Self-Selection and Advice in Venture Capital Finance

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Motivation

- In many countries focus on entrepreneurship as generator of growth and employment
- Special attention to venture capital (VC) backed entrepreneurship
- Right quantity and quality of VC-backed start-ups?

VC-backed entrepreneurship

- VC: joint provision of financing and commercial expertise

- Problems in start-up finance (Gompers/Lerner)

  – limited own funds, limited commercial experience
  – high risk, potentially high returns
  – non-contractible/non-verifiable efforts, incentives important, special contracts

- Main functions of VC (Kaplan/Strömberg a.o.)

  – screening, contracting, advice/support

  – small part of financial intermediation, but disprop. large share in industrial innovation (Kortum/Lerner 00)

  – value added of VCs: comparison of VC-backed and other firms (Hellman/Puri)

  – controversy: selection vs. advice? why do VC-backed firms perform better?

  – M. Sørensen 05: approx. 50% advice, 50 % selection

This paper

- Simple theoretical model of entrepreneurial self-selection and VC value added (both selection and moral hazard issues)

- Own previous research: structural models of VC industry; GE

  – emphasizing VC advice, taxes/public policy; no selection issues

- Adverse selection literature on project finance:

  – deMeza/Webb, ..., Boadway/Keen; simple contracts, no VC (value-added)

- **In the model**:
  - extend self-selection model of Hall 05 (labor market model)
  - 2 types of projects (good, bad); type unknown to E and VC
  - however, entrepreneurs receive continuous signals; decide on entry
  - E-effort and VC-advice after contracting
  - contract with convertible security: allocate incentives and induce self-selection
  - VCs finance good and bad firms (signals imperfect); smart contracts lead to better selection on average

- **Main policy questions**:
  - right number of VC-backed start-up firms?
  - right quality? 2 dimensions: advice per project, composition of good/bad projects
  - if not, then what?

- **Timing:**

  1. VCs offer contract to finance $I - k$ in return for share s in firm, entry/self-selection of Es based on signal

  2. contract is signed and capital I is sunk, collaboration starts, true type v_G, v_B is revealed

  3. VC exercises option to increase share if project is good

  4. entrepreneurial effort and VC advice conditional on v_j

  5. success/failure determined, income distributed

- **2 types of projects:** value $v_G > v_B$, share ε of good projects
  – type not known, entrepreneurs (Es) get signal; signal: project is good with probability q
  – high quality $q > \varepsilon$, low quality $q < \varepsilon$
  – average quality over all $q' > q$ is $Q > q$

- **Success prob.**: effort $l_j \in \{0, 1\}$, VC advice a_j continuous

$$p_j = p^j\left(l_j, a_j\right) = l_j \cdot \left(a_j\right)^{\alpha}, \quad j \in \{G, B\}$$

- **Contract with convertible:** VC buys share s_j at price $b_j + I - k$

  basic agreement (debt) s_B, b_B
  convert to s_G at cost $b_G - b_B$ if type is G.

- **Shares** (s_B, s_G) just ensure essential effort of E; leave maximum incentive for VC to provide advice

- **Competition** between VCs determines (b_B, b_G);
  competitive VCs *can* break even per project,
  but must *always* break even on average, $Q > q$.

$$Q \cdot \left(R_G^F - b_G\right) + (1 - Q) \cdot \left(R_B^F - b_B\right) = I - k.$$

  (R denotes expected rent – income minus effort cost – at effort stage)

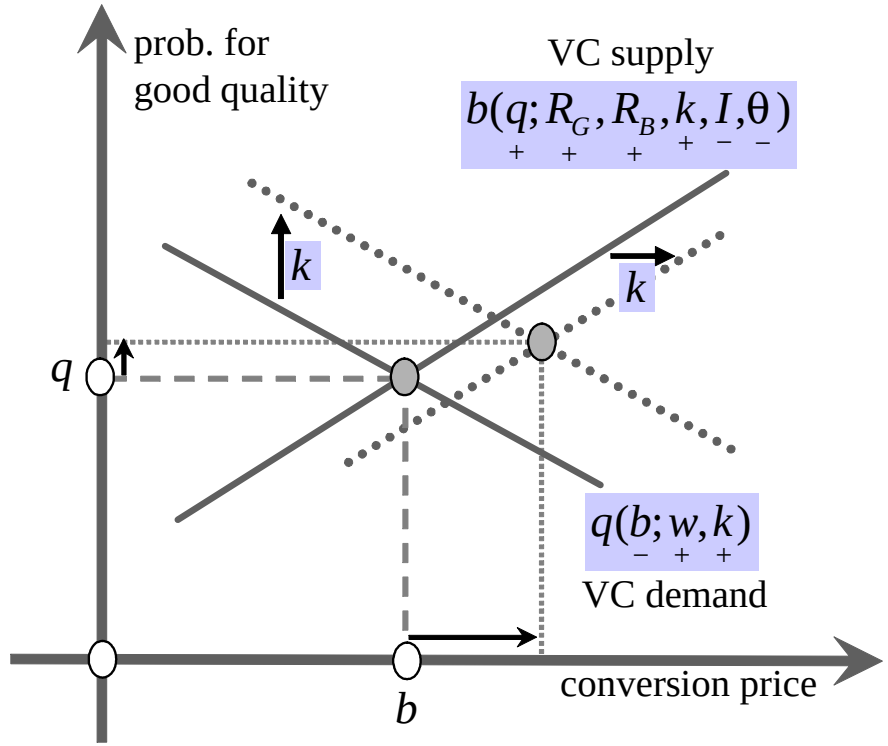
- **Entry** of Es: signal before type j (G, B) is known

$$\pi^E = q\left(R_G^E + b_G\right) + (1 - q)\left(R_B^E + b_B\right) - k - w \geq 0.$$

Proposition 2: Two cases:
(a) Type B profitable, all exp. prof. to (inframarg.) Es.
VCs break even on each j, no cross-subsidy.
(b) Type B unprofitable, VCs break even on average.
Cross-subsidy from good to bad projects.

- Concentrate on case (b): market for VC finance

Supply/demand with unprof.B projects



(θ measure of informativeness of signal)

COMPARATIVE STATICS

Proposition 4 with comparative static results

- **Example:** own capital k, two opposing effects

  1. VCs get same share s_j, finance less $I - k$, VCs bid up b_G, supply shifts right,
     – small gain for marg. E, weak increase in entry

  2. higher k raises opp.cost of E, demand curve shifts up,
     – big loss to marg. E, strong decline in entry

- net effect of k is positive (q up), entry falls (lessening of cross-subs.)

EFFICIENCY

- **Proposition 3:** compare optimal and market allocation
  - **excess entry:** due to cross-subsidization,
    too favorable deal for low quality Es
  - **too little advice/VC support:**
    – due to double moral hazard,
    – VC must share returns to advice with E

- **Policy implications:** need to encourage effort,
  at the same time should not enhance entry

  – tax reductions on profits (incentives for effort), combined with tax on capital cost (entry)?

SUMMARY AND CONCLUSIONS

- Model of **VC financing with different qualities**
  - 2 types of projects: high/low market value
  - entry and self-selection based on signals
    – high quality E: likely to have good project
  - financing and advising (value added) of VCs
  - convertible debt: incentives *and* selection

- **Novel role for convertibles:** induce self-selection
  – convertibles shift compensation to good type
  – attract Es who are likely to have good project

- **Efficiency of markets:**
  - excess entry/too little VC support

- **Policy implications:**
  - stimulate effort in start-ups: selective tax cuts?
  - discourage entry: investment tax?

- **Ongoing work:**
  - deeper into question of optimal contracts
  - continuous efforts of Es
  - study of selected policy instruments
  - consider VC *and* bank financing
  - VC screening

- **Optimal contracts:**
  - the contract in the paper (w/ convertible) is in fact optimal

- **Continuous efforts of Es:**
  - more symmetric specification of E and VC efforts
  - solutions to selection and MH problems become more interdependent
  - shares (s_B, s_G) derived with an eye to both self-selection and MH
  - lead to lowest VC share for good projects
  - in line with stylized facts of the VC sector