Advanced Micro Theory
Entrepreneurial Finance

Joacim Tåg

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Overview

Entrepreneurial Finance

- Introduction to financing frictions
- Moral hazard
- Adverse selection
- Uncertainty/Skewness/Intangible Assets
- The capital structure decisions of new ventures
- Government policy

Entrepreneurial Finance

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Entrepreneurial Finance

Introduction to financing frictions

Financing frictions

- Well-functioning financial markets drive economic growth because the help allocate capital efficiently by
  - directly financing innovative activities
  - allocating external finance to firms with greatest capacity to commercialize ideas
  - discontinuing financing of low productive firms

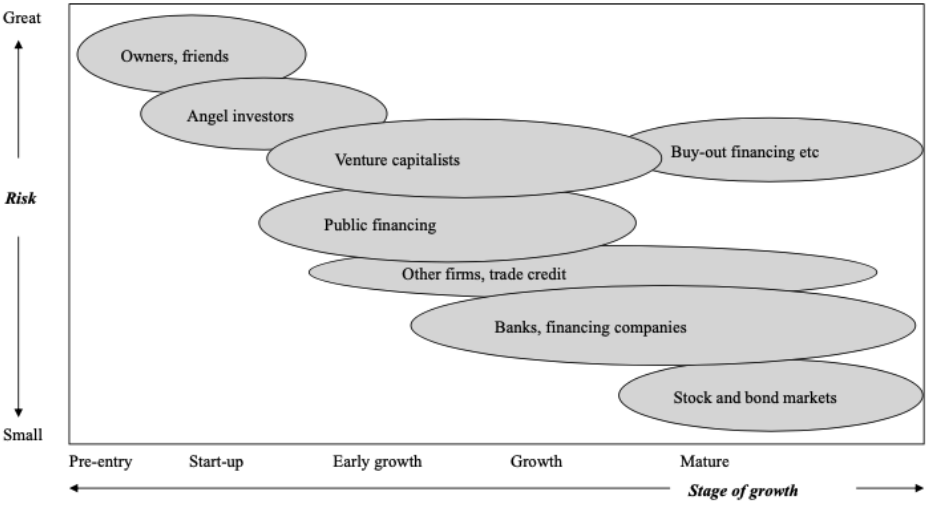
- In a frictionless world:
  - Projects with NPV$>$0 should be financed (no financing constraints)
  - Source of financing irrelevant (type of financier does not matter)

Financing frictions

- Major sources of financing frictions
  - moral hazard
  - adverse selection
  - uncertainty
  - skewness
  - intangible assets

- In a world with frictions
  - Projects with NPV>0 are not financed (financing constraints motivate policy action)
  - Specialized intermediaries arise (angels, venture capitalists, banks, public markets)

Financing frictions



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Entrepreneurial Finance

Moral hazard

Moral hazard

- Inability to commit to the agreed plan for the use of financing
  - shirking to obtain private benefits of control
  - adjusting the risk of the project
  - entrenchment
  - self-dealing (corporate jets, excessive salaries)

- Leads to credit rationing and arises with
  - investors versus entrepreneurs
  - investors versus controlling owners
  - investors versus management

Credit rationing

- Formal model (Tirole 2006):
  - two dates ($t = 1, 2$)
  - no discounting ($r = 0$)
  - everybody is risk-neutral
  - an entrepreneur E

- The entrepreneur
  - has a project that requires the funding I
  - has assets (cash, net worth) equal to $A < I$
  - need at least $I - A$ from outside investors to ensure that the project can be undertaken

Credit rationing

- Moral hazard (agency costs) = cash flow depends on the entrepreneur's behavior

- If the project is undertaken
  - it generates at $t = 2$ a cash flow of $X \in \{0, X_H\}$
  - $\Pr[X = X_H]$ is θ_i, with $i \in [H, L]$.
  - $\Pr[X = X_H]$ depends on the entrepreneur's effort choice ($e = \{e_L, e_H\}$) at $t = 1$.
  - θ_i when working (e_H) is θ_H
  - θ_i with shirking (e_L) is $\theta_L = \theta_H - \Delta_\theta$
  - $\Delta_\theta > 0$ is the increase in the success probability
  - shirking confers private benefits B to the entrepreneur.

Credit rationing

- Loan agreement
  - contributing $I - A$ at $t = 1$, leads to repayment of R at $t = 2$.
  - repayment cannot be larger than cash flow X ($R \leq X$) due to limited liability
  - Failure = both the investor and the entrepreneur gets zero.
  - Success = investor gets R_H and E gets $X_H - R_H$.

- Competitive capital markets means that the investor just breaks even so the return ($\theta_i R_H$) equals the contribution to the project ($I - A$):

$$\theta_i R_H = I - A$$

Credit rationing

- Assume that
  - the project has positive NPV if E works ($\theta_H X_H - I > 0$)
  - the project has negative total returns if E shirks ($\theta_L X_H + B - I < 0$).

- Implies that if the contract makes it optimal for E to shirk, no investor will accept that contract since

$$\underbrace{\theta_L(X_H - R_H) + B - A}_{E\text{'s return}} + \underbrace{\theta_L R_H - (I - A)}_{\text{Investor's return}} < 0.$$

- Either E is better off consuming his assets A or the investor fails to break even or both.

Credit rationing

- Working (e_H) is efficient: the expected gains of the high outcome exceeds the loss of the private benefits ($\Delta_\theta X_H - B > 0$)
- The project can generate positive NPV and ought to secure financing
- But, the repayment obligation R_H to the investors has to be chosen to preserve E's incentive to work
- E must be compensated for loss of private benefits

Credit rationing

- The incentive compatibility constraint (IC):

$$\underbrace{\theta_H(X_H - R_H)}_{\text{Gain to } E \text{ from working}} \geq \underbrace{\theta_L(X_H - R_H) + B}_{\text{Gain to } E \text{ from shirking}}. \qquad \text{(IC)}$$

- Gain to E from working must be strictly larger than the gains from shirking
- Contract is compatible with giving E the incentive to work

Credit rationing

- The IC can be simplified to $\Delta_\theta(X_H - R_H) \geq B$, or to

$$R_H \leq X_H - B/\Delta_\theta.$$

- The maximum R_H is thus

$$R_H^{\max} = X_H - B/\Delta_\theta.$$

- Pledgeable income = the maximum repayment while still having incentives to exert effort

Credit rationing

- Expected pledgeable income need to exceed the investor's initial outlay
- Participation constraint (PC):

$$\theta_H \underbrace{[X_H - B/\Delta_\theta]}_{R_H^{\max}} \geq I - A \qquad \text{(PC)}$$

- The participation constraint is sometimes called the break-even condition or the financing condition
- Binds under the assumption of perfect capital markets

Credit rationing

- Participation constraint in combination with the pledgeable income translate into minimum wealth requirement.

- Solving the PC for A:

$$A \geq \theta_H B/\Delta_\theta - [\theta_H X_H - I].$$

- Minimum wealth:

$$A^{\min} = \underbrace{\theta_H B/\Delta_\theta}_{\text{Agency rent}} - \underbrace{[\theta_H X_H - I]}_{\text{NPV of project}}$$

- Net wealth A must cover the difference between E's minimum expected rent and the project's NPV.

Credit rationing

- NPV of the project is larger than the agency rent:
  - $[\theta_H X_H - I] > \theta_H B/\Delta_\theta$
  - $A^{\min} < 0$
  - an entrepreneur with zero wealth A can find financing

- NPV of the project is smaller than the agency rent:
  - $\theta_H B/\Delta_\theta > [\theta_H X_H - I]$.
  - $A^{\min} > 0$
  - A must be sufficiently large to ensure that the IC and the PC hold
  - Poor entrepreneurs ($A < A_{\min}$) do not get financed (despite +NPV project)

Credit rationing

- Intuition:
  - poor entrepreneurs need to borrow and repay large amounts so claim on cash flow too small to induce effort (e_H).
  - the cash that remains after paying off the investors is just not enough to make effort worth while
  - Not enough "skin in the game"

- If the project is financed ($A \geq A_{\min}$), competitive capital markets imply that E gets the entire NPV. E's payoff net of A is

$$\theta_H \left[X_H - R_H\right] - A = \theta_H \left[X_H - \frac{I - A}{\theta_H}\right] - A = \theta_H X_H - I.$$

Determinants of credit rationing

- Net wealth A
- As A becomes larger, the financing condition (PC) becomes

$$\theta_H \left[X_H - B/\Delta_\theta \right] \geq I - A$$

- When A is large, E needs to raise and repay less.
- Her return in case of success increases which mitigates the moral hazard problem.

Determinants of credit rationing

- Market rate r
- For $r > 0$, the financing condition(PC) becomes

$$\frac{\theta_H \left[X_H - B/\Delta_\theta\right]}{(1+r)} \geq (I - A)$$

- Higher market rates implies that the minimum wealth requirement increases:

$$A^{\min} = I - \frac{\theta_H[X_H - B/\Delta_\theta]}{1+r}$$

- Repayment has to be higher since it is discounted by investors

Determinants of credit rationing

- Pledgeable income is unaffected since the IC is unaffected:

$$\underbrace{\frac{\theta_H(X_H - R_H)}{1+r}}_{\text{Gain to } E \text{ from working}} \geq \underbrace{\frac{\theta_L(X_H - R_H) + B}{1+r}}_{\text{Gain to } E \text{ from shirking}}.$$

Determinants of credit rationing

- Private benefits B

- To exert effort when private benefits B increase:
  - E must get a larger fraction of returns
  - reduces the pledgeable income $R_H^{\max} = [X_H - B/\Delta_\theta]$
  - making financing harder to obtain since the PC is less likely to hold:

$$\theta_H [X_H - B/\Delta_\theta] \geq I - A \qquad \text{(PC)}$$

Solutions

- Solutions to credit rationing problem:
  - Monitoring (reduces B)
  - Reducing investment scale (ensures enough pledgeable capital)
  - Diversification (cross pledging uncorrelated returns)
  - Pledging collateral (limited by costly seizure)
  - Pledging outside collateral (own wealth/house)

Financing frictions

- Major sources of financing frictions
  - moral hazard
  - adverse selection
  - uncertainty
  - skewness
  - intangible assets

- In a world with frictions
  - Projects with NPV>0 are not financed (financing constraints motivate policy action)
  - Specialized intermediaries arise (angels, venture capitalists, banks, public markets)

Entrepreneurial Finance

Adverse selection

Adverse selection

- Entrepreneurs may know more about profitability than the outside investors

- Entrepreneurs may have more information about
  - the value of existing assets (level or riskiness)
  - the prospects of investment (level or riskiness)
  - the value of pledged collateral (level or riskiness)
  - the timing of income accrual (short or long term)
  - private benefits of control

- Consequences
  - market breakdown can occur (+NPV projects are not financed)
  - firms follow a pecking order of financing (earnings, debt, equity)
  - firms hoard cash (Apple)
  - entrepreneurs may be willing to reveal or transmit information (costly signalling)
  - IPO underpricing

Adverse selection

- Formal model (Tirole 2006)
  - E wants to raise funds
  - Positive NPV project
  - E has superior information
  - Problem: investors are concerned that E may simply want to sell overvalued shares
- At $t = 1$
  - E has a project that requires I
  - E has no own wealth ($A = 0$)
- At $t = 2$
  - Cash flow is $X \in \{0, X_H\}$
  - Probability of success is $\theta \in \{\theta_G, \theta_B\}$ with $\theta_G = \theta_B + \Delta_\theta$
  - Probability of project good (θ_G) is ν.

Adverse selection

- Expected success probability is

$$\hat{\theta} = \nu\theta_G + (1-\nu)\,\theta_B = \theta_B + \nu\Delta_\theta$$

- Value is: $V(\theta_i) = \theta_i X_H - I$

- Assume $V(\theta_G) > 0$, but $V(\theta_B) \lesseqgtr 0$

Adverse selection

- Symmetric information
  - Project of type θ_G obtains financing as $V(\theta_G) > 0$
  - Contract that leaves most to E is $R_H^G = I/\theta_G$ and $R_L^G = 0$ (PC binds)
  - If $V(\theta_B) < 0$, the bad project θ_B cannot secure financing
  - If $V(\theta_B) > 0$, the bad project is financed with $R_H^B = I/\theta_B$

- Asymmetric information
  - E knows the true value of θ. Absent further information, PC binds at $\hat{\theta} R_H = I$ with

$$\hat{\theta} = \theta_B + \nu \Delta_\theta$$

  - Investors make money in case of good project and lose money in case of bad project breaking break even on average

Adverse selection

- Fundamental problem:
  - E with good project sell underpriced claims: $\hat{\theta} R_H < \theta_G R_H$
  - E with bad project sell overpriced claims: $\hat{\theta} R_H > \theta_B R_H$
  - Good firms subsidize bad firms

Adverse selection: underinvestment

- Cross-subsidization can lead to credit rationing and under-investment
  - Suppose: $\hat{\theta} X_H < I$
  - E with a good project should get financed as $V(\theta_G) > 0$
  - E with a bad project would have an incentive to claim to have a good project:

$$\theta_B(X_H - \underbrace{I/\theta_G}_{R_H}) > 0.$$

  - No feasible repayment ($R_H \leq X_H$) such that investors break even as $\theta_G(X_H - I/\hat{\theta}) - I < 0$.

- Capital market breaks down: no financing even though $V(\theta_G) > 0$ (because of risk of bad project)

Adverse selection: overinvestment

- Cross-subsidization can also lead to overinvestment
  - Suppose now: $\hat{\theta} X_H > I$
  - Both types receive financing
  - E with good project make a profit despite the discount:

$$\theta_G(X_H - R_H) = \theta_G(X_H - I/\hat{\theta}) > 0$$

  - But E with bad project make a profit as well

$$\theta_B(X_H - R_H) = \theta_B(X_H - I/\hat{\theta}) > 0$$

- May be projects with negative NPV=overinvestment (note: no spillovers here)

Adverse selection:

- Solutions to adverse selection problems:
  - Internal funds
  - Monitoring by banks/venture capitalists/investment banks
  - Co-funding (good E invests own money to make bad E back off)
  - Deliberate underpricing
  - Use low sensitive securities (safe debt)
  - Use debt (default is costly and more likely for bad E)

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Uncertainty/Skewness/Intangible Assets

Uncertainty/Skewness/Intangible Assets

- Entrepreneurship/innovation is characterized by inherent uncertainty
  - Uncertainty vs risk
  - Uncertainty = probabilities associated with unknown outcomes + set of potential outcomes are unclear

- Skewness
  - Return distribution is extremely skewed
  - Pareto distribution: variance does not exist or converge
  - Standard ways of valuing projects do not apply

- Intangible assets
  - Hard to value and pledge
  - Often embedded in workers that can leave (human capital)

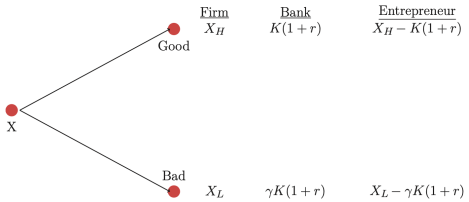
Entrepreneurial Finance

The capital structure decisions of new ventures

The capital structure decisions of new ventures

- Robb and Robinson (2012)
  - Kauffman Firm Survey of young firms started in 2004 (followed to 2007)
  - Close to 5000 US firms
  - New business, purchase of franchise/existing business

- Key distinction between liquidity provision and risk bearing



The capital structure decisions of new ventures

Business Legal Status		
	Sole proprietorship	0.360
	Partnership	0.057
	Corporation	0.277
	Limited liability corporation	0.306
Business Location		
	Home-based	0.500
	Leased space	0.396
	Other	0.104
	Urban/MSA	0.84
Business Product/Service Offerings		
	Service offered	0.858
	Product offered	0.516
	Business offers both service(s)/product(s)	0.378
Intellectual Property		
	Patents	0.022
	Copyrights	0.086
	Trademarks	0.137
Employment Size		
	Zero	59.2
	1	14.0
	2	9.1
	3	4.6
	4–5	5.8
	6–10	3.9
	11+	3.6

The capital structure decisions of new ventures

Characteristics	Weighted Percentage	Characteristics:	Weighted Percentage
Male	69.2		
Female	30.8	Industry Exp. (Yrs.)	
		0	9.8
White	79.3	1–2	13.9
Black	8.6	3–5	15.6
Asian	4.2	6–9	9.9
Others	2.3	10–14	13.6
		15–19	11.3
Non-Hispanic	94.5	20–24	9.3
Hispanic	5.5	25–29	7.5
		30+	9.3
Owner Age			
24 or younger	1.3		
25–34	16.5	Previous Start-ups	
35–44	33.6	0	57.5
45–54	29.0	1	21.5
55 or older	19.6	2	10.2
		3	5.0
Owner Education		4 or more	5.8
HS grad or less	13.9		
Tech/trade/voc. Deg.	6.4		
Some coll., no deg.	21.8	Hours Worked	
Associate's	8.6	<20	18.5
Bachelor's	25.3	20–35	19.5
Some grad, no deg.	5.9	36–45	14.3
Master's degree	13.4	46–55	15.2
Professional/doctorate	4.7	56 or more	32.5

The capital structure decisions of new ventures

Category	Funding Source	Full KFS	Analysis Sample	Mean if >0	Count
Owner Equity		33,640	31,734	40,536	3,093
Owner Debt		4,952	5,037	15,765	1,241
	Personal CC balance, resp.	2,812	2,811	9,375	1,158
	Personal CC balance, others	1,906	238	7,415	132
	Personal loan, other owners	235	1,989	124,124	67
Insider Equity		2,221	2,102	44,956	177
	Spouse equity	524	646	40,436	62
	Parent equity	1,697	1,456	42,509	126
Insider Debt		7,257	6,362	47,873	480
	Family loan	2,760	2,749	29,232	327
	Family loan to other owners	1,719	284	34,509	29
	Personal loan to other owners	272	550	28,988	73
	Other personal loans	649	924	81,452	45
	Business loan by family	1,156	1,760	57,207	115
	Business loan by owner	635	15	9,411	5
	Business loan by emp.	52	79	22,198	9

The capital structure decisions of new ventures

Outsider Equity		19,257	15,935	354,540	205
	Other informal investors	5,148	6,350	244,707	110
	Business equity	6,621	3,645	321,351	56
	Govt. equity	5,242	798	146,624	27
	VC equity	701	4,804	1,162,898	26
	Other equity	1,546	337	187,046	8
Outsider Debt		50,130	47,847	128,706	1,439
	Personal bank loan	18,031	15,859	92,433	641
	Owner bus. CC balance	16,213	1,009	7,107	543
	Personal bank loan by other owners	5,017	1,859	80,650	92
	Bus. CC balance	4,227	812	6,976	452
	Other Bus. CC balance	2,275	135	7,852	62
	Bus. bank loan	1,591	17,075	261,358	243
	Credit line balance	1,030	5,057	95,058	210
	Nonbank bus. loan	133	3,627	214,920	72
	Govt. bus. loan	857	1,331	154,743	34
	Other bus. loan	241	231	78,281	19
	Other individual loan	206	226	43,202	22
	Other debt	308	626	119,493	22
Total Financial Capital		117,458	109,016	121,981	3,536
Trade Credit		21,628	21,793	93,536	838

The capital structure decisions of new ventures

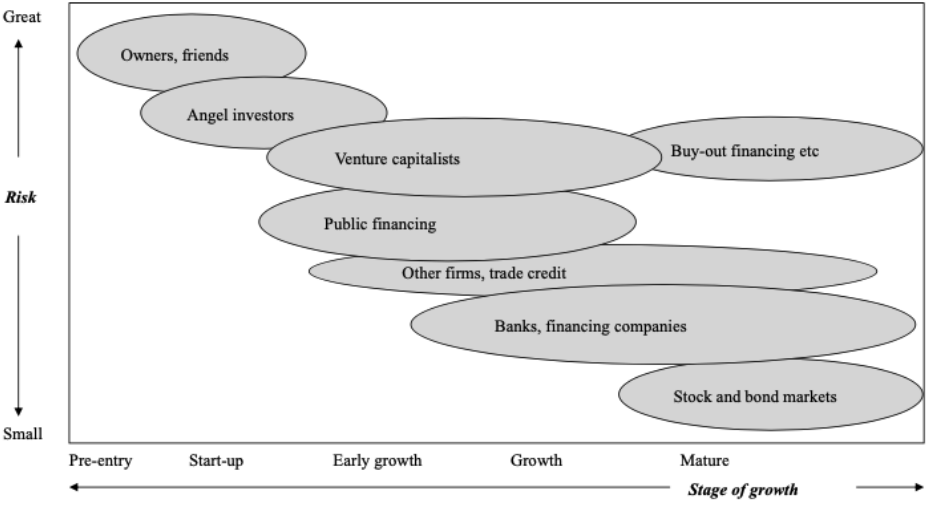
- Key takeaways from Robb and Robinson (2012)
  - Funding from formal debt dwarfs funding from family and friends (7 to 1)
  - Formal credit channels provide 40% of initial startup capital
  - Personal equity in 75% of new ventures
  - Personal assets are also important => entrepreneurs hold leveraged claims
  - Even VC backed firms rely on 25% formal bank debt
  - "bank debt, personal equity, trade credit"

- Formal credit markets do appear to alleviate financial constraints

Entrepreneurial Finance

Government policy

Financing frictions



Policies for financing new ventures

- Reasons to get involved
  - Innovation is linked to growth
  - New ventures spur innovation (specially VC backed)
  - Social returns to innovation are higher than private returns
  - Credit rationing due to asymmetric information and moral hazard
  - Spurring the creation of an eco-system (virtuous cycle)
  - Providing certification

- Reasons to not get involved
  - Picking winners is hard
  - Crowding out of private investors
  - Regulatory capture

Government venture capital (Da Rin and Hellmann 2020)

- Government can
  - Directly fund companies (Government VC fund)
  - Government as an LP (increase size of domestic VC pool)
  - Government invests in a fund-of-funds (second layer of fees)

- Pari passu (same terms as private investors)
  - + Being in the same boat as private investors (incentives and monitoring)
  - + Less scope for regulatory capture
  - - Crowding out (empirical evidence is mixed here)
  - - Not really providing any subsidies

Institutions and Venture Capital (Lerner and Tåg 2013)

- Institutions that correlate with VC activities
  - Legal institutions (structures, screening, monitoring)
  - Financial market development (exit opportunities, deregulation of pension funds)
  - Tax system (capital gains, wage taxes ect)
  - Labor market regulations (flexibility, EPLs vs insurance)
  - Public spending on R&D (supply of ideas)

- Later development in Sweden compared to US due to
  - Taxes on entrepreneurs/active investors exceeding 120% 1960-1990
  - Strict employment protection legislation 1960-1980
  - R&D spending higher in Sweden since 1991

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