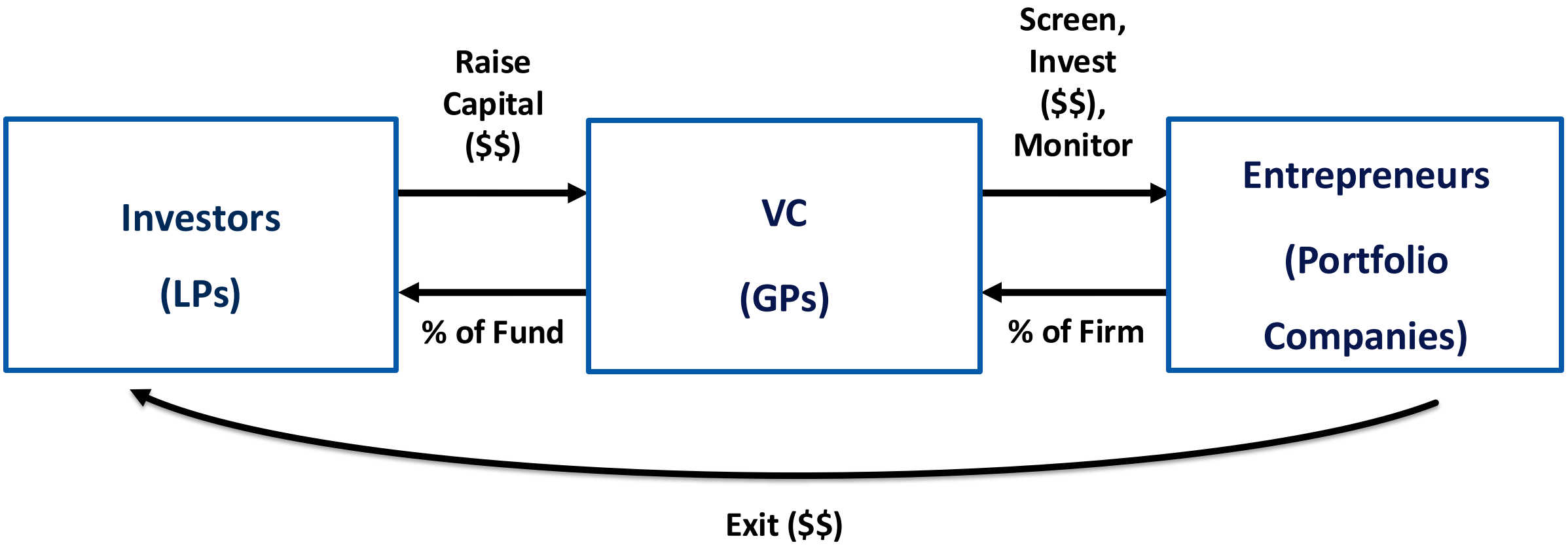
MICHIGAN ROSS

Winter 2025

FIN 623: Venture Capital Finance

Valuation Part I

Reminder


Investors
(LPs)
Raise
Capital
($$)
% of Fund
VC
(GPs)
Screen,
Invest
($$),
Monitor
% of Firm
Entrepreneurs
(Portfolio
Companies)
Exit ($$)

Unique Features of VC Investments

- Large, negative cash flows in first years
  - Significant investment by firm
- Huge potential rewards if successful
  - Uncertainty of success
  - Patents, networks effects, scale economies
- Valuation estimates quite sensitive to assumptions

Evaluating Early-Stage Startups

- Extremely Hard!

- VCs rarely construct a fully fledged DCF model for pre-revenue companies
  - Hardly any information on the company
  - High uncertainty around the viability of the idea
  - No historical data exists to generate projections of cash flows in the future or construct a full-fledged DCF model
  - Typically, no positive cash flows yet
  - Innovative ideas make it hard to assess the proper market and find the correct comparables

Road Map

Characteristics Correlated to Value	The "Sweet Spot" Method	The VC Method	Modified DCF
❑ How large is the opportunity? ❑ What level of risk does the opportunity entail?	❑ How much **cash** does the company need to accomplish the next milestone? ❑ How much **ownership** is required to exert appropriate control without undermining the founders' incentives?	❑ At time of exit, how **large** is the market, how **profitable** will the company be, and what investors pay per dollar of profit? ❑ What is the **probability** of a successful exit?	❑ How much cash will the company generate during the **early years**? ❑ How much cash will the company generate at **maturity**?
Qualitative Approach	**Objective Valuation**	**Subjective Valuation**	

Least Data-Driven
Based on Market Demand

Most Data-Driven
Based on Performance Expectations

Plan for today

Part I: Terminology

Part II: The “Sweet Spot” Method

Part III: The VC Method

Part I: Terminology

What Is Valuation?

- **Publicly Listed Company**

Valuation = Market Capitalization = Share Price x Number of Shares Outstanding

Tesla Inc.

AFTER HOURS

$393.33

▼ -1.61 -0.41%

After Hours Volume: 2.7M

Last Updated: Jan 8, 2025 at 7:45 p.m. EST
- Delayed quote

CLOSE	CHG	CHG %
$394.94	0.58	0.15%

KEY DATA

OPEN $392.95	DAY RANGE 387.40 - 402.50
52 WEEK RANGE 138.80 - 488.54	MARKET CAP $1.27T
SHARES OUTSTANDING 3.21B	PUBLIC FLOAT 2.8B
BETA 1.63	REV. PER EMPLOYEE $691.59K
P/E RATIO 108.19	EPS $3.65

Value of Tesla is 1.27T = $393.33 x 3.21B

What Is Valuation?

ANTHROP\C

THE WALL STREET JOURNAL.

- **January 7, 2025:** Anthropic Raised $2B in a $60B Valuation
- Does Anthropic's $60B Valuation = Market Cap?

NO!

Valuation After a Financing Round Fails to Consider the Fact that VCs Receive Preferred Shares

- Preferred Shares Are **MORE** Valuable than Common Shares

AI Startup Anthropic Raising Funds Valuing It at $60 Billion

Amazon-backed OpenAI rival was valued at $18 billion last year

By Berber Jin Follow

Updated Jan. 7, 2025 4:50 pm ET

81 Gift unlocked article Listen (3 min)

Dario Amodei, chief executive of Anthropic, at an event in Paris last year. PHOTO: JULIEN DE ROSA/AGENCE FRANCE-PRESSE/GETTY IMAGES

Anthropic is in advanced talks to raise $2 billion in a deal that would value it at $60 billion, more than triple its valuation from a year ago.

The funding round is being led by the venture firm Lightspeed Venture Partners, people familiar with the matter said. The $60 billion valuation includes the money Anthropic plans to raise in the round.

Pre-Money and Post-Money Valuation

- **Post-Money Valuation** is a company's valuation after a financing round
  - Equal to: **Investment in Financing Round/Proposed Ownership Share (%)**
  - Or Equal to: **Price Per Share at Which x Total Number of Fully-Diluted Shares Post-Financing**
  - **Fully-Diluted Shares** are the total number of shares outstanding assuming the conversion of preferred shares and the exercise of outstanding options
- **Pre-Money Valuation** is a company's valuation before a financing round
  - Equal to: **Post-Money Valuation – Investment in Financing Round**
  - Or Equal to: **Price Per Share x Total Number of Fully-Diluted Shares Pre-Financing**

Total Valuation > Post-Money Valuation → Investment is NPV > 0

- **Total Valuation** is a subjective estimate of a company's value

Examples

- *"We'll put in $4M based on a $6M pre-money".*
  - **Post-Money Valuation = Pre-Money Valuation + Investment in Financing Round**
  - **Post-Money Valuation =** $6M + $4M = $10M

- *"I'm looking for two-fifths of the company post, and for that I'll put in the four".*
  - **Post-Money Valuation = Investment in Financing Round/Proposed Ownership Share (%)**
  - **Post-Money Valuation =** $4M/0.40 = $10M

- *"It's worth six pre-money, and I want to own 40% after we close".*
  - **Post-Money Valuation = Pre-Money Valuation + Investment in Financing Round = Investment in Financing Round/Proposed Ownership Share (%)**
  - **Investment in Financing Round +** $6M **= Investment in Financing Round**/0.40 or **Investment in Financing Round** = $4M or **Post-Money Valuation =** $6M + $4M = $10M

Pricing Versus Valuation

	Definition
Post-Money Valuation	Pricing of a Company After a Financing Round Objective Estimate
Total Valuation	What VCs Think the Company is Actually Worth Company's Fundamental Value Subjective Estimate

Total Valuation > Post-Money Valuation → Investment is NPV > 0

Valuation Over Time

- **Staged Investment** impacts existing investors and founders

- **Up Round**
  - **Pre-Money Valuation in Current Round > Post-Money Valuation in Previous Round**

- **Down Round**
  - **Post-Money Valuation in Last Round > Pre-Money Valuation in Current Round**
  - Particularly dilutive for non-participating investors or founders

Part II: The “Sweet Spot” Method

Road Map

Characteristics Correlated to Value	The "Sweet Spot" Method	The VC Method	Modified DCF
❑ How large is the opportunity? ❑ What level of risk does the opportunity entail?	❑ How much **cash** does the company need to accomplish the next milestone? ❑ How much **ownership** is required to exert appropriate control without undermining the founders' incentives?	❑ At time of exit, how **large** is the market, how **profitable** will the company be, and what investors pay per dollar of profit? ❑ What is the **probability** of a successful exit?	❑ How much cash will the company generate during the **early years**? ❑ How much cash will the company generate at **maturity**?
Qualitative Approach	**Objective Valuation**	**Subjective Valuation**	

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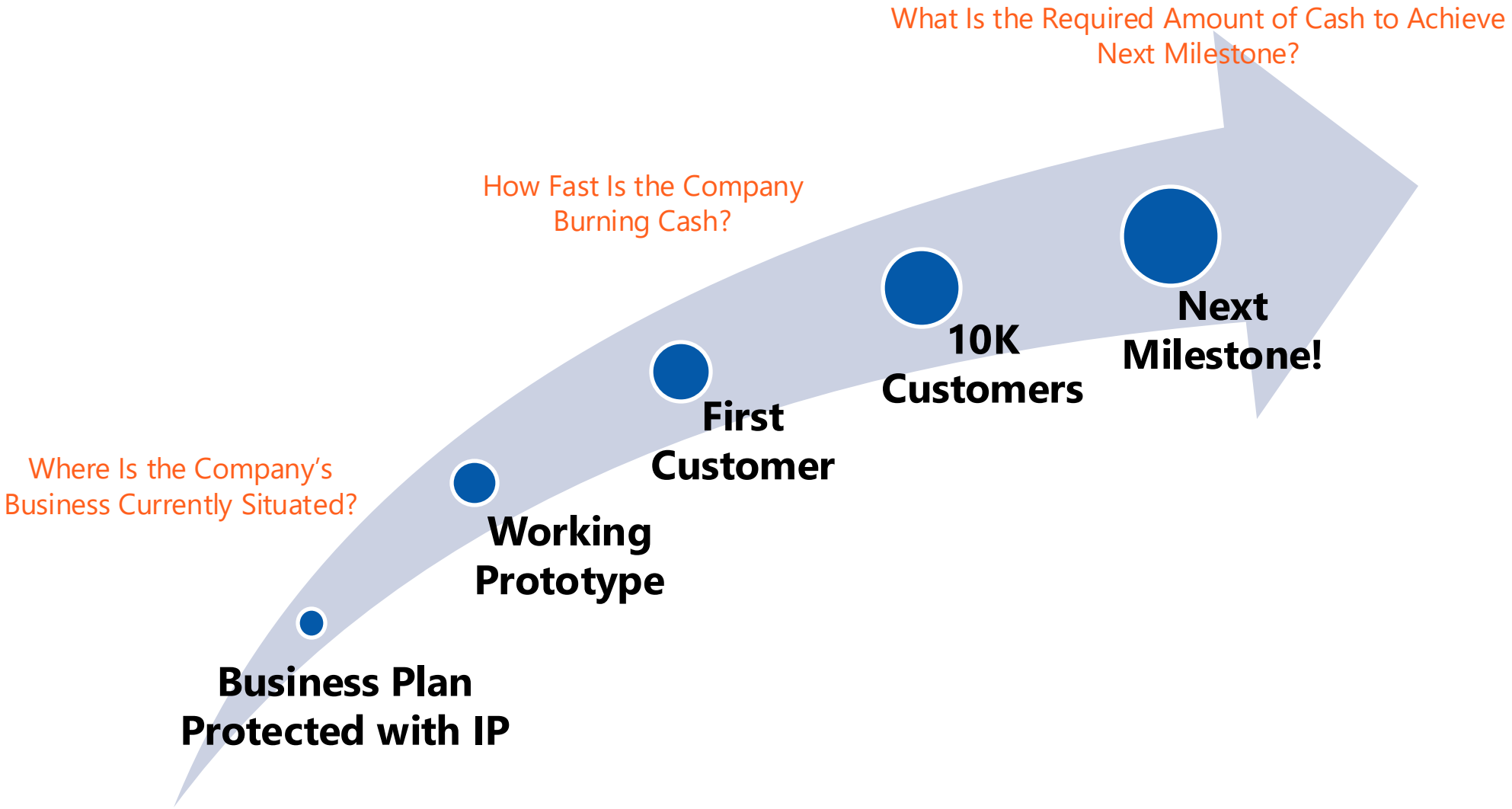
The “Sweet Spot” Method

- The Method is a **practical tool** to value a company. Used in cases where information is scarce, and a formal method provides only limited contribution to improving valuation accuracy.

Step 1: Estimate the Amount of Cash Required to Reach the Next Milestone

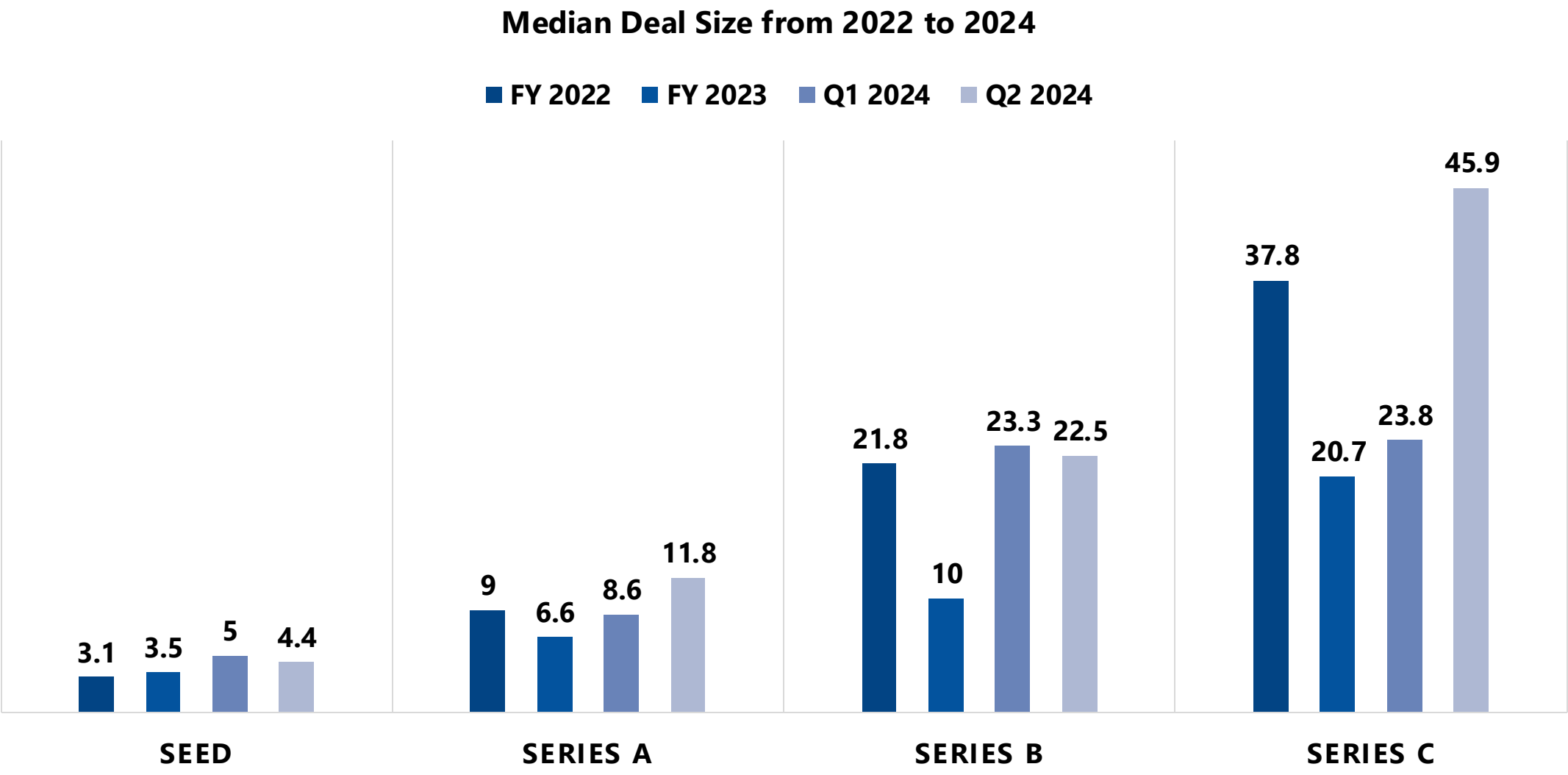
Step 2: Estimate the Level of Ownership Required to Exert the Desired Level of Control

Step 1: Required Cash



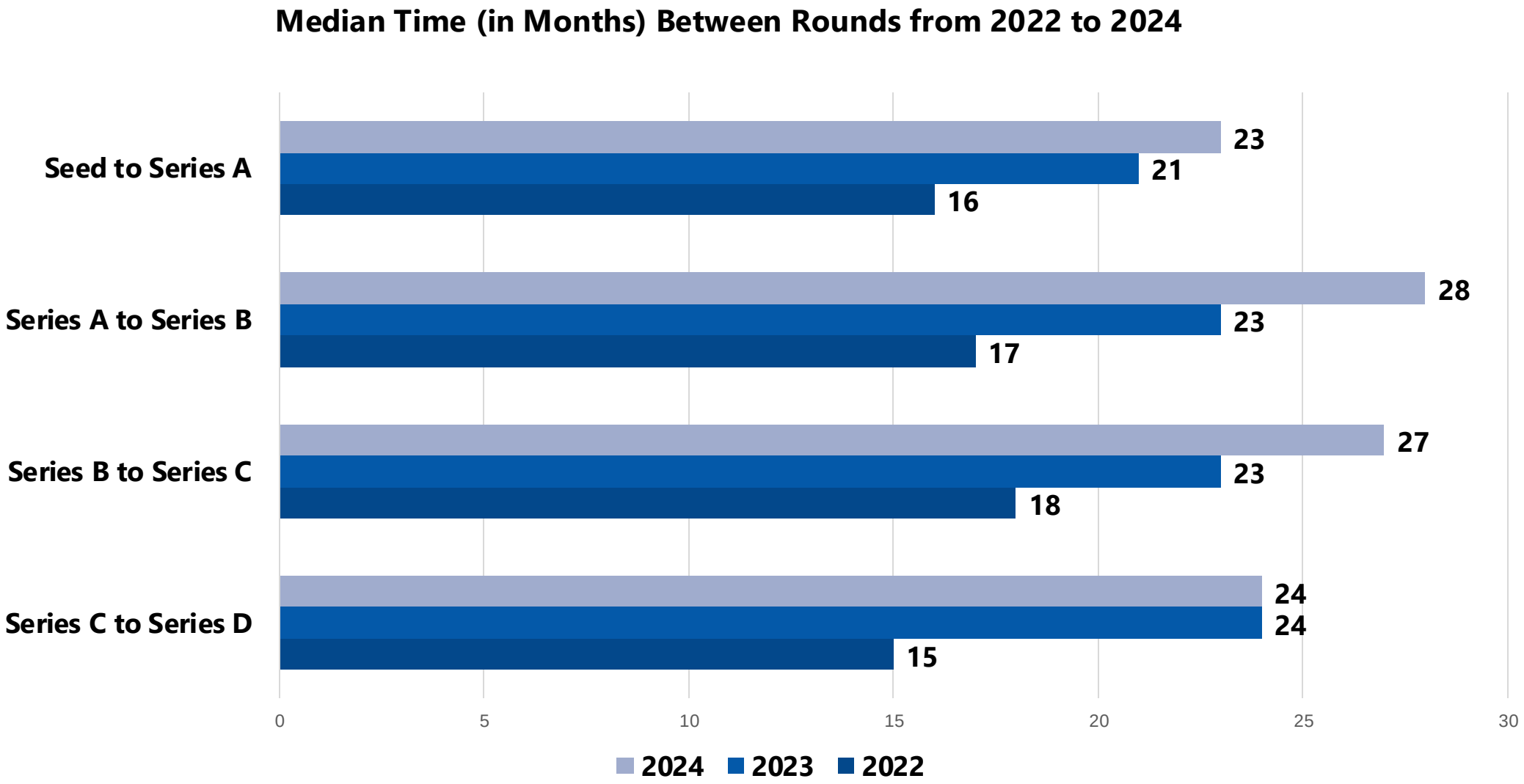
Source: Framework by David Wessels and Jonathan Zandberg

Step 1: Required Cash



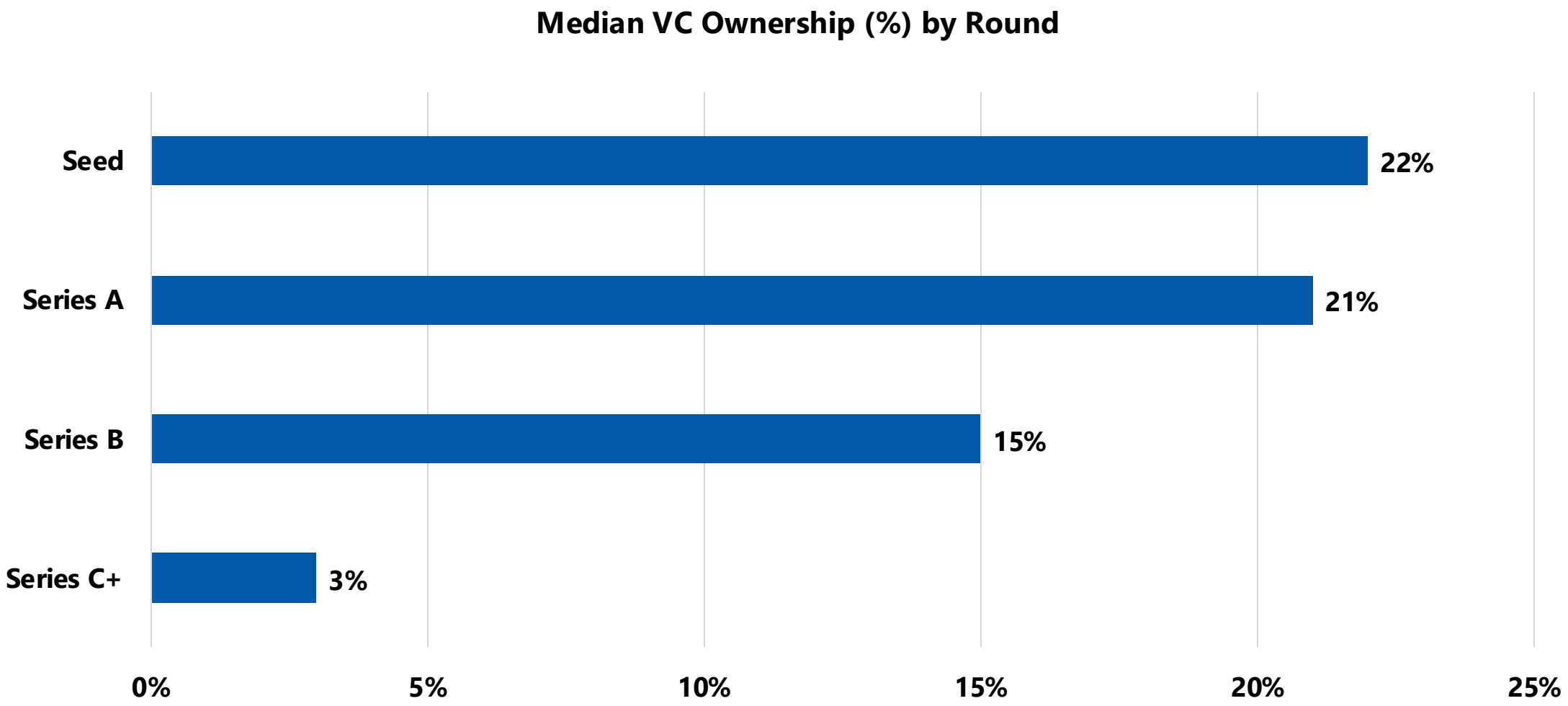
Source: Wilson Sonsini, The Entrepreneur Report 1H 2024

Step 1: Required Cash



Source: CB Insights

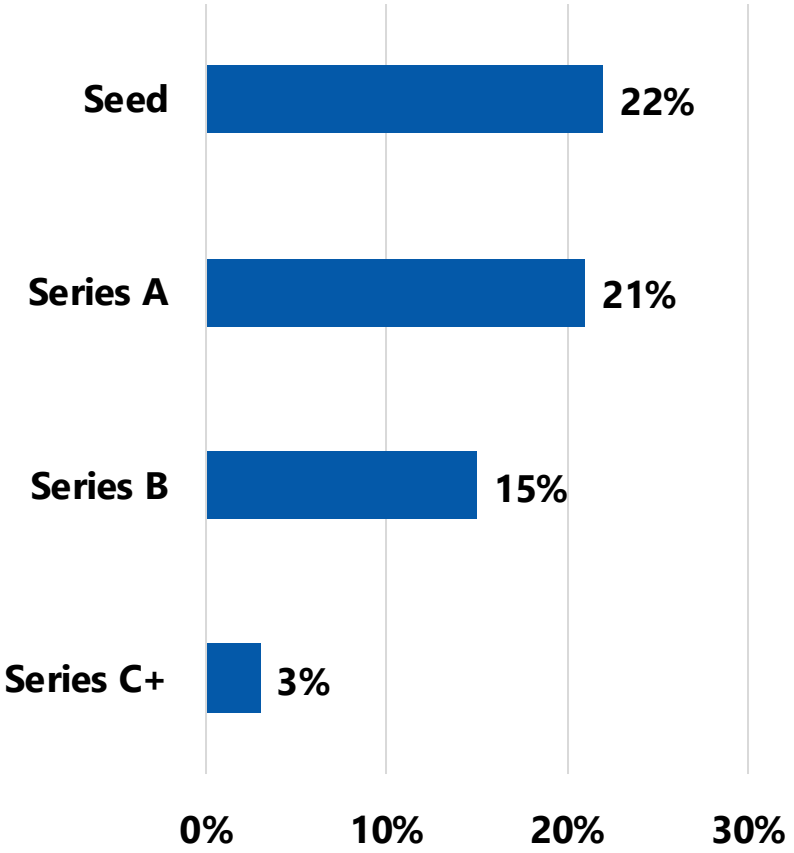
Step 2: Required Ownership



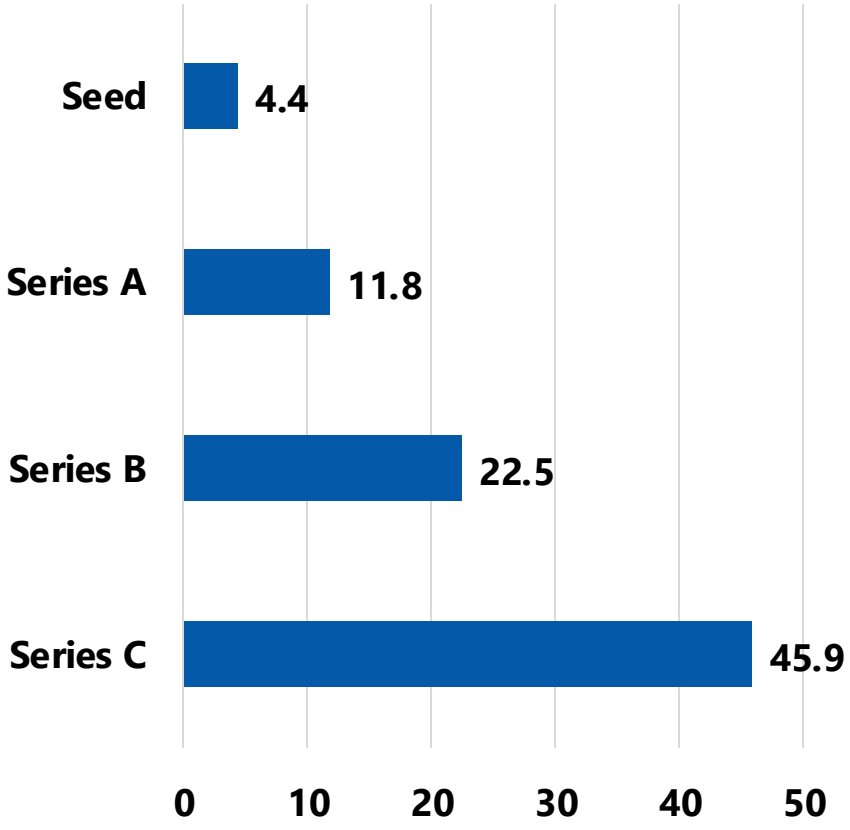
Source: Wilson Sonsini, The Entrepreneur Report 1H 2024

Implied Post-Money Valuation

Median VC Ownership (%) by Round



Median Deal Size ($M)



Implied Post-Money Valuation

$4M/0.22 = $20M

$11.8M/0.21 = $56.2M

$22.5M/0.15 = $150M

$45.9M/0.03 = $1,530M

Source: Wilson Sonsini, The Entrepreneur Report 1H 2024

Part III: The VC Method

Road Map

Characteristics Correlated to Value	The "Sweet Spot" Method	The VC Method	Modified DCF
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The VC Method

- The VC Method is a **simplified version** of the Discounted Cash Flow (DCF) Method. The DCF Formula is as follows:

$$P_0 = \sum_{t=1}^{N} PV(\text{Expected Cash Flow}_t) = \sum_{t=1}^{N} \frac{E(CF_t)}{(1+r)^t}$$

$$E(CF_t) = \sum_{i=1}^{N} p_i CF_{t,i} = p_1 CF_{t,1} + p_2 CF_{t,2} + \ldots + p_N CF_{t,N}$$

- The VC Method simplified the DCF Formula by:
  - Focusing Only on the Cash Flows at the Time of the Exit
  - Considering Only the Following Possible Scenarios: Exit and Failure

The VC Method

- The Total Valuation of a Startup is Equal to:

$$\text{Total Valuation}_0 = \frac{(1 - \mathrm{p}_{\mathrm{Exit}}) \times 0 + \mathrm{p}_{\mathrm{Exit}} \times \mathrm{E}(\mathrm{CF}_{\mathrm{Exit}})}{(1 + \mathrm{r}_{\mathrm{VC}})^{\mathrm{T}}}$$

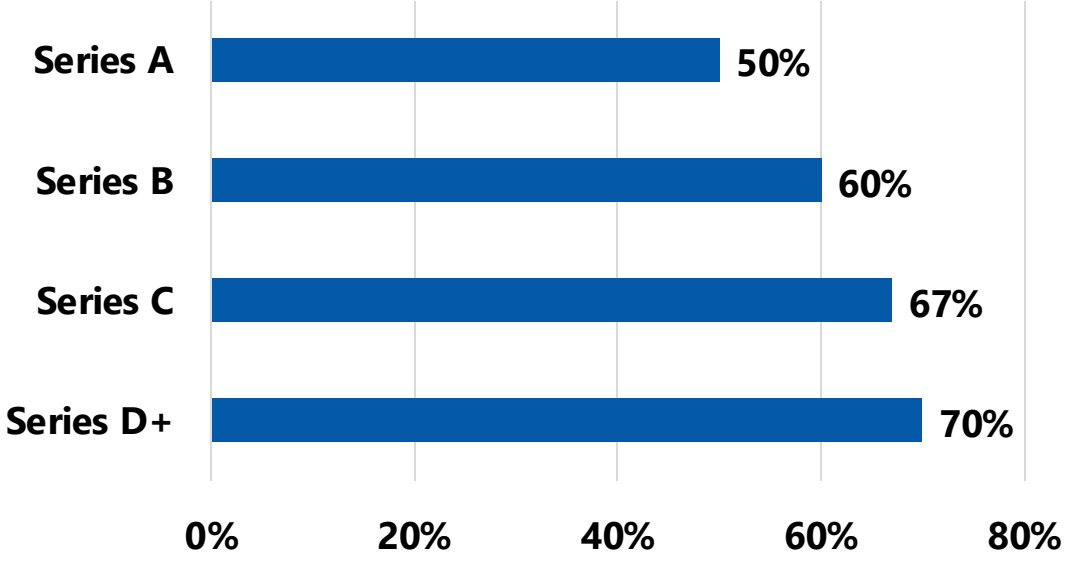
$$\mathrm{E}(\mathrm{CF}_{\mathrm{Exit}}) = \text{Retention (\%)} \times \text{Exit Value}$$

- The **Probability of a Successful Exit** is Equal to $\mathbf{p_{Exit}}$
- **Failure** is Associated with a Cash Flow to the Shareholders Equal to 0
- **Retention** is the Fraction of Equity Remaining to VCs After Exit
- **Exit Value** is the Cash Flow to Shareholders of the Startup Conditional on a Successful Exit
- **T** is Time in Years to Exit and $\mathbf{r_{VC}}$ is VC Cost of Capital

Retention (%)

$$\text{Retention (\%)} = \frac{\text{Expected Ownership Share at Exit (\%)}}{\text{Current Ownership Share (\%)}}$$

- Reflects **dilution** of VC investors between current financing round and exit
  - Reflects a startup's **capital needs** to reach the exit stage
  - VCs **adjust** retention rates depending on **industry**, **company stage**, and **market conditions**



Question: In Which Company Are Seed VCs Expected to Have a Higher Retention Rate?

A. Startup Creating a Version of Twitter in France

B. Startup Creating Reusable Rockets for Transatlantic Travel

Source: Based on Observed Successful Exits

Investment Recommendation

- VC Funds Own **Only** a Fraction of the Entire Startup
- Determine the VC Fund's **Partial Valuation** by Considering the Level of Proposed Ownership

$$\text{Total Valuation}_0 = \frac{\text{Retention (\%)} \times p_{\text{Exit}} \times \text{Exit Value}}{(1 + r_{VC})^T}$$

$$\text{Partial Valuation} = \text{Total Valuation}_0 \times \text{Proposed Ownership Share (\%)}$$

Investment Recommendation:

- Partial Valuation > Required Investment → **INVEST**
- Partial Valuation < Required Investment → **DO NOT INVEST**

VC Method: Example 1

In considering the Series A $4M investment for 25% proposed ownership Michigan Ventures IV estimates that the company has a 20% probability of success, a (successful) exit valuation of $250M in 5 years, and that future financing rounds will double the company's total share count before exit. Use 16% as your cost of capital.

1. What is the total valuation of the company today (after the investment)?
2. What is the partial valuation of the company today for Michigan Ventures IV?
3. What is Michigan Ventures IV's investment recommendation?

VC Method: Example 1

Inputs:

- Investment= $4M
- Proposed Ownership = 25%
- p_{Exit} = 20%
- Exit Valuation = $250M
- Years to Exit (T) = 5 Years
- r_{VC} = 16%
- 2x Share Count Prior to Exit

To Find Retention Rate:

- Company Issued 2x Share Prior to Exit and Currently Michigan Ventures IV's Owns 25% of Total Shares:

  # of Shares Owned by Michigan Ventures IV = 0.25 x # of Total Current Shares

- Expected Ownership Share at Exit:

  (0.25 x # of Total Current Shares) / (2 x # of Total Current Shares) = 0.125

- Retention Ratio = 0.125/0.25 = 0.5 = 50%

$$\text{Total Valuation}_0 = \frac{\text{Retention} \times p_{\text{Exit}} \times \text{Exit Value}}{(1 + r_{VC})^T} = \frac{0.5 \times 0.2 \times \$250\text{M}}{(1 + 0.16)^5} = \$11.9\text{M}$$

$$\text{Partial Valuation} = \text{Total Valuation}_0 \times \text{Proposed Ownership Share} = \$11.9\text{M} \times 0.25 = \$2.98\text{M}$$

Investment Recommendation: DO NOT INVEST!

Partial Valuation ($2.98M) < Investment Amount ($4M)

VC Method Steps

- Use the VC Method to bargain over Ownership Share:
  - **Step 1**: Forecast sales or earnings for a period of years
  - **Step 2**: Estimate the time at which the VC will exit the investment (typically through an IPO or sale to strategic buyer)
  - **Step 3**: Value the exit price based on an assumed multiple of earnings or sales or customers, etc. The multiple is typically based on comparable public companies or comparable transactions
  - **Step 4:** Discount investment and exit value at rates ranging from 25% - 80%
  - **Step 5**: Forecast dilution from future rounds
  - **Step 6:** Determine the VC's required ownership

VC Method: Example 2

Offer: Invest $5m in Ross.com?

- Ross.com:
  - VC invests $5 million in Series A
  - Target return: 50%
  - Exit in 5 years
  - Probability of exit: 1
  - Earnings in year 5 estimated at $1 million
  - Valuation multiple: 100x earnings
  - No follow-up rounds

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cash flows	-5	0	0	0	0	100

VC Method: Example 2

- Step 1: Forecast sales or revenues – Earnings of $1m in year 5
- Step 2: Forecast company exit timing – after 5 years
- Step 3: Forecast exit multiple – it will go public at a multiple of 100x earnings for a value of $100M.
- Step 4: Valuation at 50% Discount Rate
  - Post-money = $100M/(1.50)^5 = $13.2M
  - Pre-money value = $13.2M-$5M = $8.2M
- Step 5: Forecast future rounds – none needed here.
- **Step 6: Determine the VC's required ownership…**

VC Method: Example 2

Step 6: VC share

- You can apply our formula
  - Post-money valuation after series A (using 50% target return as discount rate):

$$Total\ Valuation = \frac{Retention\ * p_{Exit} *\ Exit\ Value}{(1 + target\ return)^T} = \frac{Exit\ Value}{(1 + target\ return)^T} = \$13.2\ million$$

  - VC invests $5 million a receives share of 5/13.2 = 38% in Series A
  - No dilution (100% retention) so VC owns 38% at exit

- Our Investment rule implies $Ownership * Total\ Valuation \geq Investment$:

$$Ownership \geq \frac{Investment \times (1 + target\ return)^T}{Retention\ \times\ p_{Exit} \times\ Exit\ Value}$$

$$Ownership \geq \frac{5 \times (1 + 50\%)^5}{1 \times\ 1 \times\ (1\ \times 100)} = 38\%$$

VC Method: Example 2

Step 6: Share price

- VC will ask for a share s = 5/13.2 = 38.0% equity stake to invest $5M

- Assume N_e = 1M shares outstanding prior to financing

- How many new shares, *N_vc*, does the VC get?
  - Total shares T= N_e+N_vc, N_vc=sT, so
  - $s = \frac{N_{vc}}{N_e+N_{vc}}$, $N_{vc} = \frac{s}{1-s} N_e$
  - *N_vc* = 0.612M shares

- Stock price = $5M/0.612M = $8.17 per share

Example 2: Adding Option Pools

- If the firm needs to give out m=15% of the equity (by the exit date) to recruit management team, then we need to adjust the number of shares so that the VC still gets 38% of the equity

- If m is the stock option pool percentage, and Nm is the number of shares issued in the form of stock options, then

N_{vc}+Nm= $(s+m)*$T and N_e=$(1-s-m)*$T so $\mathrm{T} = N_e/(1-s-m)$

- The shares issued to the VC and the options are N_{vc}+$Nm = \frac{s+m}{1-s-m} N_e$

- The shares held by the VC investor, Nvc, are: $\frac{s}{1-s-m} N_e$

Example 2: Adding Option Pools

- How many shares must VC receive to hold 38% equity stake ($5M investment)?

- Suppose that:
  - Founders have 1 million shares outstanding prior to financing
  - Firm needs to reserve 15% of the equity (by the exit date) to recruit management team

- How many total shares after the financing round?
  - Total Shares = Founder shares + Option Pool + VC shares
  - Total Shares = 1,000,000 + 0.15 x Total Shares + 0.38 x Total shares
  - Total Shares = 1,000,000 / (1 – 0.15 – 0.38) = 2,127,660 shares
  - VC shares = Nvc = 0.38 x Total shares = 808,511 shares

- Share price = $5M / 808,511 shares = $6.18 per share

Example 2: Adding Option Pool + Follow on Round

- Same series A as before, same exit, same target return, same option pool at exit

- VC 2 invests in Series B in year 2: $3 million, target return of 30%

Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Series A: $5 M investment		Series B: $3 M investment			Exit: $100 M

Example 2: Adding Option Pool + Follow on Round

- VC 2 required ownership in Series B

$$Ownership \geq \frac{Investment \times (1 + target\ return)^T}{Retention \times\ p_{Exit} * Exit\ Value}$$

$$OwnershipVC_2 \geq \frac{3 \times (1 + 30\%)^3}{1 \times 100} = 6.6\%$$

- VC 1 in Series A:
  - Retention rate = 93.4% (from 1 – 0.066)
  - $OwnershipVC_1 \geq \frac{5\times (1+50\%)^5}{0.934\times 100} = 40.65\%$
- Option pool:
  - 15% of equity <u>by exit date</u>
  - Initial option pool = 15%/.934 = 16.1%

Alternative way to calculate Follow-on Rounds

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Cash flows	-5	0	-3	0	0	100

- New investor (discount rate of 30%):
  - Values company at end of year 3 at $100M/1.33^3 = $45.5M
  - Requires share, s2, $3M/$45.5M = 6.6% of firm in second round
  - First-round VC still requires 38% of firm at exit, but will start off with more shares and greater percentage (which will then be diluted)

Follow-on Rounds

$$\mathrm{T} = N_e/(1 - \%VC1 - \%VC2 - \%options)$$

- Initial VC:
  - Nvc1 = 0.38 * 1M /(1 - 0.38 - 0.066 - 0.15) = 0.941M;
  - Share price= $5M/0.941M=$5.33
  - Initial VC gets 0.941M/(0.941M+0.371M+1M)=40.7% initially
  - Thus, the post-money valuation is now 5/40.7% = $12.285M and the pre-money valuation is $7.285M

- Follow-on Investor:
  - Nvc2 = 0.066 * 1M /(1 - 0.38 - 0.066 - 0.15)=0.163M;
  - p1= $3M/0.163M=$18.40

- Option Pool
  - Nm=0.15 * 1M /(1 - 0.38 - 0.066 - 0.15) = 0.371M

Comment on Dilution

- Note that the first round VC investor starts off with a 40.7% equity stake, which then gets **diluted** to 38% ownership when the second round VC investor comes on board

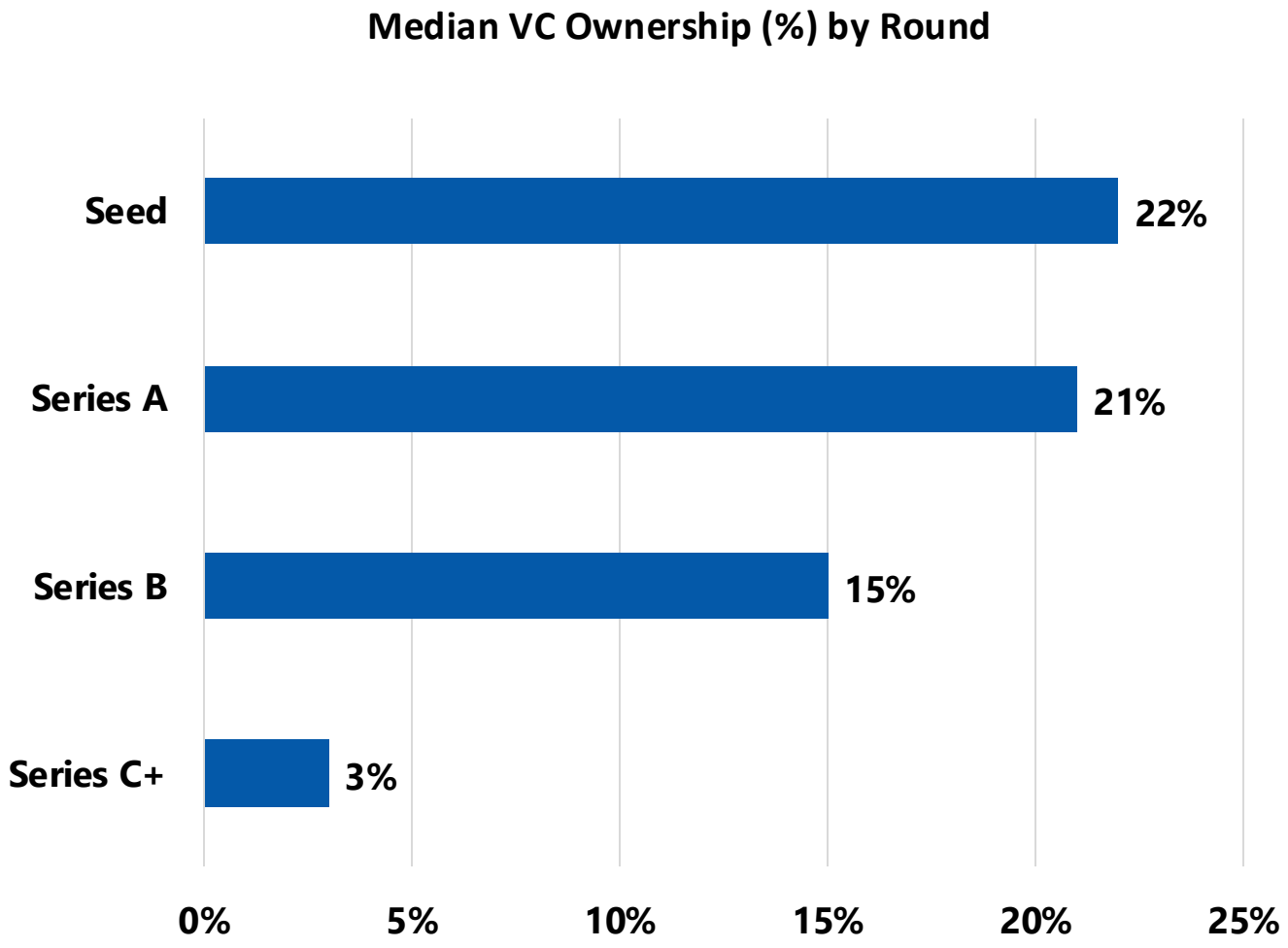
- If expected development time slips by two years, then second round investors require 11.1% equity share, since their valuation at year 2 is $26.9M = 100/1.3^5. If we still have to give 15% in option pool, this implies that:

$$N_{vc2} = \frac{s_2}{1 - s_2 - m}(N_e + N_{vc1})$$

which is (0.111/(1 - 0.111 - 0.15))*1.940M = 0.291M shares (prev. 0.163M).

- The first-round VC ends up with only 36% of the shares at the exit date and the IRR on the investment falls to 32.5% from 50%

Founders' Retention



Founders' Implied Ownership

100% x (1-0.22) = 78%

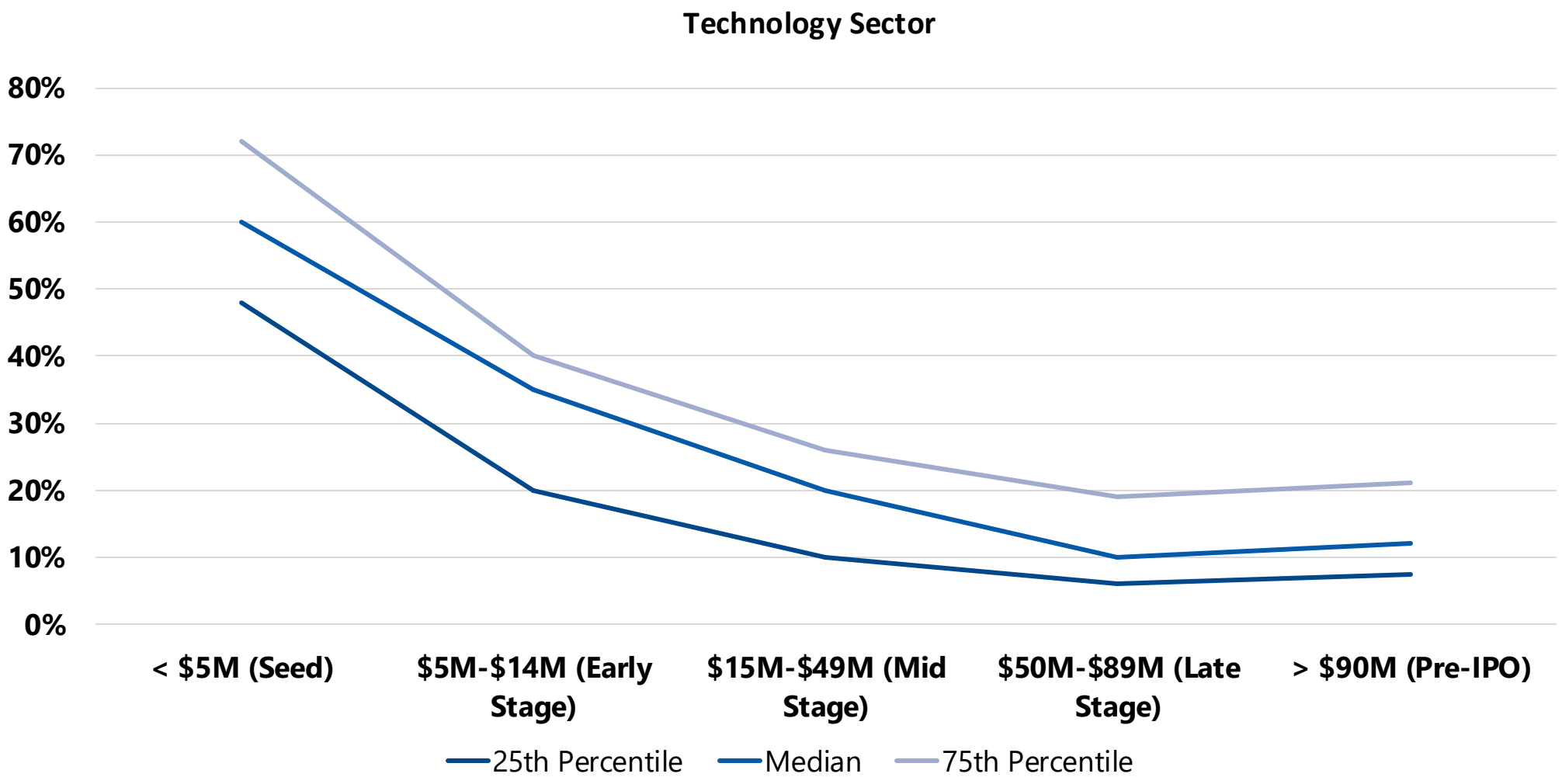
78% x (1-0.21) = 62%

62% x (1-0.15) = 53%

53% x (1-0.03) = 51%

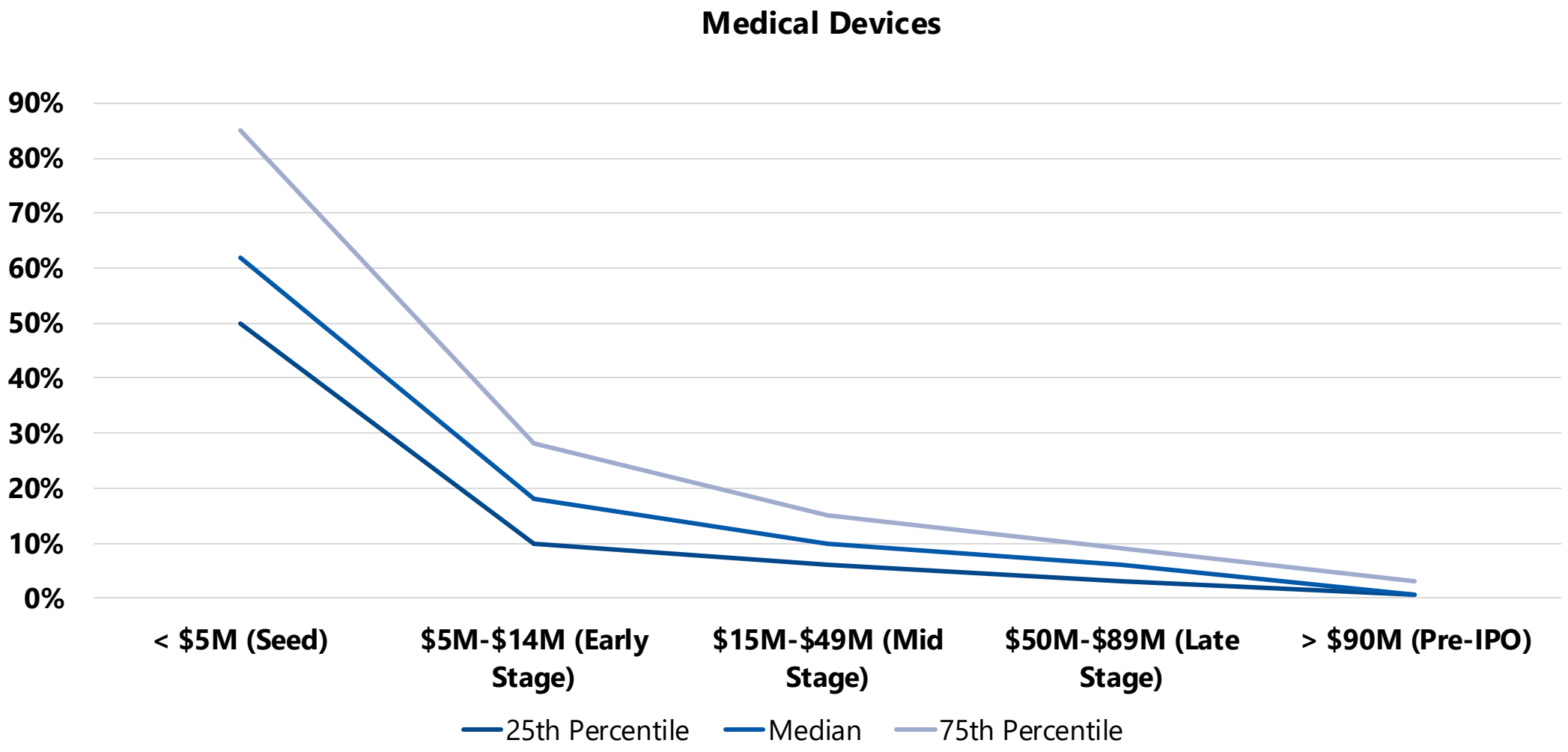
Source: Wilson Sonsini, The Entrepreneur Report 1H 2024

Founders' Dilution In Reality



Source: Pitchbook

Founders' Dilution In Reality



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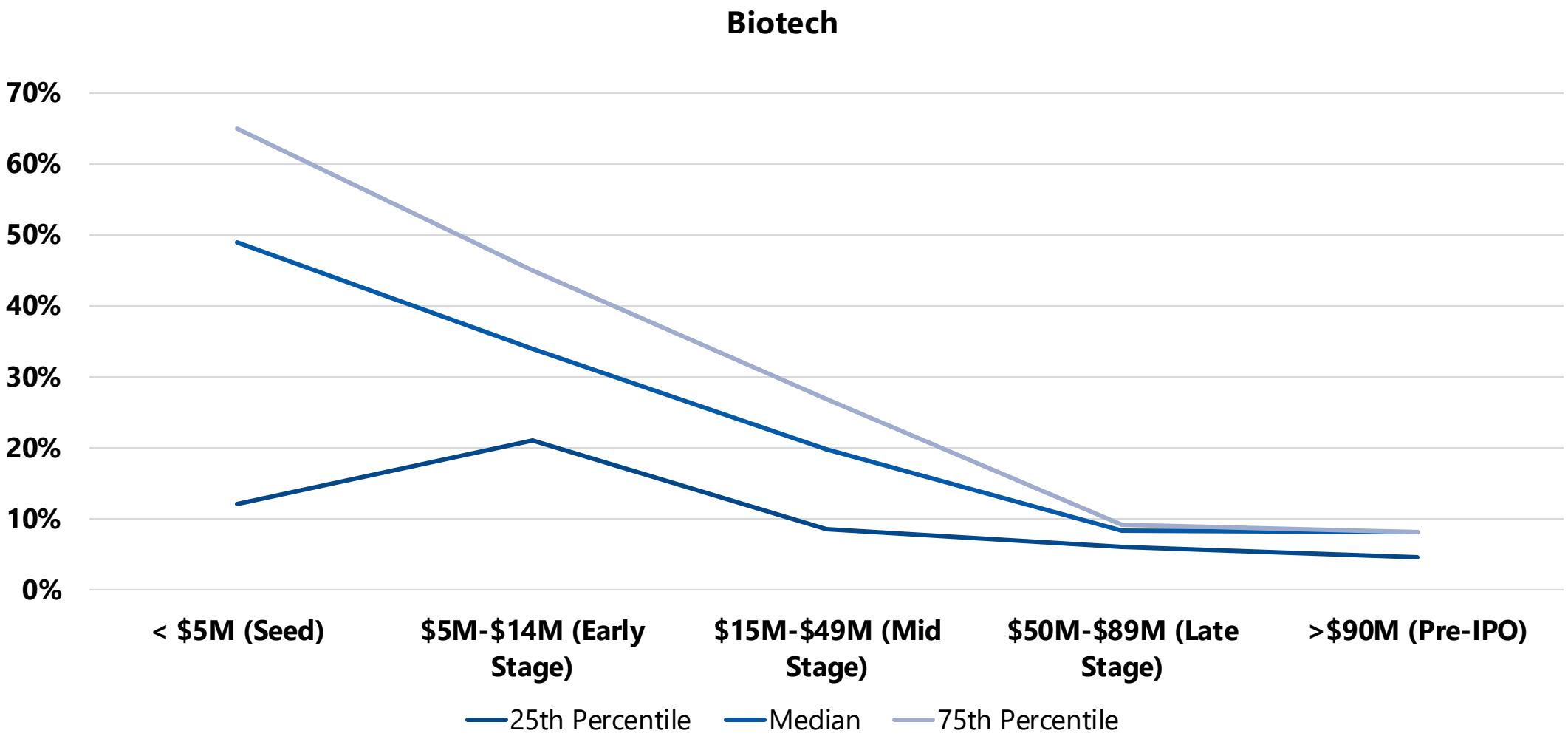
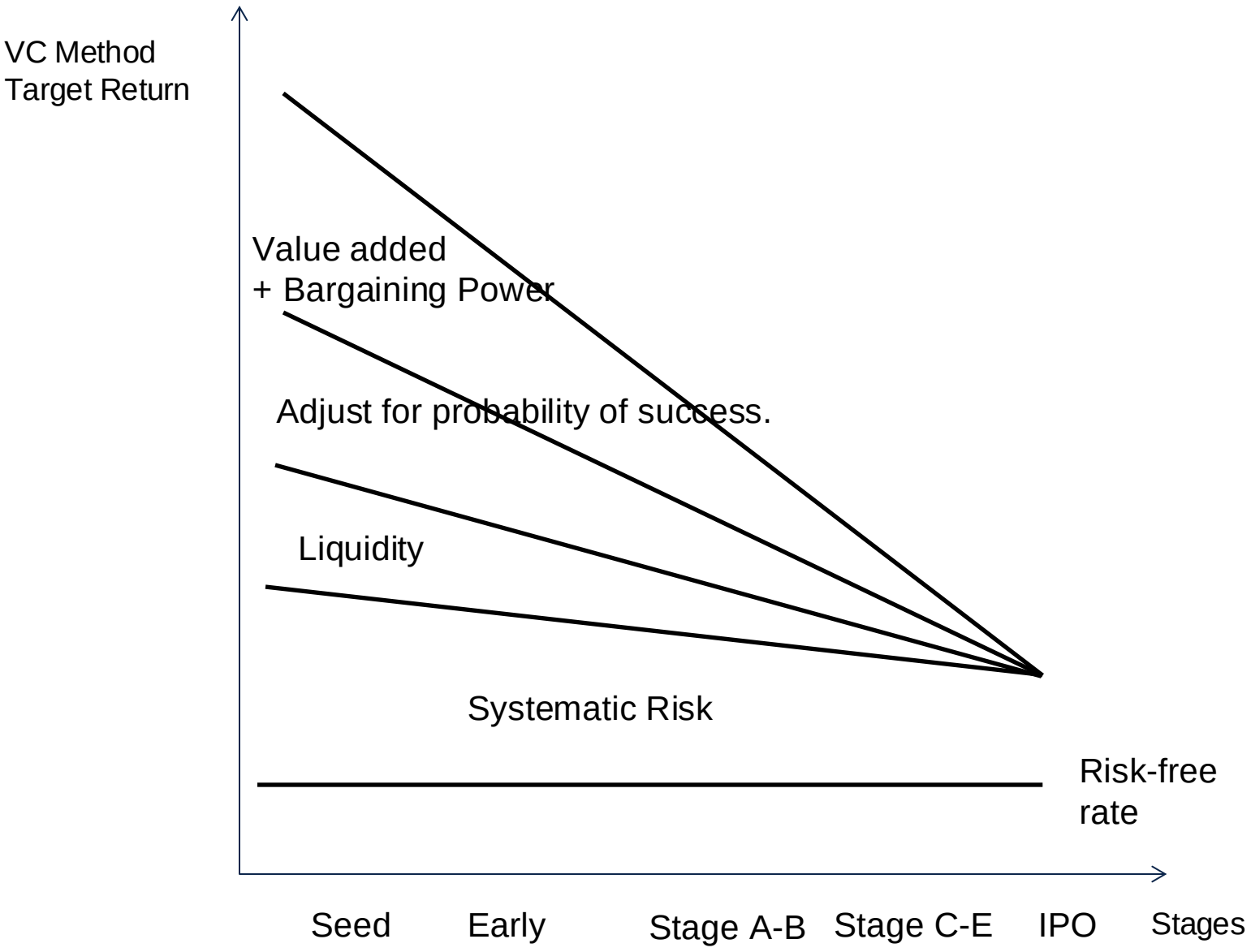


Source: Pitchbook

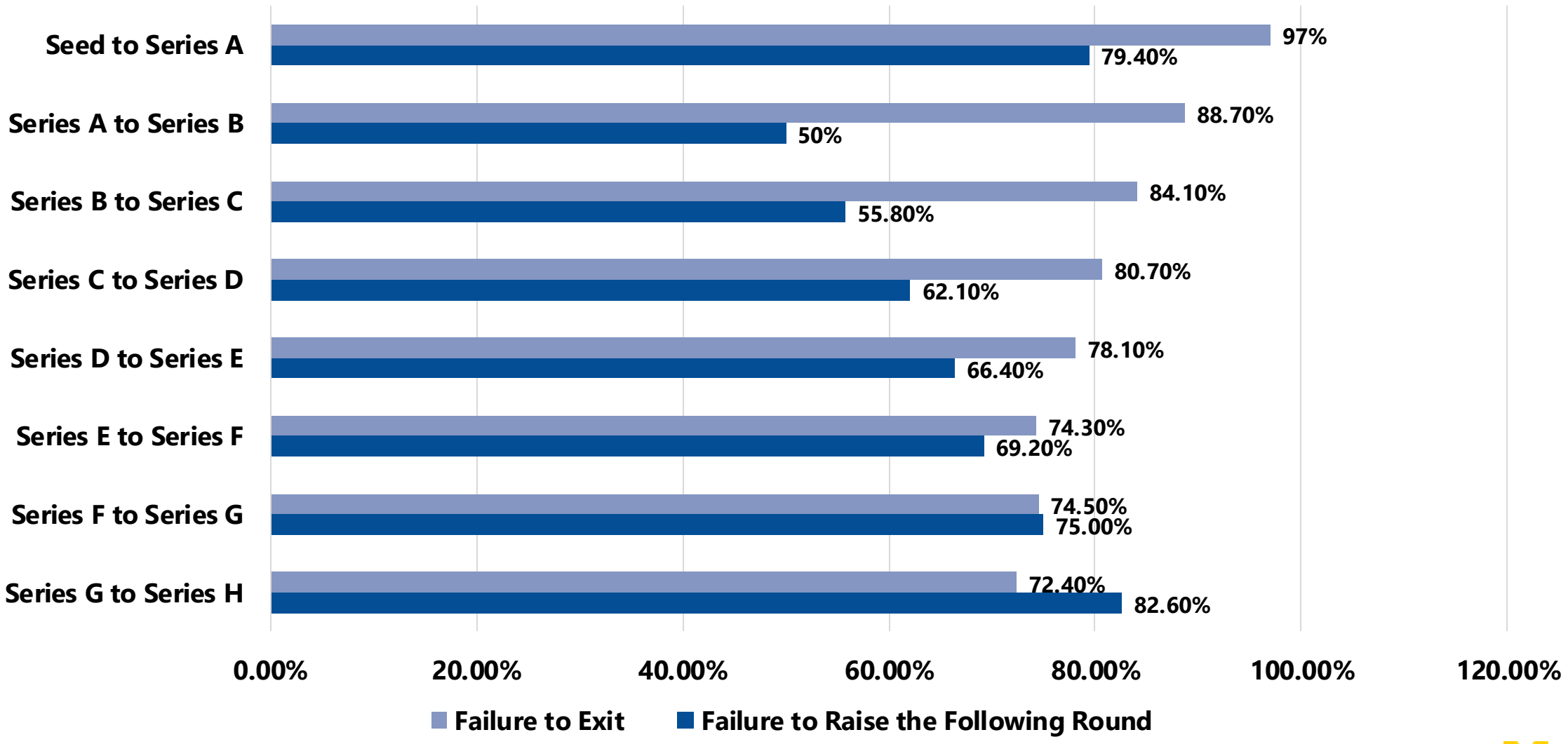
Why are discount rates so high?

- Illiquidity?
- VC Value Add?
- Optimistic Forecasts?

Why are discount rates so high?



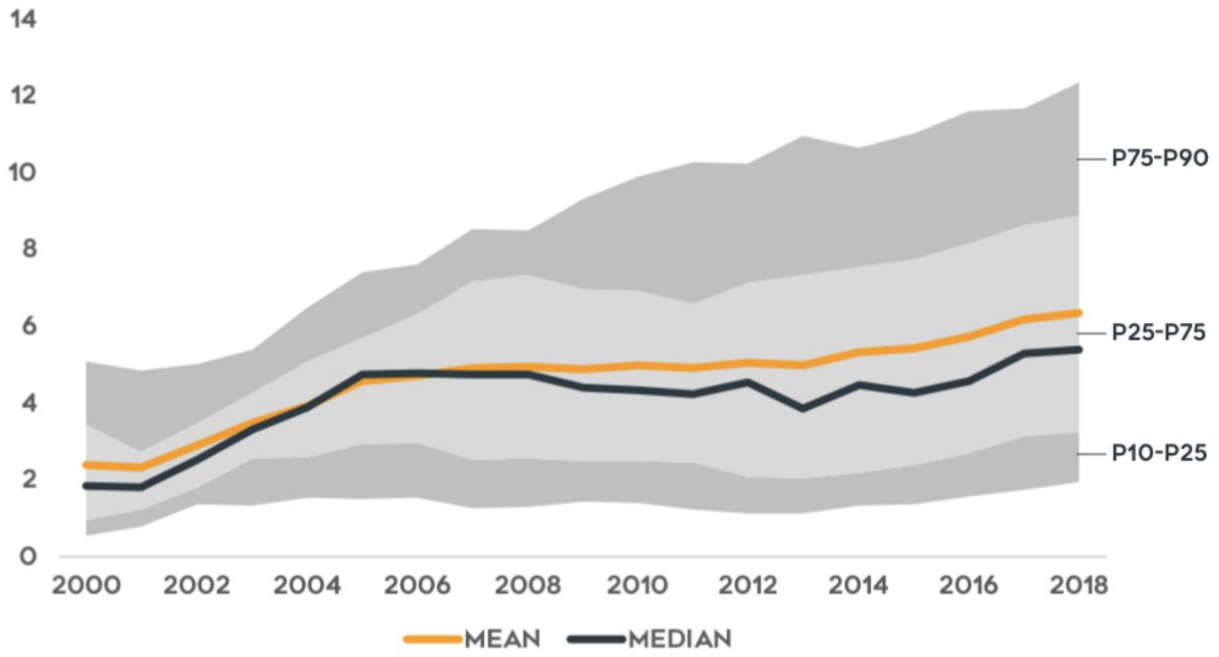
Survival Rates



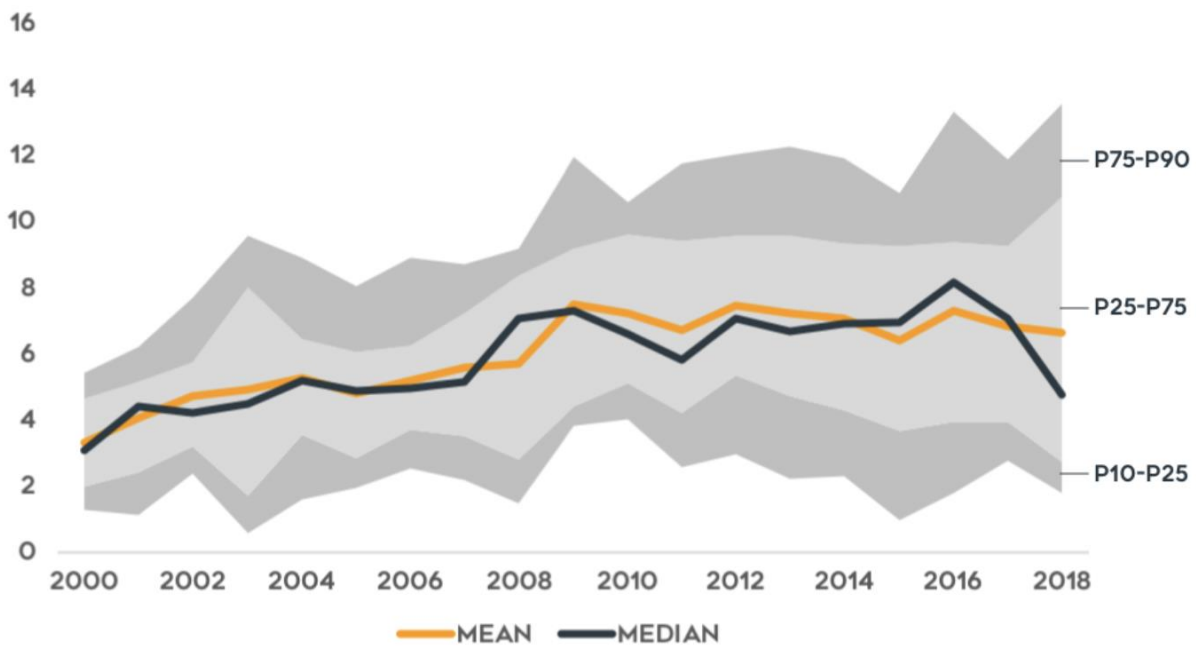
Source: Pitchbook

Time to Exit

Time to Exit (Acquisition) in Years Since First Financing, 2000-2018



Time to Exit (IPO) in Years Since First Financing, 2000-2018



Source: Pitchbook

Moving Beyond the VC Method

- The VC Method is particularly useful for deals with early-stage companies

Always Test Sensitivity of Valuation Estimates!

- Quantify uncertainty using probability-weighted scenarios
- Compare forecasts with similar companies or markets
- Perform sensitivity analysis around your estimates of retention rate, discount rate, and time to exit
- Transition to DCF when possible, however keep the DCF and accounting machinery simple
- Focus majority of your efforts on quantifying the **key value drivers**

Next: Valuation Part II