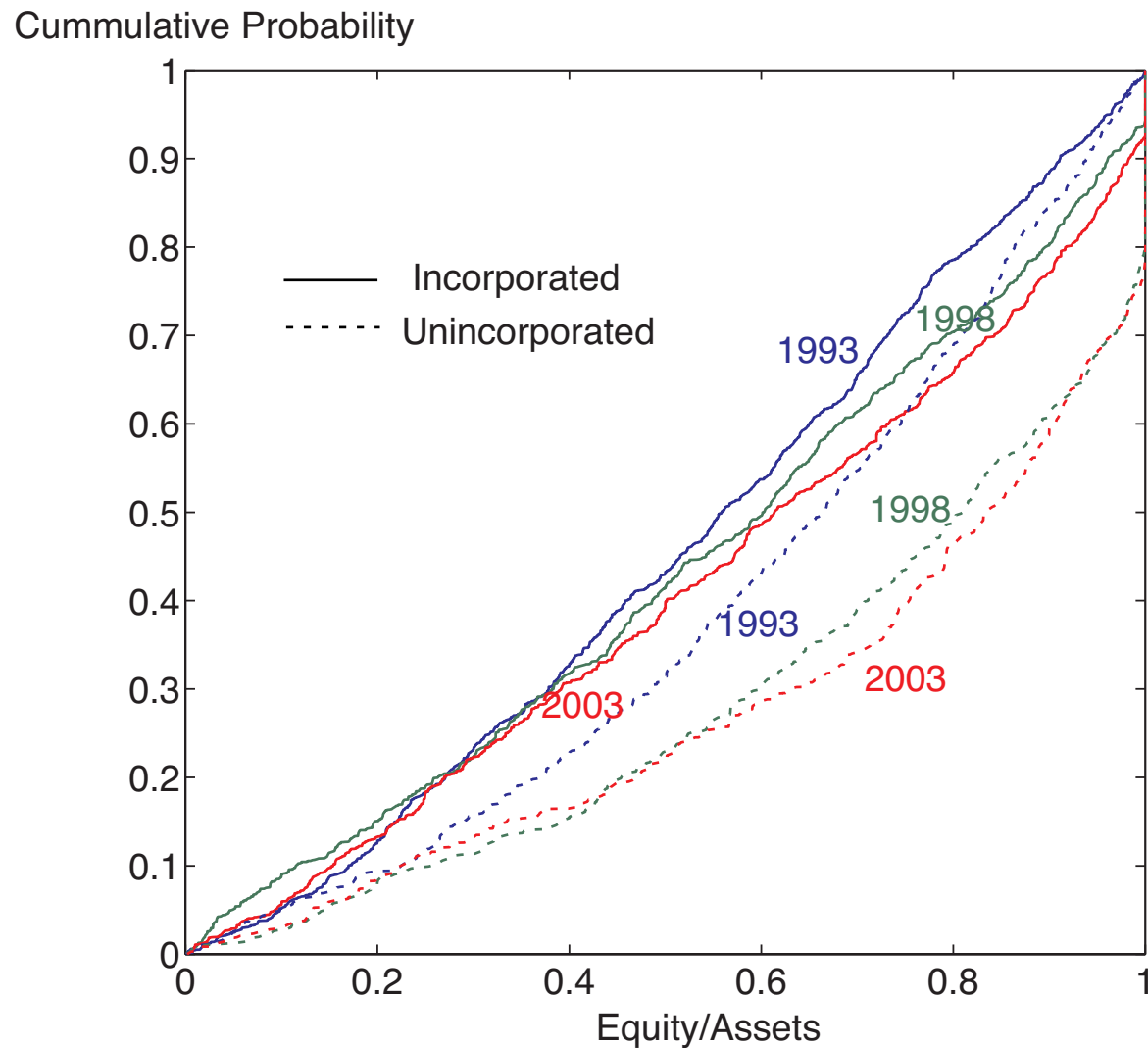
Unincorporated firms: 12.2%, 18.6%, 13.8%

Capital Structure: 93 & 98 Inc

Cumulative
probability



Change over time for Unincorp



Dynamic Model

- Describe an entrepreneur by
 - Preferences (heterogeneous)
 - Resources
 - Production Technology
 - Information
- Lender: resources & opportunities

Heterogeneous Entrepreneurs: ρ



A (scale of
production,
assets)

Assets: Ax

ε (% self
finance)

$1-\varepsilon$ (% debt
finance)

realization x

Equity: $A(x-\bar{v})$

Net worth outside firm:
 $(1+r)(1-c-\varepsilon A)$

c (consumption)

\bar{v} (repayment)

Debt: $A\bar{v}$

Problem 3 $v_S = \max_{c,A,\epsilon,\bar{v}} u(c) + \beta v_B \int_{\underline{x}}^{x^*} \left[(1+r)(1-\epsilon A - c) \right]^{1-\rho} dF(x)$

$$+ \beta v_S \int_{x^*}^{\bar{x}} \left[A(x - \bar{v}) + (1+r)(1-\epsilon A - c) \right]^{1-\rho} dF(x) \Big]$$

Subject to:

$$\int_{\underline{x}}^0 x dF(x) + \int_0^{x^*} (1-\delta)x dF(x) + \int_{x^*}^{\bar{x}} \bar{v} dF(x) = (1-\epsilon)(1+r_B)$$

$$x^* = \max \left\{ \bar{v} - \left[1 - \left(\frac{v_B}{v_S} \right)^{\frac{1}{1-\rho}} \right] \frac{(1+r)(1-\epsilon A - c)}{A}, \underline{x} \right\}$$

$$c + \epsilon A \leq 1$$

$$(1-\epsilon)A \leq b$$

$$c \geq 0, A \geq 0, 0 \leq \epsilon \leq 1.$$

HPC Methods

We use HPC methods to solve the model:

- Compute distributions: firm returns, net-worth, debt-equity, firm size.
- Choose model parameters that fit the data
- Construct the distribution of risk aversion
- Choose decision rules: c , A , ε , \bar{v}

Need HPC to compute distributions

Quantitative Analysis

Parameter	Value	Comment/ Observations
β	0.97	determined from r and r_B
T	11	U.S. credit record
δ	0.10	Boyd-Smith (1994)
r_B	1.2%	real rate, 6 mo T-Bill, 1992-2006
r	4.5%	real rate, 30 year mortgage, 1992-2006
$f(x)$		SSBF 1993 (Appendix D)

Remaining parameters:

- μ and σ :
 - ▶ $N(\mu, \sigma)$ distribution of risk aversion ρ
- b :
 - ▶ borrowing constraint

Quantitative Analysis

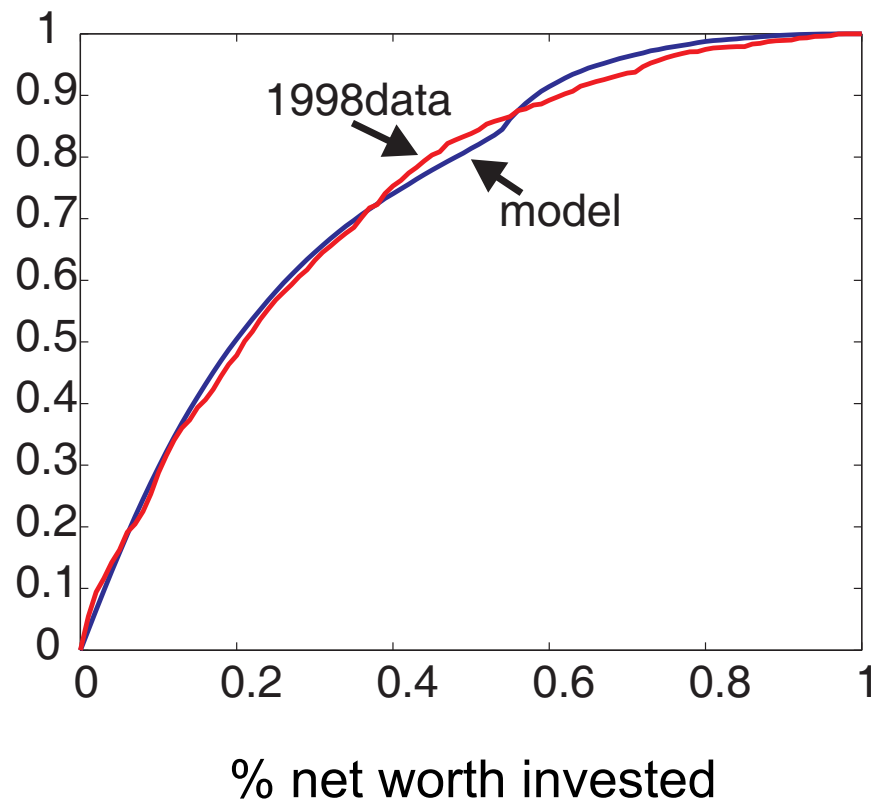
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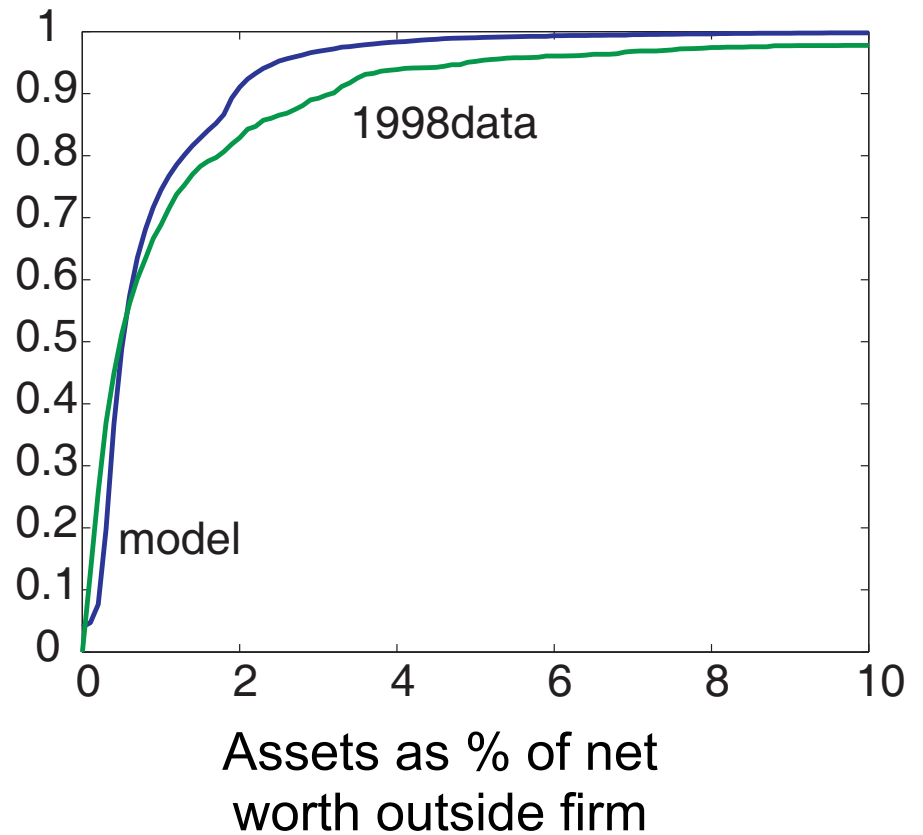
- μ : 1.55
 - σ : 0.83
 - b : 21.5%
- 75% of entrepreneurs have risk aversion between 1 and 3.

Model Predictions

Cumulative
probability

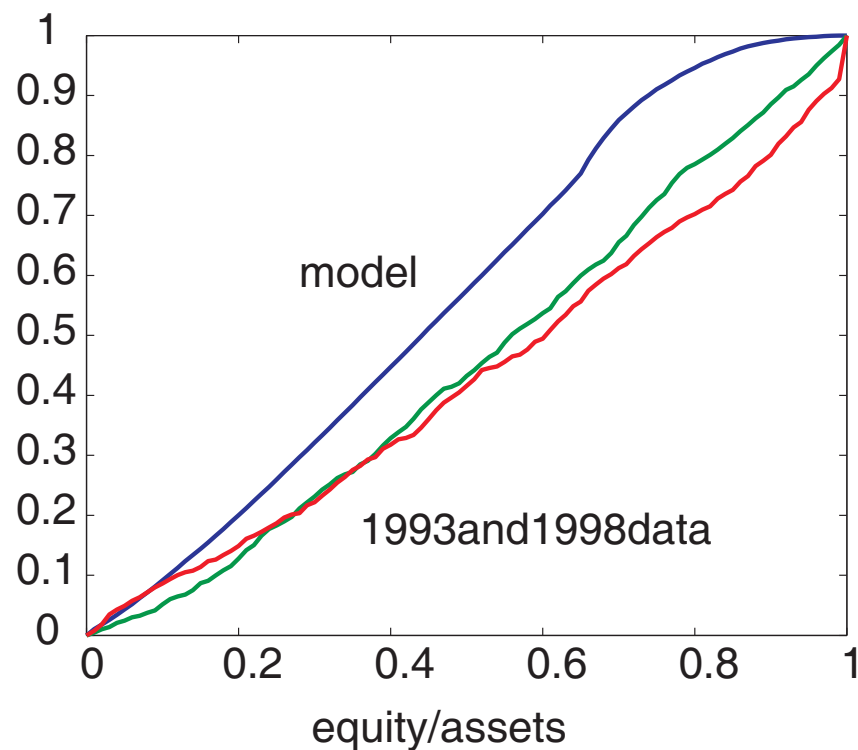


Cumulative
probability

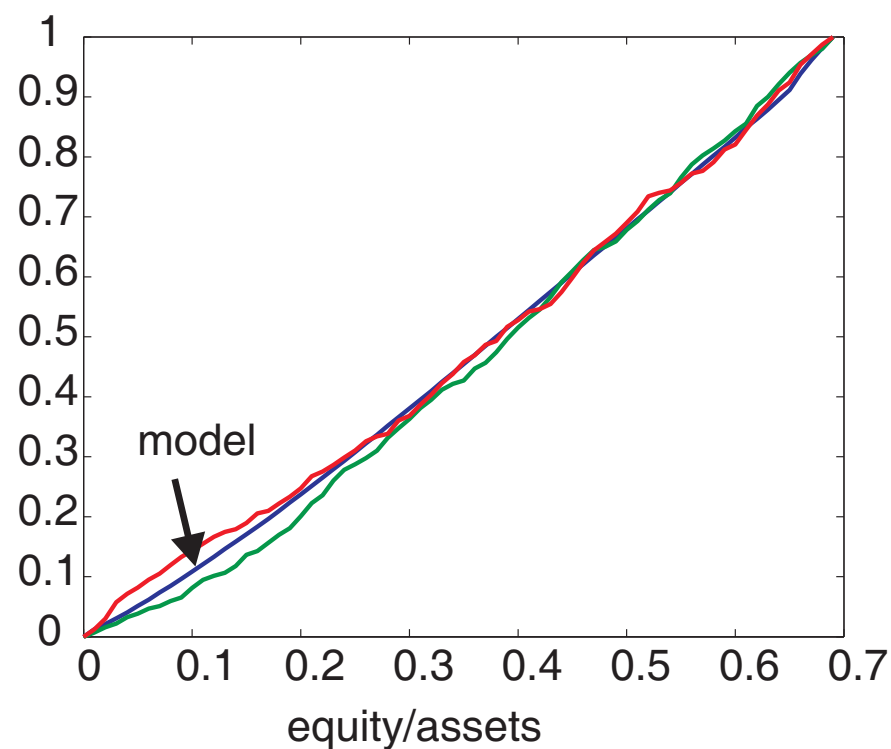


Model Predictions

Cumulative
probability



Cumulative
probability



Model Predictions

Parameter	Interpretation	Value	Data
median A%	median firm assets	48.1	43.1 - 51.9
default %	firm default rate	4.4	3.5 - 4.5
cons. %	c as % of net worth	3.6	3 - 5
neg. Eq. %	neg. equity in firm	10.6	15.7 - 21.0

Policy Experiment: T

Welfare Effects

risk aversion ρ	0.9	1.2	1.5	1.8	2.1	2.5	3.0	3.5	4.0
$T = 6$	36.9	11.2	7.7	6.1	5.0	3.9	3.1	2.6	2.2
$T = 7$	27.5	8.1	5.6	4.4	3.6	2.8	2.2	1.9	1.6
$T = 8$	19.8	5.5	3.9	3.0	2.4	1.9	1.5	1.3	1.1
$T = 9$	13.5	3.2	2.4	1.8	1.5	1.2	0.9	0.7	0.6
$T = 10$	6.3	1.3	1.1	0.8	0.7	0.5	0.4	0.3	0.3
$T = 11$	—	—	—	—	—	—	—	—	—
$T = 12$	-3.6	-0.7	-0.9	-0.7	-0.5	-0.4	-0.3	-0.3	-0.2
$T = 13$	-4.4	-3.2	-1.5	-1.3	-1.0	-0.8	-0.6	-0.5	-0.4
$T = 14$	-7.6	-4.4	-2.1	-1.8	-1.4	-1.0	-0.8	-0.6	-0.5
$T = 15$	-10.5	-5.5	-3.2	-2.1	-1.7	-1.3	-1.0	-0.8	-0.6
$T = 16$	-12.7	-6.5	-3.8	-2.4	-2.0	-1.5	-1.1	-0.9	-0.7
$T = 20$	-20.4	-9.4	-5.7	-4.0	-2.8	-1.8	-1.5	-1.2	-1.0

Policy Experiments: T

Change in Loan Interest Rate

risk aversion ρ	0.9	1.2	1.5	1.8	2.1	2.5	3.0	3.5	4.0
$T = 6$	18.0	15.3	14.2	14.0	14.3	14.4	14.3	14.1	14.1
$T = 7$	17.7	14.9	13.7	13.5	13.8	13.8	13.7	13.6	13.5
$T = 8$	17.3	14.5	13.3	13.0	13.3	13.3	13.2	13.1	13.0
$T = 9$	17.0	14.1	12.9	12.5	12.8	12.9	12.7	12.6	12.5
$T = 10$	16.6	13.7	12.4	12.1	12.3	12.4	12.2	12.0	11.9
$T = 11$	16.3	13.3	12.0	11.6	11.9	11.9	11.6	11.5	11.4
$T = 12$	16.0	12.9	11.7	11.2	11.4	11.4	11.2	11.0	10.9
$T = 13$	15.6	12.6	11.3	10.8	11.0	10.9	10.7	10.6	10.4
$T = 14$	15.3	12.3	10.9	10.5	10.6	10.5	10.3	10.2	10.1
$T = 15$	15.0	12.0	10.7	10.1	10.2	10.2	10.0	9.8	9.7
$T = 16$	14.7	11.8	10.4	9.8	9.8	9.8	9.6	9.5	9.4
$T = 20$	13.6	10.7	9.3	8.7	8.5	8.8	8.6	8.5	8.4

Experiment: μ

μ	1.15	1.25	1.35	1.45	1.55	1.65	1.75	1.85
fit	0.224	0.146	0.109	0.074	0.042	0.080	0.117	0.153
median A %	74.3	65.4	58.3	52.7	48.1	44.4	41.2	38.6
default %	4.2	4.2	4.3	4.4	4.4	4.5	4.6	4.7
cons. %	2.8	3.0	3.2	3.5	3.6	3.8	4.0	4.1
neg Eq. %	8.4	8.9	9.5	10.0	10.6	11.1	11.7	12.3

% women owned businesses: 16% (1993), 24% (1998)

Median Asset level normalized

by net worth outside firm: 53% (men) 39% (women)

Negative equity (1993) 14.8%(men) 19.5% (women)
 (1998) 19.4%(men) 26.1% (women)

Optimism

10% additional return

T	10	11	12	13	14	15	16	20
μ	1.92	1.89	1.83	1.79	1.76	1.73	1.70	1.61
σ	0.83	0.81	0.77	0.74	0.72	0.70	0.69	0.63
b %	26.6	26.2	27.0	27.2	27.3	27.3	27.3	27.4
fit	0.030	0.030	0.029	0.029	0.029	0.029	0.029	0.028
median A %	54.9	54.1	54.8	54.8	54.8	54.8	54.8	54.7
default %	4.4	4.0	3.8	3.6	3.4	3.3	3.1	2.7
cons. %	5.2	5.1	5.1	5.0	5.0	4.9	4.9	4.7
neg Eq. %	15.8	16.7	17.5	17.8	17.8	17.8	17.7	17.6

Conclusion

- Model & data help us understand owner behavior, financial & legal structure, default, output, welfare
- SSBF data are essential for questions & measurement (firms & owners)
- Institutions matter & interact with modest heterogeneity in owner characteristics
 - ▶ Bankruptcy makes entrepreneurs more willing to bear risk (80% with p between 0.74 and 3)
 - ▶ Negative equity: “Option value” of continuing to operate the firm.
- Big welfare effects with production