A Model of Financial Rents

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Motivation

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- Are too many resources being drawn to Finance? (Tobin, 1984)
- Are financial rents excessive? (Bolton, Santos and Sheikman, 2011)
- Are these rents, instead, fair compensation for the provision of a fixed factor?
- Are financial rents driven by skill?

The case of VC (venture capital)

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- VC is a blend of capital and expertise
- We propose a simple span-of-control model of VC . . .
- . . . and take the implications of that view to the data

Summary

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1. The average size of VC firms rise
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If and only if skill is heterogeneous, then

4. The dispersion in the size of VC firms rises

Empirical strategy: does the dot.com boom provide evidence in favor of the last prediction?

Literature

- Phillipon and Reshef (2012), Greenwood and Scharfstein (2013), Philippon (2015), Arcand, Berkes, and Panizza (2015)
- Tobin (1984), Bolton, Santos and Scheikman (2012), Glode, Green, and Lowery (2012), Pagnotta and Philippon (2011)
- Gennaioli, Shleifer, and Vishny (2013), Amaral, Corbae and Quintin (2017)

Other related papers

The environment

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- Households die with probability $\frac{1}{1+\phi}$ at the end of each period
- Households can save at rate R but cannot borrow
- All agents are risk-neutral
- Households are more patient than experts

$$\beta_H > \frac{1}{R} = \beta_E$$

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- Their wealth evolves according to

$$a_{t+1} = a_t R + y_t$$

where y_t is their income at date t

Experts

- Experts can become trained experts (VC firms) in any given period
- The mass of trained experts evolves according to:

$$N_{t+1} = g_N(N_t) \in [0, \bar{N}]$$

- In the period in which they become experts, they draw their talent $z \sim \mu$

Ideas to output

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To generate output, and idea needs four ingredients:

1. A unit of capital invested at the start of the period
2. Entrepreneur needs to privately exert effort at disutility cost κ. When and only when effort is exerted, investment is successful with probability $\pi \in (0, 1)$.
3. Unskilled labor $l > 0$ must be hired
4. Management input/advice from an expert

Span of control

An expert of talent $z > 0$ who manages an interval $[0, n]$ of entrepreneurs who employ labor $l(i)$ for $i \in [0, n]$ and all exert effort generates total net operating income:

$$z^{1-\eta}\pi \left[\int_0^n l(i)^{\alpha} di - w \int_0^n l(i) di \right]^{\eta}$$

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After maximizing over l, NOI is

$$z^{1-\eta}\Theta n^\eta$$

where

$$\Theta = \pi(1-\alpha)\alpha^{\frac{1}{1-\alpha}} w^{-\frac{\alpha}{1-\alpha}}.$$

VC contracts

- A contract between an expert and an entrepreneur of wealth $a \geq 0$ features:
  1. A contribution $e \leq a$ by the entrepreneur to the investment
  2. Payoffs $w_H(e) \geq 0$ if the idea becomes productive and $w_L(e) \geq 0$ otherwise
- Incentive compatibility:

$$w_H(e) + (1 - \pi)w_L(e) \geq w_L(e) + \kappa$$

- Participation:

$$\pi w_H(e) + (1 - \pi)w_L(e) \geq q_t(e)$$

where $q_t(e)$ is entrepreneur surplus in equilbrium

Expert payoff

- Total payoff for expert:

$$\Pi(n; z, q_t) = z^{1-\eta}\Theta n^{\eta} - \int_0^n q_t(e(i))di - \int_0^n (1 - e(i))Rdi$$

- Or, in equilibrium,

$$\Pi(n; z, q_t) = z^{1-\eta}\Theta n^{\eta} - n(q_t + R)$$

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- Let

$$n^*(z; q_t) = \arg\max_n \Pi(n; z, q_t)$$

Equilibrium

An equilibrium in this environment boils down to a sequence $\{q_t\}_{t=0}^{+\infty}$ such that demand for ideas coincides with its supply when $q_t > 0$ i.e.

$$N_t \int_{z \geq \underline{z}(q_t)} n^*(z; q) d\mu = A_t$$

Testable predictions

In any given period, as the ratio $\frac{A}{N}$ of ideas to experts rises:

1. The price q of ideas falls while the active expert talent threshold $\underline{z}$ falls;
2. The average size of trained experts rises, as does the size of incumbent experts and the size of the smallest active expert;
3. If and only if μ is such that
$$\frac{E(z|z > \underline{z})}{\underline{z}}$$
is monotonically declining in $\underline{z}$, average expert rents rise;
4. The dispersion in the size of active experts rises in the sense that for any $z_H > \underline{z}$
$$\frac{E\left(n^*(z;q)|z \geq z_H\right)}{n^*(\underline{z};q)}$$
rises;

Example

$$A_{t+1} = g_A(A_t) = A_t + (\bar{A} - A_t)\frac{\bar{\delta}}{1 + \exp(-b_A A_t)}$$

$$N_{t+1} = N_t + (\bar{N} - N_t)\frac{\bar{\delta}}{1 + \exp(-b_N N_t)}$$

with $A_0 = N_0 = 0.05$, $\bar{A} = \bar{N} = 0.5$ and $b_N = 0 < 2 = b_A$.

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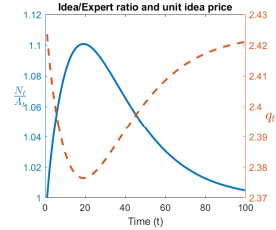
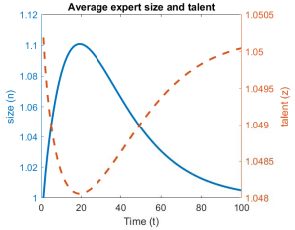
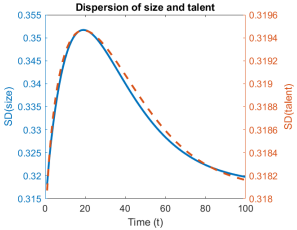
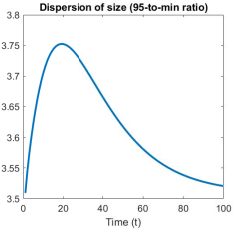
The skill distribution μ is log-normal with location 0 and dispersion 0.3

VC boom-bust

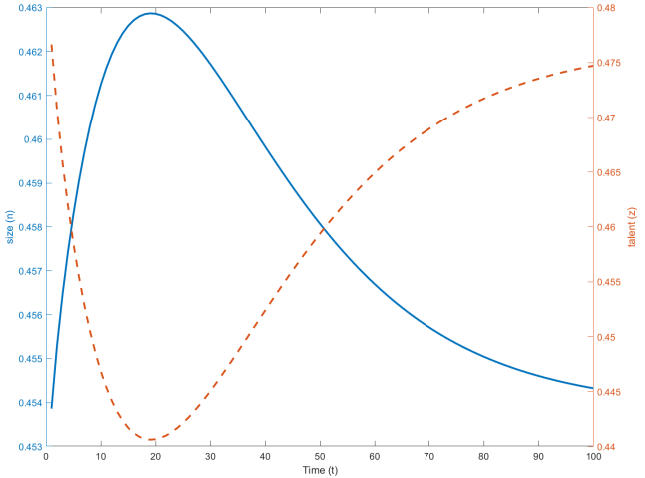

Idea/Expert ratio and unit idea price
Time (t)


Average expert size and talent
size (n)
talent (z)
Time (t)


Dispersion of size and talent
SD(size)
SD(talent)
Time (t)


Dispersion of size (95-to-min ratio)
Time (t)

Minimal talent and size



Alternative models

- Alternative 1: $\eta = 1$, z is almost surely constant
  1. q_t is constant over time
  2. Size distribution is indeterminate
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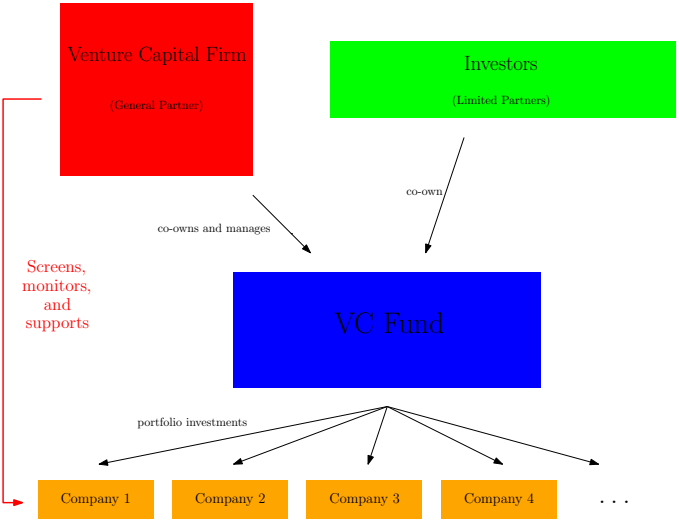
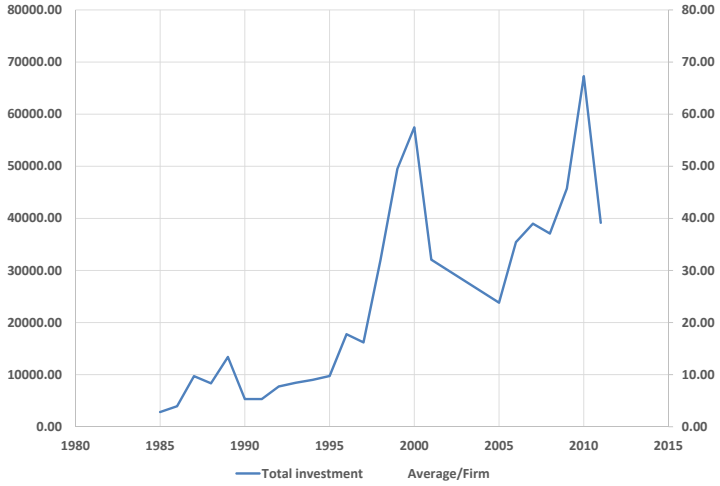
  3. No rents
- Alternative 2: $\eta < 1$, z is almost surely constant
  1. q_t falls with $\frac{A}{N}$
  2. Rents rise with $\frac{A}{N}$
  3. All firms have the same target size
  4. Any dispersion is “luck”


Venture Capital Firm
(General Partner)
Investors
(Limited Partners)
co-own
co-owns and manages
Screens, monitors, and supports
VC Fund
portfolio investments
Company 1
Company 2
Company 3
Company 4
. . .

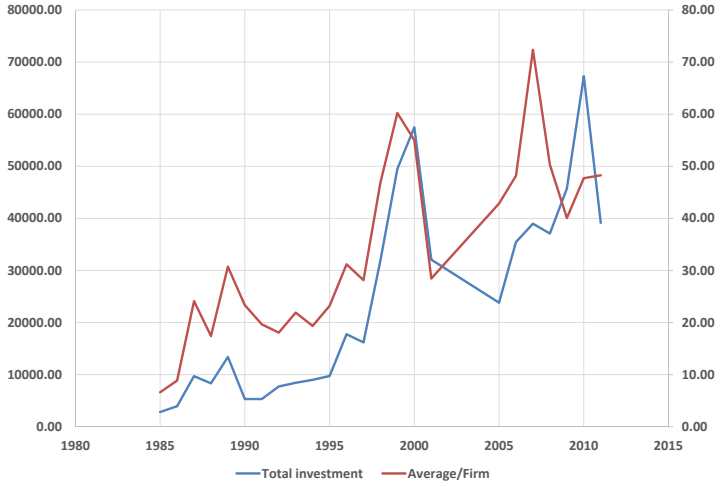
Data

- VentureXpert, a unit of Thompson Reuters
- Self-reported data on investment by funds into portfolio companies, starting in 1961 but with improvements after 1980
- We use all investment rounds between 1985 and 2010
- Kaplan, Sensoy and Stromberg (2002) find that VentureXpert:
  1. The database includes about 95% of all financing rounds and understate total investment
  2. Oversamples California
  3. Rounds are included in 98.4% of cases for California, 89.5% if not
  4. Bigger rounds are more likely to be included
  5. Round amounts are noisy but do not appear to be biased

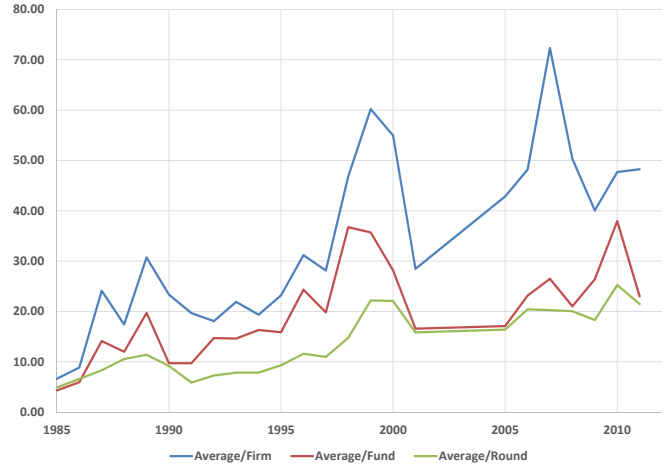
Total VC investment ($M, real)



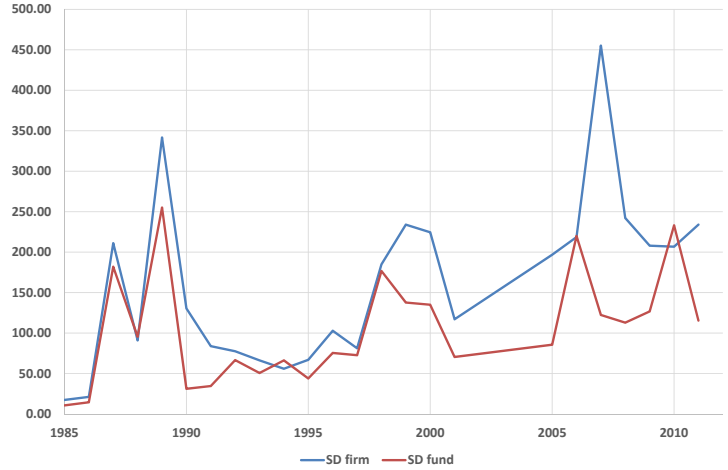
Average portfolio size of VC firms



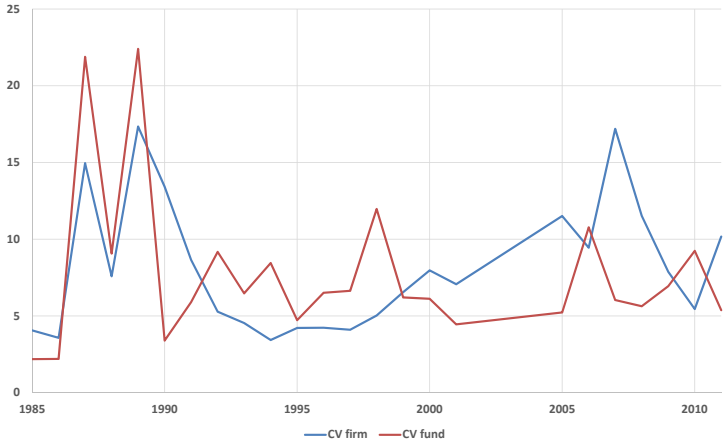
More averages



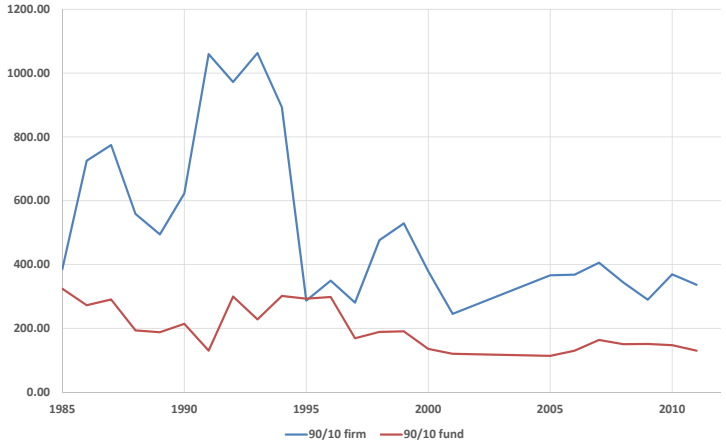
Dispersion (1)



Dispersion (2)



Dispersion (3)



Dispersion (4)

Summary

- A span of control model with heterogenous skills predicts that the size dispersion of VC firms should rise during booms and fall during busts
- This is eminently testable and provides an alternative way to study the skill-vs-luck question in finance
- Much to do