

How Does VC Activism Backfire in Startup Experimentation?

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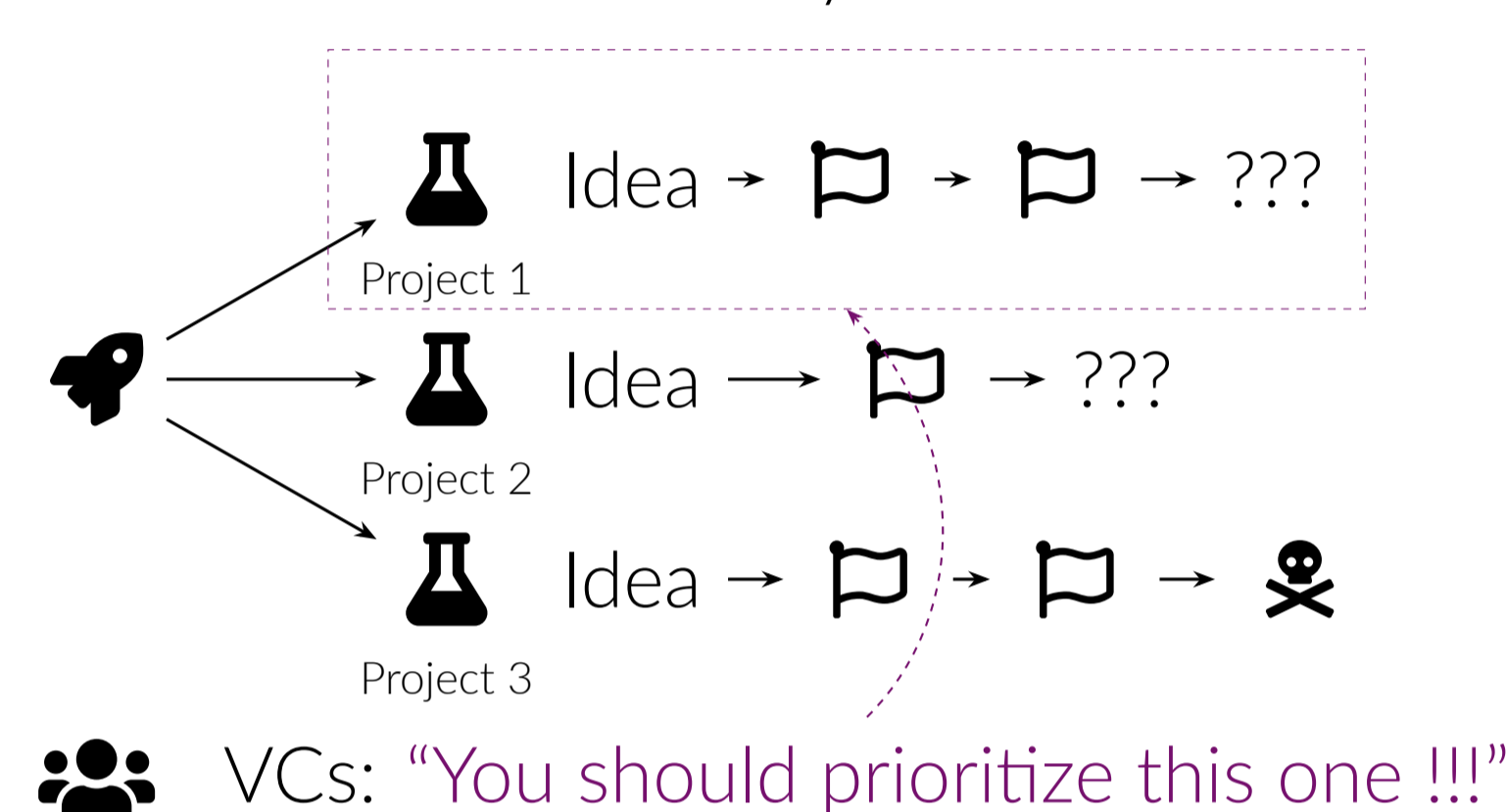
Abstract

We utilize granular data from the life science sector to study how VC activism affects strategic experimentation decisions. While smaller VCs are more involved in pipeline decisions, their portfolio firms show lower IPO rates and slower clinical progress. For identification, we use limited partners' adoption of ESG objectives as instruments for affected VCs' portfolio attention. Lastly, we highlight conflicting experimentation preferences between general partners and founding teams due to investment horizon and portfolio cannibalization.

Motivation

Startups may work on multiple experimentations simultaneously; due to *significant uncertainty* and *limited resources*, startups may have to strategically make prioritization decisions.

Sometimes decisions may not be made alone:



VCs may engage in the decision-making progress through activism for two reasons:

- VCs may have limited investment horizons:
 - VC holding period: ≈ 10 years
 - Startup R&D process: $\gg 10$ years
- VCs may hold portfolio companies working on same areas:
 - VC 1: , , , ...
 - VC 2: , , , , , , ...
 - VC 3: , , , , ...

Institutional Background

Drug-indication development in the biotech sector follows a structured granular regulatory process:

- Each drug-indication project has to go through Preclinical \rightarrow Phase 1 \rightarrow Phase 2 \rightarrow Phase 3
- The FDA evaluates candidate drug indications based on experimental safety and efficacy

Here are some further quick statistics for the biotech sector:

- > 20% VC funding goes to biotech annually
- The whole drug indication development process usually takes 5 to 20 years (median = 8 years)
- The average cost of getting a drug approved takes about \$1.3 billion
- < 18% of drugs from our data ultimately receive approval

Taken together, biotech constitutes an ideal sector for empirically testing our motivation.

Data and Variables

We leverage two main data sources: (i) **Cortellis** data for detailed records for drug development progress, and (ii) **Pitchbook** data for detailed records for VC investment deals.

By merging the two datasets, we construct a quarterly drug-indication (i.e., project) panel spanning from 2000Q1 to 2020Q4, containing 84,846 observations for 6,068 drugs from 1,387 VC-backed drug startups. Then we build proxies for drug innovation progress and VC activism as follows:

- Proxy for innovation progress - *Next Phase*: a dummy variable equal to 1 if the project advances to the next phase in the next quarter
- Proxy for VC activism intensity # 1 - *EW-Size* (\propto lower activism): equal-weighted portfolio sizes of all investing VCs for the focal project
- Proxy for VC activism intensity # 2 - *EW-HHI* (\propto higher activism): equal-weighted HHI of allocation weights (by startup) of all investing VCs for the focal project

Stylized Facts

- Biotech startups prioritize drug projects in the strategic experimentation process upon IPOs
 - Throughout the pre-IPO period, a typical startup initiate almost 12 projects
 - Upon the IPO, a typical startup has only 1 Phase 2 project and 1.3 Phase 1 projects
- Smaller/more concentrated VCs are more active in overseeing biotech startups
 - VCs with more diversified portfolio companies are less likely to sit on their investing drug company's board
 - Biotech startups backed by smaller/more concentrated VCs have a higher frequency of turnovers among the initial founding team members
- Biotech startups backed by smaller/more concentrated VCs are less likely to exit through IPO
 - The group of startups held by the smallest VCs exit via IPO by a chance 2.8%, which is 8 times smaller than those held by the largest investors (22.9%)

Main Findings

Baseline results: We focus on the drug-indication quarterly panel from 2000Q1 to 2020Q4 and regress *Next Phase* on *VC Activism*, controlling for startup funding pipelines. We find that

	Next Phase	
<i>Ln(EW-Size)</i>	0.005***	(3.10)
<i>EW-HHI</i>	-0.028***	(-3.65)
Phase FE	Yes	Yes
Drug Indication FE	Yes	Yes
Year-Quarter FE	Yes	Yes
Adjusted R^2	0.1347	0.1349
Number of observations	84,123	84,123

- The coefficients of *equal-weighted VC sizes (HHIs)* are significantly positive (negative)
- The economic size is non-trivial - 1 StD \uparrow in *Ln(EW-Size)* is associated with 0.58% \uparrow in *Next Phase* stands for 44% of unconditional probability
- The mean value of *Next Phase* is 1.13% \Rightarrow 0.58%
- Less VC concentration is significantly associated with better innovation outcomes

Identification: To avoid concerns on endogenous matching between diversified VCs and quality startups, we use the staggered adoption of ESG objectives by states into *public pension funds* as an instrument for *VC Activism*:

- From 2013 to 2020, 16 states have incorporated *sustainability* into pension investment goals
- [Relevance] Treated VCs significantly decrease allocations in the *energy* sector
- [Exclusion] The biotech sector is neither *green* or *brown*
- [Definition] $IV := (\# \text{ Holding VCs treated by limited partners}) / (\# \text{ All holding VCs})$

Our baseline results are robust with the instrumented *VC Activism*.

Economics of the conflicts: To shed lights on the economics underlying VCs holding back projects, we analyze differences in *investment horizons* and the risk of *portfolio cannibalization*.

- We repeat the baseline analysis on two sub-samples - drug indications in *fast* and *slow* ICD-9 categories. The negative effects mostly concentrate on *slow* ICD-9 drug indications.
- We examine *VC activism* and % of projects owned by the same/competing VCs. Startups backed by more active VCs tend to concentrate on few specific diseases.

Robustness Checks

We validate the robustness of our results with a battery of checks:

- We replicate the analysis using each focal startup's *lead VC activism*
- Our results are robust to defining concentration at the *industry* or the *geography* level
- Our results remain robust when using *VentureXpert* data
- Results are robust with the *direct flight*-based identification strategy by Bernstein et al. (2016)