Understanding the Secular Decline in New Business Creation

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EF&G FALL 2020
CUFE

October 17, 2020

Motivation

- Slowdown in U.S. business dynamism since 1980s
  - lower business startup rates (12-13% to 7-8%)
  - aging firm population (young firms (age$\leq$5): 50% to 35%)

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  - aggregate productivity, welfare, output
- **Questions**
  1. What is the main driving force behind the secular decline in firm entry in the U.S. economy?
  2. What are the macroeconomic implications of this trend?

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  2. increase in entry cost to start a business
- Why focus on these two forces?
  - hard to be observed (measured) in the data
  - opposite macroeconomic implications

What We Do

- Model
  - Heterogeneous-agent economy with occupation choice
  - costly switch from the worker to entrepreneur sector
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- Calibration
  - match key micro and macro moments using SMM
- Quantitative experiments
  - assess the relative importance of the two potential channels and investigate their macroeconomic impacts
  - simulate the transition dynamics triggered by a financial shock

Related Literature

- Empirical evidence on business dynamism
  Haltiwanger et al. (2013), Haltiwanger (2012), Decker et al. (2014), Decker et al. (2016a), Decker et al. (2016b)

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- Theoretical framework
  Quadrini (2000), Cagetti and De Nardi (2006), Buera and Shin (2013), Clementi et al. (2014), Moll (2014)
- Causes of decline in business dynamism
  Akcigit and Ates (2019), Salgado (2018), Engbom (2019), Karahan et al. (2019), Hopenhayn et al. (2019), Davis and Haltiwanger (2019)

Outline

- An Aiyagari economy with occupation choice
- Calibration methodology
- Infer and analyze the main driving force
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Model: environment

- Demographics
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  - z_t: entrepreneurial productivity
  - d_{t-1}: last-period occupation

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- Preference

$$U(C) = \mathbb{E}_0 \left[\sum_{t=0}^{\infty} \beta^t \frac{c_t^{1-\sigma} - 1}{1-\sigma} \right]$$

Model: environment

- Shocks
  - Labor productivity

$$log\epsilon_t = \rho_\epsilon log\epsilon_{t-1} + e_{\epsilon,t},\ \ e_{\epsilon,t} \sim N(0, \sigma_\epsilon)$$

  - Entrepreneurial productivity

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- Financial market
  - perfectly competitive financial intermediary with zero profit
  - receive deposits from households (r_t) and rent out capital to entrepreneurs ($r_t + \delta$)

Model: environment

- Production and technology
  - entrepreneur

$$\pi_t(a_t, z_t) = \max_{0 \le k_t \le \lambda a_t, l_t \ge 0} \{z_t f(k_t, l_t) - w_t l_t - (r_t + \delta) k_t\}$$

$$z_t f(k_t, l_t) = z_t (k_t^{\alpha} l_t^{1-\alpha})^{\gamma}$$

  - corporate

$$\pi_{C,t} = \max_{K_{C,t}, L_{C,t} \ge 0} \{AF(K_{C,t}, L_{C,t}) - w_t L_{C,t} - (r_t + \delta) K_{C,t}\}$$

$$AF(K_{C,t}, L_{C,t}) = A K_{C,t}^{\theta} L_{C,t}^{1-\theta}$$

Model: environment

- Timeline
  - carry last-period choice a_t and d_{t-1} to the current period
  - receive productivity shocks ϵ_t and z_t
  - choose current-period occupation d_t
  - work for wage $w_t \epsilon_t$ or earn profit π_t
  - choose consumption c_t and savings a_{t+1}

Model: recursive problem

- Occupation choice

$$v(a, \epsilon, z, d_-) = \max_{d \in \{0,1\}} \Big\{ (1-d) v^W(a, \epsilon, z, d_-) + d v^E(a, \epsilon, z, d_-) \Big\}$$

  - v^W : value of being a worker
  - v^E : value of being an entrepreneur
  - $d_- = 0$ identifies a worker and $d_- = 1$ an entrepreneur

Model: recursive problem

- Worker problem

$$v^W(a,\epsilon,z,d_-) = \max_{c,a'\geq 0}\Big\{u(c)+\beta\sum_{\epsilon',z'}P(\epsilon',z'|\epsilon,z)v(a',\epsilon',z',d=0)\Big\}$$

$$c+a'=(1+r)a+w\epsilon$$

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- Entrepreneur problem

$$v^E(a,\epsilon,z,d_-) = \max_{c,a'\geq 0}\Big\{u(c)+\beta\sum_{\epsilon',z'}P(\epsilon',z'|\epsilon,z)v(a',\epsilon',z',d=1)\Big\}$$

$$c+a' + \mathbb{I}(d_- = 0)\kappa = (1+r)a + \pi(a,z)$$

Model: stationary competitive equilibrium

A stationary recursive competitive equilibrium is value functions v, v^E, and v^W; individual's policy functions c, a', and d; entrepreneur's factor demand k and l; corporate sector's factor demand K_C and L_C; prices r and w; and a distribution μ over wealth (a), working ability (ϵ), entrepreneurial ability (z), previous occupation (d_-) such that

1. given prices, the policy functions solve dynamic programming problems associated with value functions v, v^E, v^W;
2. given prices, corporate sector's factor demand solve corporate firm's optimization problem;
3. the asset market clears;
4. the labor market clears;
5. the distribution of individuals over states (a, ϵ, z, d_-) are invariant.

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Calibration: methodology

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2. Estimate a set of internally calibrated parameters using SMM
   - ▷ Define Ψ as a vector of parameters to be estimated
   - ▷ Ψ is chosen to minimize the minimum-distance-estimator function

$$f(\Psi) = (m_{data} - m_{model}(\Psi))' W (m_{data} - m_{model}(\Psi))$$

where W is a diagonal weighting matrix

Calibration: parameters

Parameter		Value	Source/Target
Curvature of utility function	σ	1.50	Standard
Capital share	α	0.35	Standard
Scale of production	γ	0.79	Buera et al. 2011
Corporate capital share	θ	0.35	Corp. labor income share
Persistence of ϵ shocks	ρ_ϵ	0.70	Bhandari and McGrattan 2019
SD of ϵ shocks	σ_ϵ	0.16	Bhandari and McGrattan 2019
Capital depreciation rate	δ	0.06	BEA fixed asset tables

TABLE: Parameter values set externally

Calibration: parameters

Parameter		Value	Moment	Data	Model
Discount factor	β	0.943	Annual risk-free rate	0.040	0.040
Corporate productivity	A	1.326	Entrep. empl. share	0.272	0.272
Collateral parameter	λ	5.431	Debt to output (entrep.)	1.355	1.357
Persistence of z shocks	ρ_z	0.915	Annual entry rate	0.125	0.125
SD of z shocks	σ_z	0.236	SD of empl. growth	0.634	0.633
Entry cost	κ	12.17	Rel. size of entrants	0.630	0.630

TABLE: Parameter values calibrated internally

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1. Jointly re-calibrate $\{\rho_z, \kappa\}$, and keep $\sigma_z/\sqrt{1-\rho_z^2}$ fixed.

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   - Entry rate
   - SD of employment growth rate
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3. Decompose by shutting down each channel

$$contribution_i = \frac{X^2_{2010s} - X^{2-i}_{2010s}}{X^2_{2010s} - X^0_{1980s}}$$

Driving force: identification

	Model		Data		
	$\uparrow \rho_z$	$\uparrow \kappa$	1980s	2010s	Δ
(1) Entry rate	$\downarrow$	$\downarrow$	0.125	0.077	$\downarrow$
(2) SD of empl. growth rate	$\downarrow$	$\uparrow$	0.634	0.535	$\downarrow$
(3) Entrants' rel. empl. size	$\downarrow$	$\uparrow$	0.630	0.630	$\rightarrow$

TABLE: Identify the relative importance of each force

- $\uparrow \rho_z$ can match (1) and (2), but fail to match (3)
- $\uparrow \rho_z + \uparrow \kappa$ can keep (3) unchanged

Driving force: results

	Model (1980s)	Model (2010s)	Data (2010s)
Parameter			
ρ_z	0.915	0.940	–
κ	12.17	17.79	–
Moment			
(1) Entry rate	0.125	0.079	0.077
(2) SD empl. growth rate	0.634	0.592	0.535
(3) Entrants relative size	0.630	0.610	0.630
(4) Entrants empl. share	0.021	0.012	0.013
(5) Entrep. empl. share	0.272	0.250	0.250

TABLE: Parameters and moments after re-calibration

Analysis: entry cost

Entry cost to	Model (1980s)	Model (2010s)	Change
Entrants avg. profit	1.00	1.15	15%
Avg. entrep. profit	0.79	0.96	22%
Avg. labor income	6.00	8.80	47%

TABLE: Change of entry cost in real terms

- In 1980s, entry cost equals to entrants' first-year profit.
- In 2010s, entry cost increases by 40% and equals to 115% of entrants' first-year profit.

Analysis: decomposition

	$\uparrow\kappa$		$\uparrow\rho_z$		Both
Entry rate	-2.85pp	(62.6%)	-1.72pp	(38.0%)	-4.60pp
Entrants empl. share	-0.57pp	(70.2%)	-0.28pp	(39.4%)	-0.94pp

TABLE: Relative contribution of each force

- The relative contribution of $\uparrow\kappa$ is more than 1.5 times that of $\uparrow\rho_z$ to the decline in the entry rate of entrepreneurs.

Analysis: macroeconomic implications

	$\uparrow\kappa$	$\uparrow\rho_z$	Both
Entrep. TFP	-5.04%	3.45%	-2.80%
Welfare	-1.76%	0.44%	-1.97%
Total output	-2.50%	2.84%	-0.57%

TABLE: Macroeconomic variables

- $\uparrow\rho_z$ and $\uparrow\kappa$ have opposite effects on macro variables.
- The overall effects are all negative.

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Financial crisis: numerical exercises

1. Simulate the aggregate dynamics of the model when tightening the collateral constraint λ_t.
   - lower debt-output ratio by 25 p.p. to mimic 2008 financial crisis
   - λ_t goes back to its pre-crisis level after three periods

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2. Households are surprised by the credit shock at $t = 1$, but have a perfect foresight over the future path of λ_t.
3. Compare results along the transition path for the two sets of parameters

Financial crisis: results

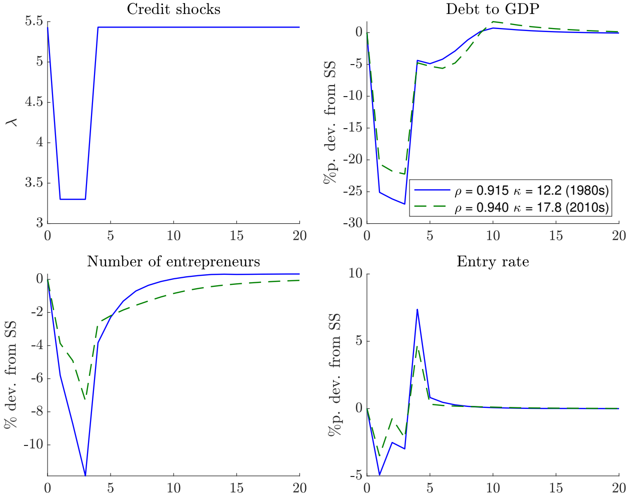

FIGURE: Transition path: entrepreneurs' dynamics

Conclusion

- We propose a framework to disentangle two potential driving forces for declining new business creation
  - higher entry cost v.s. higher persistence of shocks
- We show that higher entry cost plays a more dominant role
  - negative impact on productivity, welfare, and output
  - declining new business creation may be a cause for concern of policy makers
- We show that firm entry is more vulnerable after hit by a credit shock in the sense that the recovery speed becomes slower.

The End