Taxing Top Incomes in the World of Entrepreneurs

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Motivation

- Tax debate: increase top income tax rate

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- Concern: raising the top income tax rate would have serious adverse consequences for the economy
- Classic income taxation literature focuses on labor supply margin: optimal tax rate is 70 – 80% due to low labor supply elasticity
- More recent literature recognizes the importance of entrepreneurs (Bruggemann 2021)
  - Occupational choice model, and entrepreneurs make capital and labor input decisions
  - optimal top tax rate is around 60%.

Motivation

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- Productivity investment $\rightarrow$ affect productivity in the entrepreneurial sector
- Incorporation decision $\rightarrow$ productivity effect will spill over to the corporate sector

Motivation

Idea

- Increasing the top marginal income tax rate may generate large output costs by hitting the productivity.
- Lower productivity erodes the tax base
  $\rightarrow$ constrain revenue-maximizing top tax rates

What I do

This paper assesses the dynamic distortions of top income taxation on productivity growth in the entrepreneurial sector and in the aggregate economy as a whole.

In This Paper

Develop a general equilibrium model with

- Standard extensive margin: occupational choice
- Intensive margin: endogenous productivity growth
- Extensive margin: incorporation decision

Revisit the question of taxes on high incomes

Result Overview

Two new forces affecting the optimal top tax rate

- Lifelong entrepreneurs effect: higher top income tax rates reduce the incentives of middle-ability entrepreneurs to grow their business.

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- Serial entrepreneurs effect: high-ability entrepreneurs that will certainly have to pay the top rate, attempt to avoid the high top tax rate by incorporating their business prematurely.

Result Overview

Two new forces affecting the optimal top tax rate

- Lifelong entrepreneurs effect: higher top income tax rates reduce the incentives of middle-ability entrepreneurs to grow their business.

- Serial entrepreneurs effect: high-ability entrepreneurs that will certainly have to pay the top rate, attempt to avoid the high top tax rate by incorporating their business prematurely.

  $\rightarrow$ The revenue-maximizing tax rate is 45% compared to 60% when those effects are ignored.

Literature Review

Income tax literature

- Labor supply: Kindermann and Krueger 2022
- Human capital: Badel, Huggett, and Luo 2020
- Entrepreneurs: Bruggemann 2021
- Innovation: Jones 2022

Connect three saparate literature

- Household occupational choice: Quadrini 2000, Cagetti and De Nardi 2006
- Firm dynamics: Hopenhayn 1992
- Choice of business legal form: Dyrda and Pugsley 2019

Plan

- The model
- Calibration
- Policy experiment

The Model

Preview

- Two production sectors: entrepreneurial and corporate

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- HHs make occupational choice

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- Ents. start firms in the entrepreneurial sector

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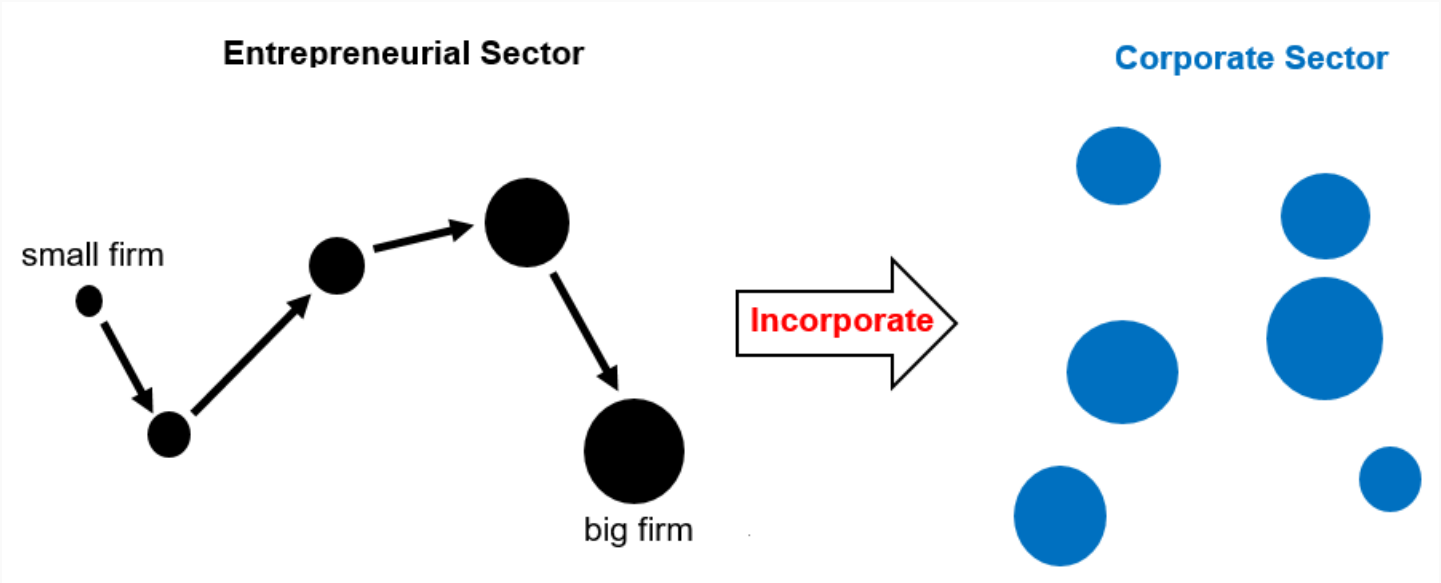
- Two production sectors: entrepreneurial and corporate
- HHs make occupational choice
- Ents. start firms in the entrepreneurial sector

  $\rightarrow$ collateral constraint
- Ents. accumulate organization capital
- Ents. can choose to incorporate their firms
  - Pay cost, sell firm to the corporate sector, get firm value
  - Pay capital gains tax
  - Leave the firm

Preview

Entrepreneurs choose to

- grow productivity by accumulating organization capital
- incorporate the firm



Literature LFO

Environment

- $t = 1, 2, 3, ...$
- A continuum of HHs of measure one.
- A life-cycle model with
  - stochastic aging
  - accidental bequest
  - no intergenerational productivity transmission
- Old retirees get the same retirement transfer.
- No aggregate uncertainty.

Preference

- Flow utility:

$$u(c, l) = \frac{c_t^{1-\sigma_1}}{1-\sigma_1} - \chi \frac{l_t^{1+1/\sigma_2}}{1+1/\sigma_2}$$

- Discount factor: β

Endowments

1. When HHs first enter the economy, they draw their entrepreneurial ability $z \in \{z_1, z_2, ..., z_{n_z}\}$. Then z is fixed.

2. In each period, HHs draw business quality $q \in \{q_1, q_2, ..., q_{n_q}\}$
   - Workers: q from initial distribution
   - Entrepreneurs: $Pr(q|q_{-1})$

3. In each period, HHs draw working productivity $s \in \{s_1, s_2, ..., s_{n_s}\}$
   - Workers: $Pr(s|s_{-1})$
   - Entrepreneurs: s from initial distribution

Discussion Production Technology

Technologies

- Retirees: retirement benefit
- Workers: wage income

Technologies

- Entrepreneurs:
  - Produce:

$$f(h, k, n) = q h^{1-\gamma}(k^{\alpha} n^{1-\alpha})^{\gamma}$$

Technologies

- Entrepreneurs:
  - Produce:

$$f(h, k, n) = q h^{1-\gamma}(k^{\alpha} n^{1-\alpha})^{\gamma}$$

  - Accumulate h: organization capital
    "a firm-specific capital good **jointly produced with output** and **embodied in the organization itself**". Discussion

$$h' = h + e^{z}[f(h, k, n)]^{\psi}$$

Technologies

- Incorporated firms

$$f^c(k, n) = q\bar{h}^{1-\gamma}(k^\alpha n^{1-\alpha})^\gamma$$

  h is fixed at its incorporation level.

  - Organization capital can only be accumulated by entrepreneurs.

  - Entrepreneurs sell 100% shares and leave the firm.

Financial Market

A risk-neutral mutual fund

- Accept deposits from HHs
- Use the funds to buy shares of firms in the corporate sector and physical capital that lends to all firms

HHs are not allowed to borrow.
Firms

- Rent physical capital from the mutual fund to produce
- Entrepreneurs have collateral constraint: $k \leq \eta a$

Government

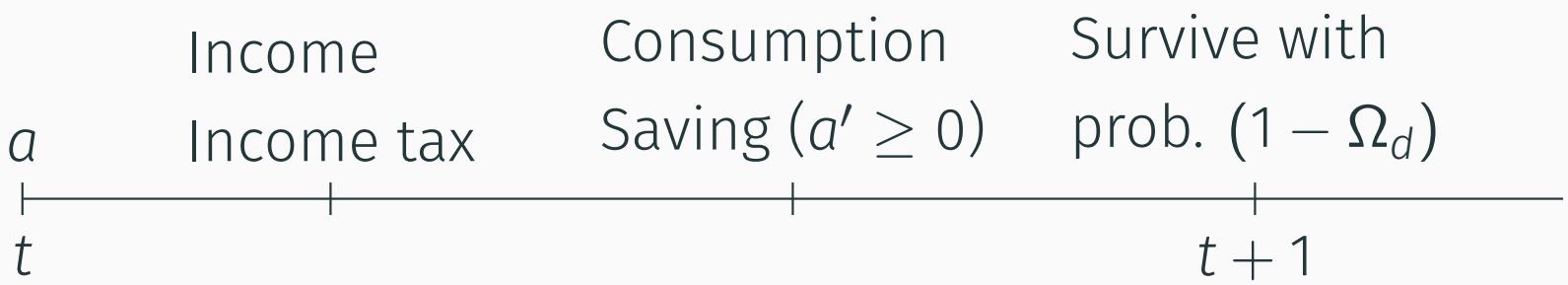
- Progressive income tax: follow Benabou (2002)

$$T_y(y) = \begin{cases} y - \tau_y y^{1-\lambda} & y \leq y_H \\ y_H - \tau_y y_H^{1-\lambda} + \tau_H (y - y_H) & y > y_H \end{cases}$$

- Capital gains tax when incorporating.
- Corporate income tax.
- Wasteful government spending.
- Retirement benefit to old HHs.

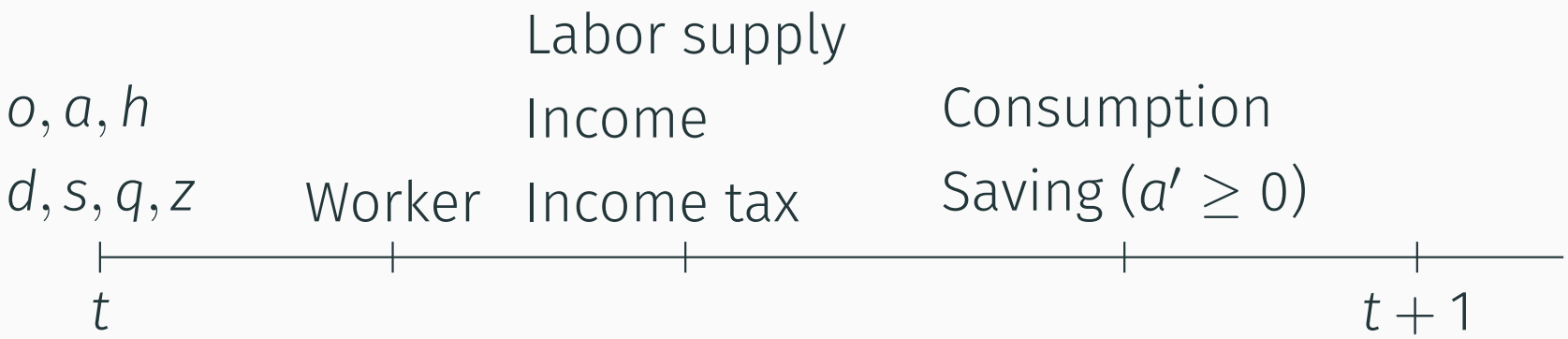
Income Tax | Calibration

Old HHs


Income
Income tax
Consumption
Saving ($a' \geq 0$)
Survive with
prob. $(1 - \Omega_d)$
a
t
$t+1$

DP

Young Worker



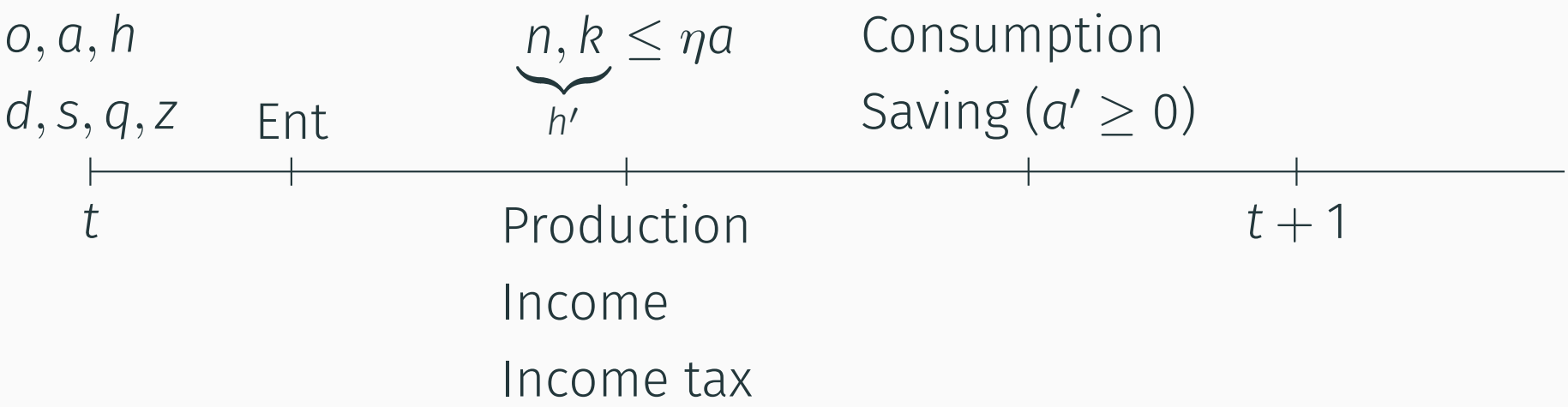
Period $t+1$

- With prob. Ω_o, become old
- With prob. $1-\Omega_o$, remain young

$$\max\left\{V^w(a', z, s'), V^e(a', h_0, z, q')\right\}$$

DP

Young Entrepreneur DP



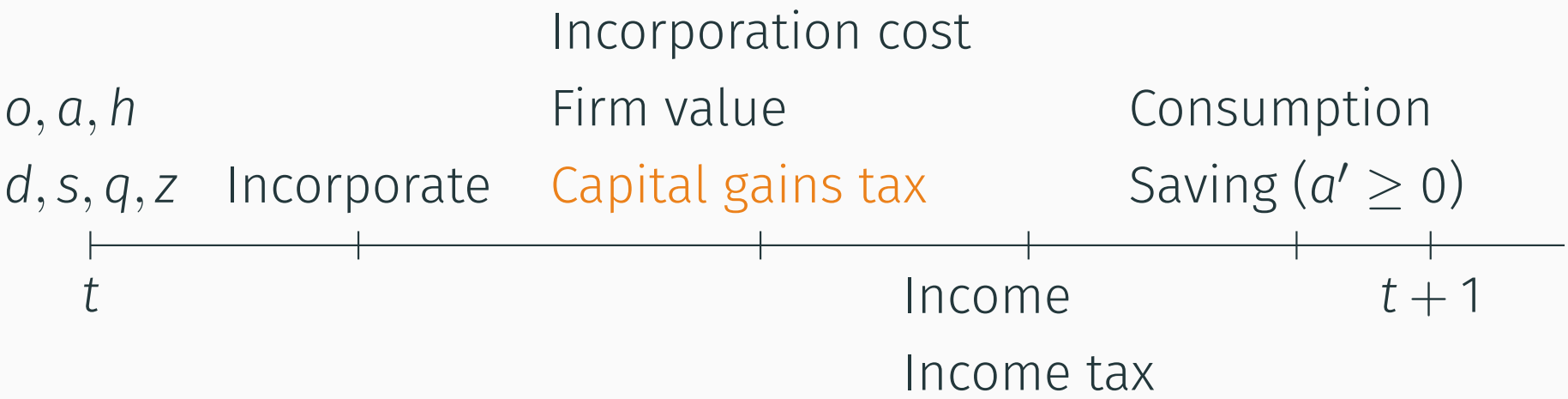
Period $t+1$

- With prob. Ω_o, become old
- With prob. $1-\Omega_o$, remain young

$$\max\{V^w(a', z, s'), V^e(a', h', z, q'), V^i(a', h', z, q')\}$$

Young Incorporation Entrepreneur

Incorporation Cost | Firm Value | DP



Period $t+1$

- With prob. Ω_o, become old
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$$\max\left\{V^w(a', z, s'), V^e(a', h_0, z, q')\right\}$$

Incorporated Firm

- Given h and q, decide capital and labor to maximize period profit.
- Pay factor price.
- Pay corporate income tax.
- In period $t+1$, die with a constant probability.

DP Equilibrium

Calibration

Calibration

Parameters obtained externally

- Estimates independent of the model, or commonly used values in the literature. Values

Parameters estimated internally – SMM

- Key parameters: parameters related to productivity

  Identification Values Moments

- Target income dist., wealth dist., and firm dynamics

  LFO

Targeted Moments

Table 1: Wealth Distribution (%)

	Quintile				Top Groups		
	$1^{st} + 2^{nd}$	3^{rd}	4^{th}	5^{th}	Top 10%	Top 5%	Top 1%
Data	0.9	4.5	11.2	83.4	71.4	60.3	33.6
Model	0.8	4.5	12.0	82.8	71.5	60.8	30.6

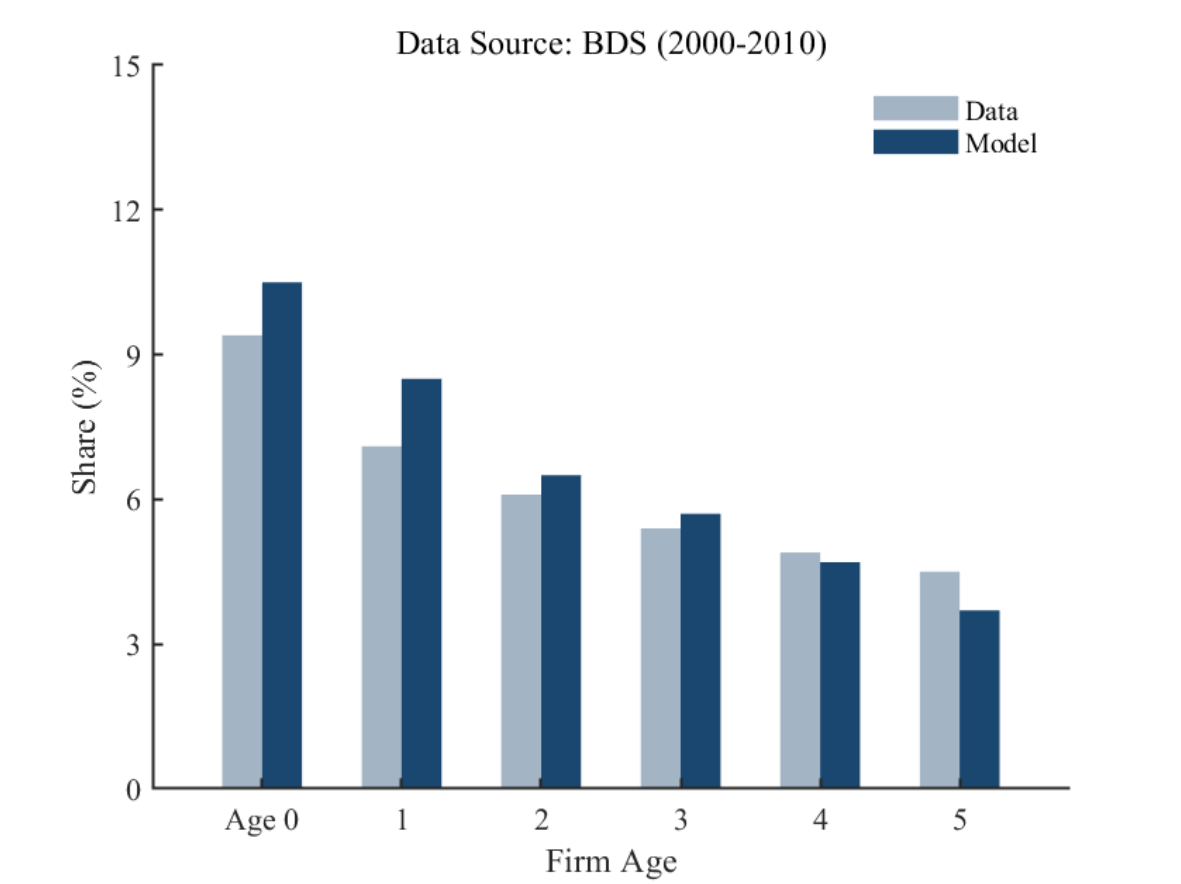
Table 2: Income Distribution (%)

	Quintile				Top Groups		
	$1^{st} + 2^{nd}$	3^{rd}	4^{th}	5^{th}	Top 10%	Top 5%	Top 1%
Data	9.5	11.3	18.3	60.9	46.9	36.8	21.0
Model	12.9	9.6	16.7	60.8	46.0	36.1	21.4

Data Source: SCF (2007)

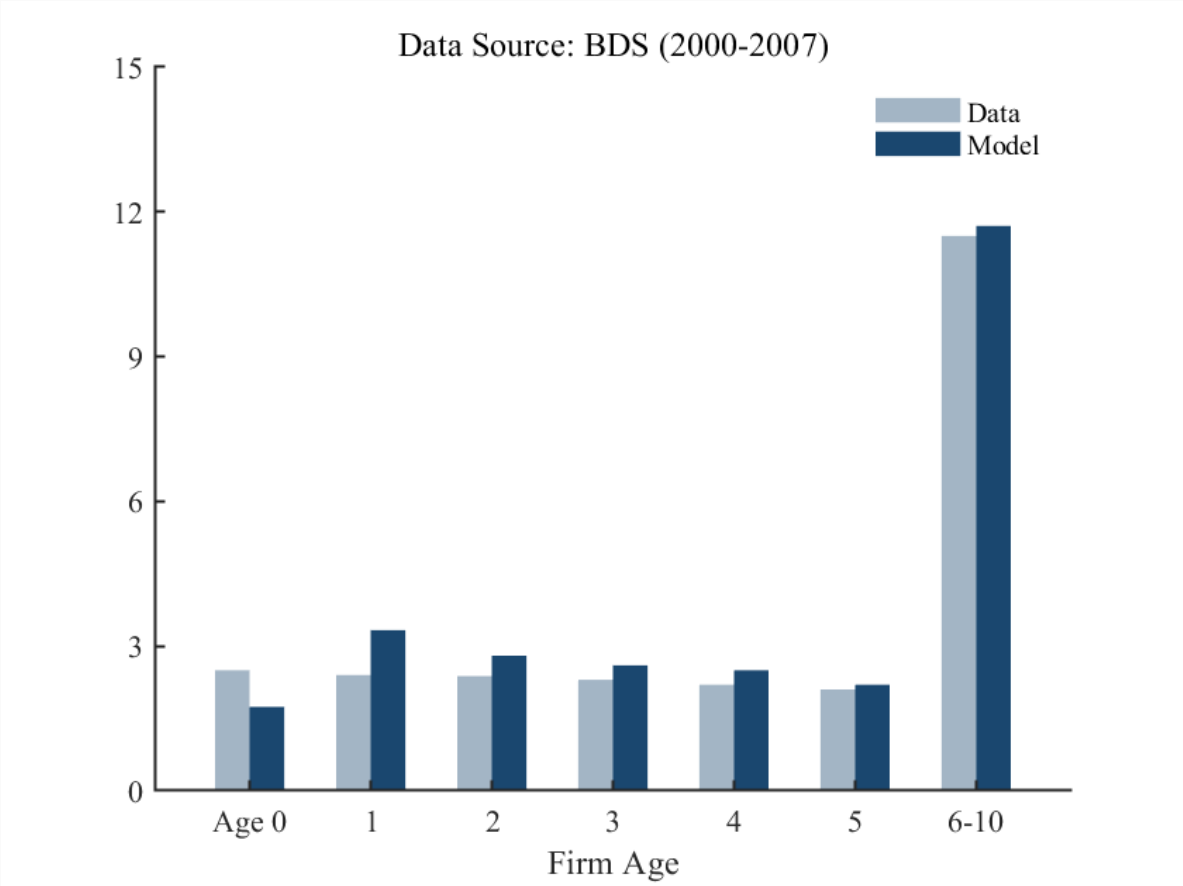
Targeted Moments

Figure 1: Firm Age Distribution



Targeted Moments

Figure 2: Firm Employment Share by Age



Untargeted Moments

Policy Experiment

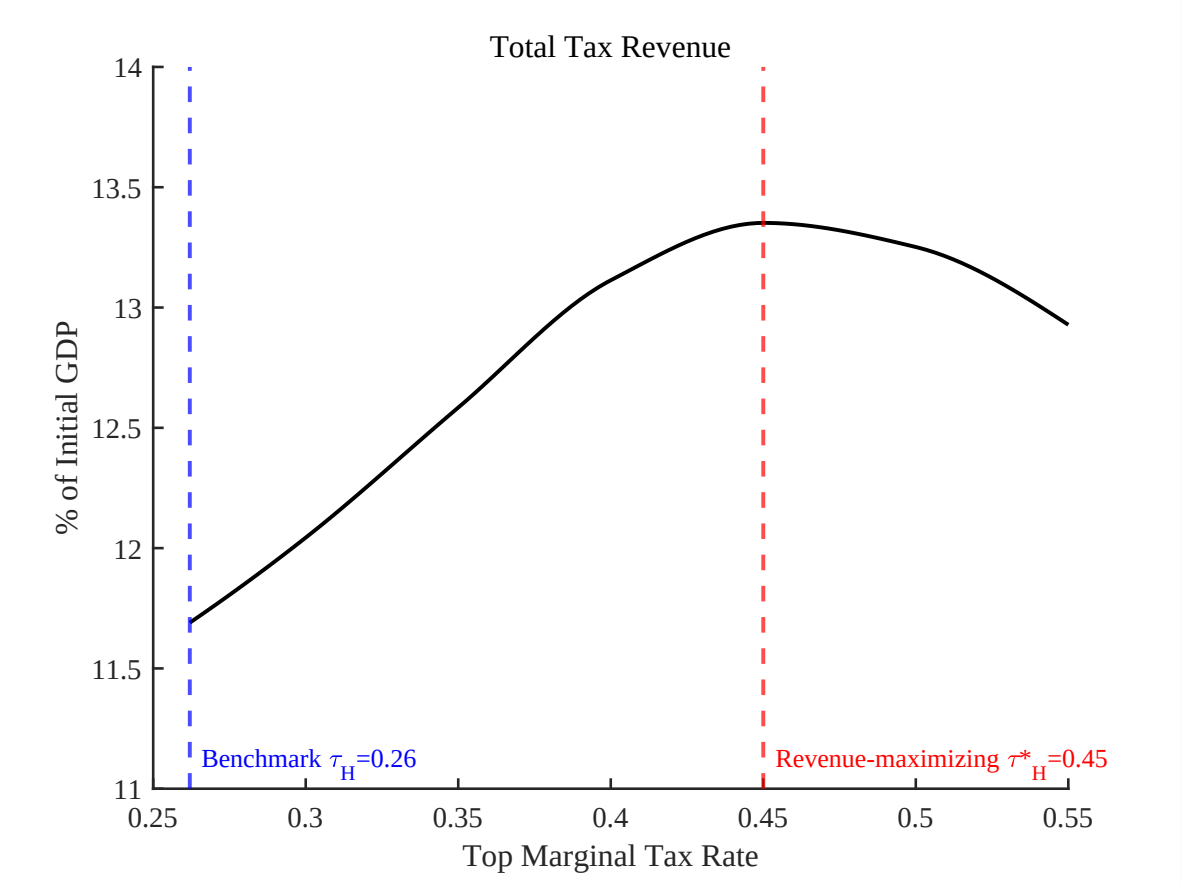
Policy Experiment

Income tax schedule

$$T_y(y) = \begin{cases} y - \tau_y y^{1-\lambda} & y \leq y_H \\ y_H - \tau_y y_H^{1-\lambda} + \tau_H (y - y_H) & y > y_H \end{cases}$$

- Gov. budget: $G + B + T = T_y + T_k + T_c$
- Keep G at the benchmark level, change τ_H (0.26), use a lump-sum transfer T to every HH to rebalance the gov. budget
- Conduct the experiment in GE and compare steady states.

Tax revenue is maximized at $\tau_H = 0.45$



Welfare

Changes in Aggregates

In the new s.s. ($\tau_H = 0.45$), % changes in aggregates compared with benchmark ($\tau_H = 0.26$)

	Overall	Ent. Sector	Corporate Sector
r	+21.8		
w	-2.3		
Y	-5.3	-5.8	-4.8
K	-13.0	-15.2	-11.9
N	-1.8	-1.8	-1.7
H	-6.9	-6.8	-7.0

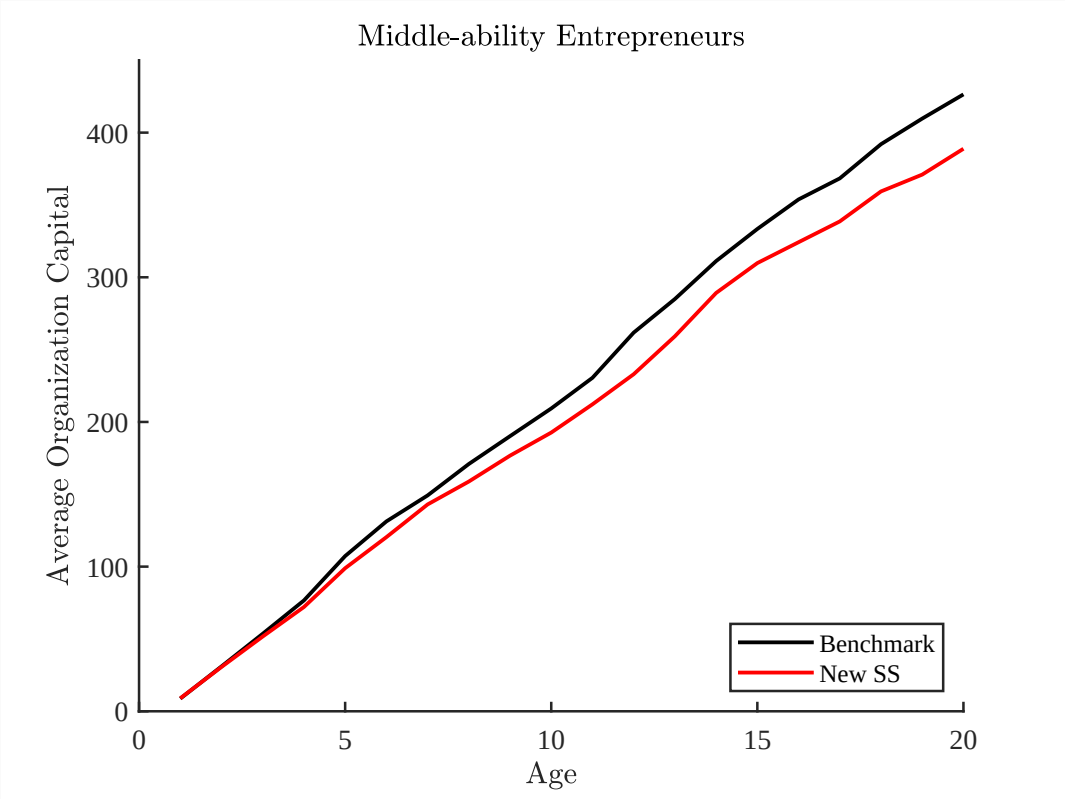
Comparison with literature

Heterogeneous Responses by Different Entrepreneurs

Lifelong entrepreneurs effect

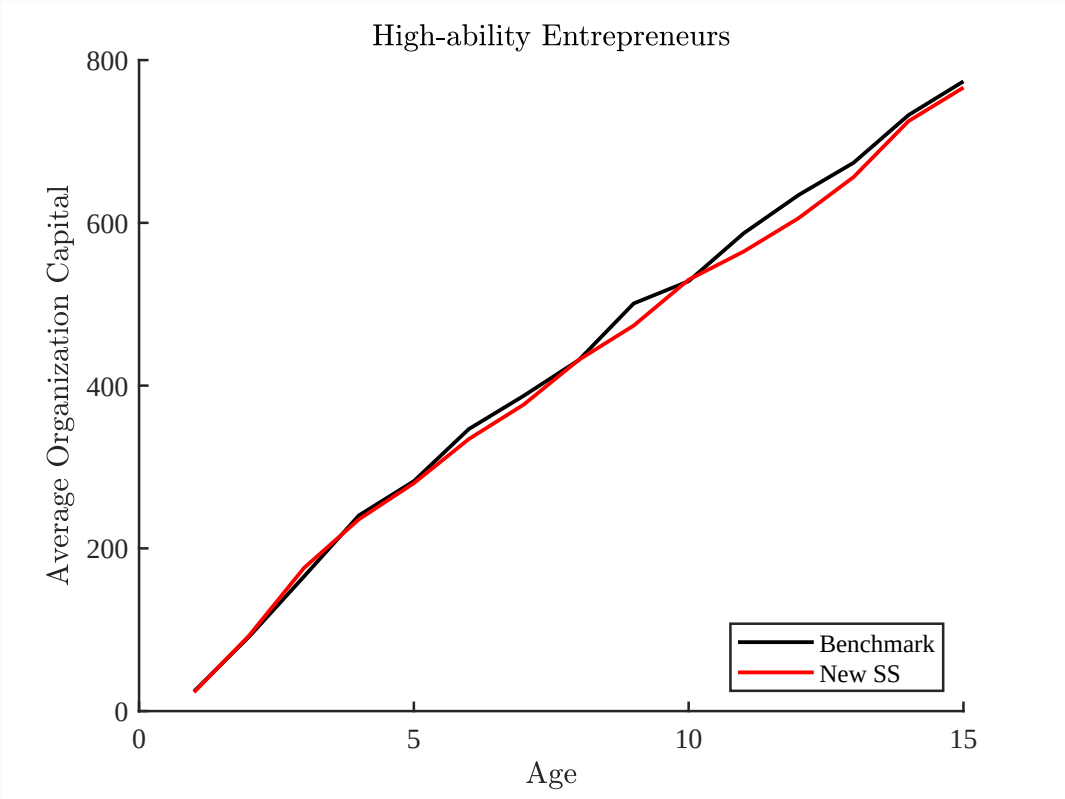
Middle-ability entrepreneurs **slow down** h accumulation.

Middle-ability: $98 \sim 99.5^{th}$ percentile of ability distribution, account for 10% of entrepreneurs. *h* simulation



Heterogeneous Responses by Different Entrepreneurs

High-ability entrepreneurs do not slow down *h* accumulation.
High-ability: top 0.5% of ability distribution, account for 6% of entrepreneurs

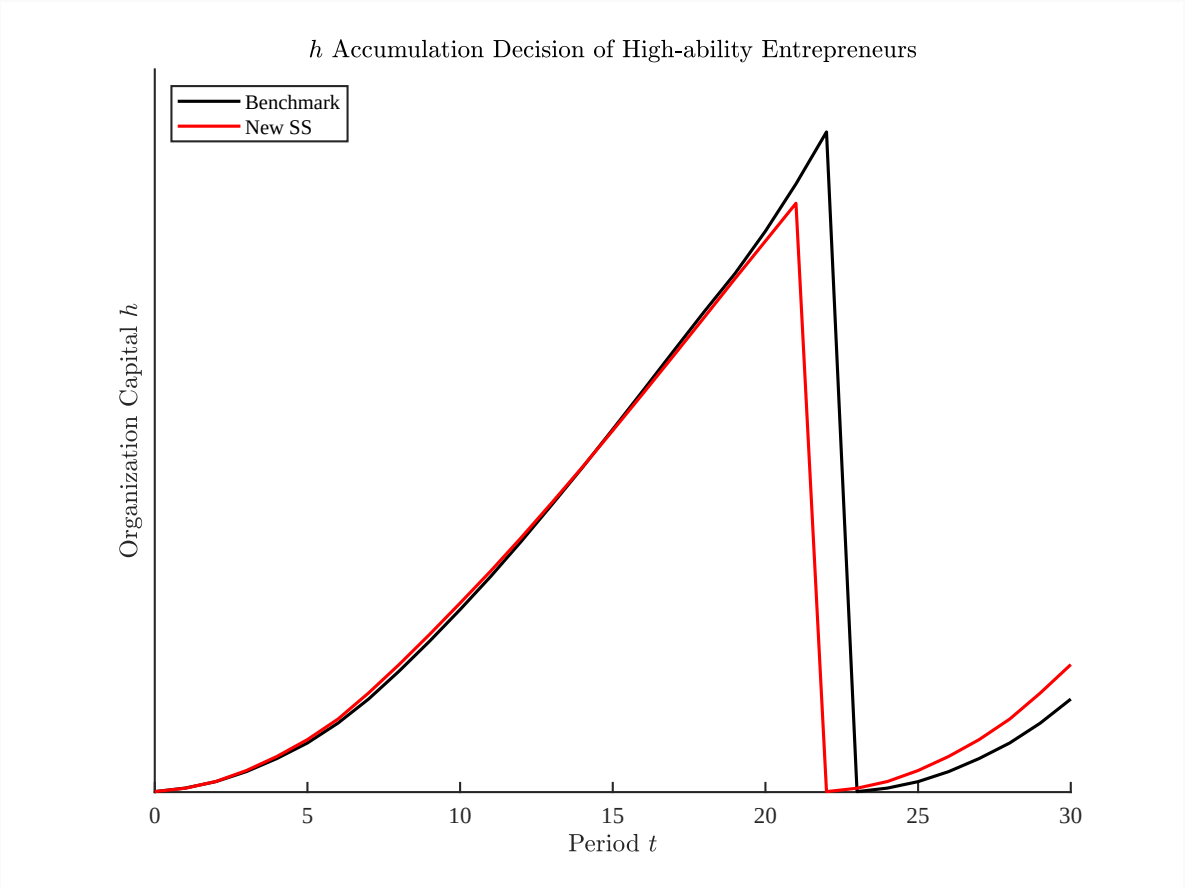


Heterogeneous Responses by Different Entrepreneurs

Serial entrepreneurs effect

High-ability entrepreneurs incorporate **premature** business.

Given $a_0 = 1$ and $h_0 = 1$, fix q in each period, simulate the h accumulation of a high-ability entrepreneur for 30 years.



Entrepreneurial Sector

- Middle-ability entrepreneurs invest less in their productivity.
- High-ability entrepreneurs incorporate earlier

Productivity in the entrepreneurial sector drops.

Corporate Sector

	Time to incorporate	Number of firms
Middle-ability ents.	35 $\rightarrow$ 39 yrs	-9.4%
High-ability ents.	12 $\rightarrow$ 10 yrs	+4.0%

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	Time to incorporate	Number of firms
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$\Downarrow$

67% of incorporate firms are founded by high-ability ents.

Number of firms in the corporate sector drops by 2%.

Corporate Sector

	Time to incorporate	Number of firms
Middle-ability ents.	35 $\rightarrow$ 39 yrs	-9.4%
High-ability ents.	12 $\rightarrow$ 10 yrs	+4.0%

$\Downarrow$

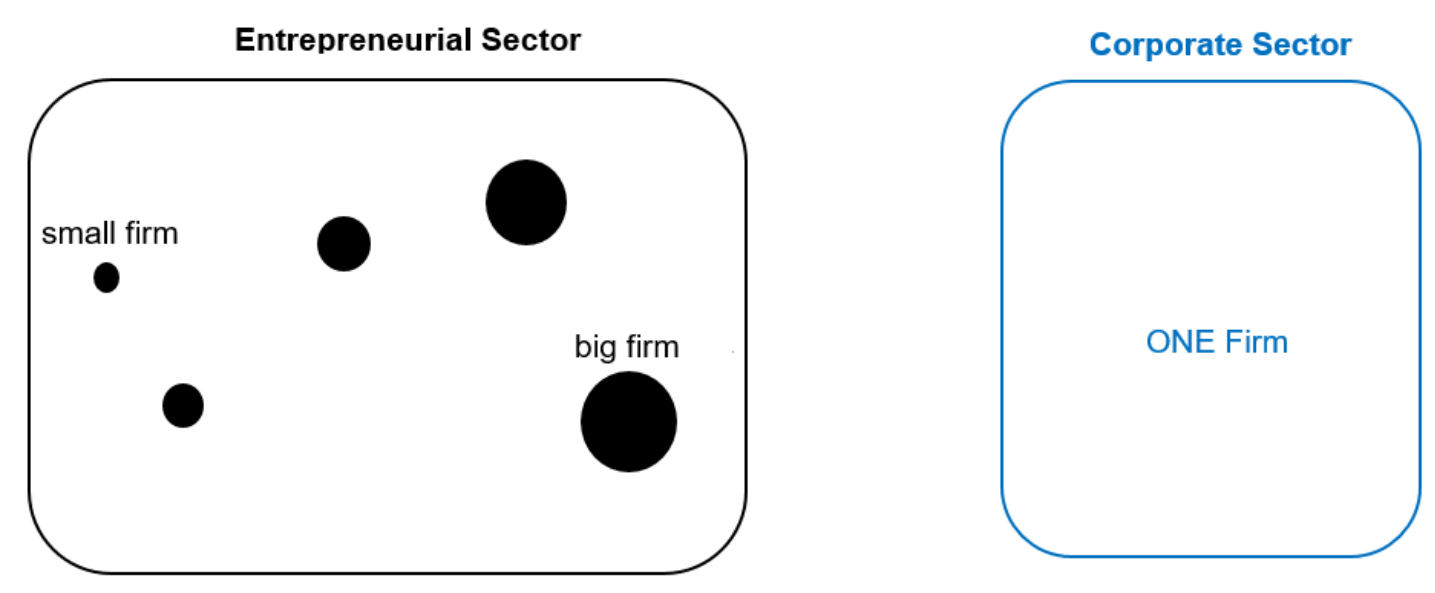
Productivity in the corporate sector drops by 7.0%

Conclusion

- In a rich and flexible framework of entrepreneurship, the revenue-maximizing top income tax rate is 45%.
- At this rate,
  - Middle-ability entrepreneurs avoid the high tax rate by slowing down their productivity accumulation.
    $\rightarrow$ Lifelong entrepreneurs effect
  - High-ability entrepreneurs use incorporation as tax shelter.
    $\rightarrow$ incorporate Serial entrepreneurs effect

Appendix

Quadrini-Cagetti-De Nardi framework



- Exogenous firm productivity process
- Entrepreneurial sector and corporate sector are separated

Organizational Forms

Big Picture | Calibration

	# of Owners	Liability Protection	Taxation of Profits
Sole Properietorship	1	No	Pass-through
General Partnership	> 1	No	Pass-through
Limited Partnership	≥ 1	No for general partners Yes for limited partners	Pass-through
LLC	≥ 1	Yes	Pass-through
S Corporation	$1 - 100$	Yes	Pass-through
C Corporation	≥ 1	Yes	Entity Level

Table Source: Dyrda and Pugsley (2019)

- The entrepreneurial sector firms in this paper are closer to sole proprietorships.
- In the U.S., sole proprietorships are the most common type of pass-through business and represent 43 percent of pass-throughs (Prisinzano, 2016).
- Even though S corporations are also allowed to have shareholders, about 97 percent of S corporations have three or fewer shareholders (Weltman, 2009).

SE vs PE Back

Why SE but not portfolio entrepreneurs (PE)?

1. SE account for a larger share
   - Lafontaine and Shaw (2016): 25% SE, 8% PE (US, Texas)
   - Carbonara et al. (2020): 25% SE, 4% PE (Vietnam)
   - Westhead and Wright (1998): 25% SE, 12% PE (UK)
2. SE have higher skill
   - Carbonara et al. (2020): SE have high skill and run high quality firms, whereas PE could be low skill entrepreneurs who have multiple businesses to diversify riskiness.

Why z and q? Back

- $z \rightarrow$ endogenous part of productivity
- $q \rightarrow$ exogenous part of productivity

z and q together generate firm dynamics:

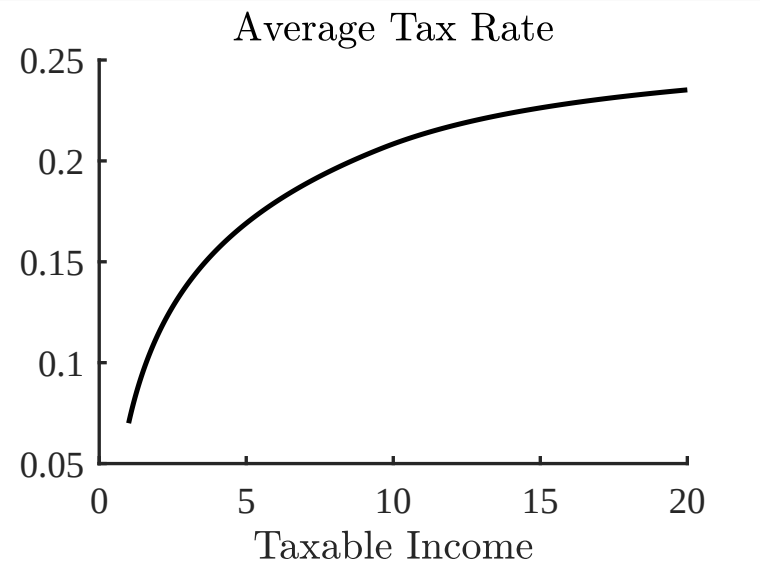
Young firms are more likely to exit. Firm productivity (its accumulation depends on z) and q are substitutes. Older firms have accumulated productivity for a while, hence their productivity is high enough to compensate for a low q shock and survive.

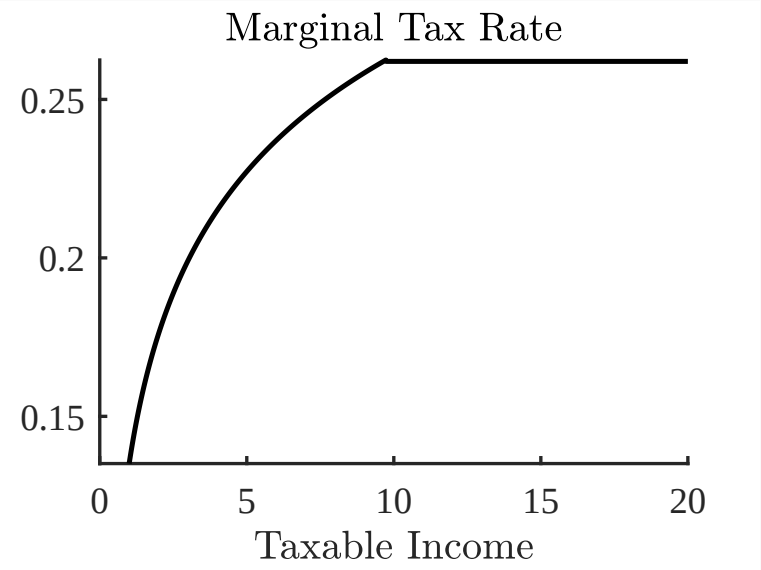
Organization Capital Back

- Arrow (1962), Rosen (1972), Ericson and Pakes (1985), Tomer (1987), Lev and Radhakrishnan (2003), Atkeson and Kehoe (2005)
- Organization capital can be knowledge about the best organizational procedure, the marketing and development of the product or the technology itself.
- The literature views organization capital as "a firm-specific capital good jointly produced with output and embodied in the organization itself."

Income Tax Schedule

Back





Old HH

Back

$$W^r(a) = \max_{c,a'} \; u(c,0) + \beta(1-\Omega_d)W^r(a')$$

$$s.t.$$

$$c + a' = y + a - T_y(y)$$

$$y = \overline{\tau} + ra$$

$$a' \geq 0$$

$$V^w(a,z,s) = \max_{c,a'} \; u(c,l) + \beta(1-\Omega_o)\mathbb{E}\Big[V(a',h_0,z,s',q')|s\Big] + \beta\Omega_o W^r(a')$$

$s.t.$

$c + a' = y + a - T_y(y)$

$y = wsl + ra$

$a' \geq 0$

$V(a,h,z,s,q) = \max\Big\{V^w(a,z,s), V^e(a,h,z,q)\Big\}$

$$V^e(a,h,z,q) = \max_{k,n,c,a'} \; u(c,\bar{l})$$

$$+ \beta(1-\Omega_o)\mathbb{E}\max\{V^w(a',z,s'), V^e(a',h',z,q'), V^i(a',h',z,q')|q\}$$

$$+ \beta\Omega_o W^r(a')$$

$$s.t.$$

$$y = qh^{1-\gamma}(k^\alpha n^{1-\alpha})^\gamma - wn - \delta k - r(k-a)$$

$$h' = h + e^z[qh^{1-\gamma}(k^\alpha n^{1-\alpha})^\gamma]^\psi$$

$$c + a' = y + a - T_y(y) + C_e \cdot \mathbf{1}_{\{h=h_0\}}$$

$$k \leq \eta a, \qquad a' \geq 0$$

Young Incorporation Entrepreneur

Back

$$V^i(a,h,z,q) = \max_{c,a'} \; u(c,\bar{l}) + \beta(1-\Omega_o)\mathbb{E}\Big[V(a',h_0,z,s',q')\Big] + \beta\Omega_o W^r(a')$$

$s.t.$

$$c + a' = y + a + (1-\tau_k)\Pi(h,q) - C_{inc} - T_y(y)$$

$$y = ra$$

$$a' \geq 0$$

$$\Pi(h,q) = \max_{k,n}(1-\tau_c)[qh^{1-\gamma}(k^{\alpha}n^{1-\alpha})^{\gamma} - wn - (\delta + r)k] + \frac{1-D}{1+r}\mathbb{E}\{\Pi(h,q')|q\}$$

- τ_c is the linear corporate income tax.
- D is the exogenous death shock.
- h is fixed at the level when it was incorporated.
- $\Pi(h,q)$ is also the firm value that is paid to entrepreneurs when they incorporate. It is the present value of the future profit stream.

Entrepreneurial firms have collateral constraint Back

- Standard setup in the literature (Dyrda and Pugsley, 2019)
- Empirical findings from the finance literature suggest that most private firms finance investment by issuing debt and/or reinvesting internal funds. Very few private firms issue equity, and those that do, equity is generally financed by the firm's owner, since it is hard to raise external equity financing due to informational frictions.

Incorporate cost Back

There is a fixed incorporation cost, C_{inc}

- Prevent entrepreneurs from incorporating immediately after starting their businesses.
- Prevent entrepreneurs from incorporating when they get a bad q.
- Incorporating a firm has different costs: direct, such as legal fees, etc.; and indirect, such as underpricing, disclosure of public information, etc.

Equilibrium

Back

Denote by $\Xi = \mathbb{A} \times \mathbb{Z} \times \mathbb{S} \times \mathbb{Q} \times \mathbb{H} \times \mathbb{O}$ the complete state space, and $\xi \in \Xi$ the state vector representing each household. Denote by $\Xi^C = \mathbb{Q}^C \times \mathbb{H}^C$ the state space, and $\xi^c \in \Xi^C$ the state vector representing each firm in corporate sector.

Equilibrium Back

A stationary equilibrium of the model is defined by

1. The interest rate r, wage w
2. Value functions
3. Policy functions: $c(\xi)$, $l(\xi)$, $a'(\xi)$, occupation choices
4. Capital input $k(\xi)$, labor input $n(\xi)$, organization capital $h'(\xi)$ for entrepreneurs
5. Capital input $k(\xi^C)$, labor input $n(\xi^C)$ for C corporations
6. Invariant distribution of households Λ
7. Invariant distribution of firms in corporate sector Λ^C

such that the following conditions hold:

Equilibrium Back

1. Given prices, the HHs' decision rules and value functions solve their respective DP problems.

2. Given prices, C corporations decide capital and labor input.

3. Government budget is balanced period by period.

4. Goods market and factor markets clear

5. Firm value is determined by

$$\Pi(h,q) = \max_{k,n}(1-\tau_c)[qh^{1-\gamma}(k^{\alpha}n^{1-\alpha})^{\gamma} - wn - (\delta+r)k] + \frac{1-D}{1+r}\mathbb{E}\{\Pi(h,q')|q\}$$

6. Time-invariant distribution: $(\Lambda, \Lambda^C) = \Gamma(\Lambda, \Lambda^C)$

Parameters Calibrated Externally

Back

Parameter		Source	Value
Demographics and preferences			
Probability of retiring	Ω_o	Average working period	0.02
Probability of dying	Ω_d	Average retirement period	0.07
Risk aversion	σ_1	Attanasio et al. (1999)	1.5
Frisch elasticity of labor supply	σ_2	Keane (2011)	0.6
Labor supply by entrepreneurs	$\bar{l}$	Average hours worked - CPS	0.4
Endowment and productivity			
Persistence of labor productivity	ρ_s	Cagetti and De Nardi (2006)	0.95
Std. of labor productivity.	σ_s	Cagetti and De Nardi (2006)	0.40
Initial endowment of h	h_0	Normalization	1

Parameters Calibrated Externally

Back

Parameter		Source	Value
Technology			
Organization capital share	$1-\gamma$	Atkeson and Kehoe (2005)	0.15
Elasticity of capital input	α	Labor income share of 0.64	0.25
Capital depreciation rate	δ	Stokey and Rebelo (1995)	0.06
Borrowing constraint	η	Kitao (2008)	1.5
Death rate of C corporations	D	Dyrda and Pugsley (2019)	0.09
Government Policies			
Retirement benefit	$\overline{\tau}$	Kotlikoff et al. (1999)	$0.4\overline{y}$
Top bracket threshold	y_H	Kindermann and Krueger (2022)	$4\overline{y}$
Top marginal tax rate	τ_H	Piketty and Saez (2007)	0.26
Capital gains tax rate	τ_k	U.S. Department of the Treasury	0.15
Corporate income tax rate	τ_c	Hungerford (2013)	0.28

Key Parameters Identification

Back

Parameters related to productivity

- Stochastic process q: AR(1) process

$$log(q_t) = \rho_q log(q_{t-1}) + \sqrt{1-\rho_q^2}\sigma_q \varepsilon_t, \qquad \varepsilon \sim N(0,1)$$

- Organization capital accumulation: $h' = h + e^z[f(h,k,n)]^\psi$
  z is from a Pareto distribution

$$f_Z(z) = \frac{\zeta {z_{min}}^\zeta}{z^{1+\zeta}}, \qquad z_{min} \leq z$$

Key Parameters Identification

Back

Parameters of interest: ρ_q, σ_q, z_{min}, ζ, ψ.

- σ_q governs firm exit.
- ρ_q affects how fast firms drop to lower qs.

$\rightarrow$ Use firm age distribution as target.

- z_{min} governs how fast HHs accumulate h, which is the potential profitability of starting a business.

$\rightarrow$ Use the share of entrepreneurs as target.

- ζ governs the right tail of distribution of z.

$\rightarrow$ Use productivity of the corporate sector as target.

- ψ is related with firm productivity growth rate.

$\rightarrow$ Use information on firm growth rate.

Parameters Calibrated Internally

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Parameter		Value
Preferences		
Discount factor	β	0.96
Utility weight of labor	χ	1.58
Endowments		
Scale parameter	z_{min}	0.16
Shape parameter	ζ	2.74
Top labor state	s_6	21.02
Prob. of reaching s_6	p_6	0.002
Prob. of leaving s_6	p_3	0.15
Persistence of q	ρ_q	0.78
Std. of q	σ_q	0.23

Parameters Calibrated Internally

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Parameter		Value
Technology		
Curvature parameter	ψ	0.73
Sunk cost	C_e	0.86
Incorporation cost	C_{inc}	65.76
Government Policies		
Level parameter	τ_y	0.93
Progressivity parameter	λ	0.07

Targets: Data and Model

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Target	Source	Data	Model
Risk-free interest rate	McGrattan and Prescott (2001)	0.04	0.04
Average working time	Dyrda and Pugsley (2019)	0.40	0.45
Income tax revenue/GDP	Dyrda and Pugsley (2019)	0.1	0.09
Share of entrepreneurs	SCF (2007)	0.08	0.08
Age first entry to entrepreneurship	Hincapie (2020)	32-36	34.08
Share of C Corps	Keightley and Hughes (2018)	0.1-0.15	0.09
Employment share by C corps	Keightley and Hughes (2018)	0.55	0.54
Workers' income Gini	SCF (2007)	0.52	0.52
Entrepreneurs' income Gini	SCF (2007)	0.64	0.66
Frac of ents. in the top 1% income	SCF (2007)	0.45	0.41
% of top 1% income held by ents	SCF (2007)	50.2	53.4

Model Performance: Untargeted Moments

Table 3: Share of Tax Payments by Each Income Group (%)

	Income Distribution Quintiles				
	1^{st}	2^{nd}	3^{rd}	4^{th}	5^{th}
Data	0.3	2.3	6.9	15.9	74.6
Model	1.1	3.6	5.9	14.2	75.4

Data source: Guner et al. (2016), IRS data

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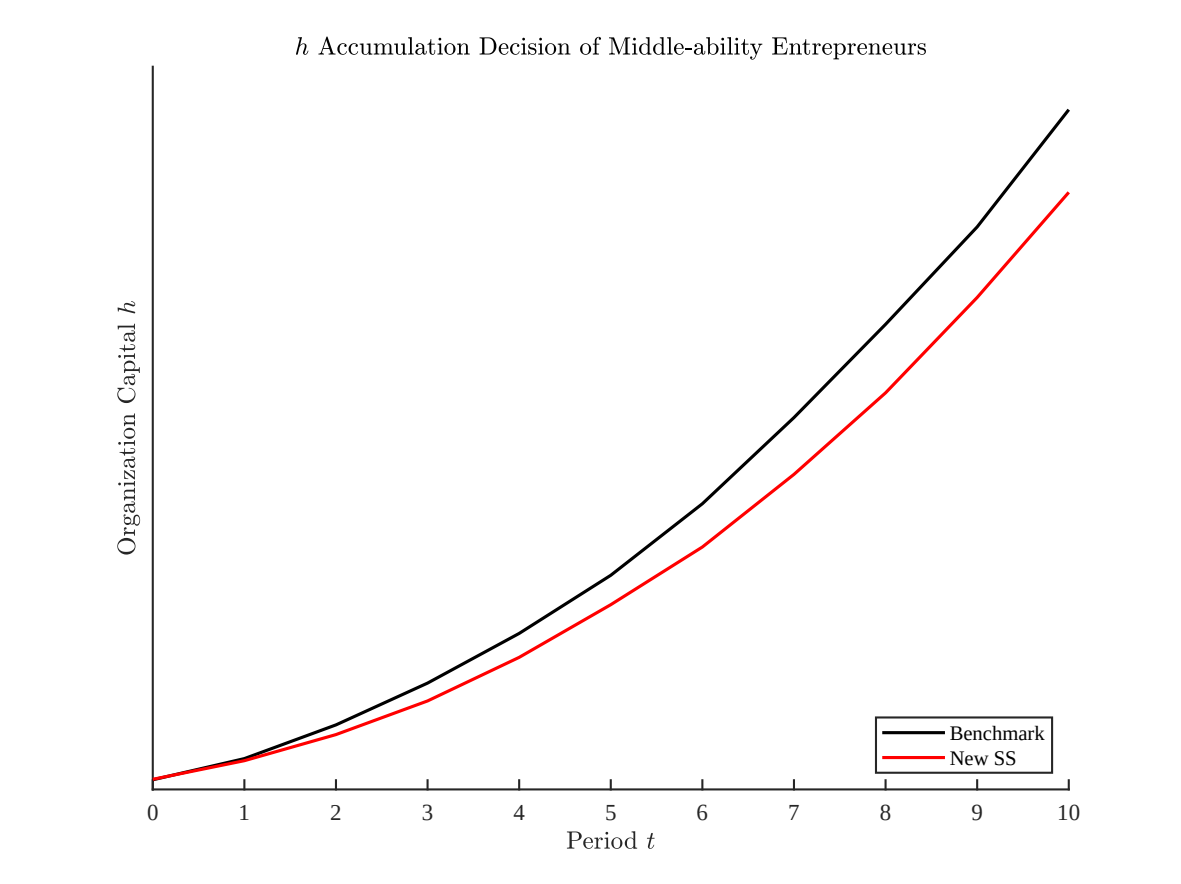
Lifelong Entrepreneurs Effect

Given $a_0 = 1$ and $h_0 = 1$, fix q in each period, simulate the h accumulation decision of a middle-ability ent for 10 yrs.



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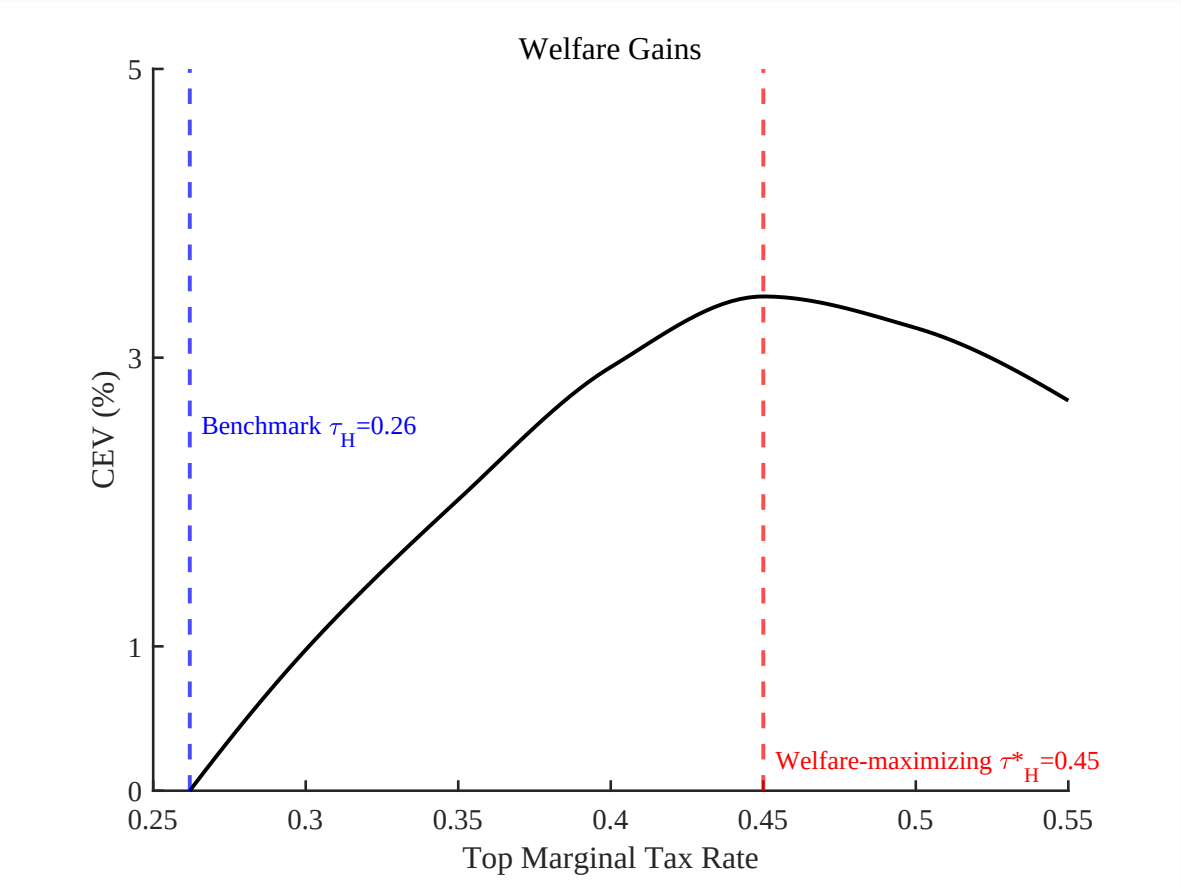
Welfare is maximized at $\tau_H = 0.45$



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Standard Literature

In a standard entrepreneurship model, optimal tax rate is 60%.
Changes in aggregates compared with benchmark

	Overall	Ent. Sector	Corporate Sector
r	+56.6		
w	-7.4		
Y	-10.7	-0.9	-19.5
K	-27.1	-13.8	-31.1
N	-5.1	+7.1	-13.0

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