IS INNOVATION IN A PLACE?
Accelerator Program Impacts On Firm Performance

a paper with Bokhari, Frenchman and Tausendshoen

MIT · THE REAL ESTATE INNOVATION LAB
RESEARCH AND DEVELOPMENT FOR THE BUILT ENVIRONMENT

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LINKING PERFORMANCE TO PEOPLE AND PLACES
PRIVATE EQUITY RESEARCH MEETS REAL ESTATE AND DESIGN RESEARCH

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Firms + **Places** = **Performance**

- Young private equity firm growth
- Growth in private equity to young firms
- Regional economic incentives

- Rise in accelerator programs
- Increase in Firm Demand
- Increase in Venture Capital Funding
- Decrease in Seed and Angel Capital

- Accelerator program literature (4 studies)
- Increases in regional economic growth
- Coworking as high performance space in real-estate

IDENTIFYING FIRMS
FINDING FIRMS ENGAGED IN INNOVATION

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Firms

"Startups"

A Moving Defintion

- A distinction is usually made between 'Small and Mediim Enterprises' (SME) and 'Innovation Driven Enterprises' (IDE)

- An IDE is an entrepreneurial venture which is representved by innovative product, service, process or a platform. Typically a newly emerged, fast-growing business that aims to meet a marketplace need by developing a viable model that can serve a global need.

- Usually, it is not prohibited in scale of quantity in time or place.

"IDEs – startups focused on addressing global markets based on technological, process or business model innovation – can potentially create hundreds or even thousands of high-skill jobs if they succeed."

Aulet and Murray (2013)

IDENTIFYING PLACES
ACCELERATOR PROGRAMS FOR CATALYZING FIRM PERFORMANCE

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Place

↓

Accelerator Programs

A Defintion

● *Accelerators are nascent firm development programs that utilize physical space,networks, mentorship, capital financing, and community engagement to acceleratethe financial feasibility of a pool of firms.*

● *These programs are generally a private sector initiative that aims to transition firms out of early stage development challenges to advance their skills and networks through their programs.*

● *Importantly,accelerator programs are differentiated by accepting a cohort of firms from an applicant pool to a program that has a start and end date.*

"A fixed-term,cohort-based program, including mentorship and educational components, that culminates in a public pitch event or demo-day."

Cohen and Hochberg (2014)

DO PROGRAMS IMPACT FIRMS
A LOOK AT THE EXISTING LITERATURE

Performance

Analysis of Impacts

Planning for Regional Growth

The expectation within the urban economics, urban planning and regional economic and development literature that certain characteristics of physical, human and equipment capital lead to the formation of entrepreneurial outcomes.

Entrepreneurship, Innovation and Growth

The link within the business strategy, corporate finance and innovation literature that there is a connection between the arrival of entrepreneurship and innovation driven enterprises.

Accelerator Program Impacts

The link within the business strategy, corporate finance and innovation literature that there is a connection between the arrival of entrepreneurship and innovation driven enterprises.

A CONTRIBUTION
## WHAT THIS PAPER ADDS TO KNOWLEDGE IN THIS GROWING FIELD

Study	Approach	Dependent variables	Results	Sample	Time period
Hallen, Bingham and Cohen (2014)	Examine the performance of accelerated companies vs non-accelerated companies	Time to raising an initial round of venture capital and time to reach a certain level of customer traction (as measured with web traffic).	Significant effects were unevenly observed across accelerators. No overall effect was found;	8 accelerator programs: *500 Startups, AngelPad, Dreamit Ventures, Excelerate Labs, LaunchBox Digital, Seedcamp, TechStars, Y Combinator* 328 Ventures (164 accelerator startups / 164 non-accelerated startups)	2011
Smith and Hannigan (2015)	Analyse the performance of accelerator-backed companies vs angel-backed companies	Exit via acquisition or failure	Accelerator startups have higher acquisition rates and failure rates than the angel-funded startups	2 accelerator programs: *Y Combinator, TechStars* 619 companies (389 accelerator-backed startups / 230 angel group backed startups)	2005-2011
Fehder and Hochberg (2014)	Local impacts of accelerators on MSAs	Seed and early-stage entrepreneurial financing activity (Number of seed and early stage VC deals; Sum of seed and early stage VC dollars invested each year at the MSA level; Number of distinct investors)	MSAs where an accelerator is established subsequently have more seed and early-stage entrepreneurial financing activity	59 accelerator programs in 38 metropolitan statistical areas (MSAs) in the US	2005-2012
Barnes (2016)	Impact of increased cohort-sizes on startup performance	Timeframes for companies to achieve an exit via acquisition or IPO	Time until an exit for Y Combinator startups is reducing even while the cohort sizes has been increased	Accelerator program: *Y Combinator* 991 startups	2005-2016
Bokhari, Chegut, Frenchman, Tausendschoen (2018)	*Measure the impact of accelerator programs on cumulative funding of firms*	*Funding activity, deal history, investor experience, funding stages accelerator program amenities, accelerator timing and physical space impacts*	*Increase cumulative funding by 7 percent relative to control firms, programing, space matters across acclerators*	*Accelerator program: 56 programs 16,720 firms 38,365 funding events*	*2005-2015*

IDENTIFYING IMPACTS OF ACCELERATOR PROGRAMS
MEASURING DIFFERENCES IN FIRM PERFORMANCE
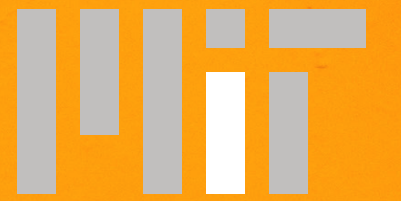
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CB INSIGHTS

THE REAL ESTATE INNOVATION LAB
RESEARCH AND DEVELOPMENT FOR THE BUILT ENVIRONMENT

Control Firms
- 13,151 firms
- 31,237 funding events
- funding details

Treated Firms
- 3,569 firms
- 7,628 funding events

Startup Accelerators
- 56 programs
- capital invested
- equity stake
- time spent in program
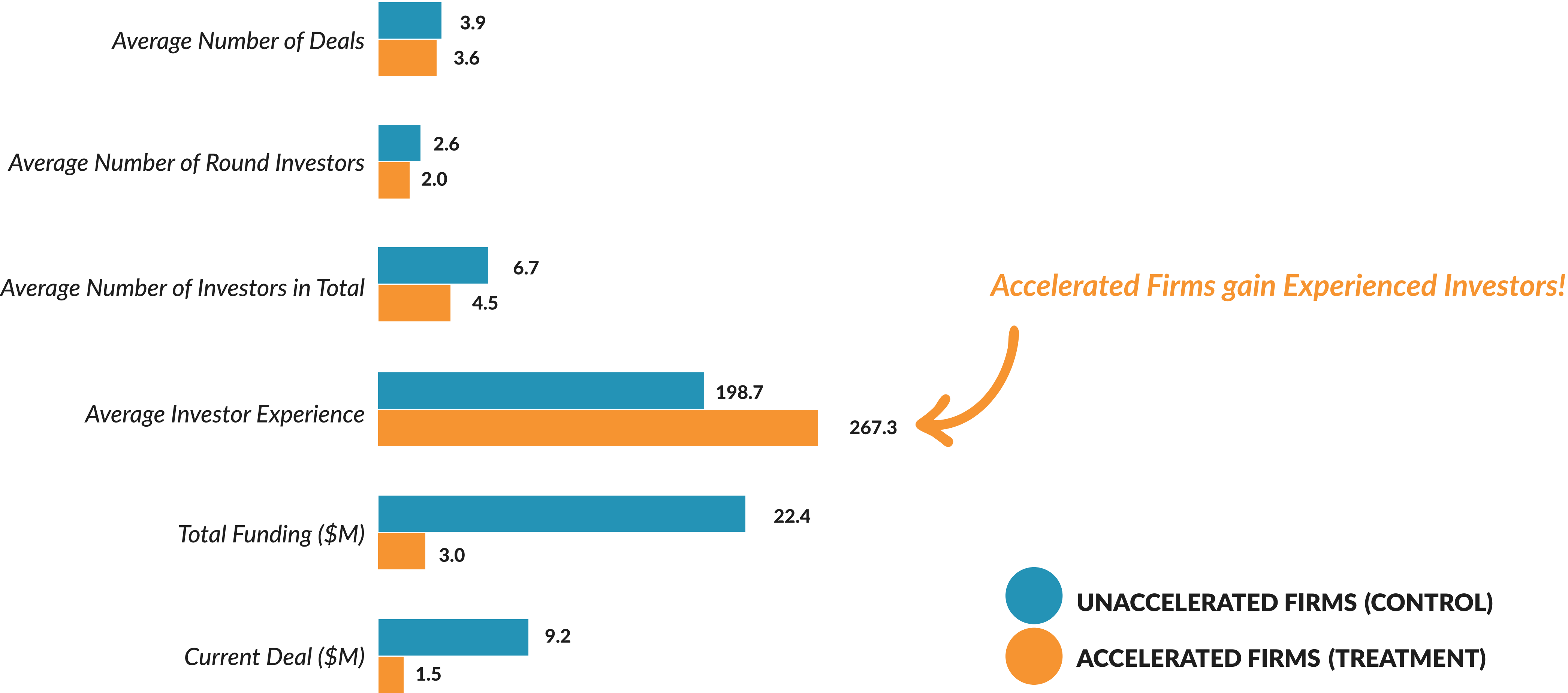- firms per class
- space provided

Sample Firms:

Panel for 2005 to 2015
- 16,720 firms
- 38, 365 funding events
- 145 urban areas
- 32 sectors

Total Accelerators:

Panel for 2005 to 2015
- 512 programs
- program details
- space details
- cohort details

Firms that went through Accelerators

VARIATION BETWEEN ACCELERATED AND NON
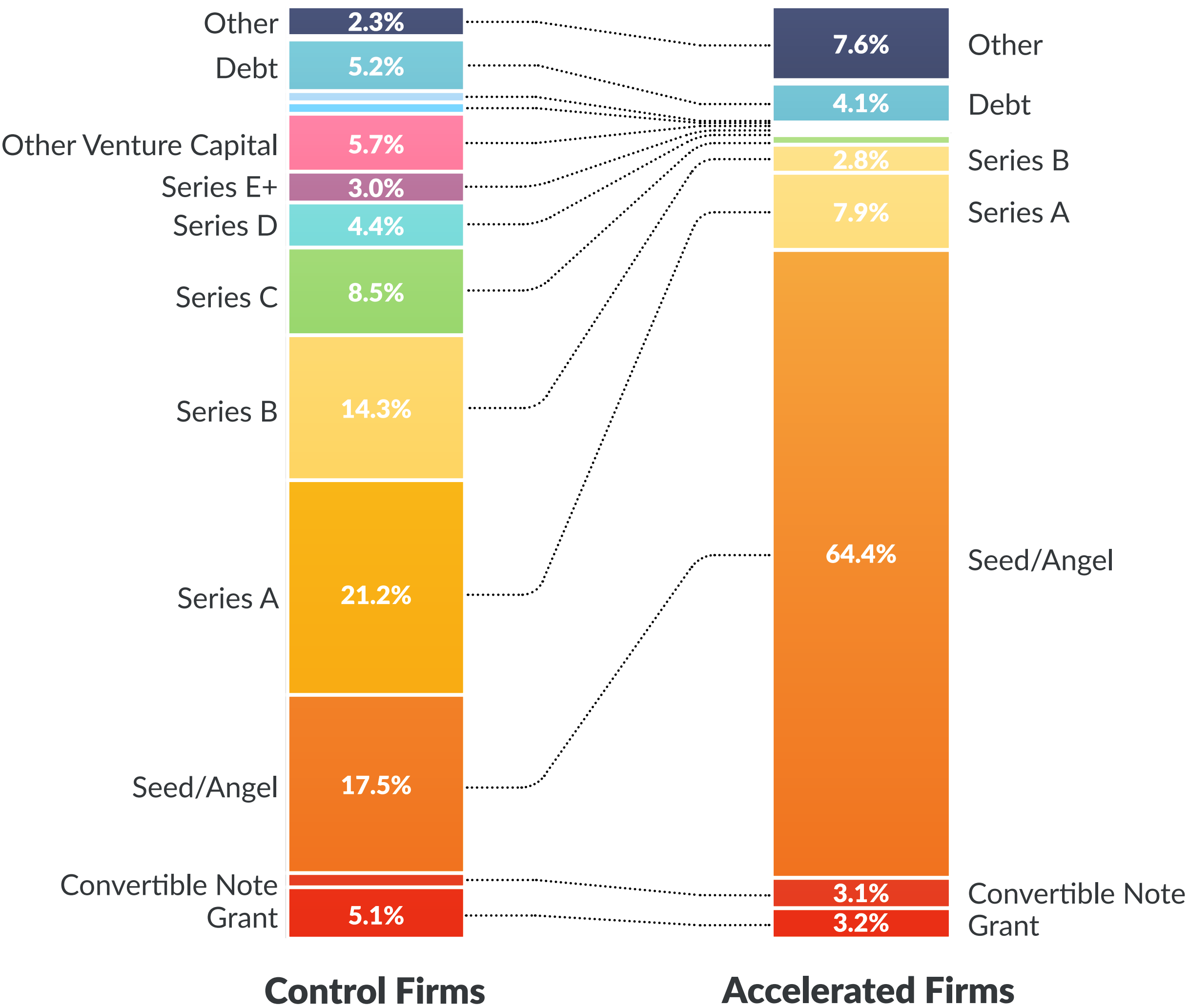## DEAL AND INVESTOR CHARACTERISTICS

Average Number of Deals
3.9
3.6

Average Number of Round Investors
2.6
2.0

Average Number of Investors in Total
6.7
4.5

Accelerated Firms gain Experienced Investors!

Average Investor Experience
198.7
267.3

Total Funding ($M)
22.4
3.0

Current Deal ($M)
9.2
1.5

● **UNACCELERATED FIRMS (CONTROL)**

● **ACCELERATED FIRMS (TREATMENT)**

FUNDING LIFECYCLE
DEAL AND INVESTOR CHARACTERISTICS

Control Firms

Control Firms	
Other	2.3%
Debt	5.2%
Other Venture Capital	5.7%
Series E+	3.0%
Series D	4.4%
Series C	8.5%
Series B	14.3%
Series A	21.2%
Seed/Angel	17.5%
Convertible Note	
Grant	5.1%

Accelerated Firms

Accelerated Firms	
Other	7.6%
Debt	4.1%
Series B	2.8%
Series A	7.9%
Seed/Angel	64.4%
Convertible Note	3.1%
Grant	3.2%

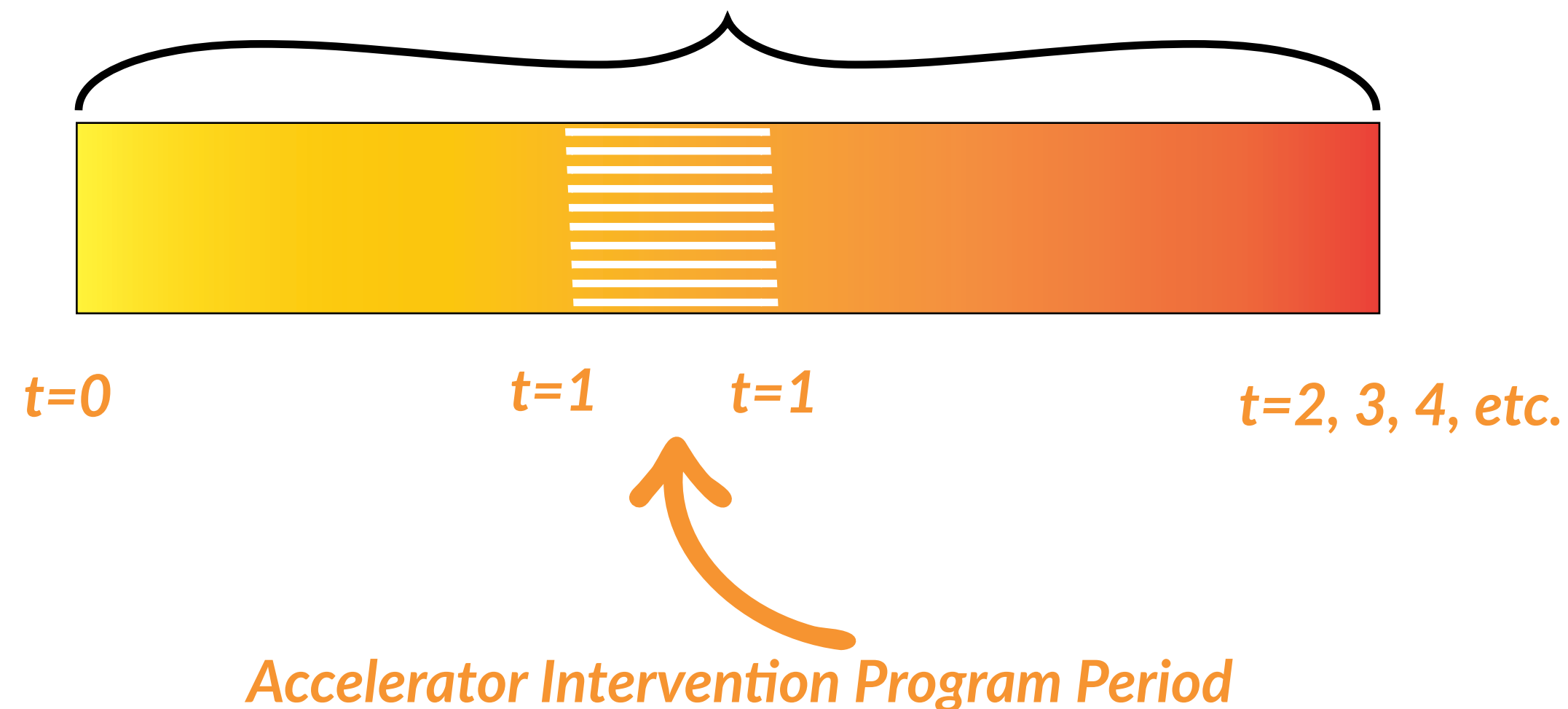*Control firms have a much more diverse capital experiences*

Accelerator Programs are still young could be seen as still developing

METHODS FOR MEASURING IMPACT
AN ACCELERATOR PROGRAM AS A POLICY INTERVENTION

Policy Intervention Period

Cumulative Funding for startup i in accelerator programs

t=0   t=1   t=1   t=2, 3, 4, etc.

Accelerator Intervention Program Period

Measure the incremental impact of an accelerator intervention period with a simple binary flag over the intervention period (the period that the firm is in the accelerator program).

We know, the accelerator program duration and the start date of entering the accelerator program.

Measuring Cumulative Funding

$$log(CF_{i,t}) = \alpha + \beta E_{i,t} + \theta X_{i,t} + \delta T_{i,t} + F_i + \varepsilon_{i,t}$$

● *where CF is the logged cumulative funding for firm i in period t.*

● *Our principal variable of interest is the policy event period defined as the accelerator experience E, which equals one if firm i is in the accelerator program in period t, and zero otherwise.*

● *X captures factors contributing to the firms accumulation of funding as a vector of control variables.*
  - *Firm's number of deals*
  - *Number of current round investors*
  - *The cumulative number of investors to date*
  - *The investors deal experience*
  - *The current round of investment in period t.*

● *T is a vector of time dummies to capture macro-economic conditions in the capital markets*

● *F is a vector of firm dummies, that controls for individual firm fixed-effects that also absorbs urban area and industry fixed-effects.*

● *The estimated parameters are α, β, θ, X, δ, T and ε.*

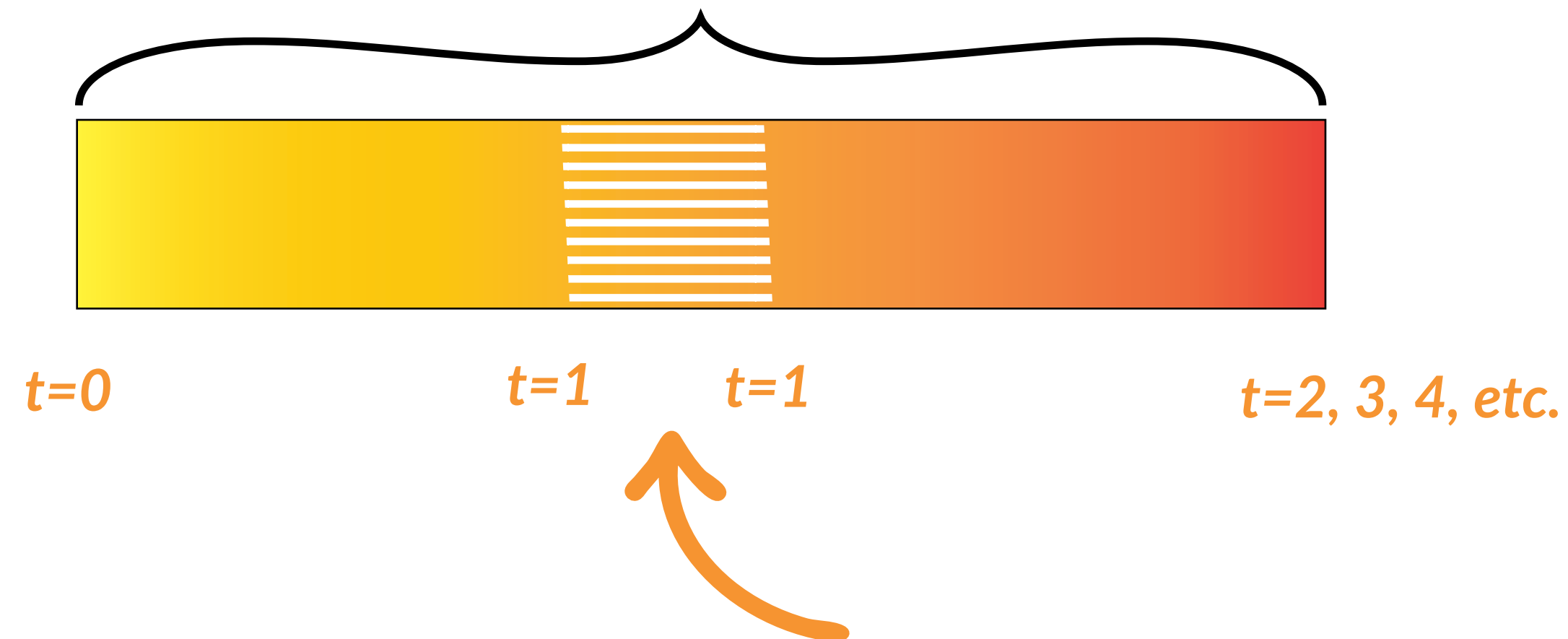● *Our estimation procedure for the equation employs OLS corrected with firm clustered standard errors.*

IMPACT WITH ENDOGENOUS ACCEPTANCE
TAKING INTO ACCOUNT GETTING INTO THE PROGRAM

Policy Intervention Period & Endogenous Acceptance

Cumulative Funding for startup i

t=0 *t=1* *t=1* *t=2, 3, 4, etc.*

An Instrument for the Accelerator Program Period

Now the period is the probability of being accepted in an accelerator program is taken as the intervention period

Probability of Acceptance

$$Pr(E_{i,t}=1|Z_{i,t})=E(E_{i,t}|Z_{i,t})=a+b\ Z_{i,t}+v_{i,t}$$

where Z is the urban area metrics for the number of accelerators, pool of firms that can be accepted in accelerators, total capital invested and average program accelerator length

Measuring Cumulative Funding

$$log(CF_{i,t})=\alpha+\beta E_{i,t}+\theta X_{i,t}+\delta T_{i,t}+F_i+\varepsilon_{i,t}$$

where E is now a probability measure, a number between 0 and 1 during the intervention period for accelerator programmed firms.
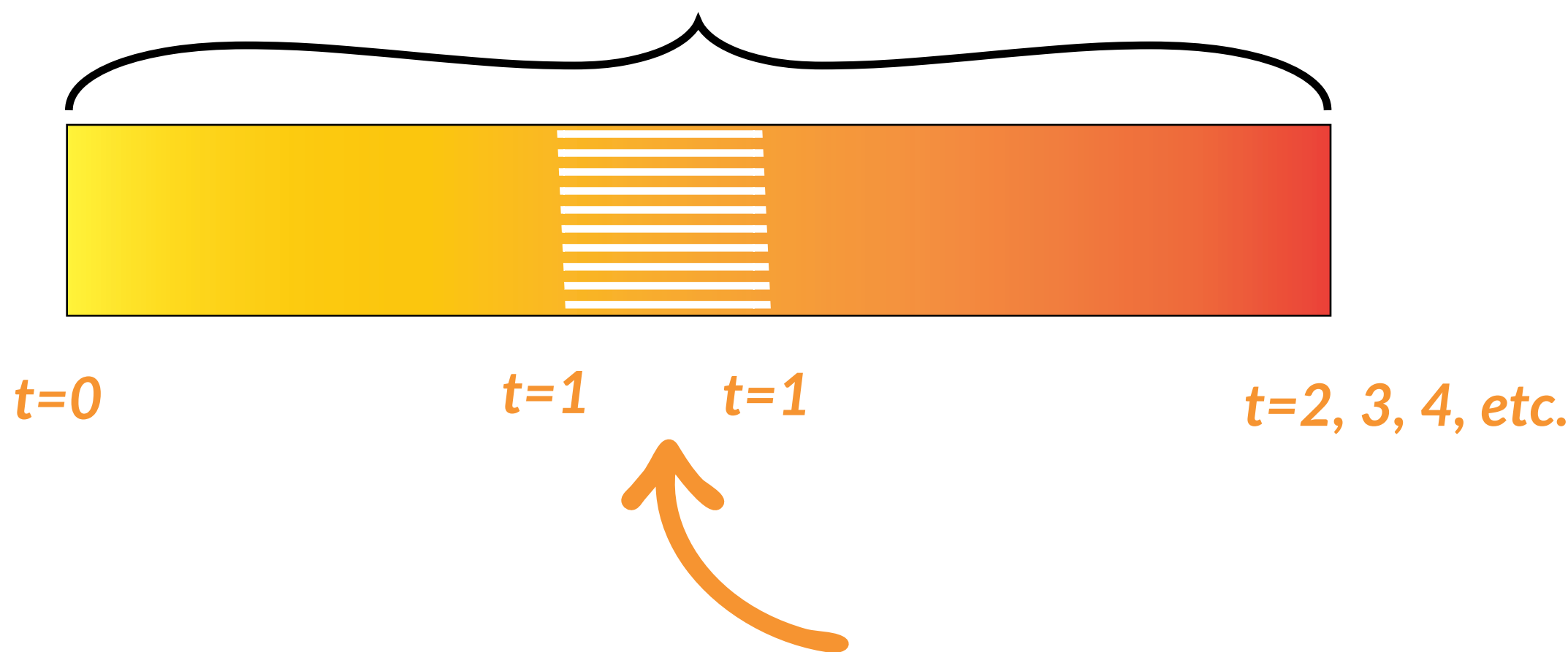
ACCELERATOR PROGRAM IMPACT
INCREMENTAL INCREASE IN CUMULATIVE FUNDING

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7.6 - 16 % more in cumulative funding

Ceteris Paribus

- *Number of Deals*
- *Cumulative Investors*
- *Investor Experience*
- *Investment Round*
- *Selection Endogeneity*
- *Funding Lifecycle*

7.6%

Accelerator experience
When considering accelerator programs like a policy intervention and invoking a natural experiment framework

16%

An endogeneous choice
After considering endogenous selection by programs to accept a firm, and the choice by a firm to access a program, cumulative funding increases by close to 16 percent

9.5%

Funding lifecyle vintage
Series B and C staged firms that have experienced an accelerator document higher cumulative funding funding
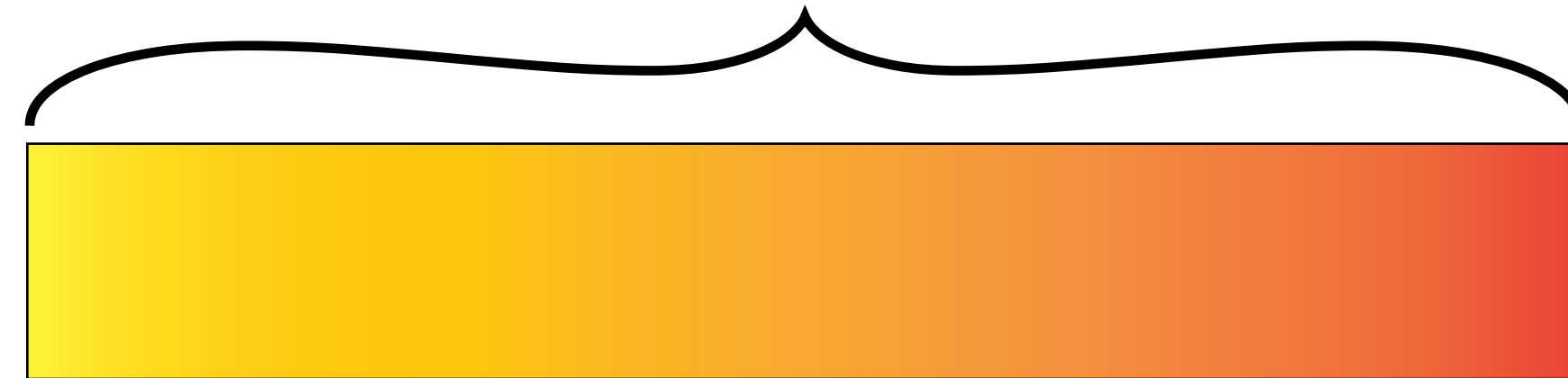
Firm Performance
across
Accelerator Programs

MEASURING PERFORMANCE ACROSS PROGRAMS

THE ROLE OF TIMING, PROGRAMING AND SPACE

Cumulative Funding for startup i across accelerator programs

Timing:

Accelerators are not always the start or end
- Startups receive grants, seed funding and sometimes debt
- Numerous types of programs give forms of follow on funding
- Can accelerate multiple times

Program:

Programs vary significantly over serveral areas:
- Duration
- Cohort size
- Equity stake
- Capital injection
- Demo Day exposure

Space:

Physical space is not the norm:
- Co-working space
- Shared-space
- Lab office space
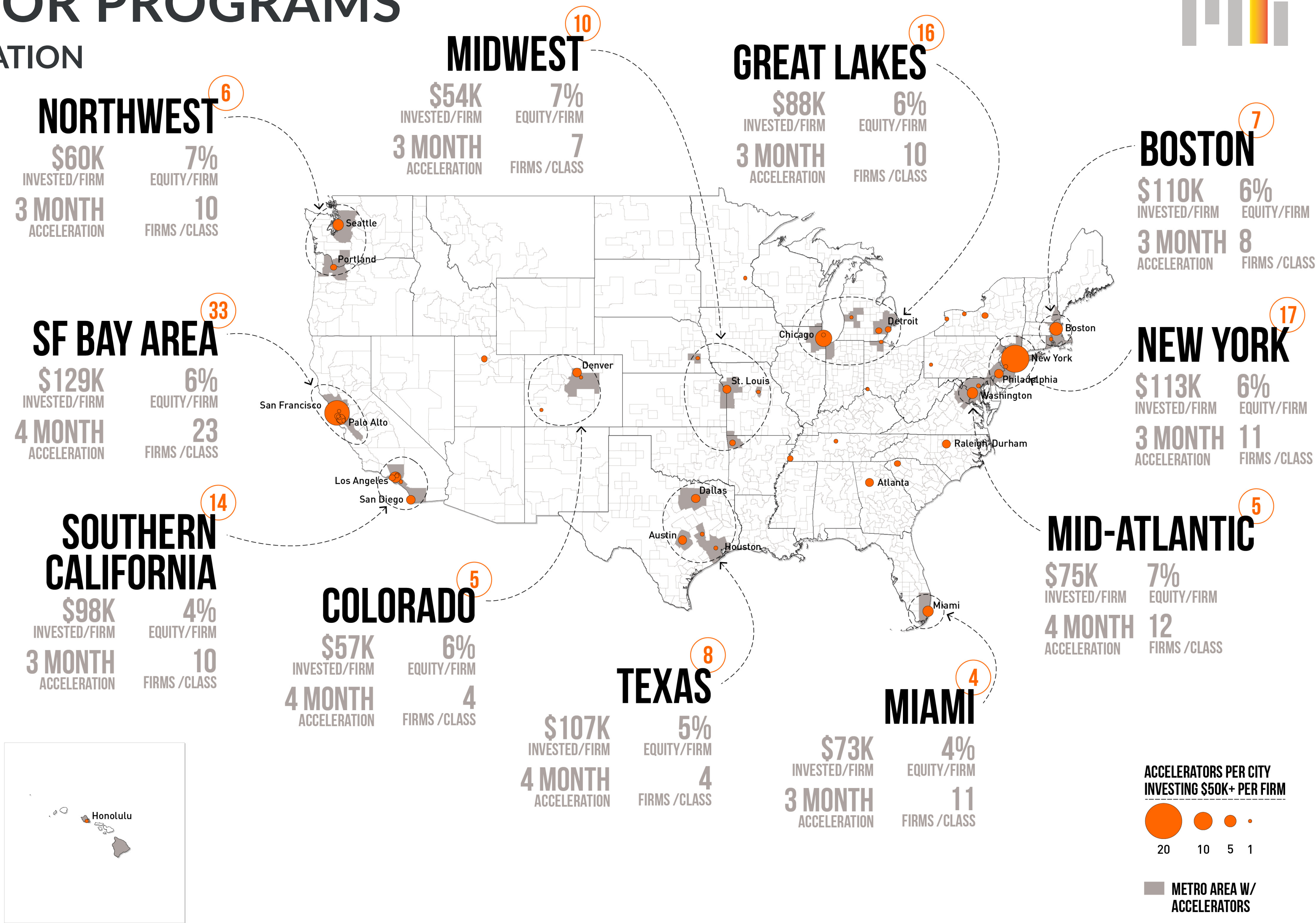
U.S. ACCLERATOR PROGRAMS

SAMPLE PROGRAM VARIATION

5.8%
EQUITY STAKE

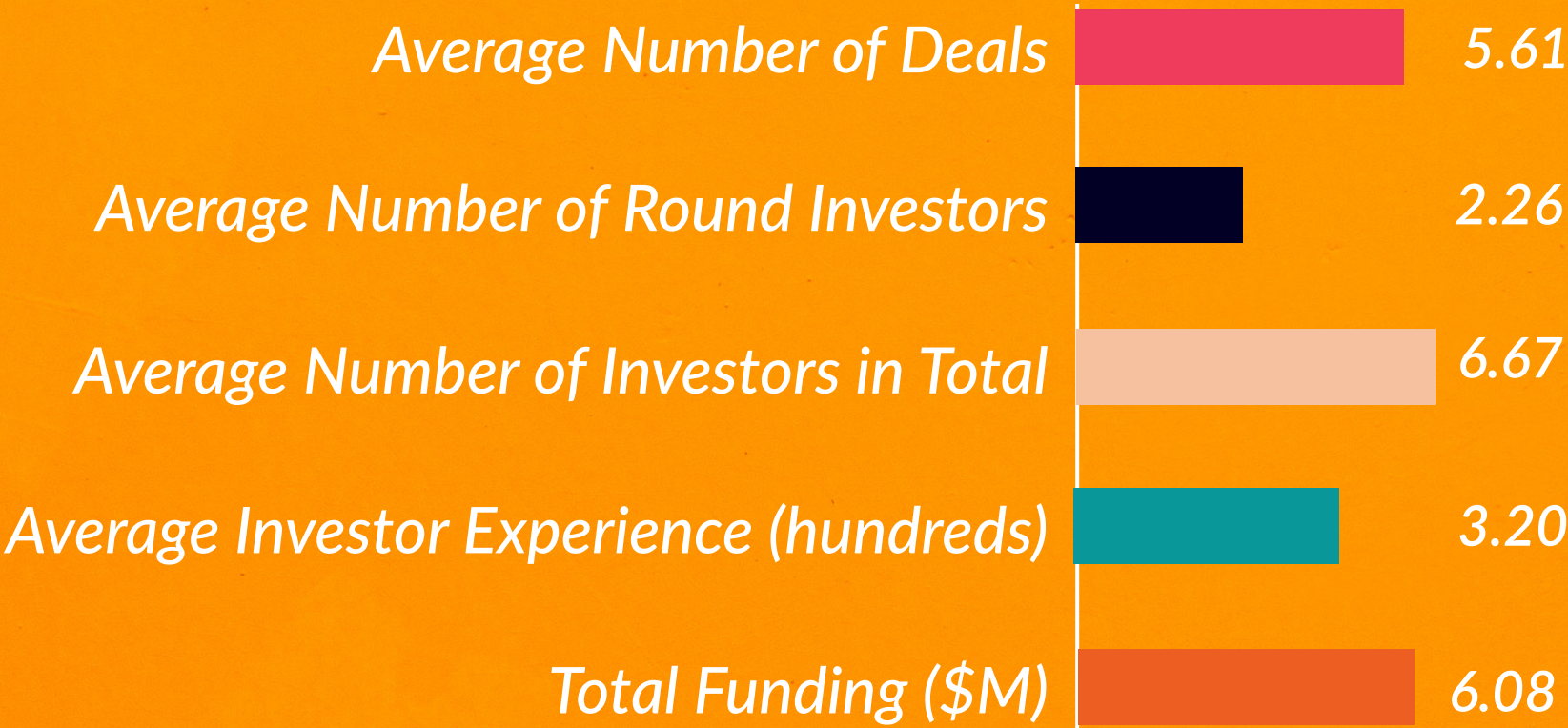**$90K**
INVESTMENT

3.4MTHS
DURATION

13 FIRMS
FIRMS/CLASS

95%
DEMO DAY

NORTHWEST (6)
$60K INVESTED/FIRM
7% EQUITY/FIRM
3 MONTH ACCELERATION
10 FIRMS/CLASS

SF BAY AREA (33)
$129K INVESTED/FIRM
6% EQUITY/FIRM
4 MONTH ACCELERATION
23 FIRMS/CLASS

SOUTHERN CALIFORNIA (14)
$98K INVESTED/FIRM
4% EQUITY/FIRM
3 MONTH ACCELERATION
10 FIRMS/CLASS

MIDWEST (10)
$54K INVESTED/FIRM
7% EQUITY/FIRM
3 MONTH ACCELERATION
7 FIRMS/CLASS

COLORADO (5)
$57K INVESTED/FIRM
6% EQUITY/FIRM
4 MONTH ACCELERATION
4 FIRMS/CLASS

GREAT LAKES (16)
$88K INVESTED/FIRM
6% EQUITY/FIRM
3 MONTH ACCELERATION
10 FIRMS/CLASS

BOSTON (7)
$110K INVESTED/FIRM
6% EQUITY/FIRM
3 MONTH ACCELERATION
8 FIRMS/CLASS

NEW YORK (17)
$113K INVESTED/FIRM
6% EQUITY/FIRM
3 MONTH ACCELERATION
11 FIRMS/CLASS

MID-ATLANTIC (5)
$75K INVESTED/FIRM
7% EQUITY/FIRM
4 MONTH ACCELERATION
12 FIRMS/CLASS

TEXAS (8)
$107K INVESTED/FIRM
5% EQUITY/FIRM
4 MONTH ACCELERATION
4 FIRMS/CLASS

MIAMI (4)
$73K INVESTED/FIRM
4% EQUITY/FIRM
3 MONTH ACCELERATION
11 FIRMS/CLASS

Map city labels: Seattle, Portland, San Francisco, Palo Alto, Los Angeles, San Diego, Denver, Dallas, Austin, Houston, Chicago, Detroit, St. Louis, New York, Philadelphia, Washington, Boston, Raleigh-Durham, Atlanta, Miami, Honolulu

ACCELERATORS PER CITY INVESTING $50K+ PER FIRM
20 10 5 1

METRO AREA W/ ACCELERATORS

ACCELERATOR PROGRAM TIMING
FUNDING AND PROGRAM EVENTS

Funding Signals

Accelerated Once
+
Pre- and Post-funding:

Average Number of Deals	5.61
Average Number of Round Investors	2.26
Average Number of Investors in Total	6.67
Average Investor Experience (hundreds)	3.20
Total Funding ($M)	6.08

Accelerated Once
+
No Funding:

Average Number of Deals	1.13
Average Number of Round Investors	1.02
Average Number of Investors in Total	1.02
Average Investor Experience (hundreds)	1.28
Total Funding ($M)	0.09

Pre- & Post-only Funding perform similarly

Accelerating multiple times performs too
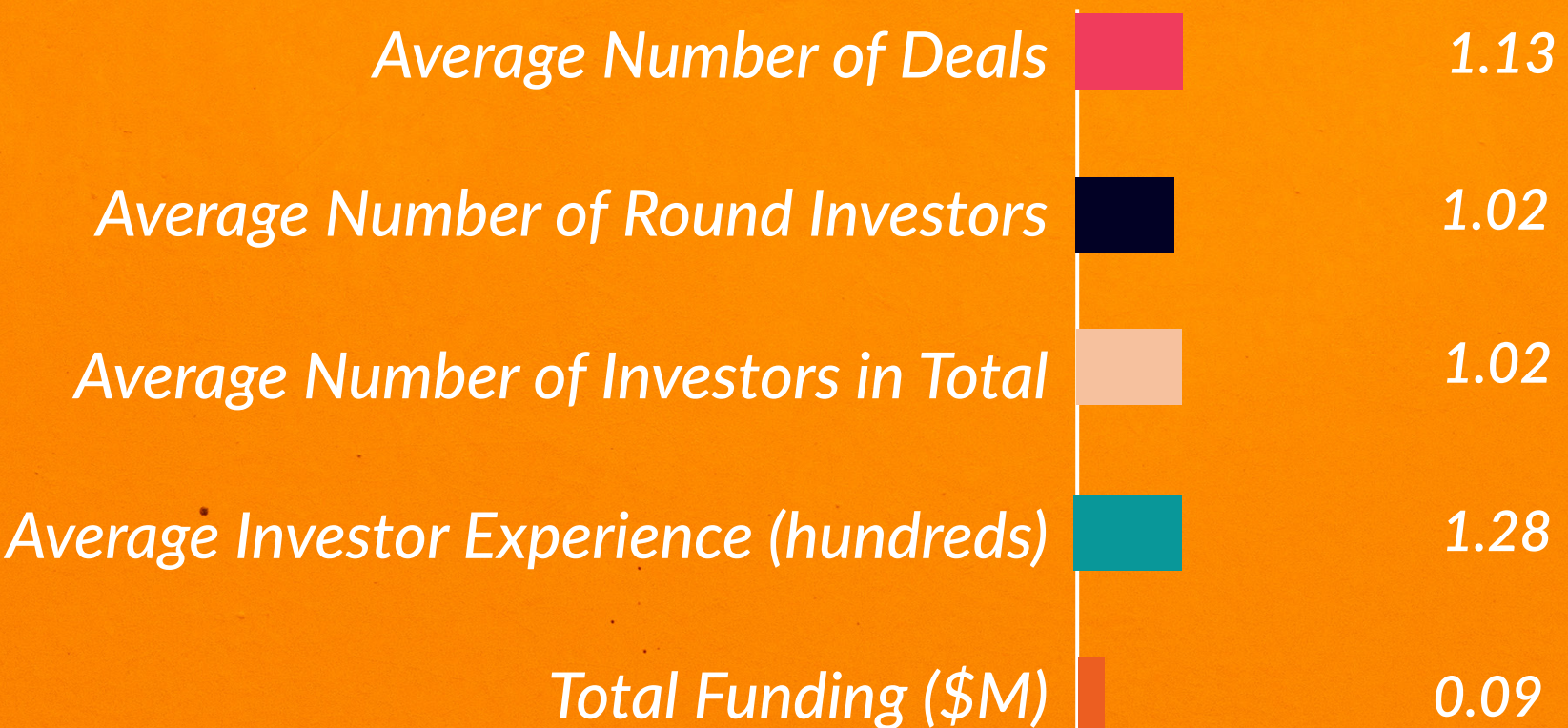
Funding acts as a signal to later investors

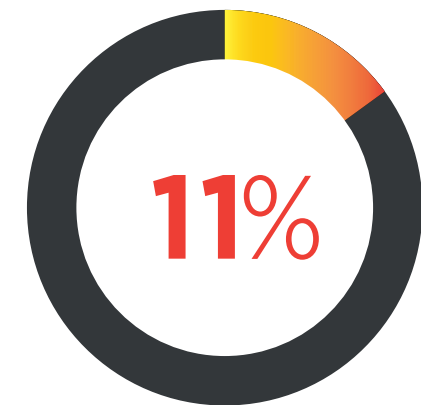# PHYSICAL SPACE TYPOLOGY
ANCHORING PRODUCTIVITY TO A PLACE

Physical space is NOT standard
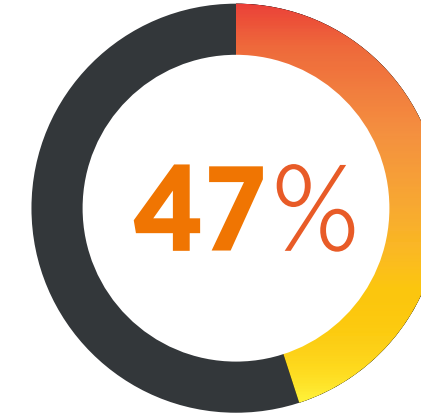
47% **Coworking**
The vast majority of space offered is in open and shared coworking space. In many cases, it is in rented coworking space by other providers
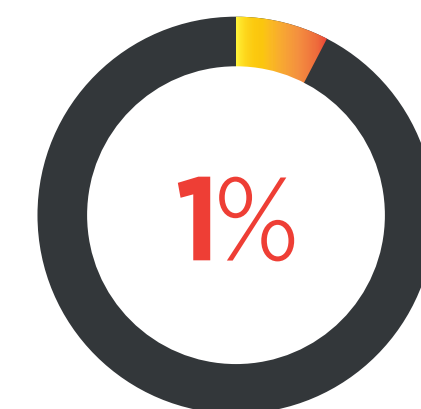
11% **Shared**
In some situations shared office spaces are available
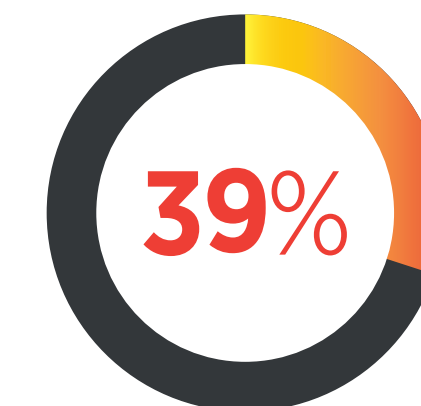
2% **Discounted**
In some situations discounted space is promoted for the programs

1% **Lab space**
In rare occurances, singular lab spaces are offered to each firm
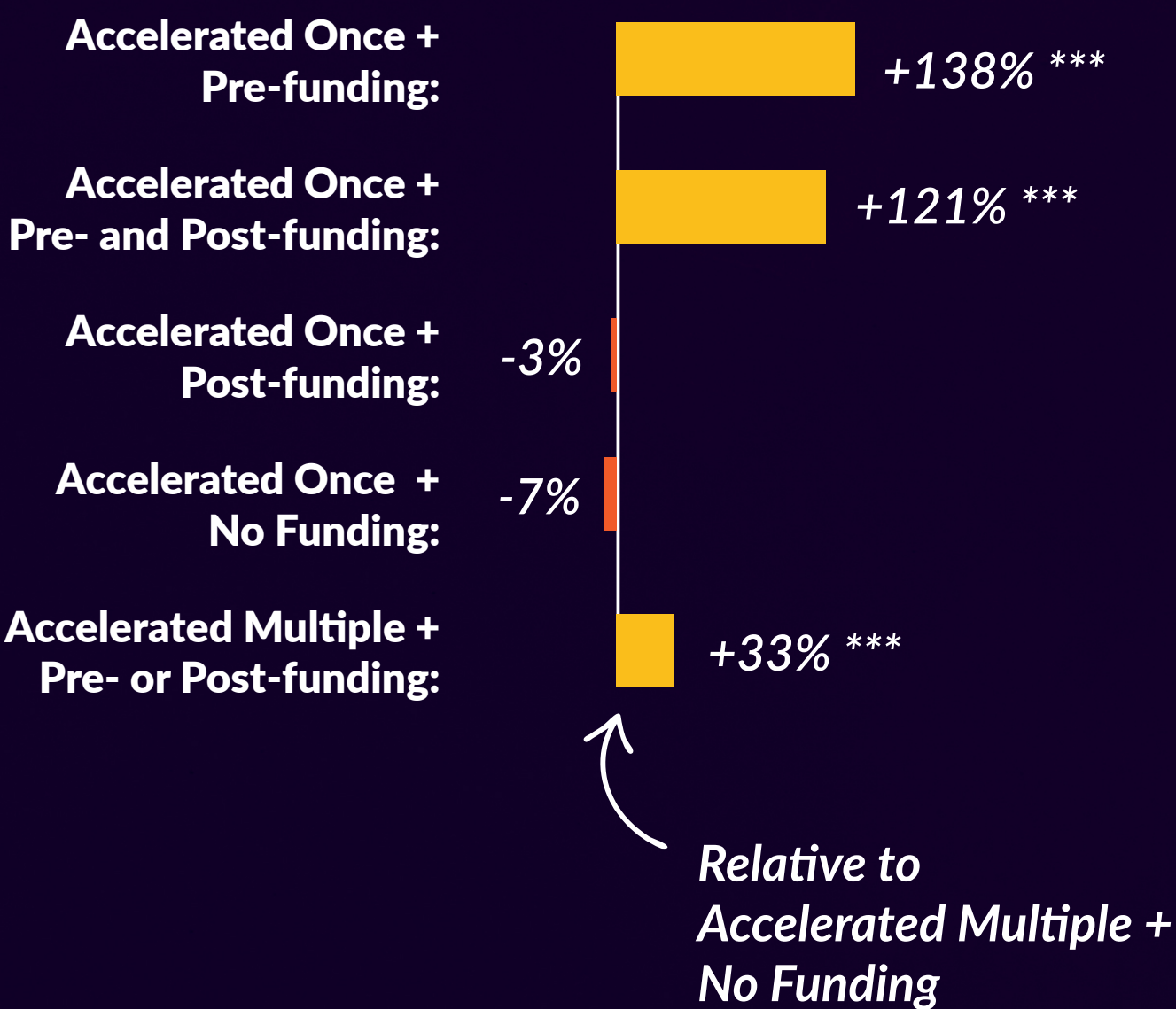
39% **NO space**
In numerous cases accelerator programs do not and cannot offer phsyical space due to budget constraints
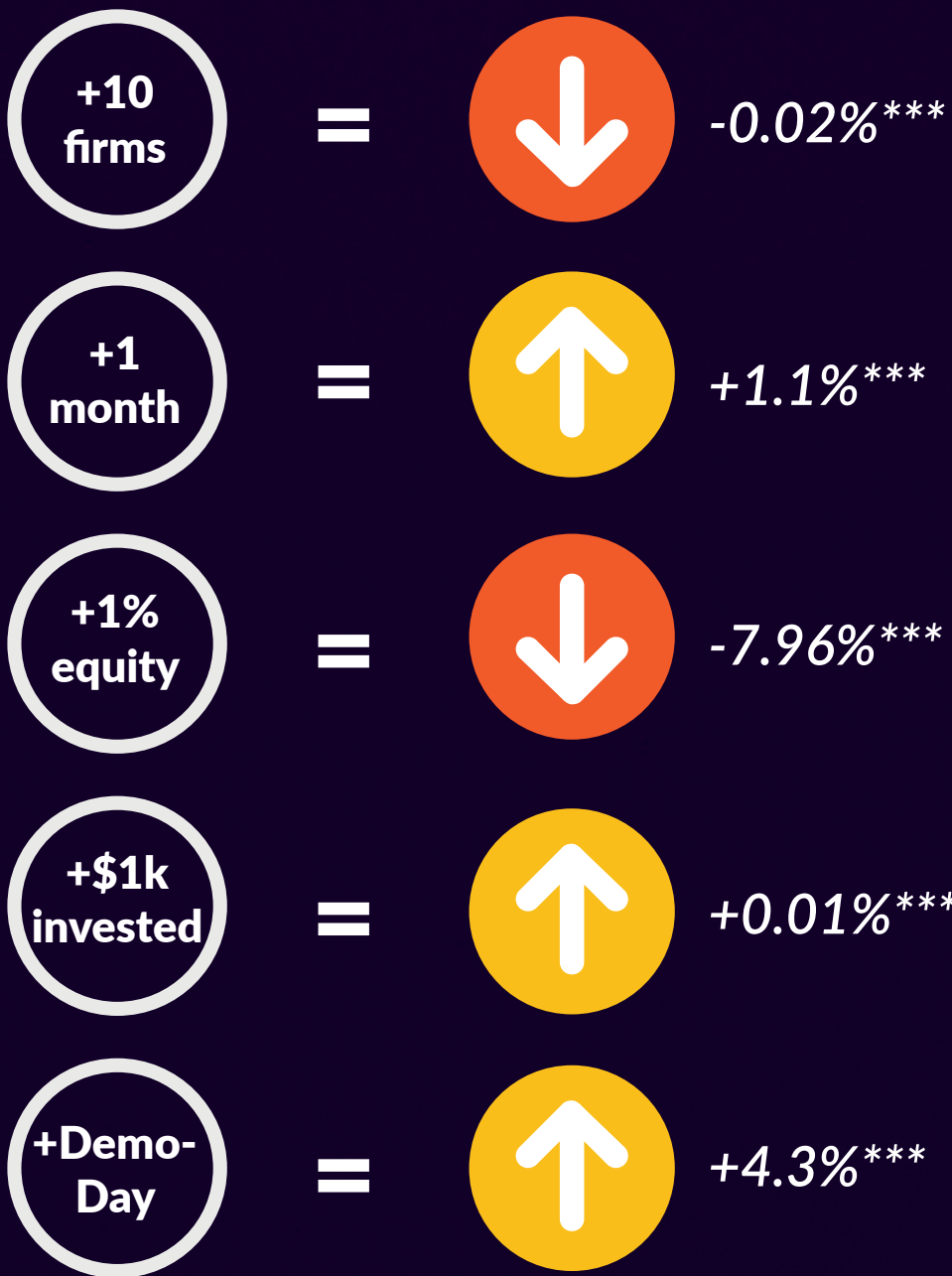
RESULTS: FIRM PERFORMANCE ACROSS PROGRAMS
CHANGES IN CUMULATIVE FUNDING FROM TIMING, PROGRAM AND SPACE

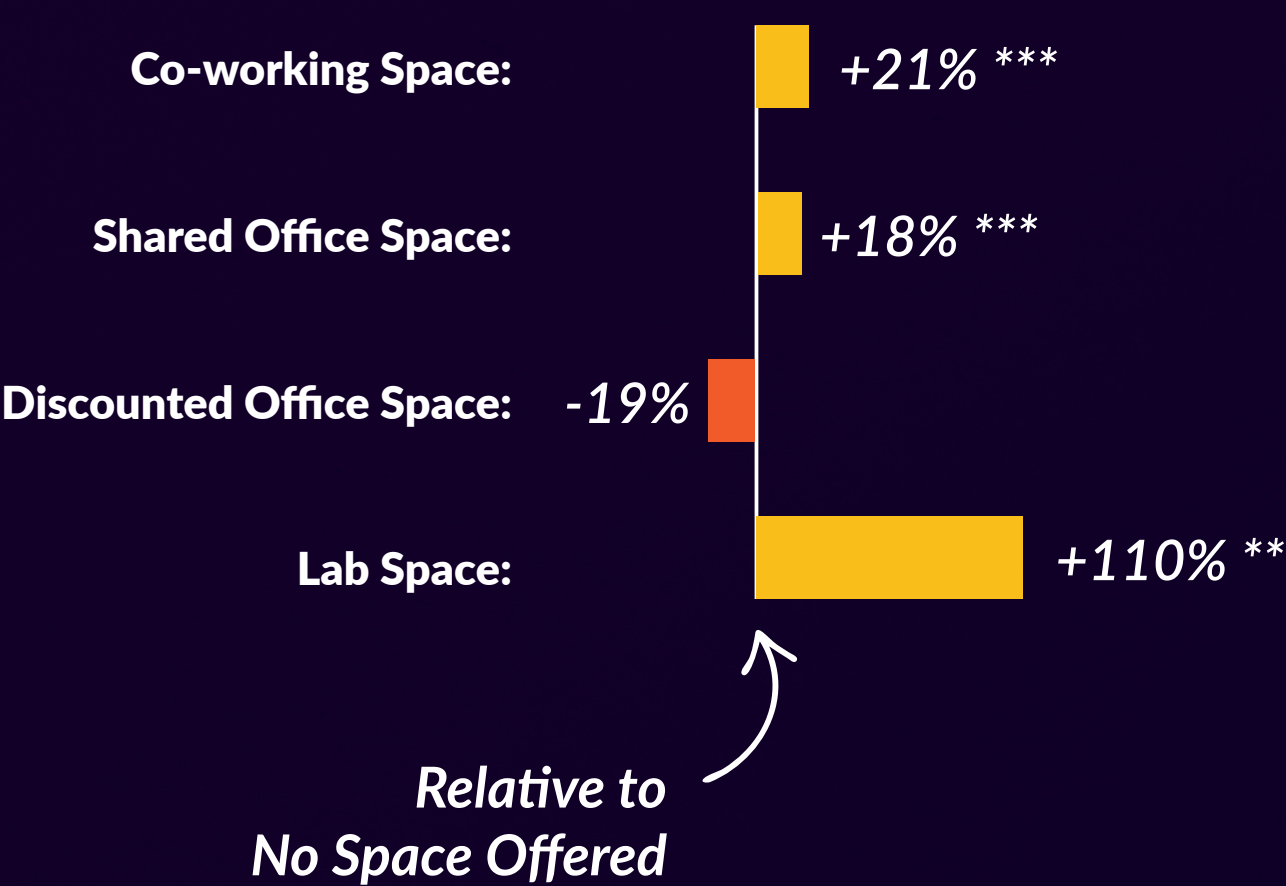### Timing:

Accelerated Once + Pre-funding: **+138% ***

Accelerated Once + Pre- and Post-funding: **+121% ***

Accelerated Once + Post-funding: -3%

Accelerated Once + No Funding: -7%

Accelerated Multiple + Pre- or Post-funding: +33% ***

Relative to Accelerated Multiple + No Funding

Signals investment screening

Program:

+10 firms = ↓ -0.02%***

+1 month = ↑ +1.1%***

+1% equity = ↓ -7.96%***

+$1k invested = ↑ +0.01%***

+Demo-Day = ↑ +4.3%***

Programming impacts later firm funding

Space:

Co-working Space: +21% ***

Shared Office Space: +18% ***

Discounted Office Space: -19%

Lab Space: +110% **
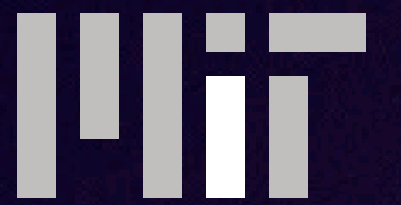
Relative to No Space Offered

Space matters

KEY TAKE AWAYS FOR ENTREPRENEURSHIP STUDIES
TIMING, PROGRAM AND SPACE MATTER

Investor Experience Counts

Accelerator programs make a difference in cumulative funding when considering their endogeneity for firm selection and choice

Program Benefits Help Firms

Accelerator programs that take too many firms, are too short, take too much equity, that don't give capital and/or don't have a demo day hurt firms cumulative funding

Funding Signals Build Rhythm

Accelerator programs receive signals from pre-funding and give signals to private sector investors for follow-on funding. This matters for long-term investment outcomes

Space Matters

Space is not a given by programs and this can actually make a difference in the long-term performance of firms