

Inequality, Household Behavior and the Macroeconomy

Wealth inequality and entrepreneurship

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May 3, 2024

Last time

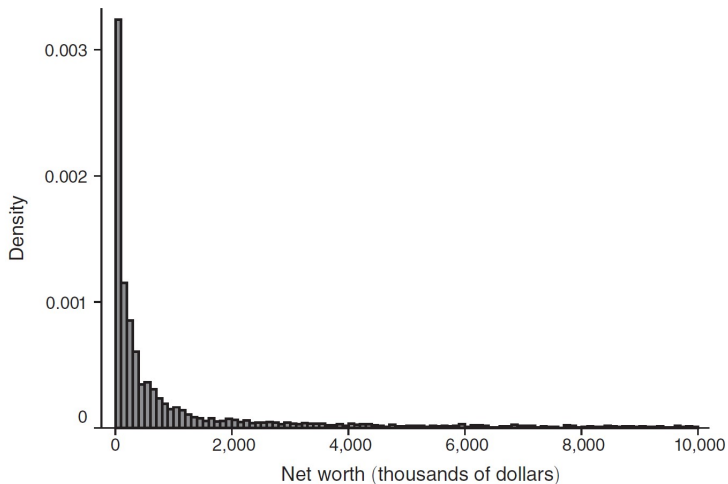
- Inheritances and bequests can generate some wealth inequality
- But not on the top

What are we missing?

Today

- A model of entrepreneurship: Cagetti & De Nardi (2006)
- This is a difficult, but really neat model
- Aim is to go very slow, please ask when something looks difficult

The distribution of wealth



Note: SCF, truncated at \$10 millions

The determinants of wealth inequality

We can summarize what we know about the determinants of wealth inequality:

- 1 Precautionary savings, saving for retirement, borrowing constraints and luck in the labor market can generate some wealth inequality, but too little at the top
- 2 Adding uncertainty in life-spans helps little to match wealth inequality. The right tail of the wealth distribution is left unexplained.

There are facts we cannot explain: Take a look at Forbes 400!

- Full of entrepreneurs
- 70% are self-made people

Why can entrepreneurs make a difference?

Being an entrepreneur might mean:

- being richer
- more incentive to save
- higher return on capital

than the rest of the population.

All this can be combined with dynastic effects (i.e. give your firm to your child)

Cagetti and De Nardi (2006) [CD] formalize this mechanism!

What is SCF?

- survey
- good for studying wealth, financial decisions
- better sample of rich people than PSID
- not a panel!

Entrepreneurship and Wealth—The Data

The Survey of Consumer Finances asks individuals whether they are self employed

- Do you work for someone else, are you self-employed or something else?
- Do you own any share in privately held businesses, farms, professional practices ...?
- Do you have an active management role in any of these businesses?

Entrepreneurs are relatively rich

TABLE 1
PERCENTAGE OF ENTREPRENEURS (According to Various Definitions) IN THE
POPULATION AND CORRESPONDING SHARE OF TOTAL WEALTH HELD

	Percent in Population	Share of Total Wealth
Business owners or self-employed	16.7	52.9
All business owners	13.3	48.8
Active business owners	11.5	41.6
All self-employed	11.1	39.0
Self-employed business owners	7.6	33.0

Entrepreneurs are relatively rich

TABLE 4
MEDIAN AND MEAN NET WORTH (in Thousands of Dollars) FOR
VARIOUS GROUPS OF PEOPLE

	Median	Mean
Whole population	47	189
Business owners or self-employed	172	599
All business owners	205	695
Business owners but not active management	293	768
Business owners not self- employed	179	470
All self-employed	169	665
Self-employed (active) business owners	265	829
Self-employed and not business owners	36	224

Wealth inequality - pooled sample

TABLE 2
U.S. WEALTH DISTRIBUTION

	FRACTION OF PEOPLE, TOP			
	1%	5%	10%	20%
Total net worth held	30%	54%	67%	81%

Lots of entrepreneurs among the very rich

TABLE 3
FRACTION (%) OF ENTREPRENEURS (According to Various Definitions) IN A GIVEN
WEALTH PERCENTILE OF THE OVERALL U.S. WEALTH DISTRIBUTION

	WEALTH PERCENTILE, TOP			
	1%	5%	10%	20%
Business owners or self-employed	81	68	54	39
All business owners	76	62	49	36
Active business owners	65	51	42	30
Self-employed	62	47	38	26
Self-employed business owners	54	39	32	22

Entrepreneurship and Wealth

Conclusion:

- A lot of rich people are entrepreneurs
- A lot of entrepreneurs are rich

But why do entrepreneurs want to save?

- Because banks are not willing to provide upfront all of the necessary liquidity to finance projects!
- Borrowing constraints therefore are essential, though entrepreneurs earn high returns on their ability.

Entrepreneurship and Wealth

Evidence on Borrowing Constraints on Firms are kind of hard to come by. There is a literature that tries to infer them through structural models (based on observed outcomes)

- So the evidence is indirect
- For example, we can see that the probability of entry in entrepreneurship is first flat with wealth, subsequently it increases in wealth... (Which shows borrowing constraints?)
- Among the self-employed business owners, 29% declare that they use their own assets as collateral... (of course this again is not sufficient... it says nothing on desired borrowing of firm- owners).

Entrepreneurship and Wealth—The Model

Based on this, let's construct a structural model:

- Assume that the horizon is infinite, but individuals get old with probability $(1 - \pi_y)$ and die with $(1 - \pi_o)$. This is a simplistic life cycle model
- Assume further that each individual has the potential to be an entrepreneur or a worker
 - ▶ θ is the talent of the entrepreneur,
 - ▶ y is the idiosyncratic income of the worker.
- Entrepreneurs have their own technology θk^ν
 - ▶ Once an entrepreneur, the agent works zero hours in the corporate sector... and full hours in her own firm.

Entrepreneurship and Wealth—The Model

What is the friction? There is imperfect enforceability of contracts!

- An entrepreneur can seize a fraction f of k (firm capital) and the lenders can seize the rest.
- Lenders know this!
- no default in equilibrium, because individuals will borrow as much as needed subject to having the incentive to repay.

Retired worker

The value function of the retired worker is

$$W_r(a) = \max_{c, a' \geq 0} u(c) + \beta \pi_o W_r(a') + \eta \beta (1 - \pi_o) EV(a', y', \theta')$$
$$s.t. \quad a' = (1 + r)a + \underbrace{p}_{\text{Pension benefits}} - c$$

Old entrepreneur

The value function of an old entrepreneur is

$$W(a, \theta) = \max \{W_e(a, \theta), W_r(a)\}$$

where

$$\begin{aligned} W_e(a, \theta) = & \max_{c, k \geq 0, a' \geq 0} u(c) + \beta \pi_o EW(a', \theta') + \eta \beta (1 - \pi_o) EV(a', y', \theta') \\ & s.t. \quad a' = (1 - \delta)k + \theta k^v - (1 + r)(k - a) - c \\ & u(c) + \beta \pi_o EW(a', \theta') + \eta \beta (1 - \pi_o) EV(a', y', \theta') \geq W_r(f \cdot k) \end{aligned}$$

η denotes the weight on the utility of descendants

Young worker

The value function of who chooses to be a worker during the current period is:

$$V_w(a, y, \theta) = \max_{c, a' \geq 0} u(c) + \beta \pi_y EV(a', y', \theta') + \beta (1 - \pi_y) E \underbrace{W_r}_{\text{Retired worker}}(a')$$
$$s.t. \quad a' = (1 + r)a + (1 - \tau)wy - c$$

Note that, entrepreneurs can stay entrepreneurs during retirement. Workers cannot become entrepreneurs during retirement...

Young agents

The value function of households with assets a , working ability y and entrepreneurial ability θ is

$$V(a, y, \theta) = \max \{ V_e(a, y, \theta), V_w(a, y, \theta) \}.$$

The value function of being an entrepreneur is

$$V_e(a, y, \theta) = \max_{c, k \geq 0, a' \geq 0} u(c) + \beta \pi_y EV(a', y', \theta') + \beta (1 - \pi_y) E \underbrace{W(a', \theta')}_{\text{retired entrepreneur}}$$

$$a' = (1 - \delta)k + \theta k^\nu - (1 + r)(k - a) - c$$

$$\underbrace{u(c) + \beta \pi_y EV(a', y', \theta') + \beta (1 - \pi_y) EW(a', \theta')}_{\text{no default constraint}} \geq V_w(k \cdot f, y, \theta)$$

The expected value of the value function is taken with respect to (y', θ') , conditional on (y, θ) ; $F(y', \theta' | y, \theta)$ is a first-order Markov process.

General equilibrium

All agents (indexed by i) solve the problems as before.

There are two sectors of the economy: corporate and entrepreneurial.

- Household wealth is put into use as capital in one of the sectors

$$K_c + K_e = \sum_i a_i$$

- Total labor supply of wage earners equals labor input of the corporate sector:

$$L = \sum_{\text{wage earners}} y_i$$

- Aggregate entrepreneurial capital equals the sum of capital used by all entrepreneurs:

$$K_e = \sum_{\text{entrepreneurs}} k_i$$

General equilibrium

All agents (indexed by i) solve the problems as before.

There are two sectors of the economy: corporate and entrepreneurial.

- The corporate sector produces with a Cobb-Douglas technology

$$Y_c = K_c^\alpha L^{1-\alpha}$$

- Total output in the entrepreneurial sector

$$Y_e = \sum_{\text{entrepreneurs}} \theta_i k_i^\nu$$

- GDP equals output in the two sectors, minus depreciated capital. $K/GDP = 3$ (target from US data).

$$\frac{K_c + K_e}{Y_c + Y_e - \delta(K_c + K_e)} = 3$$

General equilibrium

The corporate sector maximizes profits, so

- $$r = \alpha K_c^{\alpha-1} L^{1-\alpha} - \delta$$

and

- $$w = (1 - \alpha) K_c^\alpha L^{-\alpha}$$

holds.

In addition, the government budget is balanced:

- $$\sum_{retired} p = \tau_I w \sum_{wage\text{ earners}} y_i$$

Entrepreneurship and Wealth—Calibration

They need to calibrate β, f, v the grid of θ (two values: 0 or positive) and the transition matrix for θ .

They pick these parameters to match:

- Capital to output ratio (it is a general equilibrium model in the paper)
- The share of entrepreneurs
- The fraction of entrepreneurs exiting entrepreneurship
- The fraction of workers becoming entrepreneurs during each period
- The ratio of median net worth of entrepreneurs to that of workers
- The wealth Gini coefficient

Calibration in our code

We take the y and θ processes as given. We solve for r and τ to

- balance the government budget
- r should clear the capital market

(I also solved for a β implying to a capital-to-output ratio around 3, but deleted that code for simplicity)

Note that r and w are not independent quantities in a Cobb-Douglas setup, so matching r already implies matching w !

Entrepreneurship and Wealth—Results Fit

TABLE 6
COMPARING DATA AND MODELS WITH AND WITHOUT ENTREPRENEURS

	CAPITAL- OUTPUT RATIO	WEALTH GINI	ENTREPRENEURS	PERCENTAGE WEALTH IN TOP			
				1%	5%	20%	40%
U.S. data	3.0	.8	7.55%	30	54	81	94
Baseline model without entre- preneurs	3.0	.6	.0%	4	20	58	95
Baseline model with entrepreneurs	3.0	.8	7.50%	31	60	83	94

Entrepreneurship and Wealth—Results

Wealth Distribution without Entrepreneurship

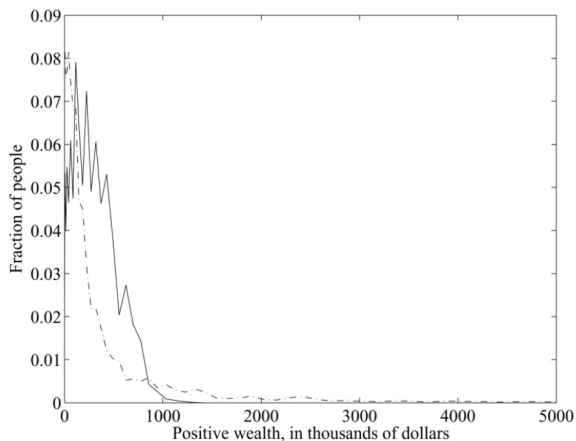


FIG. 1.—Distribution of wealth, conditional on wealth being positive, for the whole population. Dash-dot line: data; solid line: model without entrepreneurs.

Entrepreneurship and Wealth—Results

Wealth Distribution with Entrepreneurship

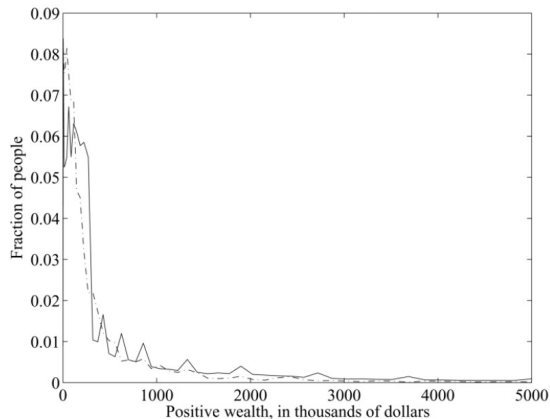


FIG. 2.—Distribution of wealth, conditional on wealth being positive, for the whole population. Dash-dot line: data; solid line: baseline model with entrepreneurs.

Entrepreneurship and Wealth—Results

Distribution of Entrepreneurs' Wealth

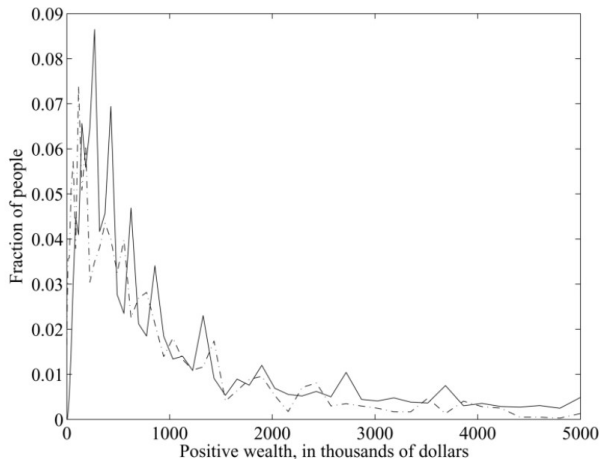


FIG. 4.—Distribution of the entrepreneurs' wealth, conditional on wealth being positive.
Dash-dot line: data; solid line: baseline model

Entrepreneurship and Wealth—Results

Entrepreneurship and Wealth-Saving Rates

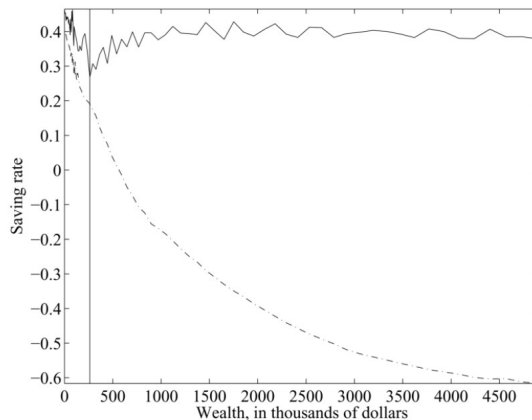


FIG. 5.—Saving rate for highest-ability workers. Solid line: those with high entrepreneurial ability; dash-dot line: those with no entrepreneurial ability; vertical line: asset level at which high-entrepreneurial ability individuals enter entrepreneurship.

Entrepreneurship and Wealth—Results

Size (Capital) Distribution

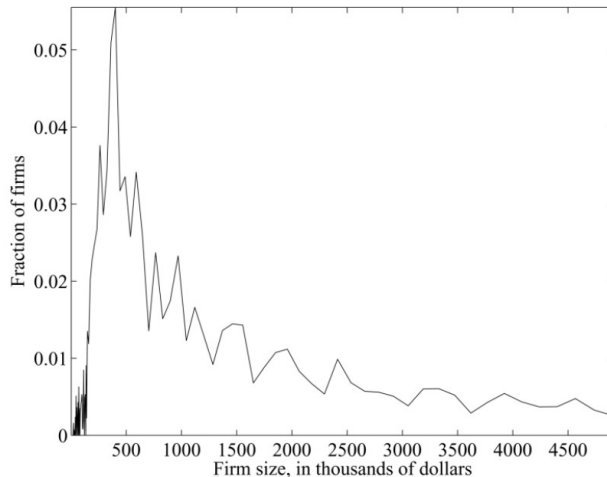


FIG. 6.—Firm size distribution, baseline model with entrepreneurs

Entrepreneurship and Wealth—Results

Decomposition

TABLE 7
THE ROLE OF BORROWING CONSTRAINTS AND VOLUNTARY BEQUESTS

	CAPITAL- OUTPUT RATIO	INTEREST RATE	WEALTH GINI	ENTREPRENEURS	PERCENTAGE WEALTH IN THE TOP			
					1%	5%	20%	40%
U.S. data	3.08	7.55%	30	54	81	94
Baseline with entrepreneurs	3.0	6.5%	.8	7.50%	31	60	83	94
More stringent borrowing constraints: $f = .85$	2.7	7.5%	.7	6.90%	24	49	75	91
No altruism: $\eta = 0$, only involuntary bequests	2.5	9.3%	.7	7.55%	21	45	73	90
$\eta = 0$, recalibrated $\beta = .88$	3.0	6.4%	.8	7.9%	28	57	81	94