The State of Emerging Therapeutic Companies

June 2022

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Vice President, Industry Research, BIO

What are the Biotech Trends for 2022 YTD?

Region	Emerging Therapeutic Company Financing and Deals	2022 vs 2021 (YTD)	
		Trend in $	Trend in #
U.S	IPOs (R&D-stage)		
	Follow-On Offerings (R&D-stage)		
	Venture Capital (R&D-stage)		
Ex-U.S.	IPOs (R&D-stage)		
	Follow-On Offerings (R&D-stage)		
	Venture Capital (R&D-stage)		
Global	Out-Licensing (R&D-stage assets)		
	Acquisitions (R&D-stage companies)		
	Acquisitions (Market-stage companies)		

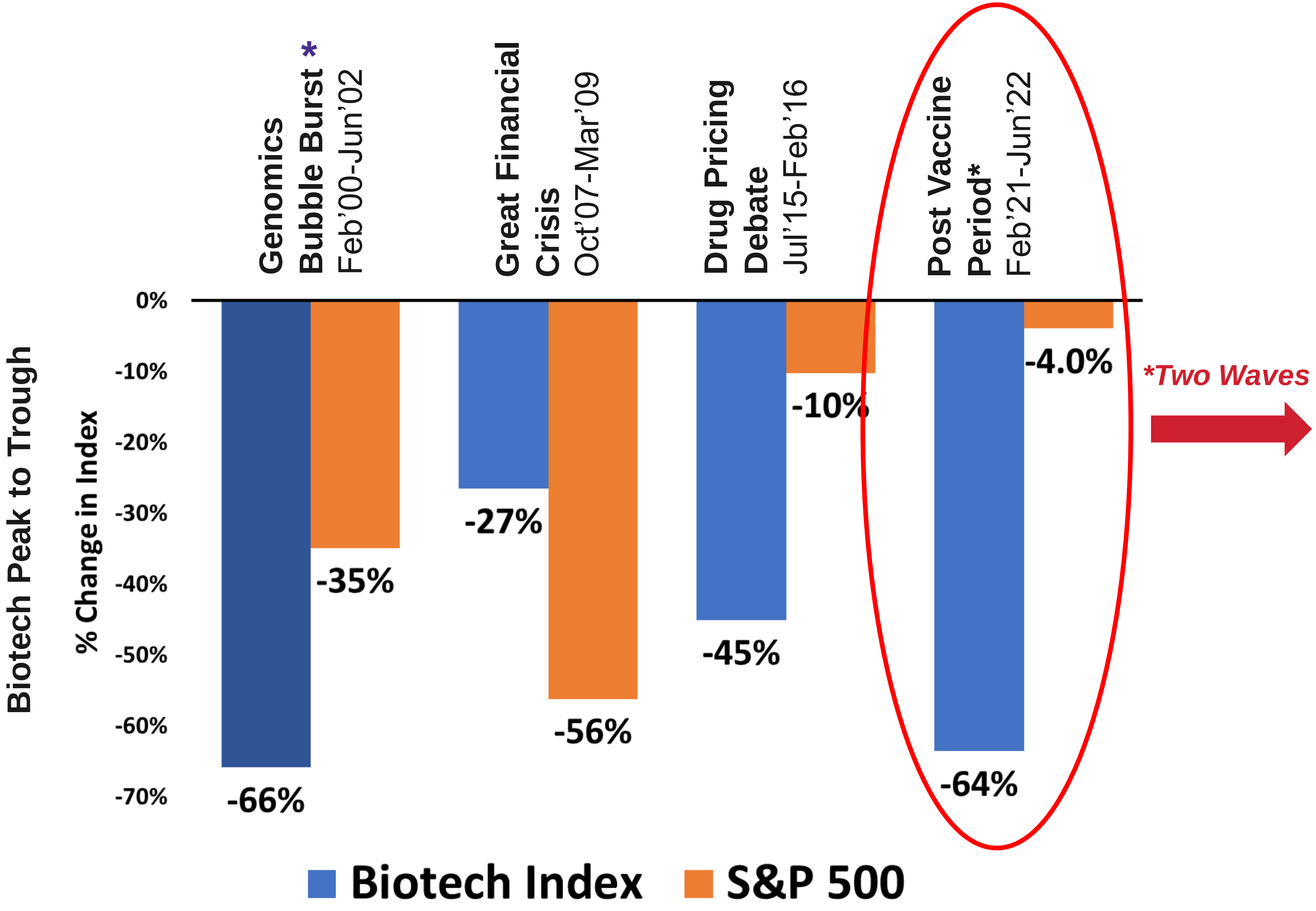
Industry Therapeutic Productivity	Trend in #
FDA Approvals	
Clinical Pipeline	

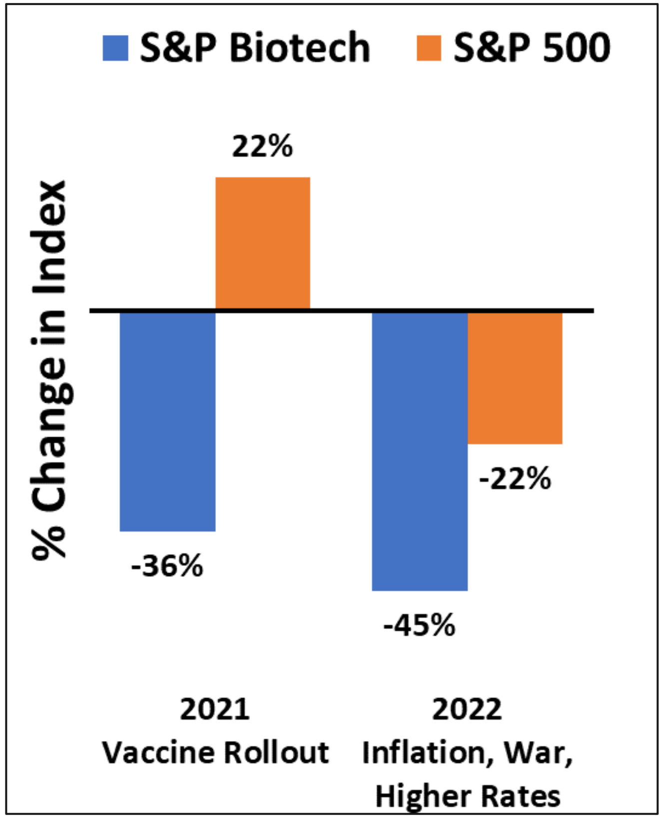
www.bio.org/iareports

Source: BIO Industry Analysis, 2022

Public Markets and Company Financials

Record Underperformance vs Market





<u>2021-2022 Headlines:</u>

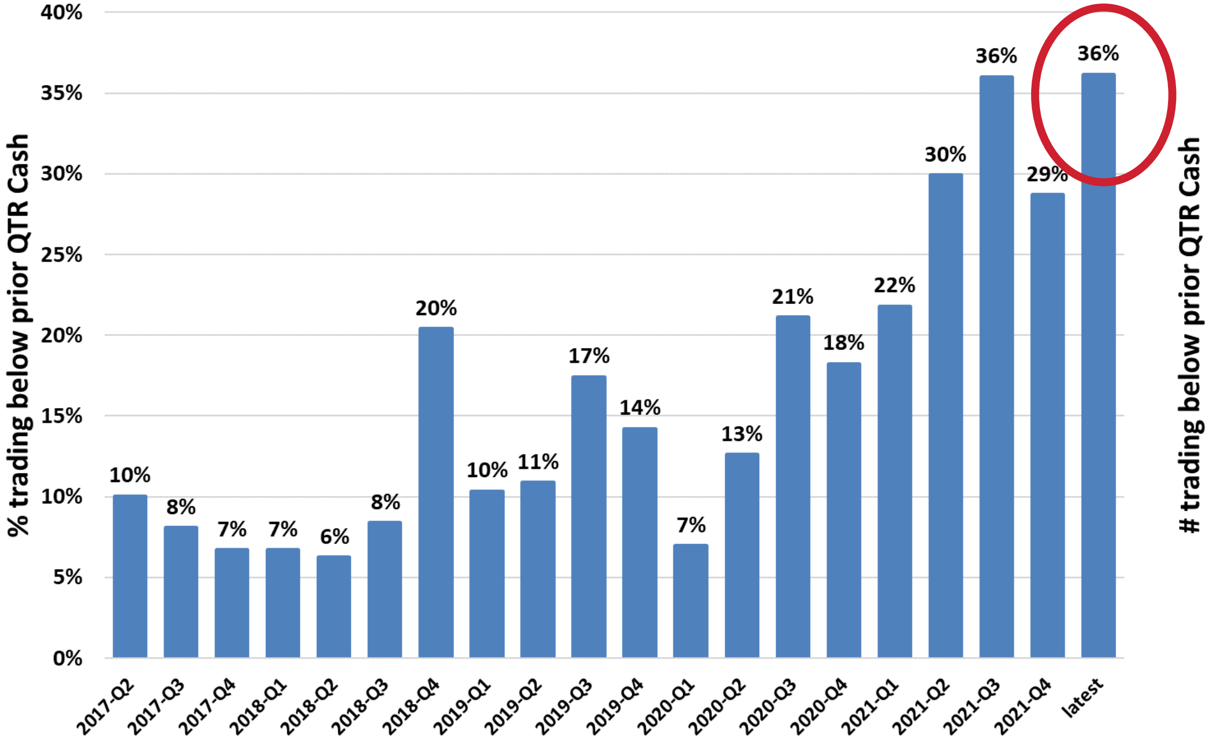
- NCD, Accelerated Approval
- TRIPS Waiver and IP
- March-in Rights
- M&A Regulation
- Drug Pricing (BBB)

*Nasdaq Biotech Index used for 2000-2002 period), S&P Biotech equal weight used for other periods

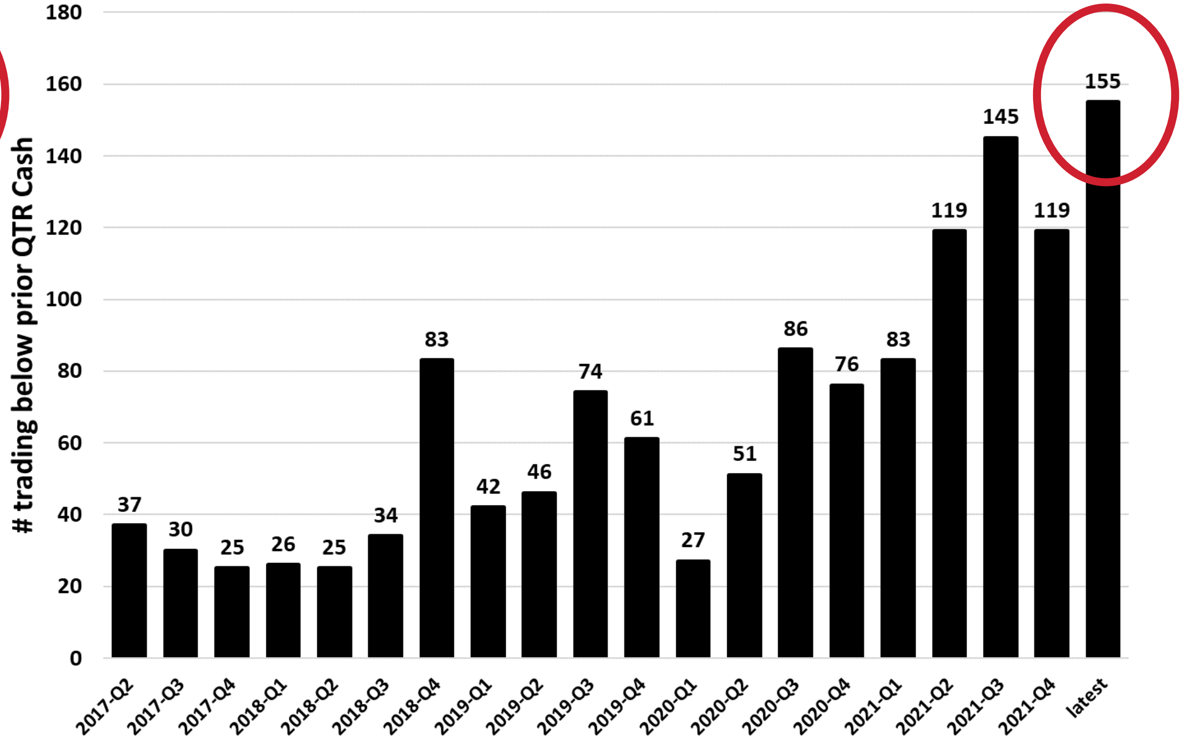
Source: Factset, BIO Industry Analysis, 2022

Record Number of Small Companies* Trading Below Cash

36% of companies



155 companies



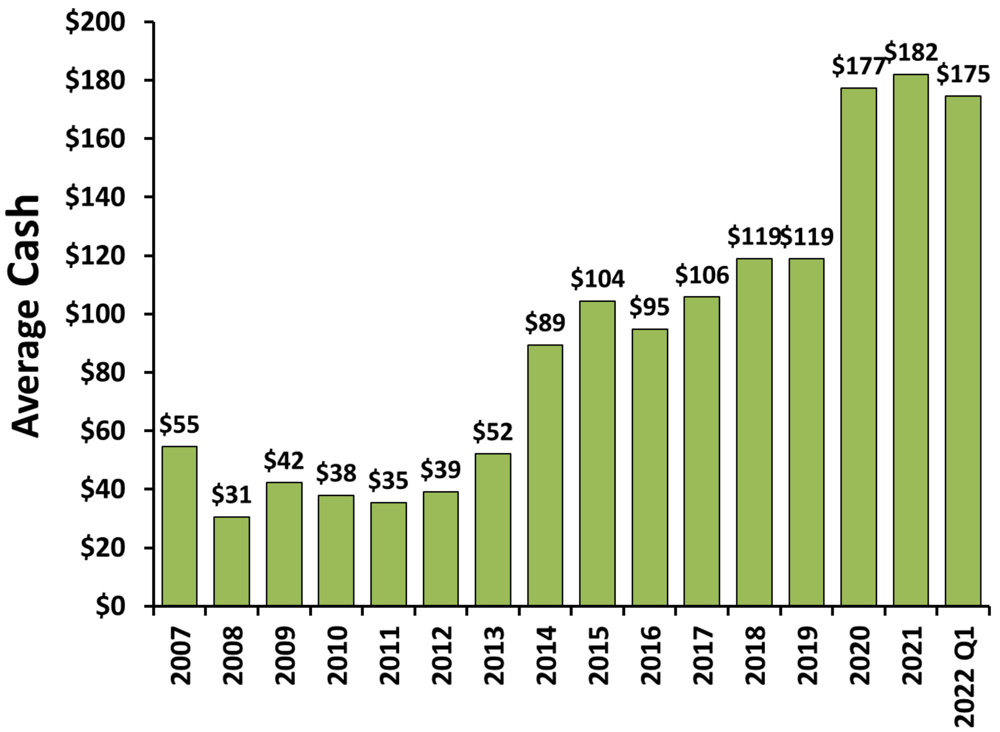
with <500 FTEs

*US BioPharma Companies with SEC filings , <500 Employees

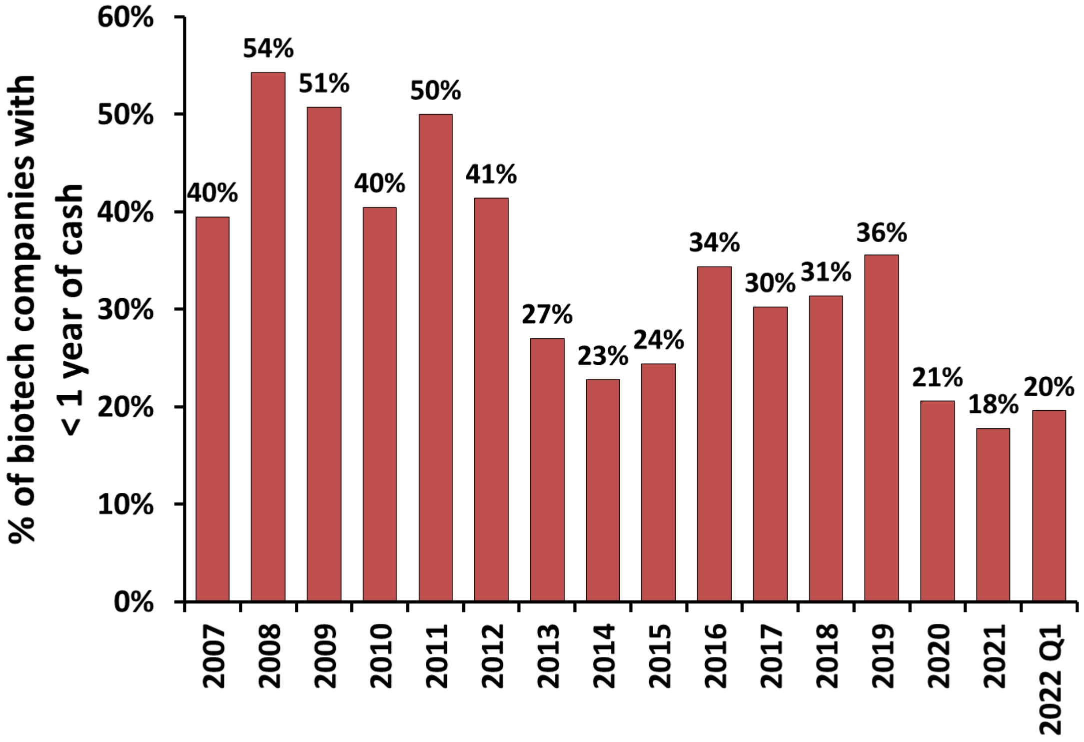
Source: Factset, BIO Industry Analysis, 2022

Small Companies Have Been Able to Raise Cash

Average Cash Balance Dec 31 Each Year



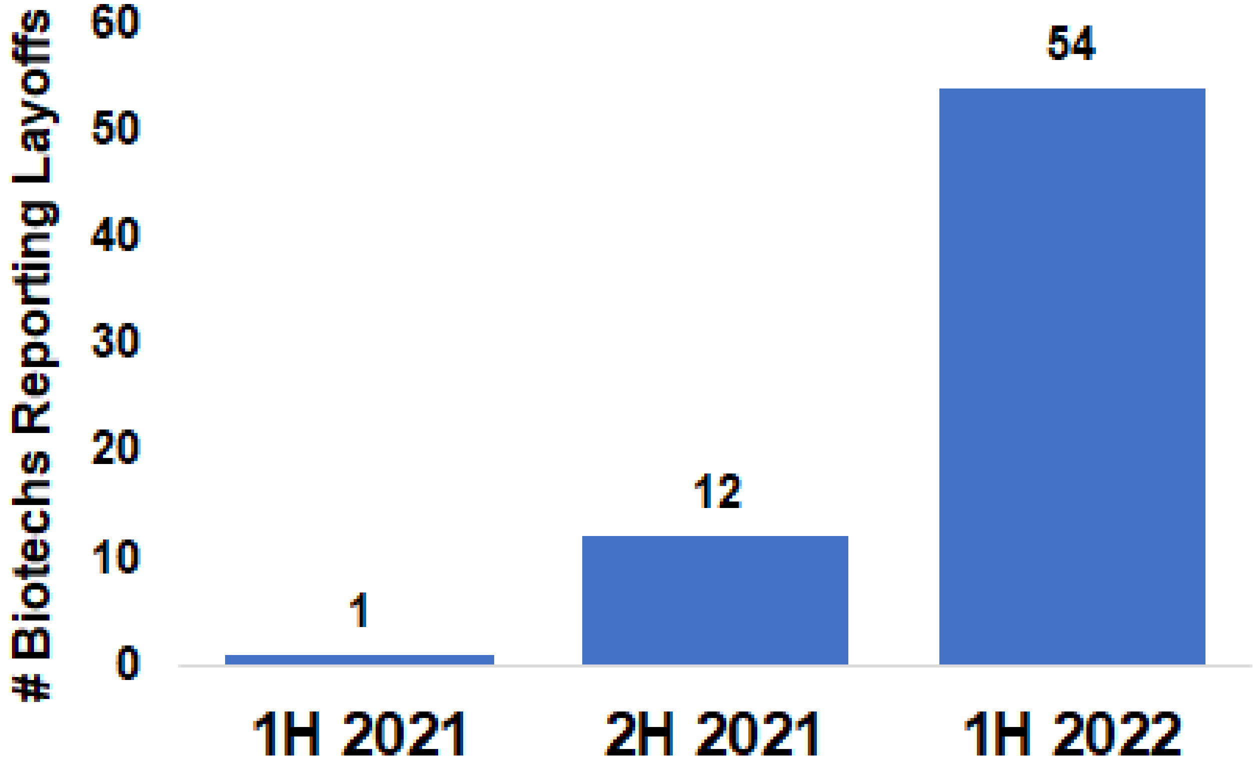
% With Less Than 1 year of Cash



US BioPharma Companies with Negative Cash Flow in SEC filings , <500 Employees

Source: Factset, BIO Industry Analysis, 2022

Jump in Biotech Layoffs

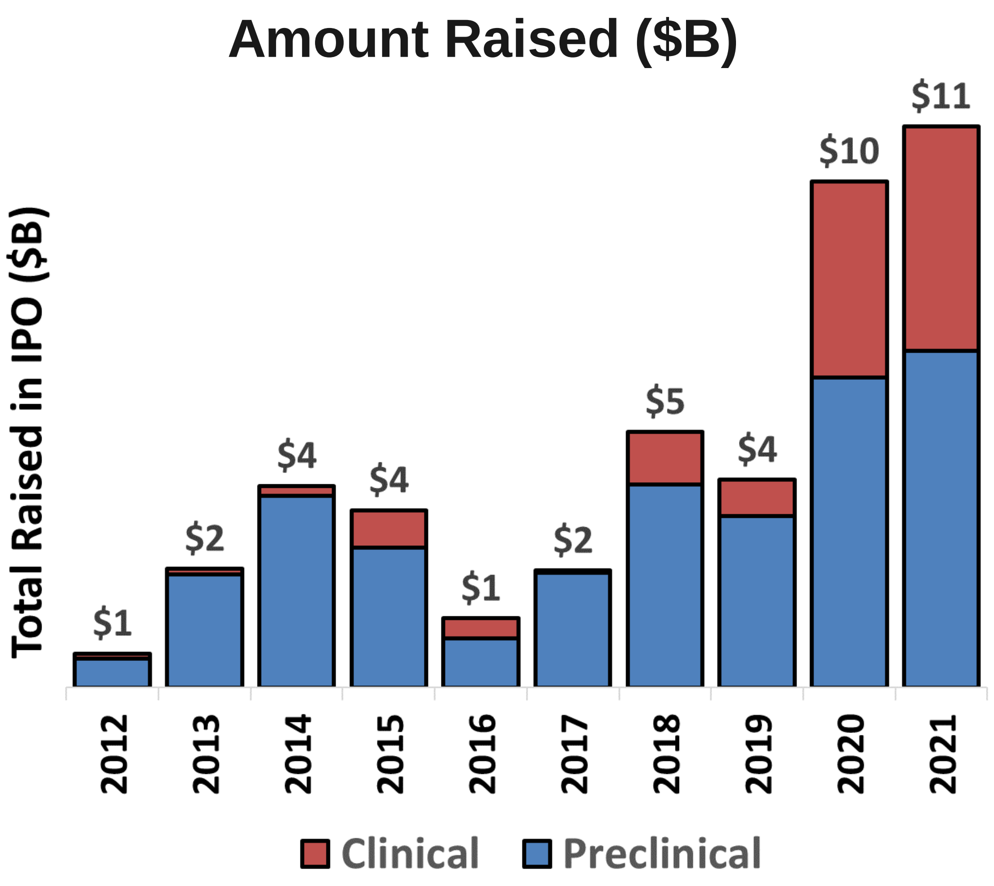


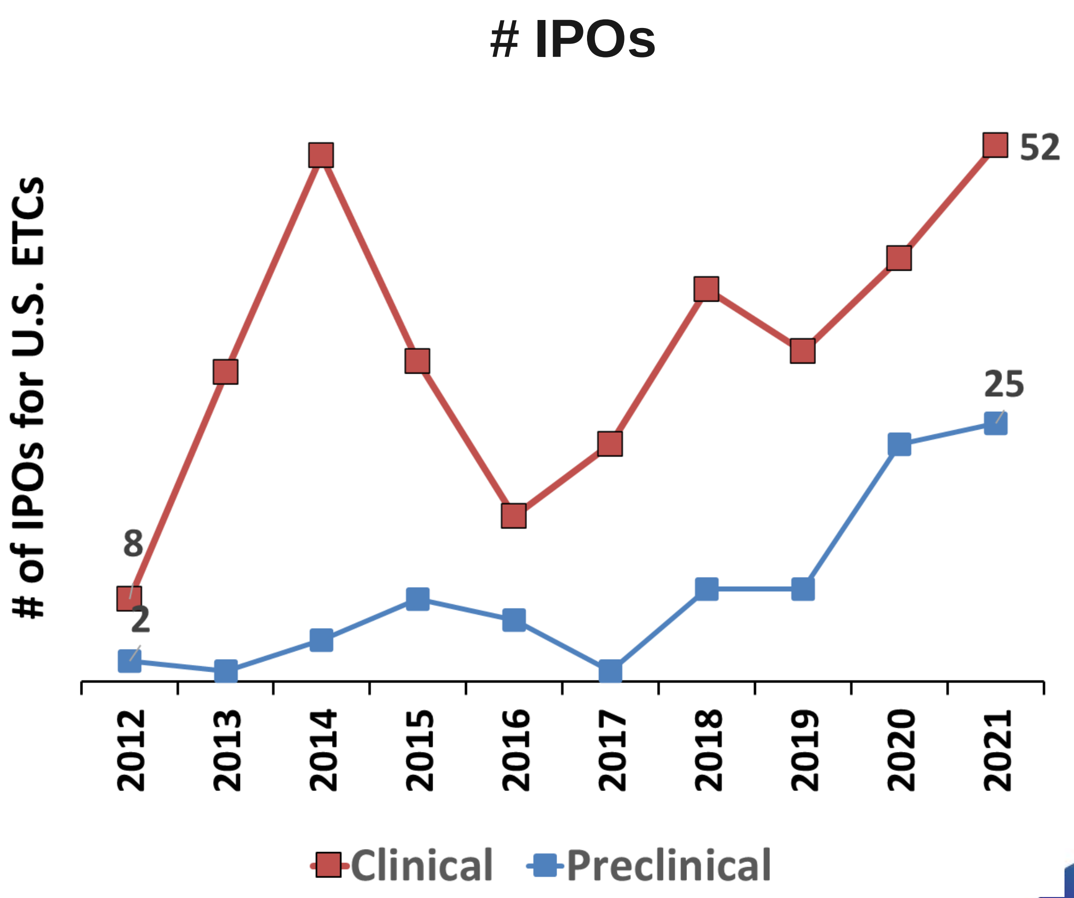
Source: Company Press Releases, EndPoints, Biopharmadive, Fierce, BIO Industry Analysis, 2022

IPOs
Follow-On Offerings

R&D-Stage IPOs for U.S. Companies

Preclinical IPOs driving the record

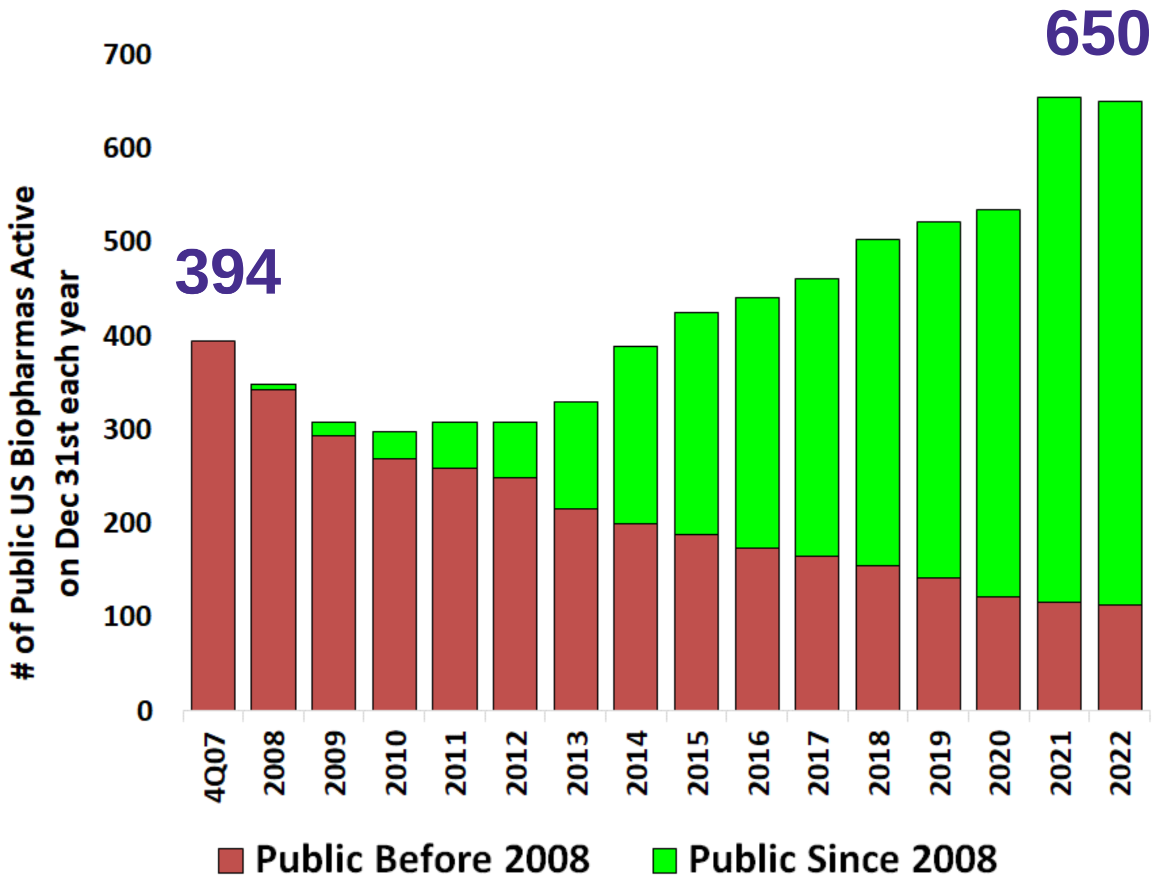




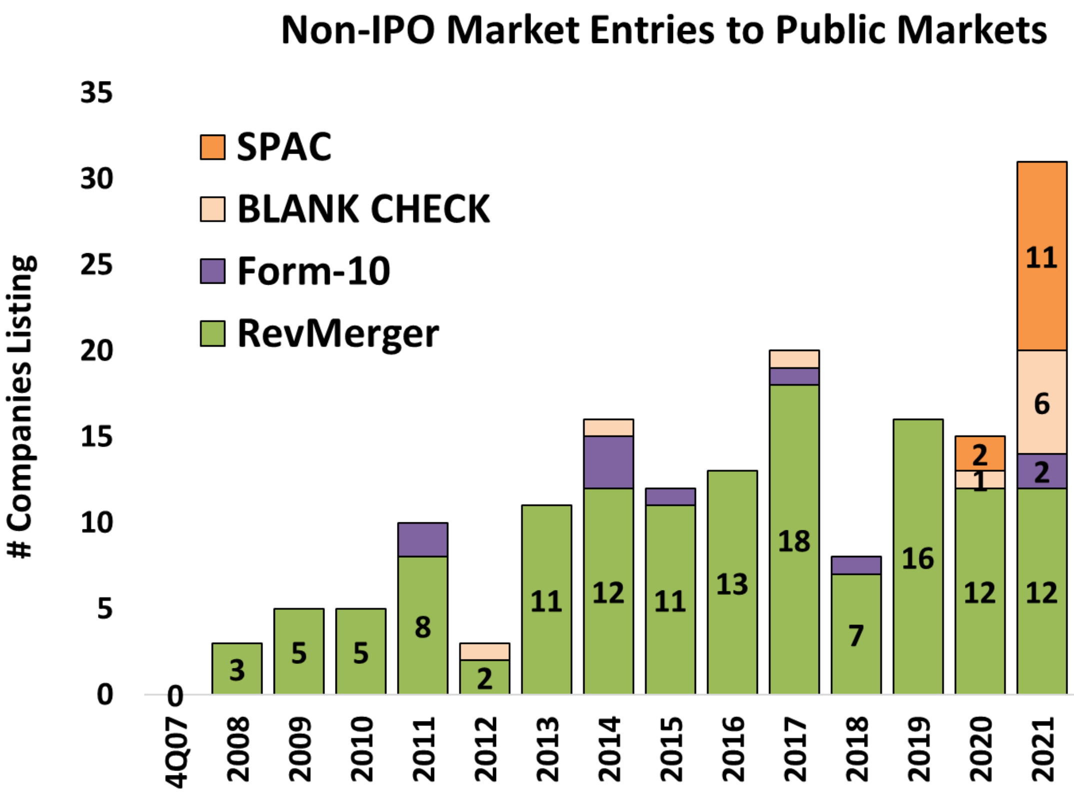
Source: Nasdaq, BCIQ, BIO Industry Analysis, 2022

Surge in New Public U.S. Companies
(and not just by IPO)

>50% of public companies debuted in last 10 years



Acquisition corps surpass Reverse Mergers in 2021



BIO Industry Analysis, 2022

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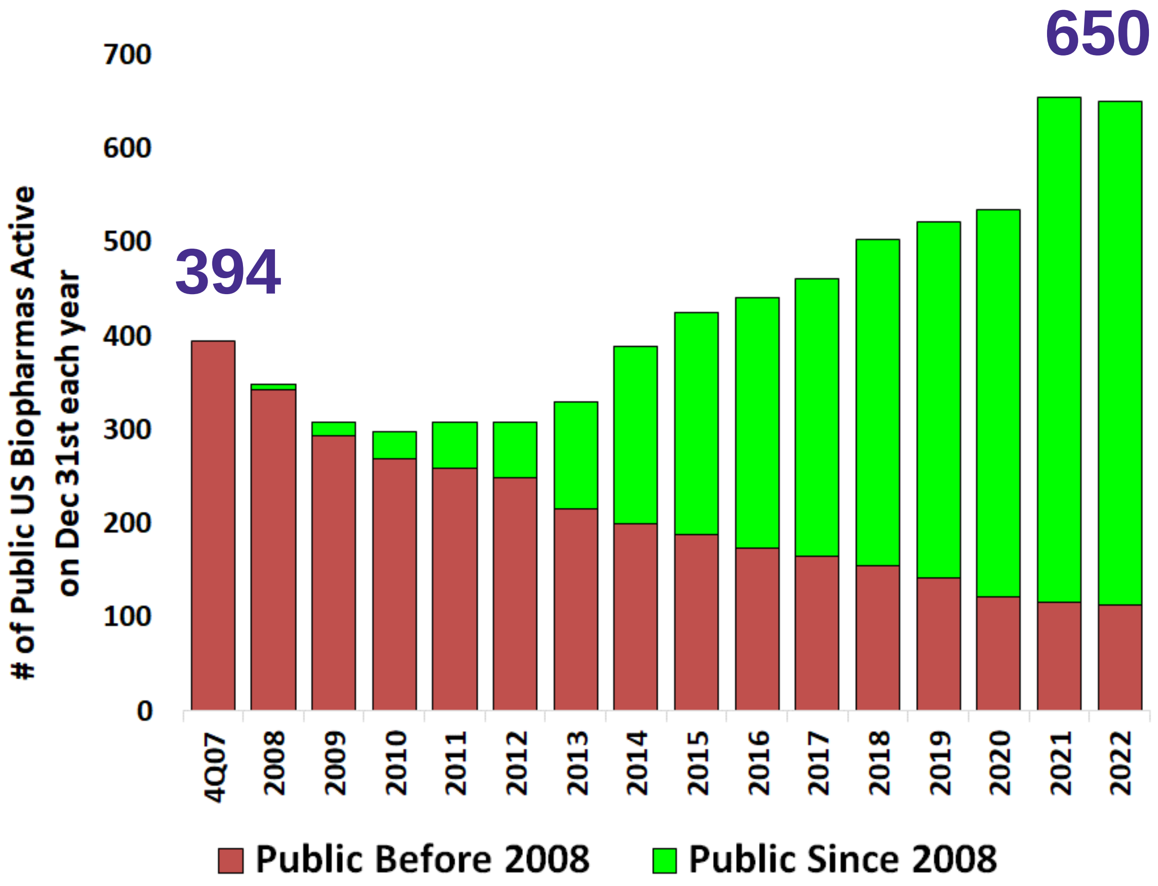
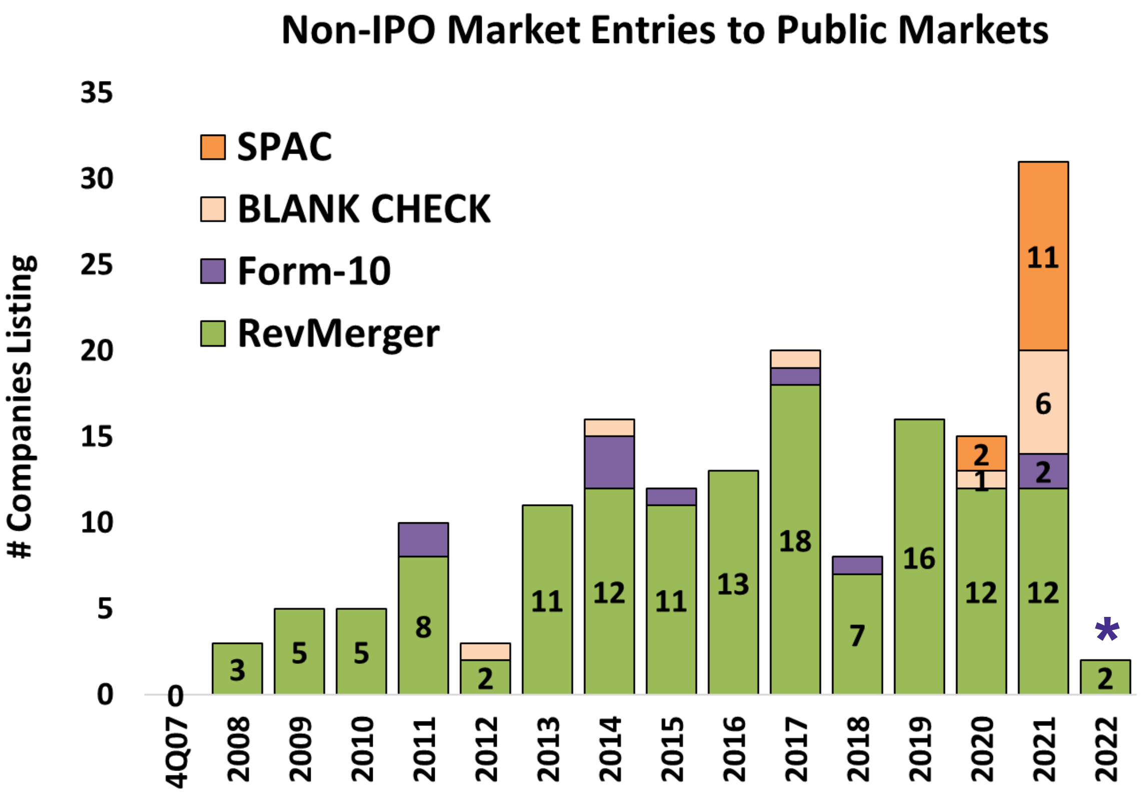


Acquisition corps surpass Reverse Mergers in 2021

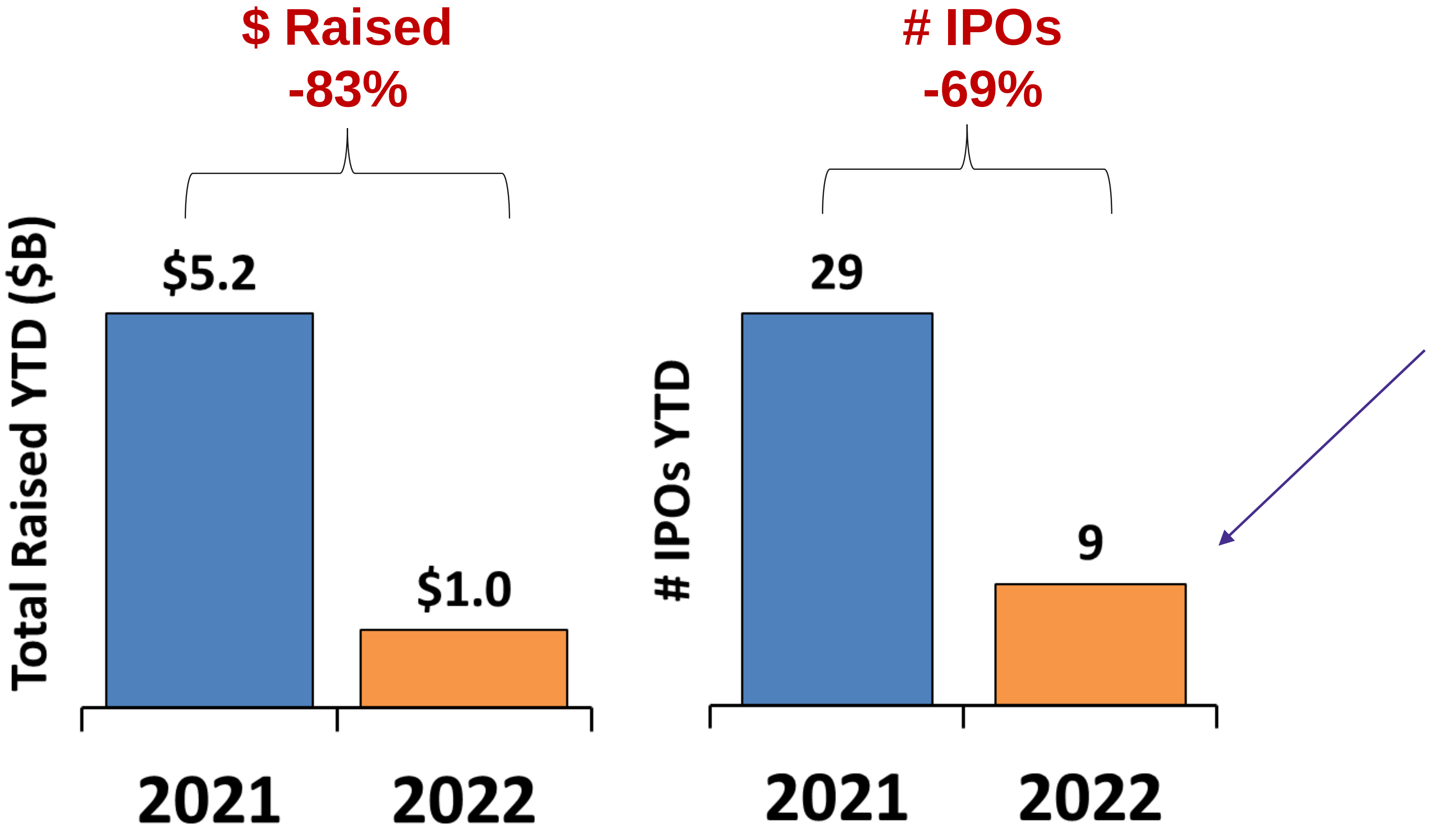


* June 9th SPAC, Senti Bio (SNTI)

BIO Industry Analysis, 2022

R&D-Stage IPOs for U.S. Companies

2022 vs 2021 YTD



Top 3 R&D IPOs of 2022

HilleVax (HLVX) $200M
CinCor (CINC) $194M
Amylyx (AMLX) $190M

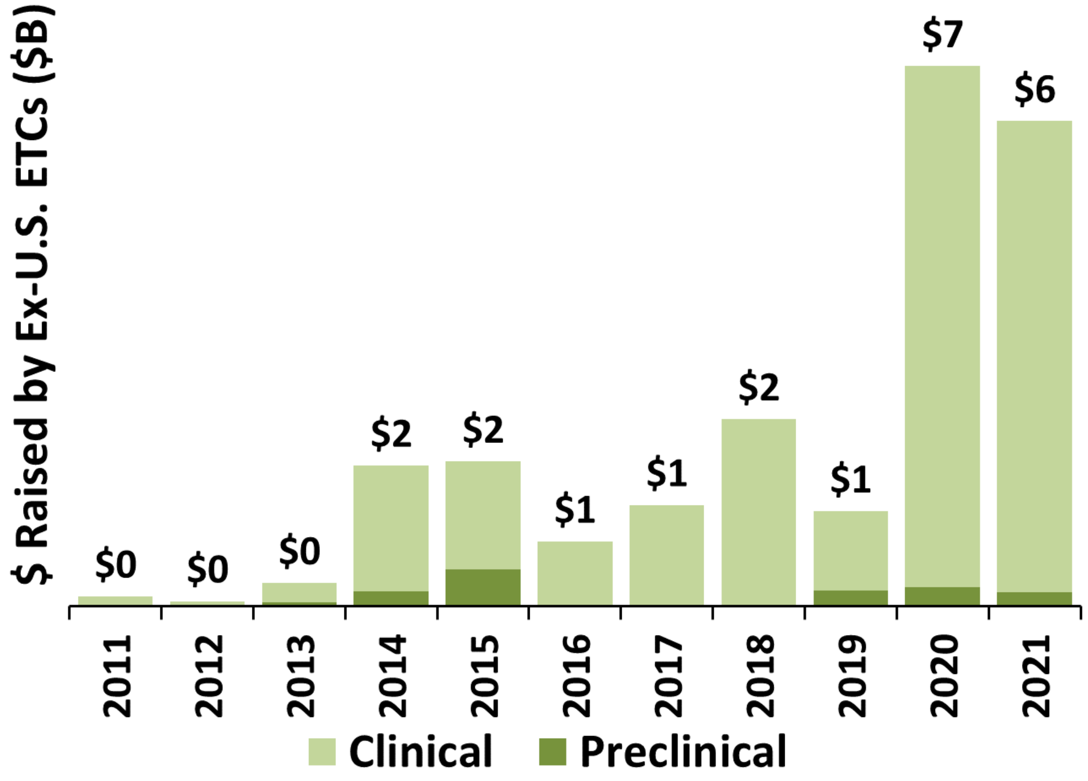
YTD data as of June 6th

Source: Nasdaq, BCIQ, BIO Industry Analysis, 2022

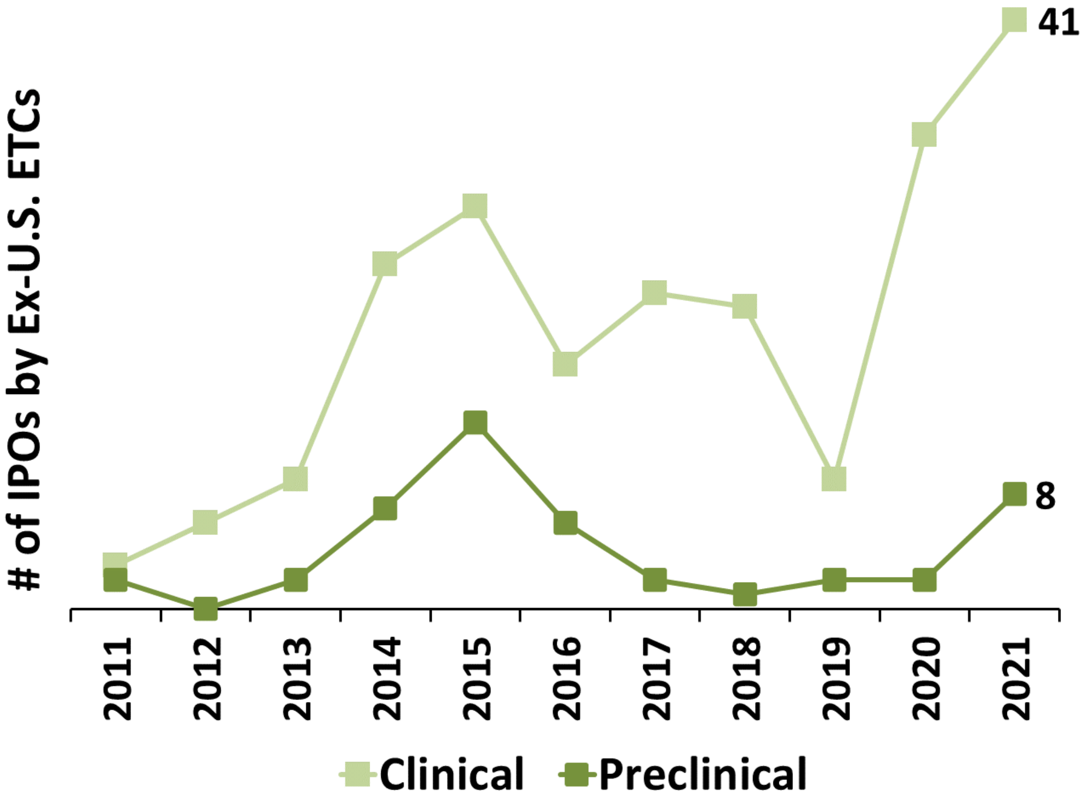
R&D-Stage IPOs by Ex-U.S. Companies

Preclinical-Stage IPOs are less common Ex-US

Amount Raised ($B)



IPOs



Source: Nasdaq, BCIQ, BIO Industry Analysis, 2022

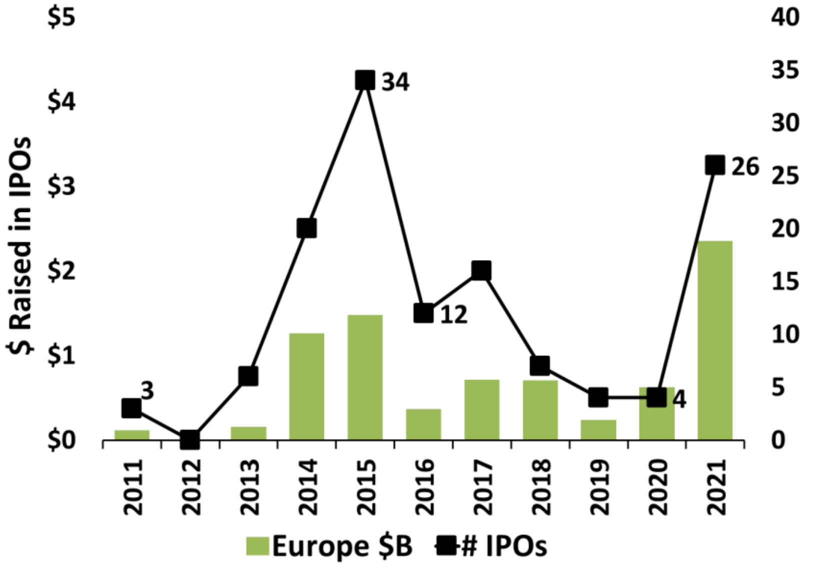
IPOs by R&D-Stage Ex-U.S. Companies

2021 Record $

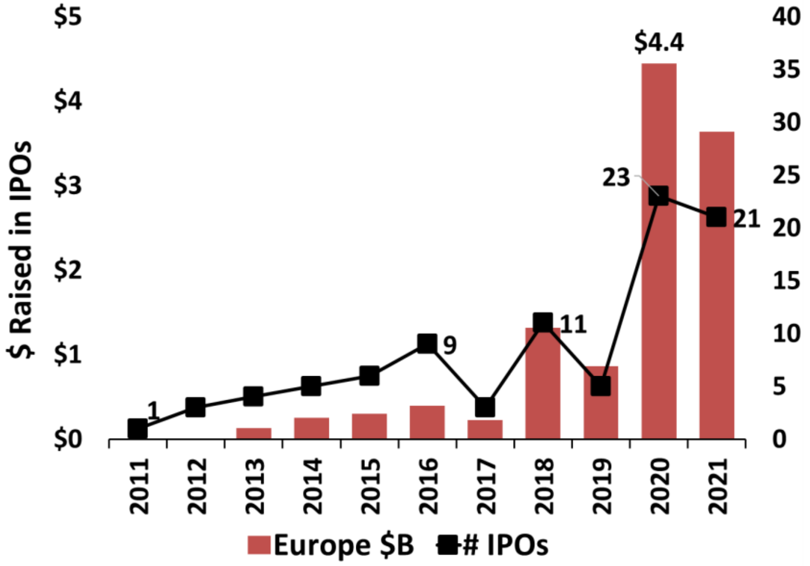
Slight Slowed Down

Only 2 IPOs

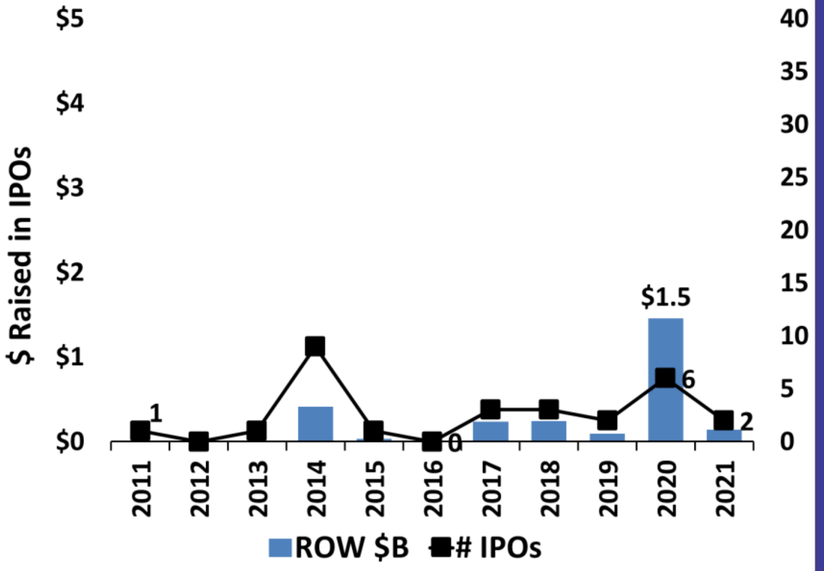
Europe



Asia



ROW

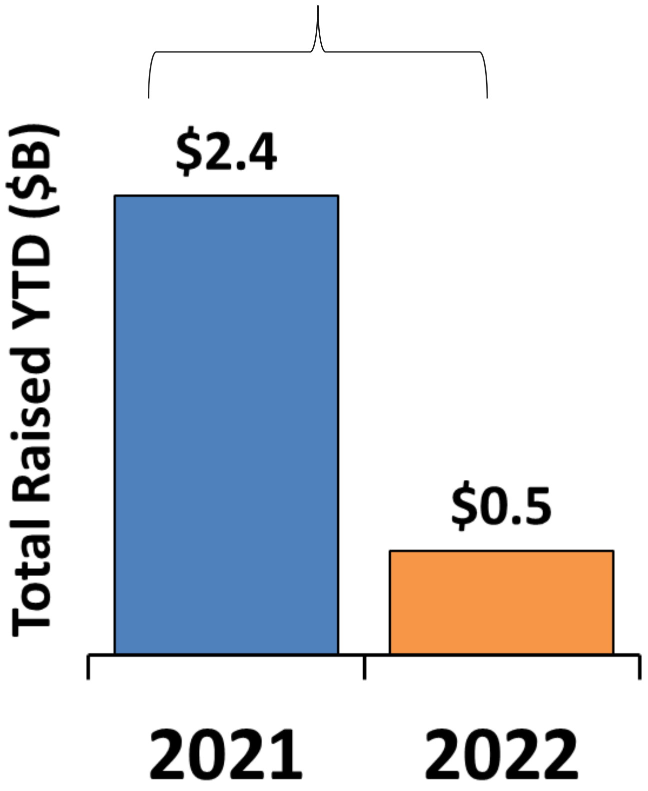


Source: Nasdaq, BCIQ, BIO Industry Analysis, 2022

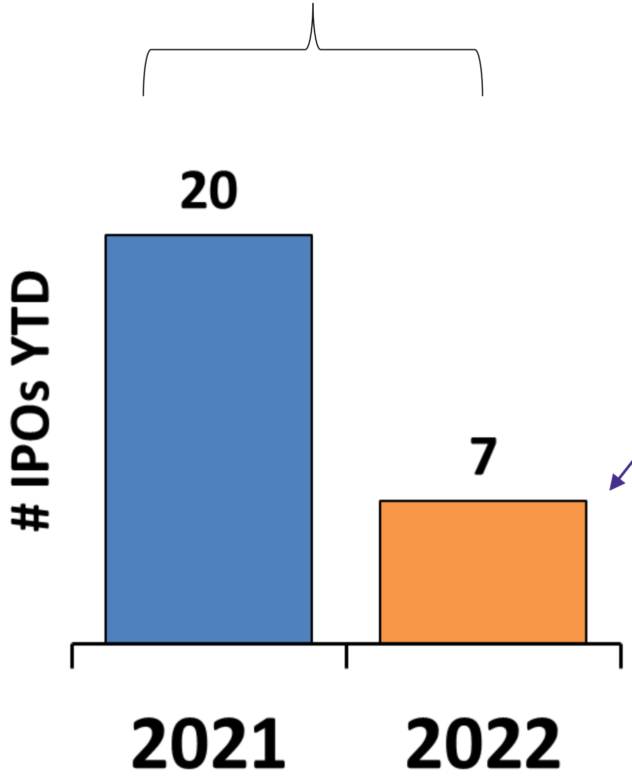
IPOs by R&D-Stage Ex-U.S. Companies

2022 YTD vs 2021 YTD

$ Raised in IPOs
-80%



 # IPOs
-65%



Top 3 Ex-US R&D IPOs of 2022

Shouyao (688197-CN), $235M
Lepu Biopharma (2157-HK), $117M
Jiangsu Recbio (2179-HK), $98M

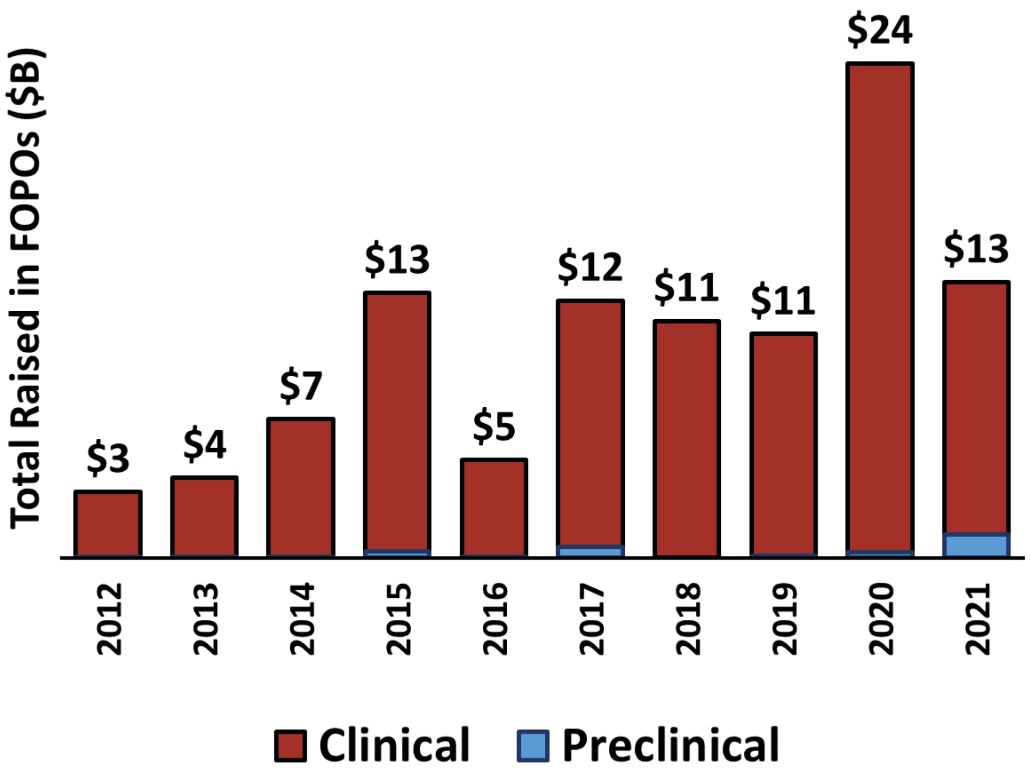
YTD data as of June 6th

Source: BCIQ, BIO Industry Analysis, 2022

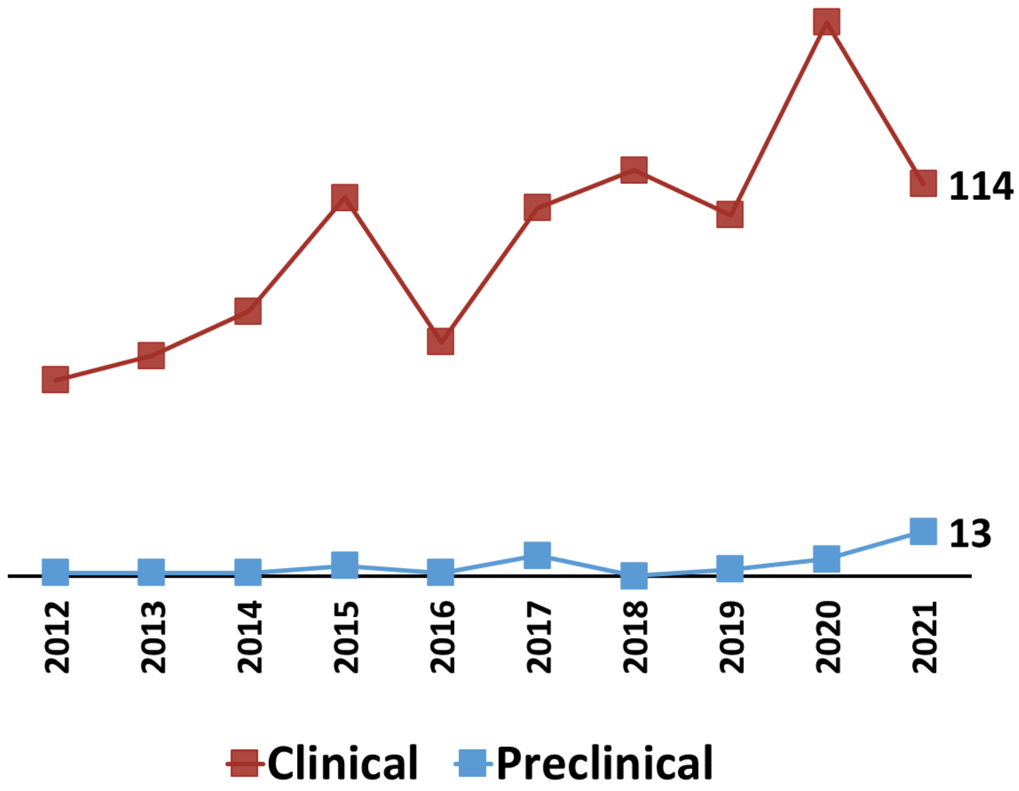
Follow-On Offerings from R&D-Stage U.S. Companies

2021 2nd highest year ever

Amount Raised ($B)



FOPOs



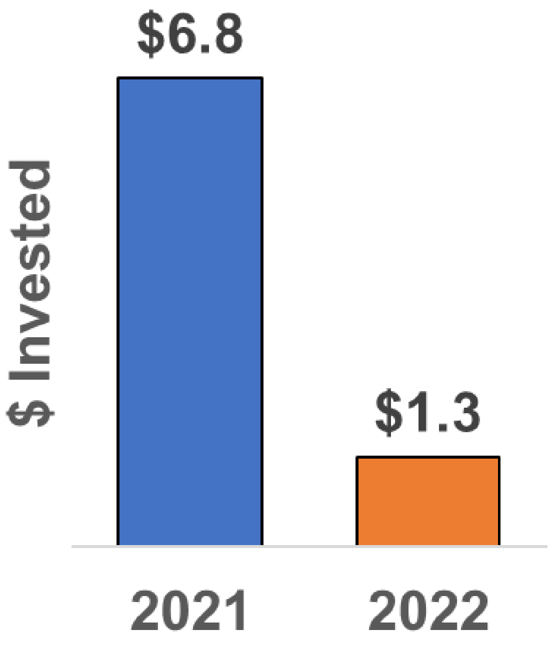
Follow-ons raising $10M+, R&D-stage biotechs

Source: BCIQ, BIO Industry Analysis, 2022

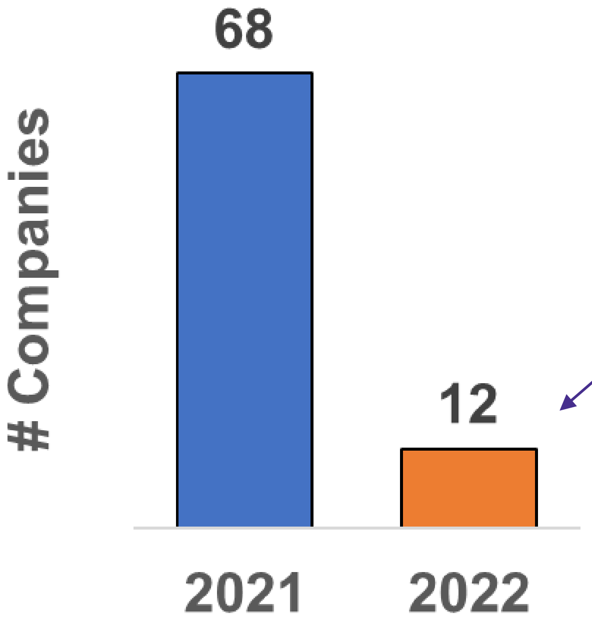
Follow-On Offerings from R&D-Stage U.S. Companies

2021 YTD vs 2022 YTD

$ Raised in Follow-Ons
-81%



 # Follow-Ons
-82%



Top 3 US R&D FOPOs of 2022

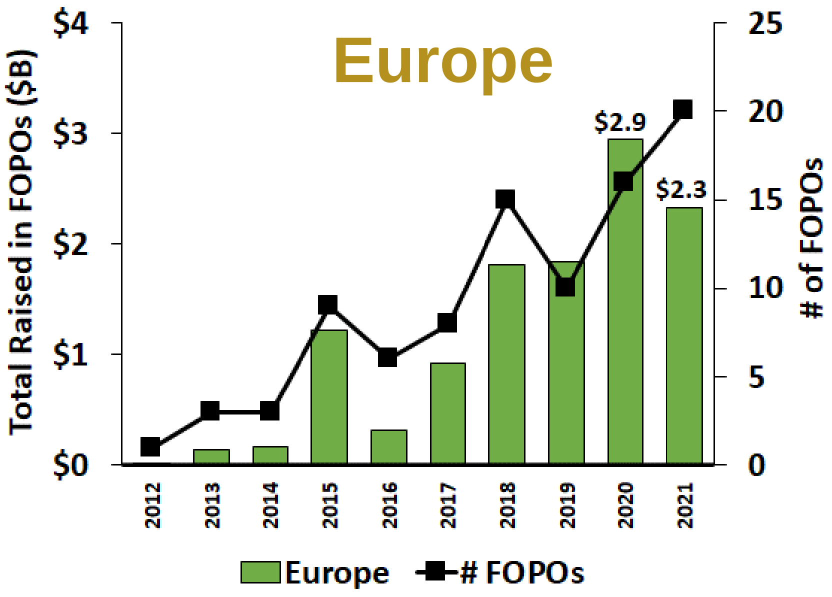
Nkarta (NKTX) $230M
IGM Biosciences (IGMS) $230M
Crinetics (CRNX) $125M

YTD data as of June 6th, Follow-ons raising $10M+, R&D-stage biotechs

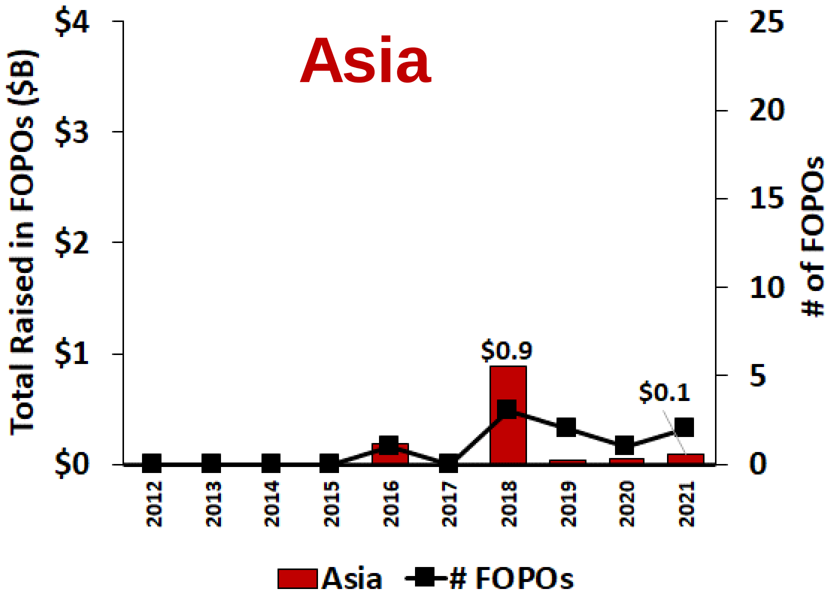
Source: BCIQ, BIO Industry Analysis, 2022

Follow-On Offerings from R&D-Stage Ex-U.S. Companies

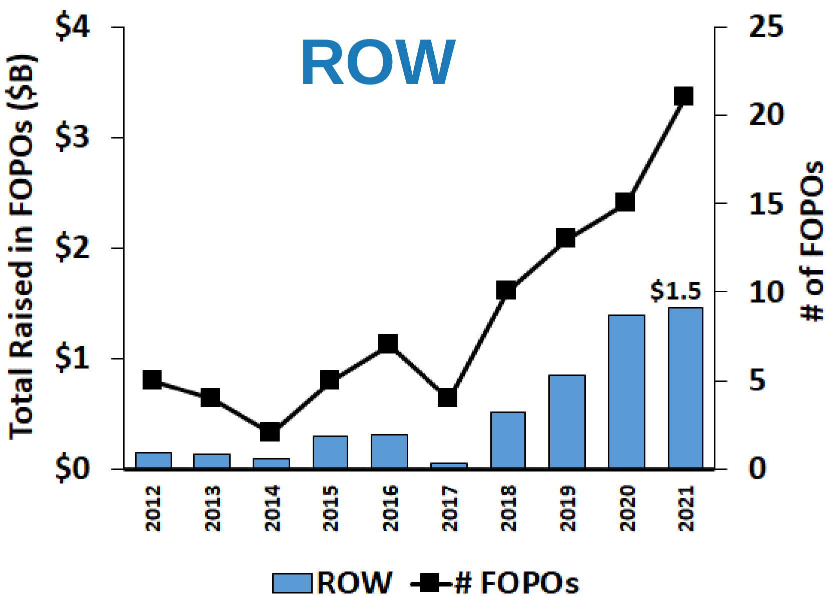
2021 = record #



Low Activity



2021 = record #



Top R&D-Stage FOPO 2021:

- *ArgenX $665M (Belgium)*
- *KalVista $223M (U.K.)*

Asia has mostly Market-Stage FOPOs, not shown.

2021 Market-Stage example:

- *Beigene $3.5B*

Top R&D-Stage FOPO 2021:

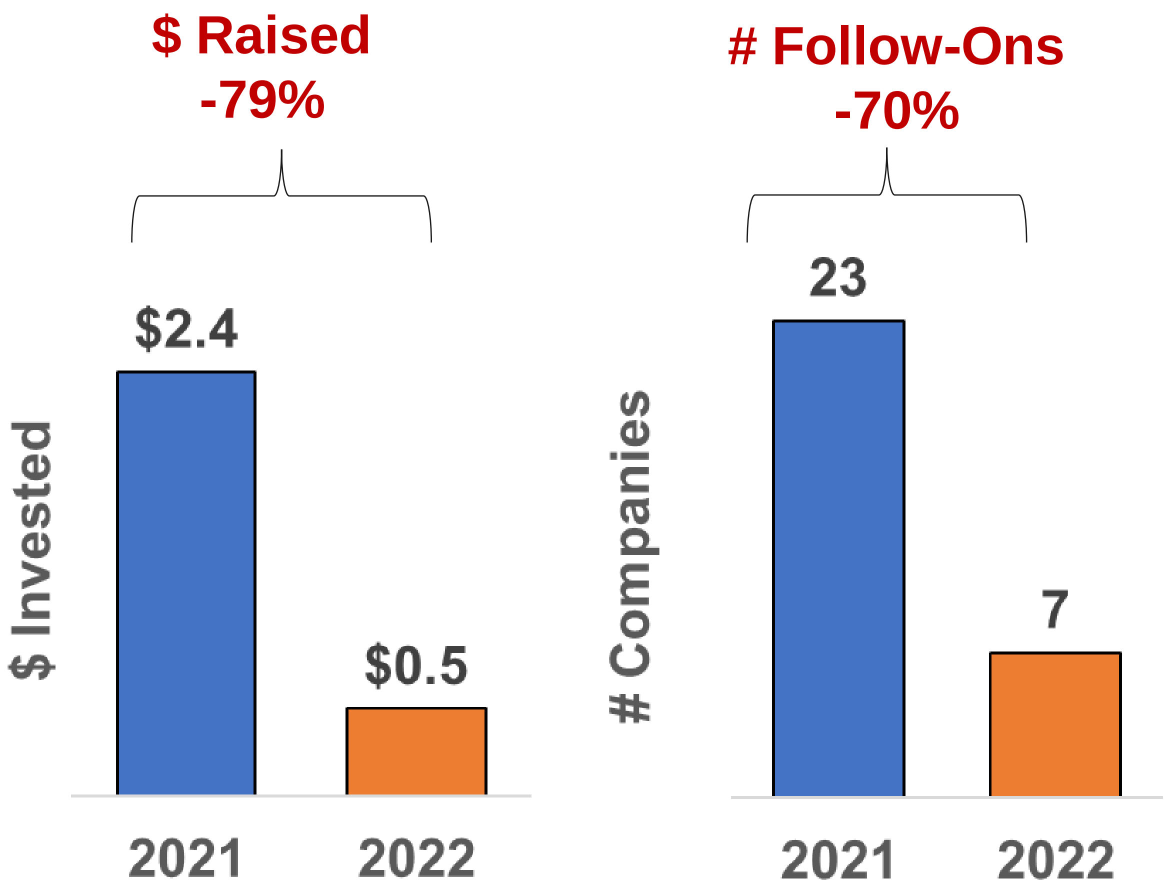
- *Xenon $345M (Canada)*
- *Bellus $200M (Canada)*

Follow-ons raising $10M+, R&D-stage biotechs

Source: BCIQ, BIO Industry Analysis, 2022

Follow-On Offerings from R&D-Stage Ex-U.S. Companies

2021 YTD vs 2022 YTD



Top 3 Ex-US R&D FOPOs of 2022

Sierra Oncology Inc.(SRRA) $155M
Zymeworks Inc.(ZYME) $115M
Affimed N.V.(AFMD) $104M

YTD data as of June 6th, Follow-ons raising $10M+, R&D-stage biotechs

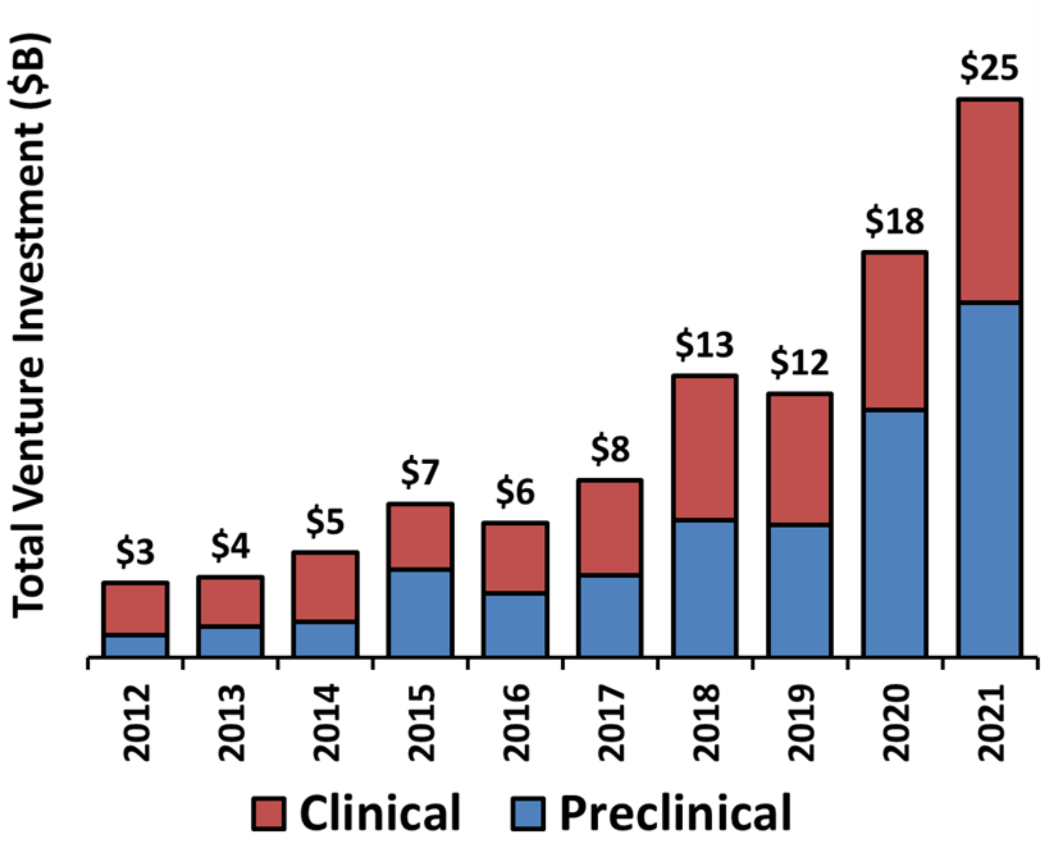
Source: BCIQ, BIO Industry Analysis, 2022

Venture Capital

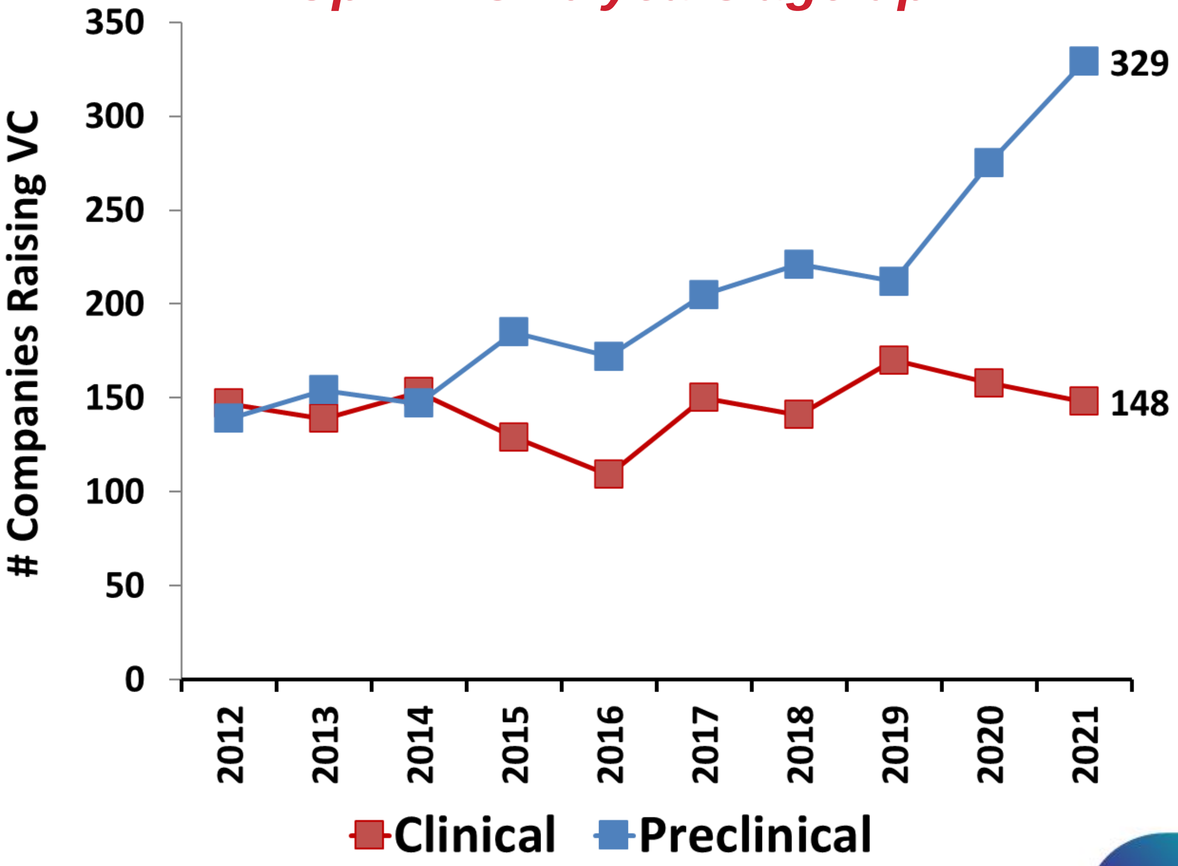
(investment in therapeutics companies only)

Venture Capital into U.S. Companies

2021 was a record year
Up ~8x vs 10 years ago



# of Preclinical Company Rounds
Up 2x vs 10 years ago up



Venture Capital into U.S. Companies

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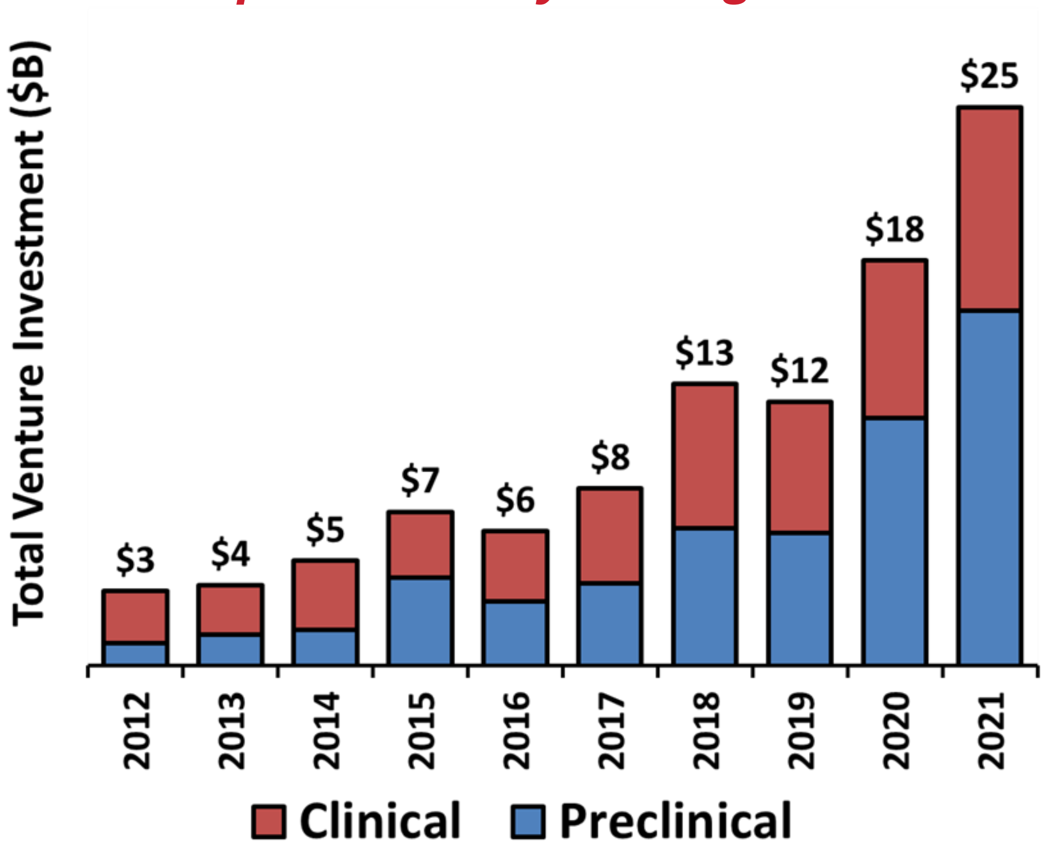
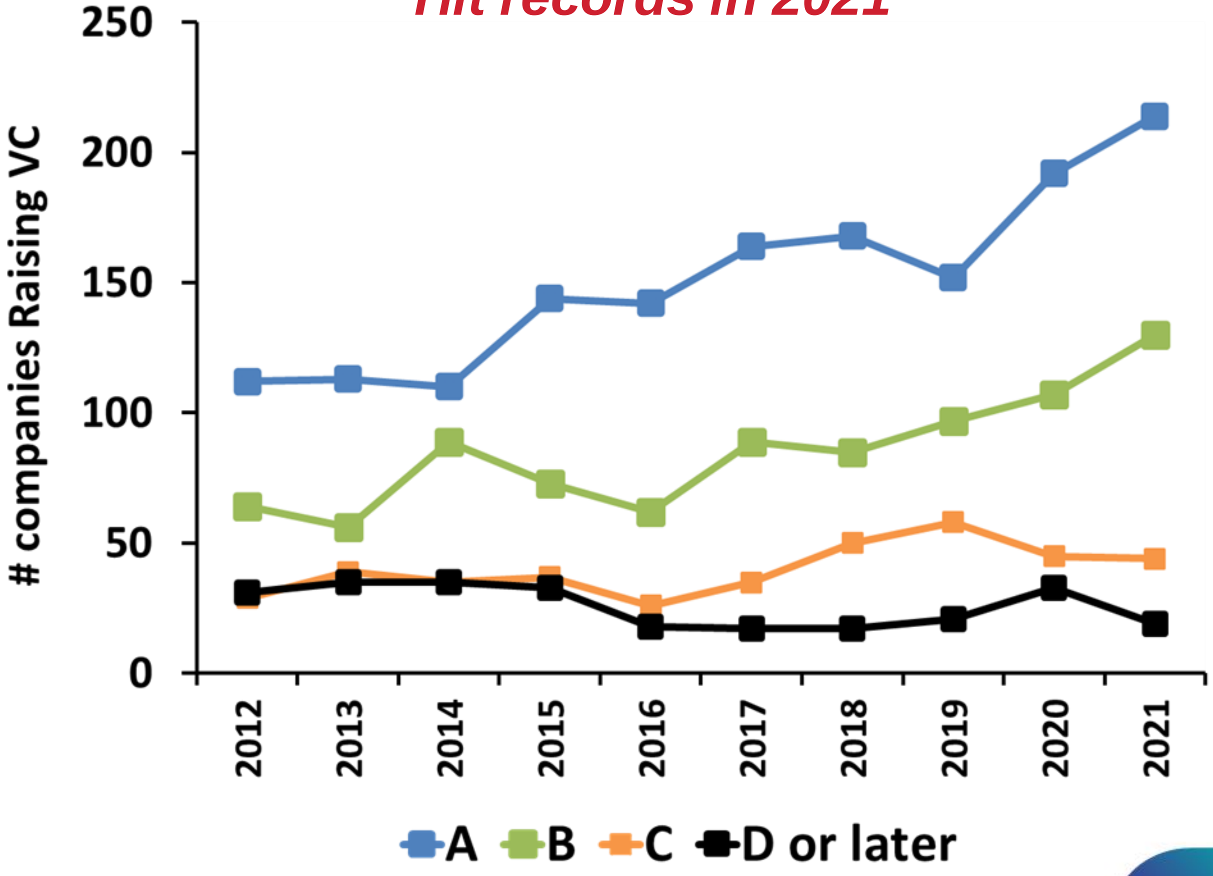


# of Series A/B Rounds
Hit records in 2021



Primary Databases used: Primary: Cortellis/TR, EvaluatePharma, Informa, Biocentury BCIQ

www.bio.org/iareports, BIO Industry Analysis, 2022

Venture Capital into U.S. Companies

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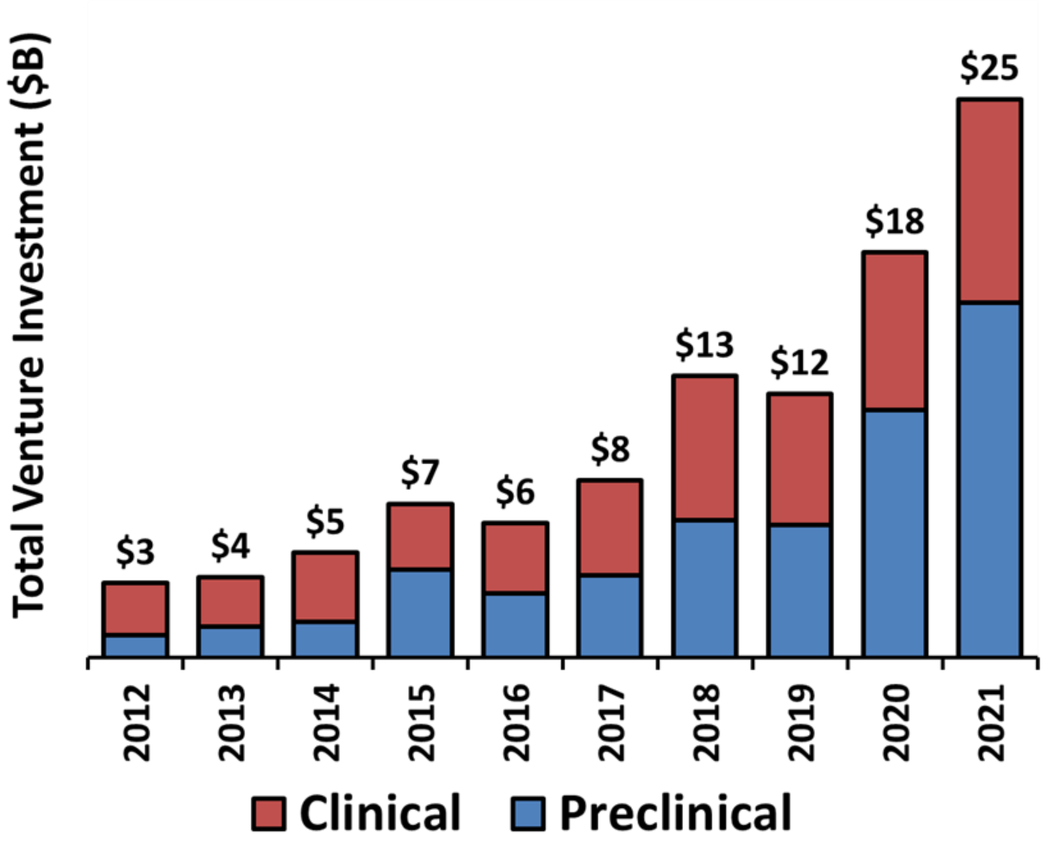
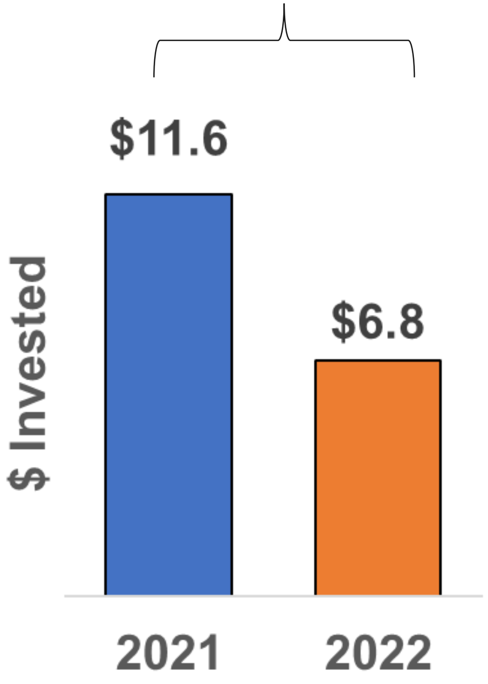
Up ~8x vs 10 years ago

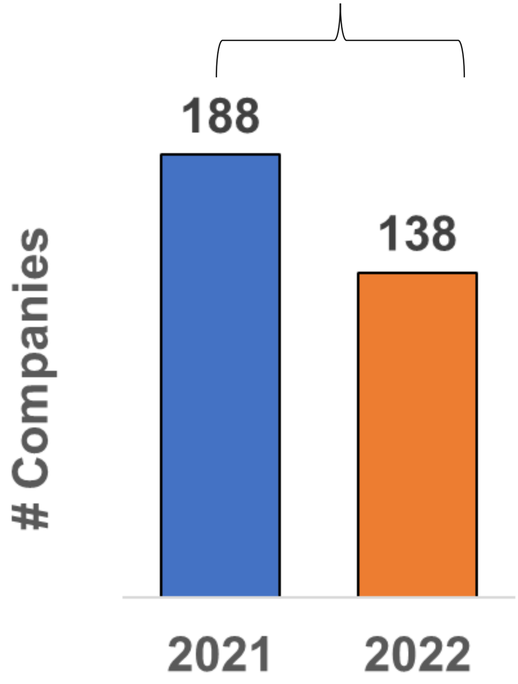


2021 YTD vs 2022 YTD

$ Raised
-41%



 # Financings
-27%



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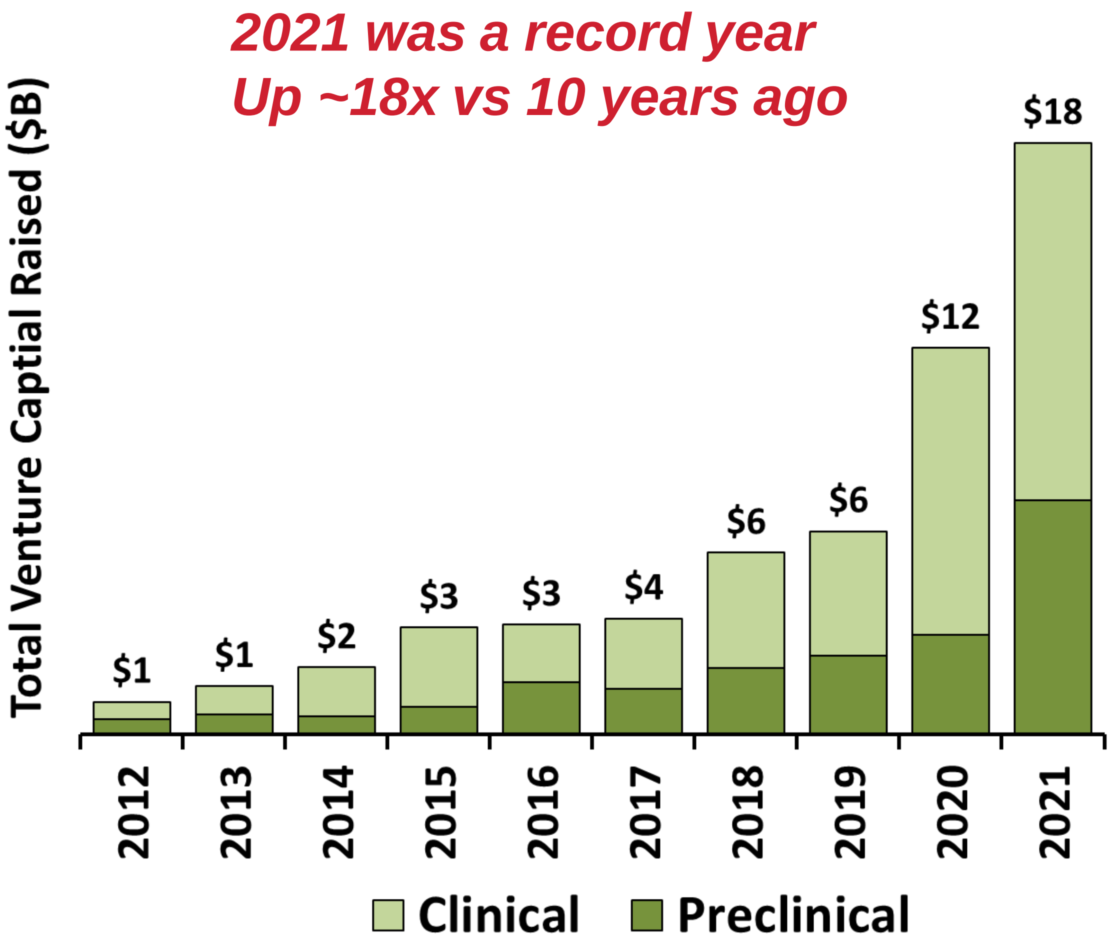
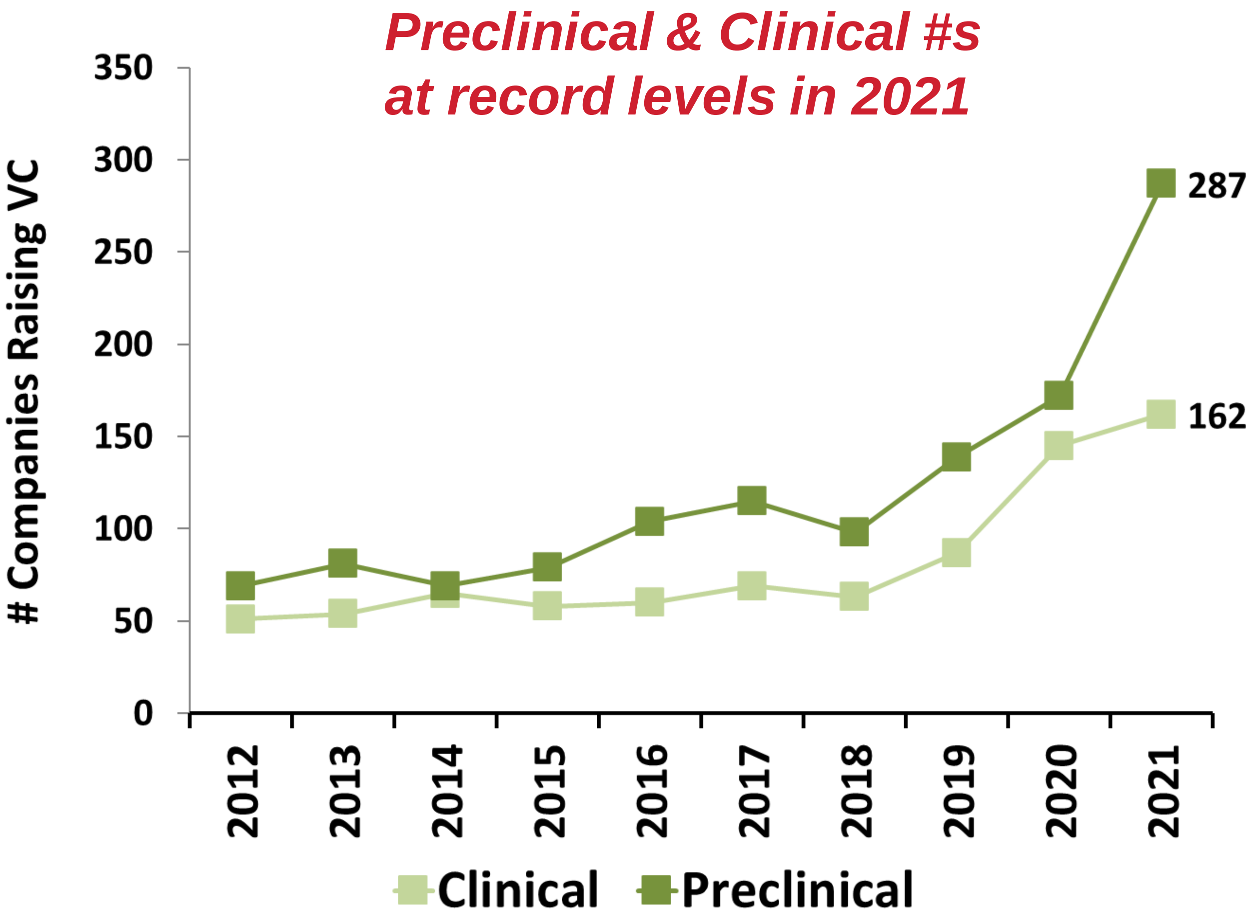
www.bio.org/iareports, BIO Industry Analysis, 2022

Venture Capital into Ex-US Companies





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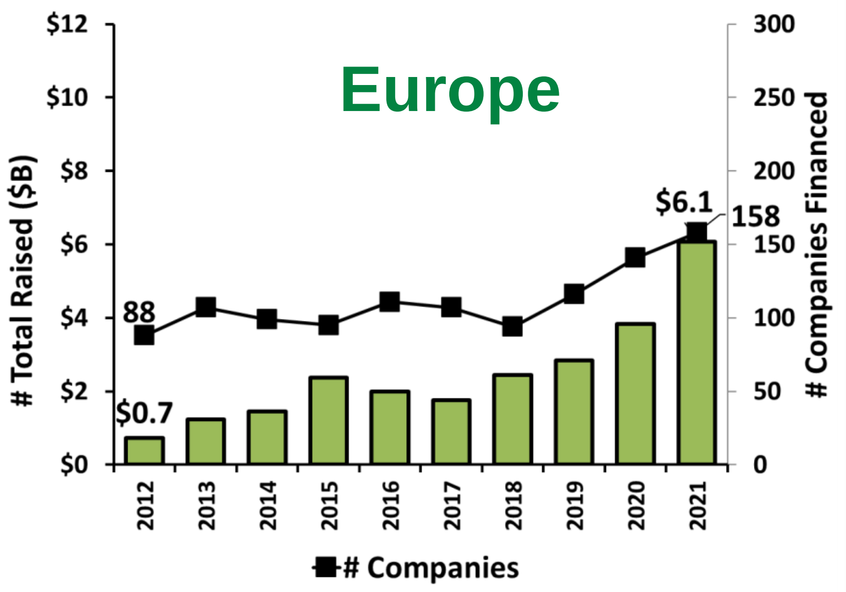
www.bio.org/iareports, BIO Industry Analysis, 2022

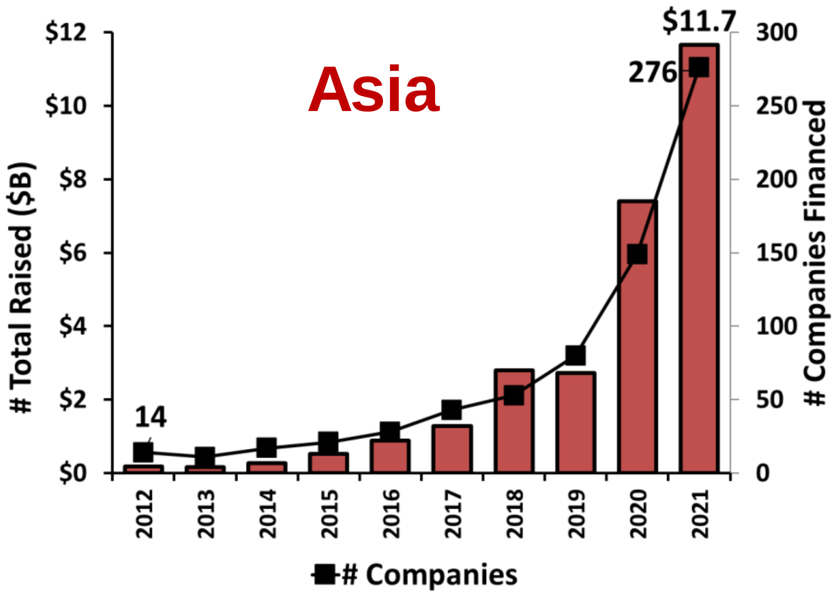
Venture Capital into Ex-U.S. companies
by Region

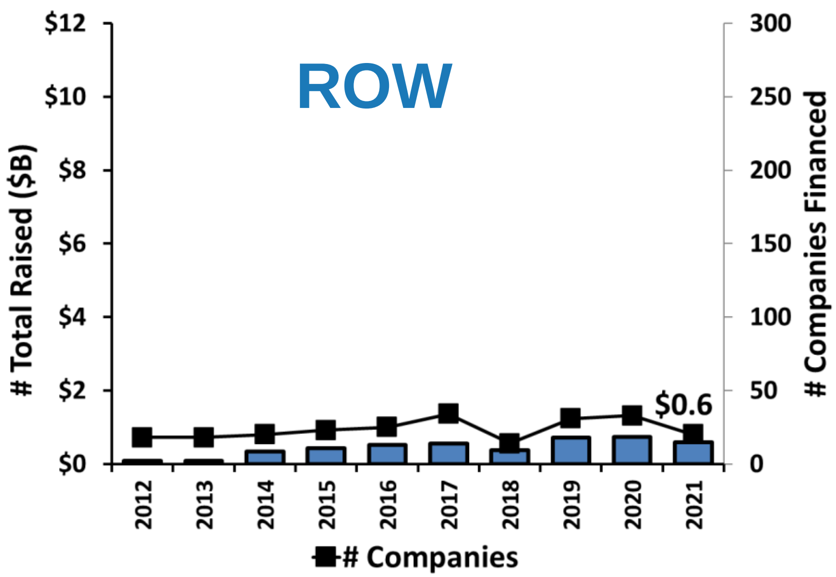
2021 = record # & $

Nearing 2x Europe

Flat







 # up 80% in 10 yrs

 # up 1,800% in 10 yrs

Primary Databases used: Primary: Cortellis/TR, EvaluatePharma, Informa, Biocentury BCIQ

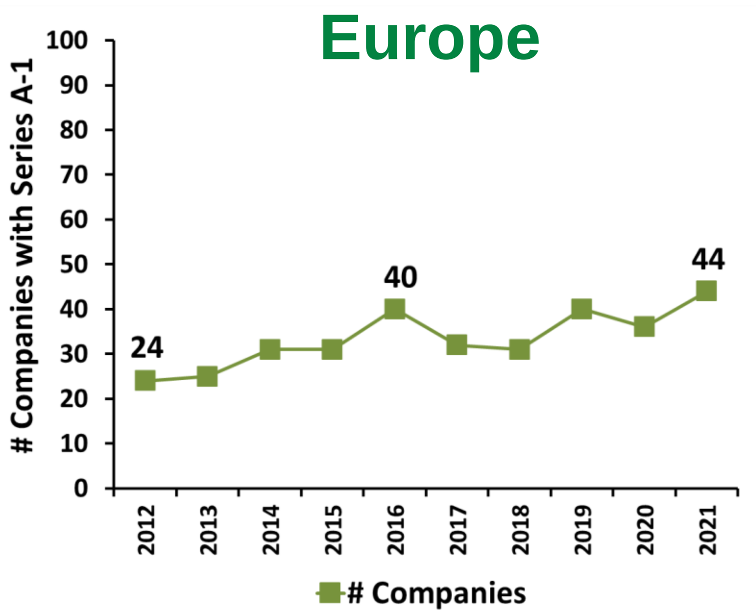
www.bio.org/iareports, BIO Industry Analysis, 2022

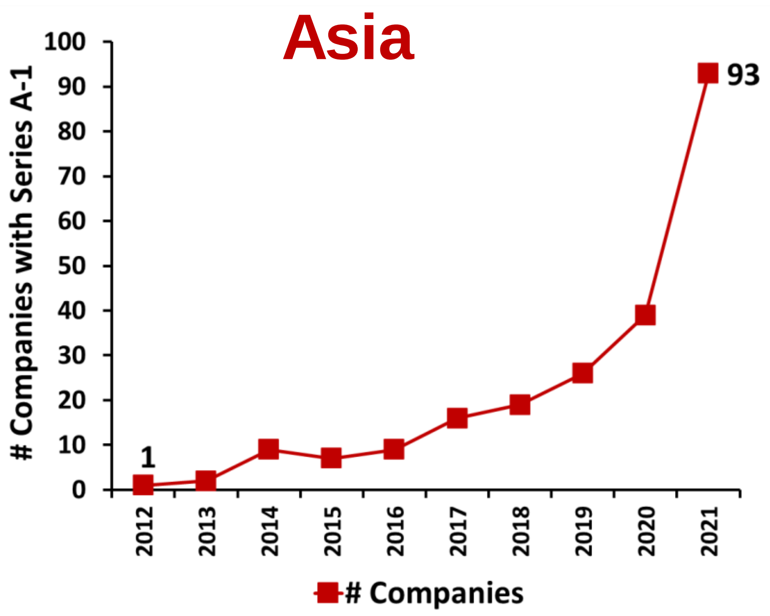
Venture Capital into Ex-U.S. companies

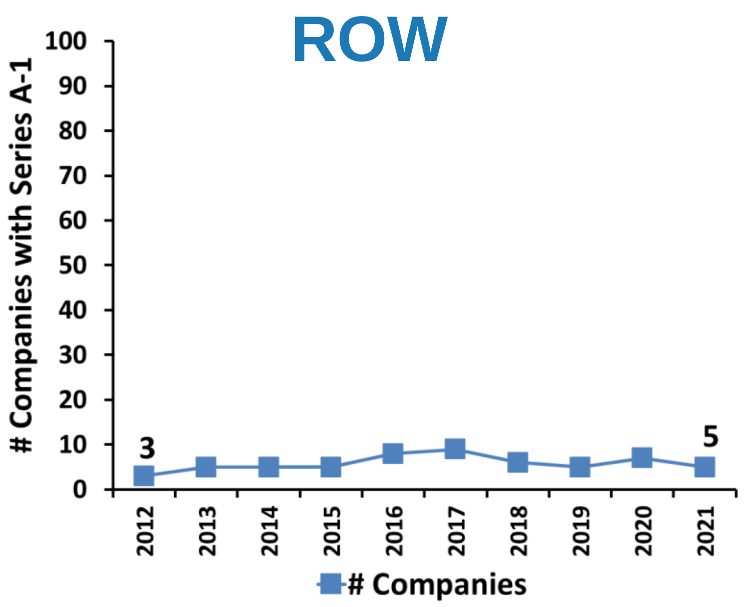
Series A-1 Rounds

2021 = barely a record

2021 = record #, by 2x vs 2020







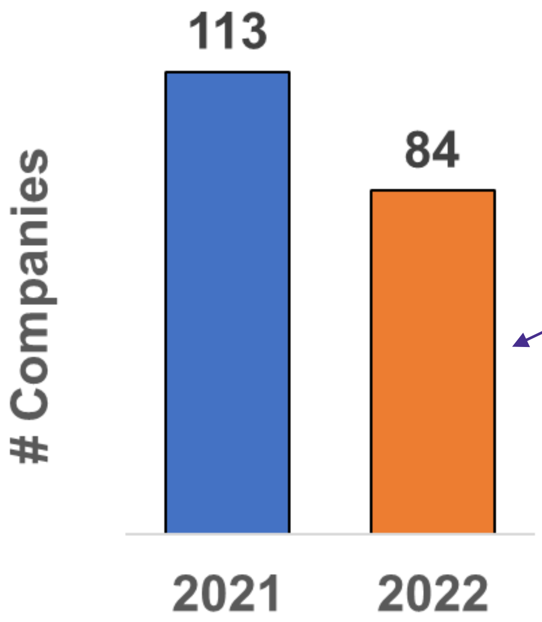
Venture Capital into Ex-US Companies

2021 YTD vs 2022 YTD

$ Raised
-48%

Europe	Asia
-63%	-35%

 # Financings
-26%



Europe	Asia
-39%	-6%

Primary Databases used: Primary: Cortellis/TR, EvaluatePharma, Informa, Biocentury BCIQ

www.bio.org/iareports, BIO Industry Analysis, 2022

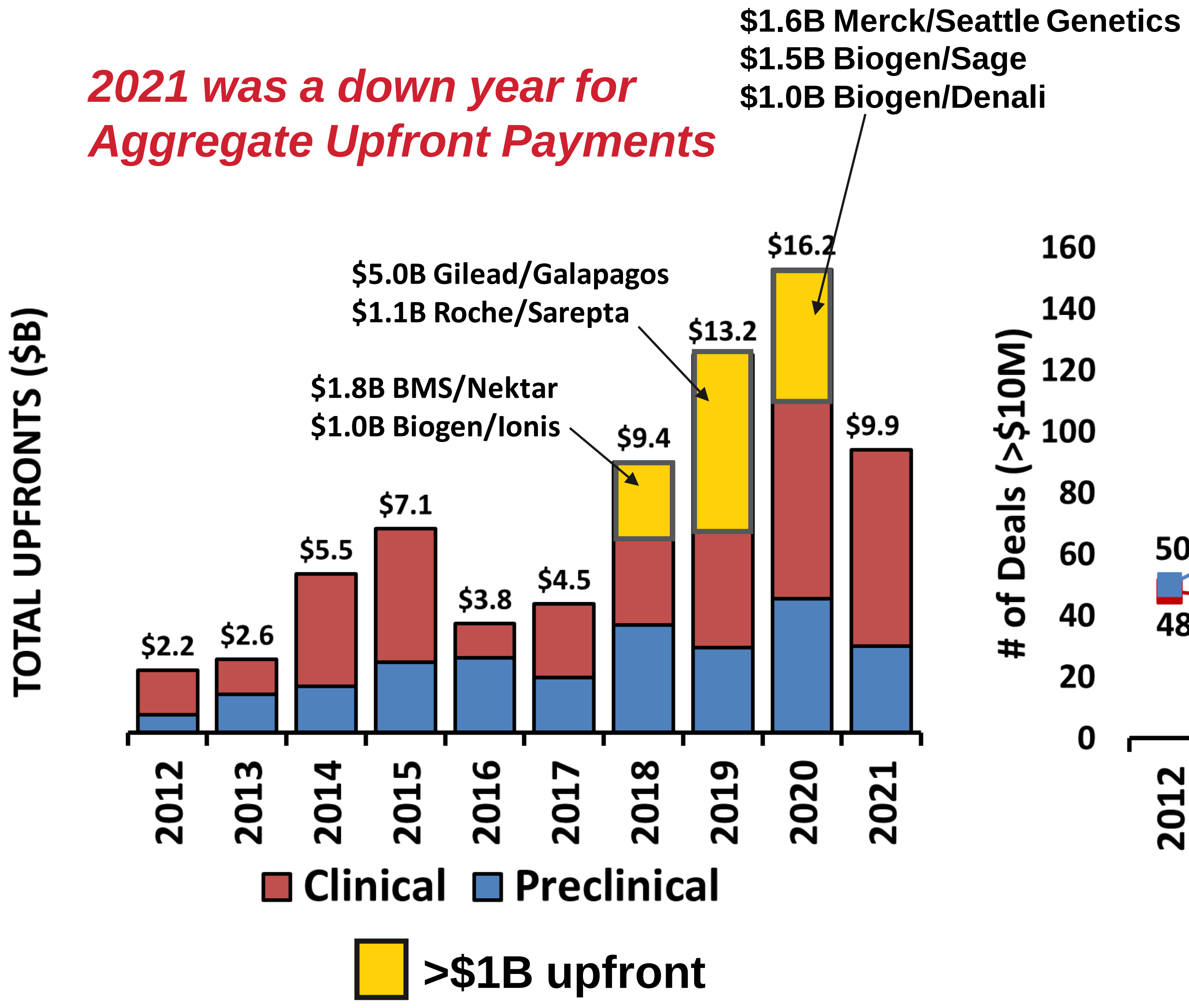
Out-Licensing of R&D-Stage Drug Assets

(<u>from</u> emerging therapeutic companies only)

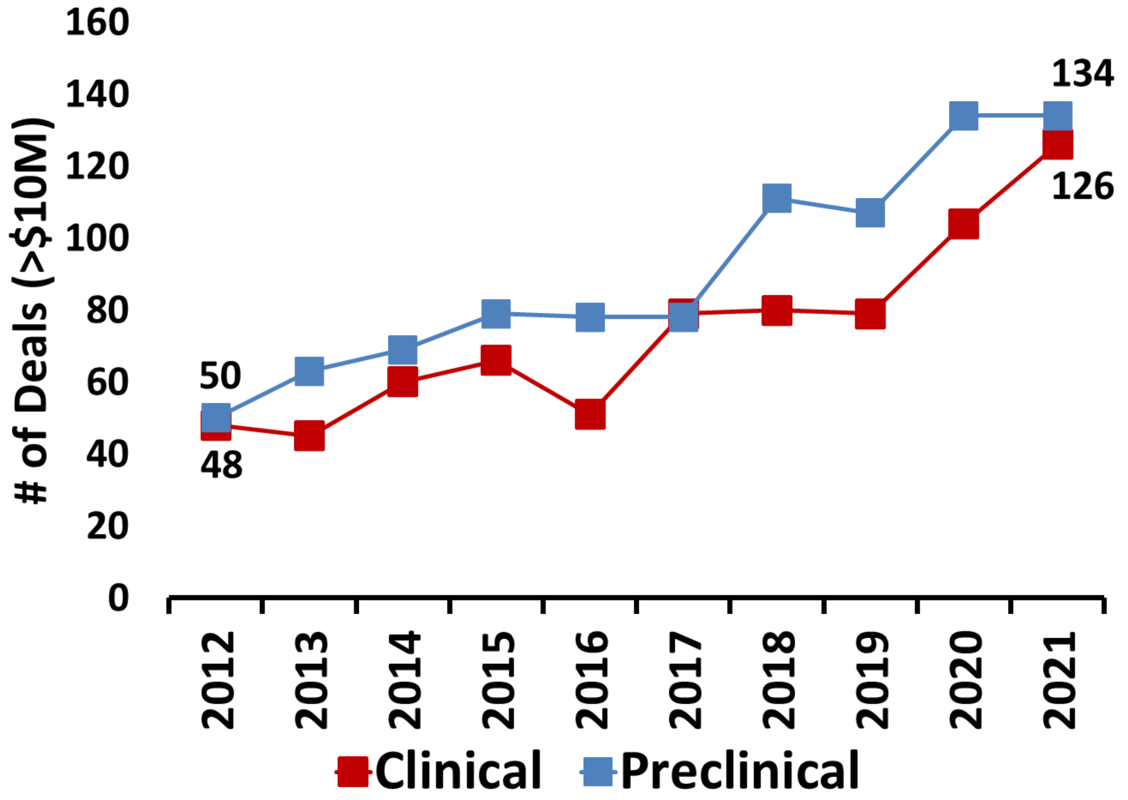
Pharma intelligence
informa

R&D-Stage Out-Licensing

2021 was a down year for Aggregate Upfront Payments



 # Clinical-Stage deals up

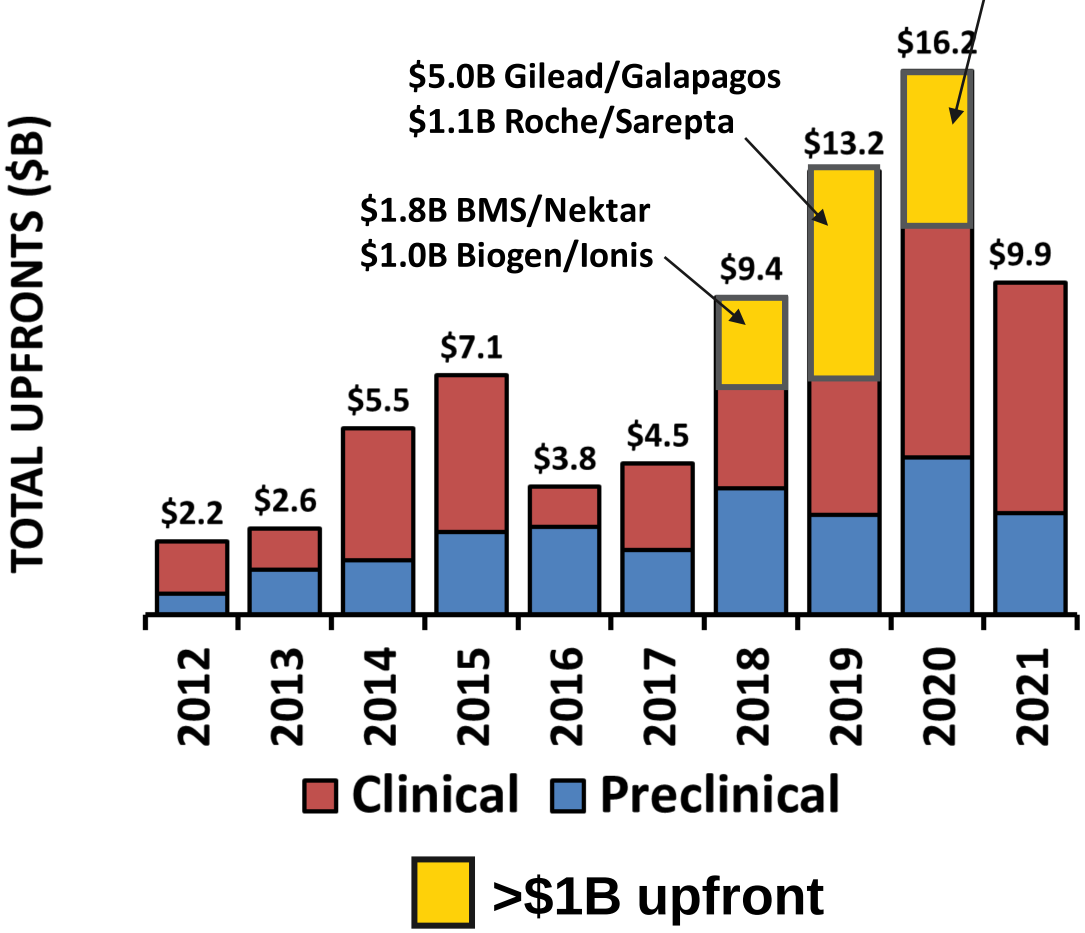


 # Deals worth >$10M

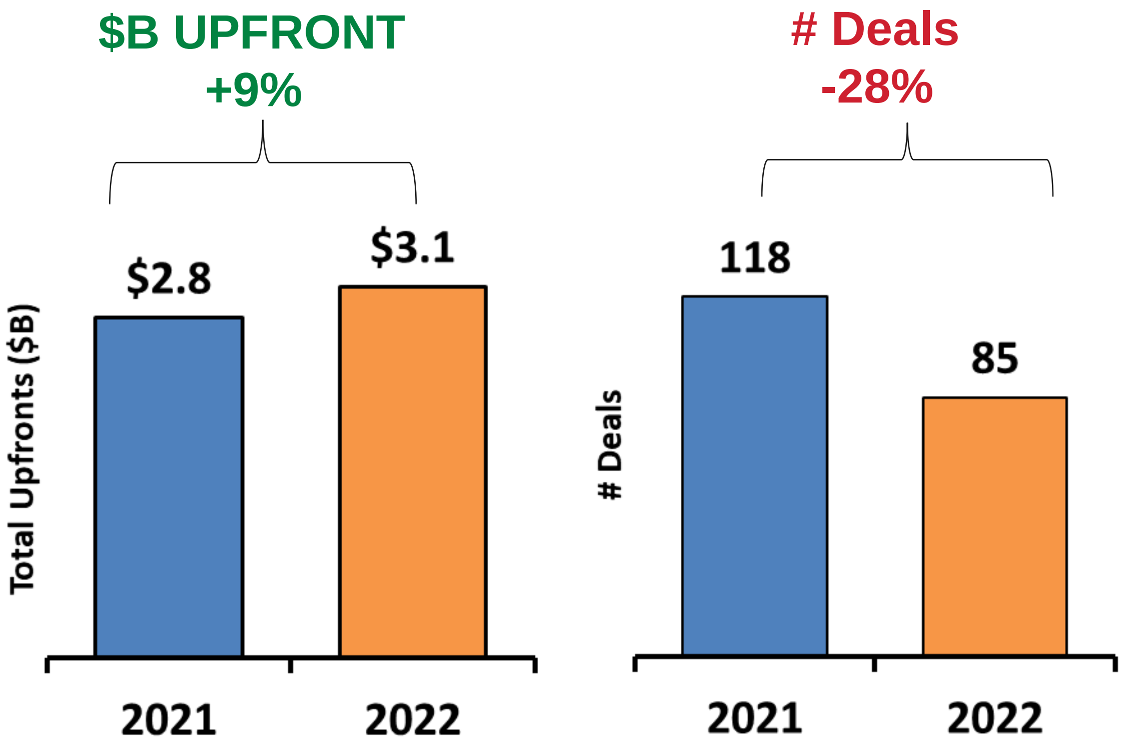
Database Source: Informa, Biomedtracker; BIO Industry Analysis, 2022

R&D-Stage Out-Licensing

2021 was a down year for Aggregate Upfront Payments



2021 YTD vs 2022 YTD



 # Deals worth >$10M, as of June 6th

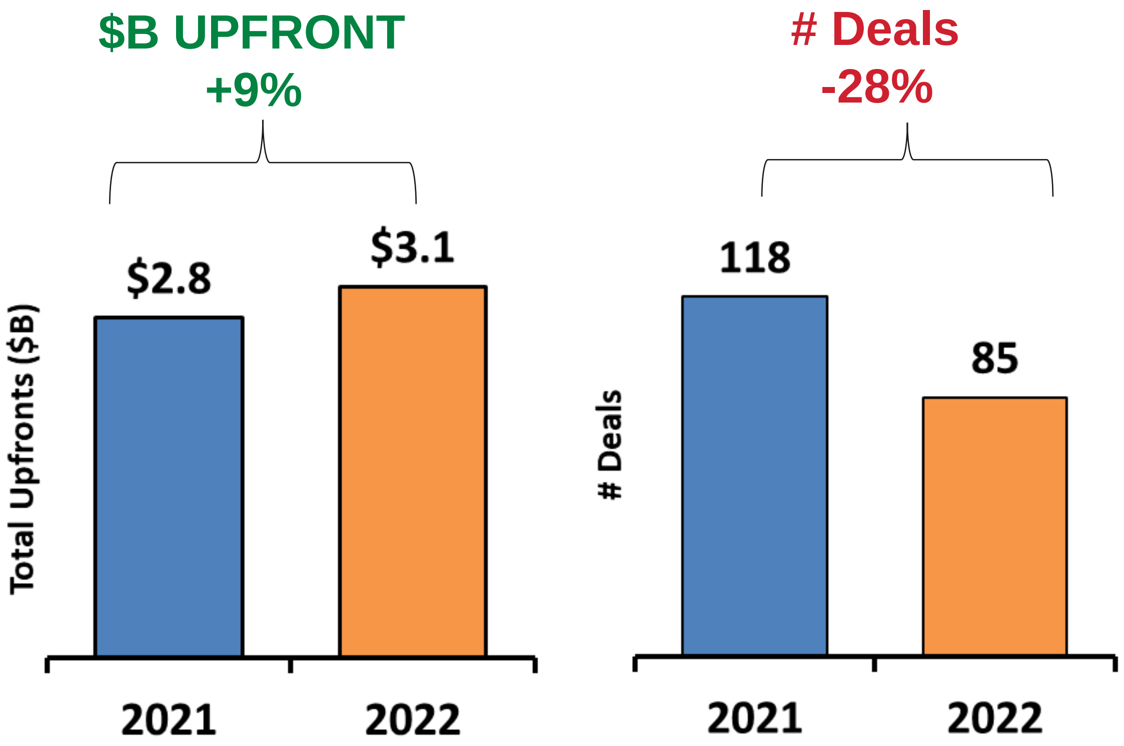
Database Source: Informa, Biomedtracker; BIO Industry Analysis, 2022

R&D-Stage Out-Licensing

Top Deals by Upfront Payment

Licensor/Licensee	Stage	Asset/Area	Upfront ($M)
Dragonfly / Gilead	PC	NK cells for Oncology	$300
Beam / Pfizer	PC	Base editing for rare diseases	$300
BioNTech / Pfizer	PC	mRNA Shingles vaccine	$225
IGM / Sanofi	PC	IgMs for Oncology/Inflammation	$150
Century / BMS	PC	NK and T-cells for Oncology	$150
Moderna / Carisma	PC	CAR-M cells for Oncology	$80
Arrakis / Amgen	PC	Small Molecule RNA Degraders	$75
ABL Bio / Sanofi	PC	Bispecific Mab for Parkinson's	$75
Stoke / Acadia	PC	pro-mRNA oligo drugs, Neurology	$60
Sarepta / GenEdit	PC	Gene editing delivery	$57

2021 YTD vs 2022 YTD



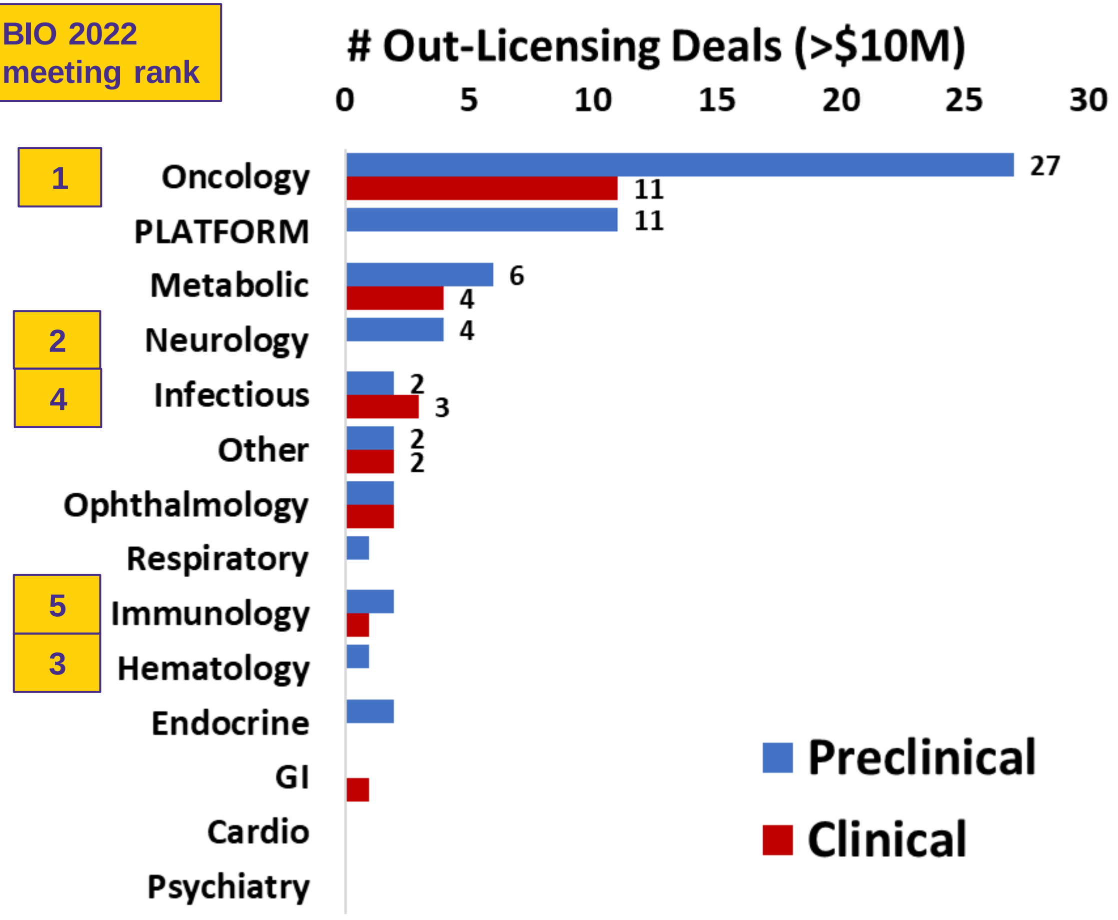
Deals worth >$10M, as of June 6th

Database Source: Informa, Biomedtracker; BIO Industry Analysis, 2022

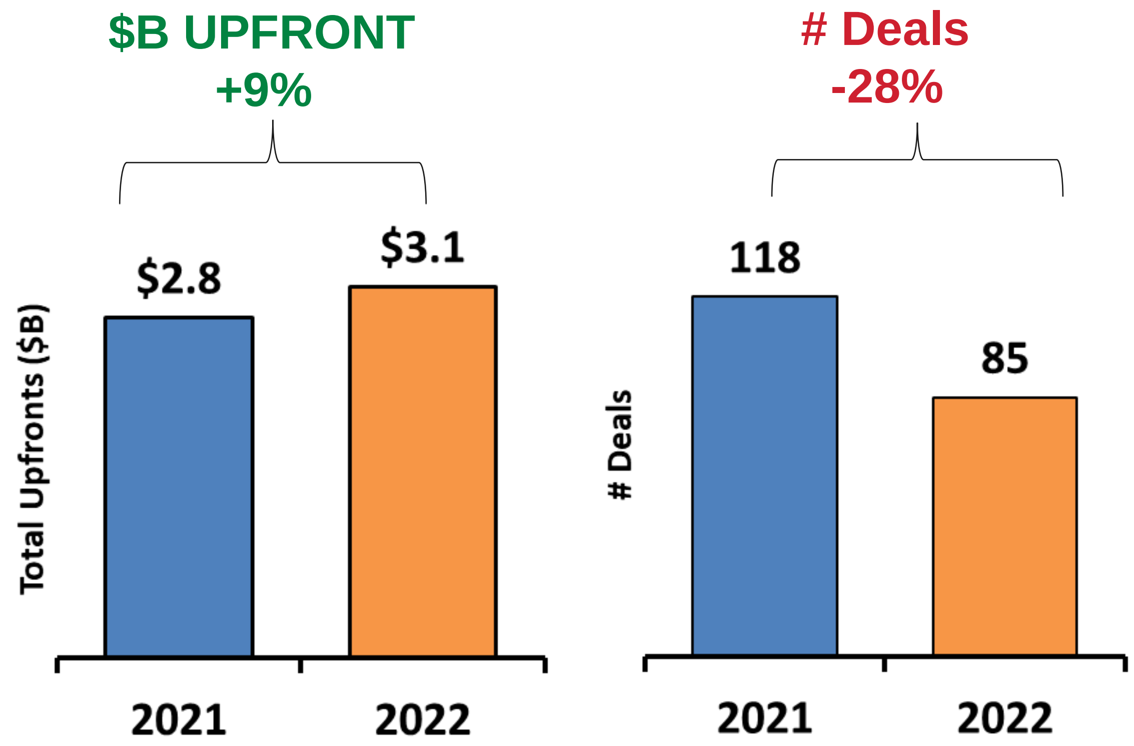
R&D-Stage Out-Licensing

2022 deals by Disease Area

BIO 2022
1x1 meeting rank



2021 YTD vs 2022 YTD



Examples in “other” = Dermatology, hearing, delivery, women’s health

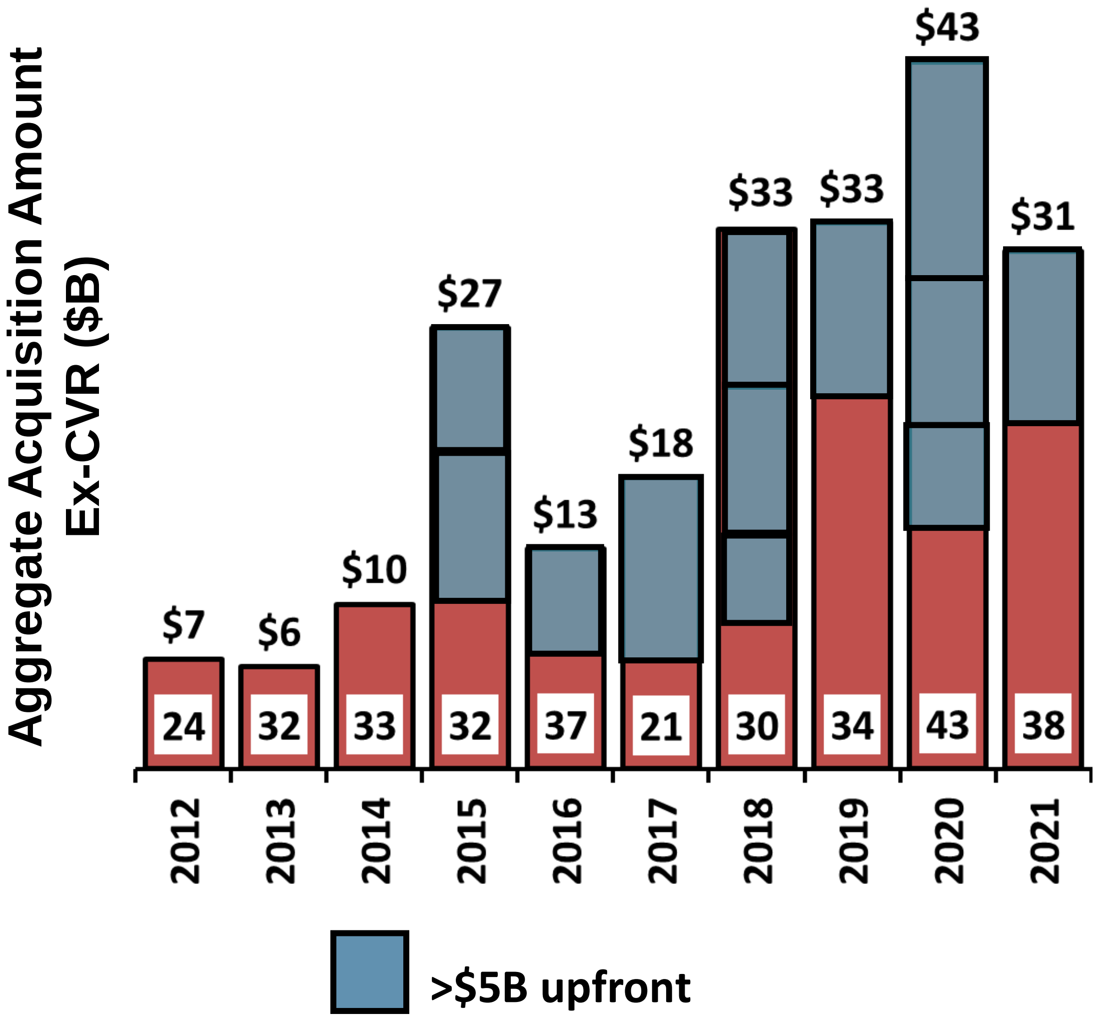
Deals worth >$10M, as of June 6th

Database Source: Informa, Biomedtracker; BIO Industry Analysis, 2022

Acquisitions

Part 1. R&D-stage companies
Part 2. Market-stage companies with <$1B sales)

R&D-Stage Acquisitions



>$5B upfront 2021

- PFE → Arena $6.9B

$1-5B upfront 2021

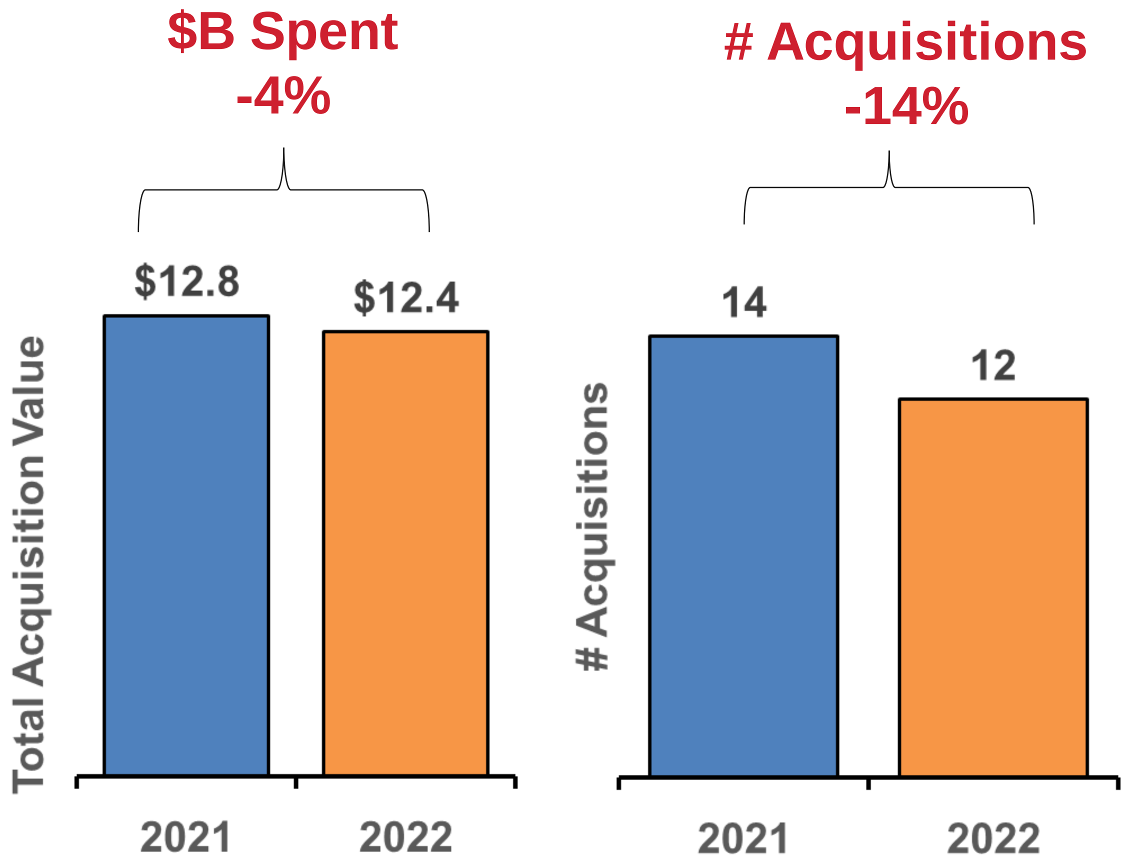
- SNY → Translate BIo $3.2B
- Novo → Dicerna $3.0B
- HORIZON → Viela Bio $3.0B
- PFE → Trillium $2.2B
- Amgen → Five Prime $1.9B
- MRK → Pandion $1.9B
- MOR → Constellation $1.7B
- BAY → Vivideon $1.5B
- LLY → Protomer $1.0B
- SNY → Amunix $1.0B

Therapeutic companies acquired for minimum $10M deal value

Database Source: Informa, Biomedtracker; BIO Industry Analysis, 2022

R&D-Stage Acquisitions

2021 YTD vs 2022 YTD



>$5B upfront 2022

(*none*)

$1-5B upfront 2022

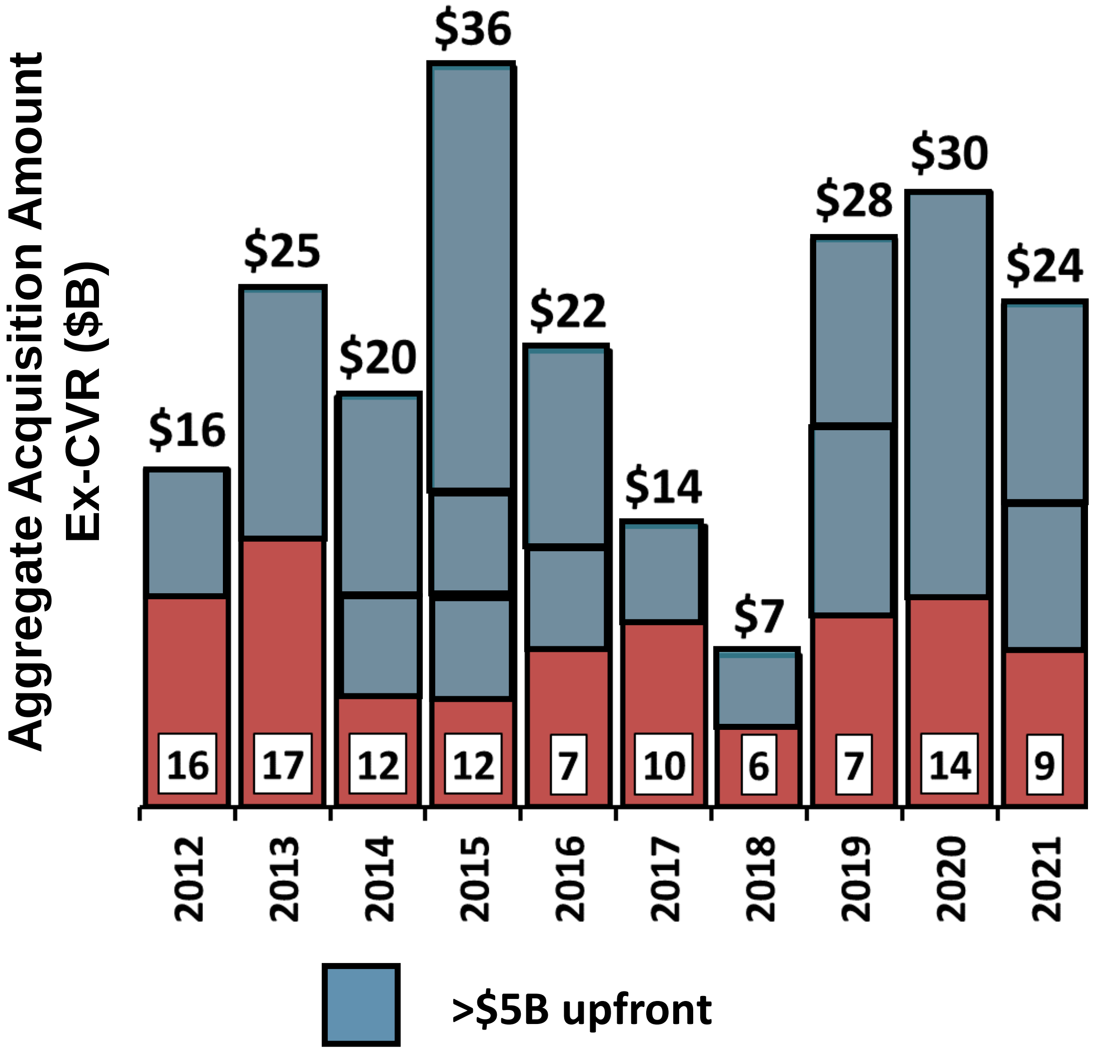
- BMS → Turning Point ($4.1B)
- GSK → Affinivax ($2.1B +CVR)
- GSK → Sierra Oncology ($1.9B)

Therapeutic companies acquired for minimum $10M deal value

Database Source: Informa, Biomedtracker; BIO Industry Analysis, 2022

Market-Stage Acquisitions

Emerging Company Targets with <$1B Sales



>$5B upfront 2021

- MRK → Acceleron $11.5B
- JAZZ → GW $7.2B

$1-5B upfront 2021

- SNY → Kadmon $1.9B
- Philip Morris → Vectura $1.4B

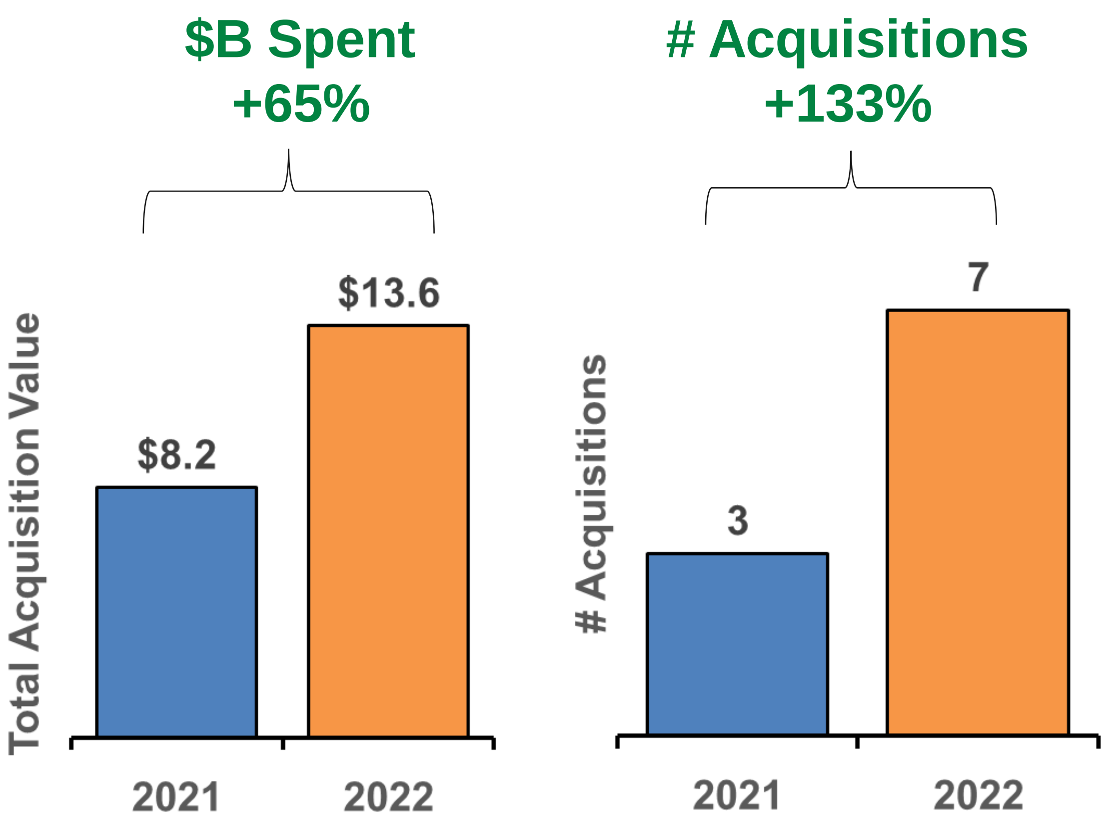
Therapeutic companies acquired for minimum $10M deal value

Database Source: Informa, Biomedtracker; BIO Industry Analysis, 2022

Market-Stage Acquisitions

Emerging Company Targets with <$1B Sales

2021 YTD vs 2022 YTD



>$5B upfront 2021

- Pfizer → Biohaven ($11.6B)

$1-5B upfront 2022

(*none*)*

* Halozyme → Antares was $960M

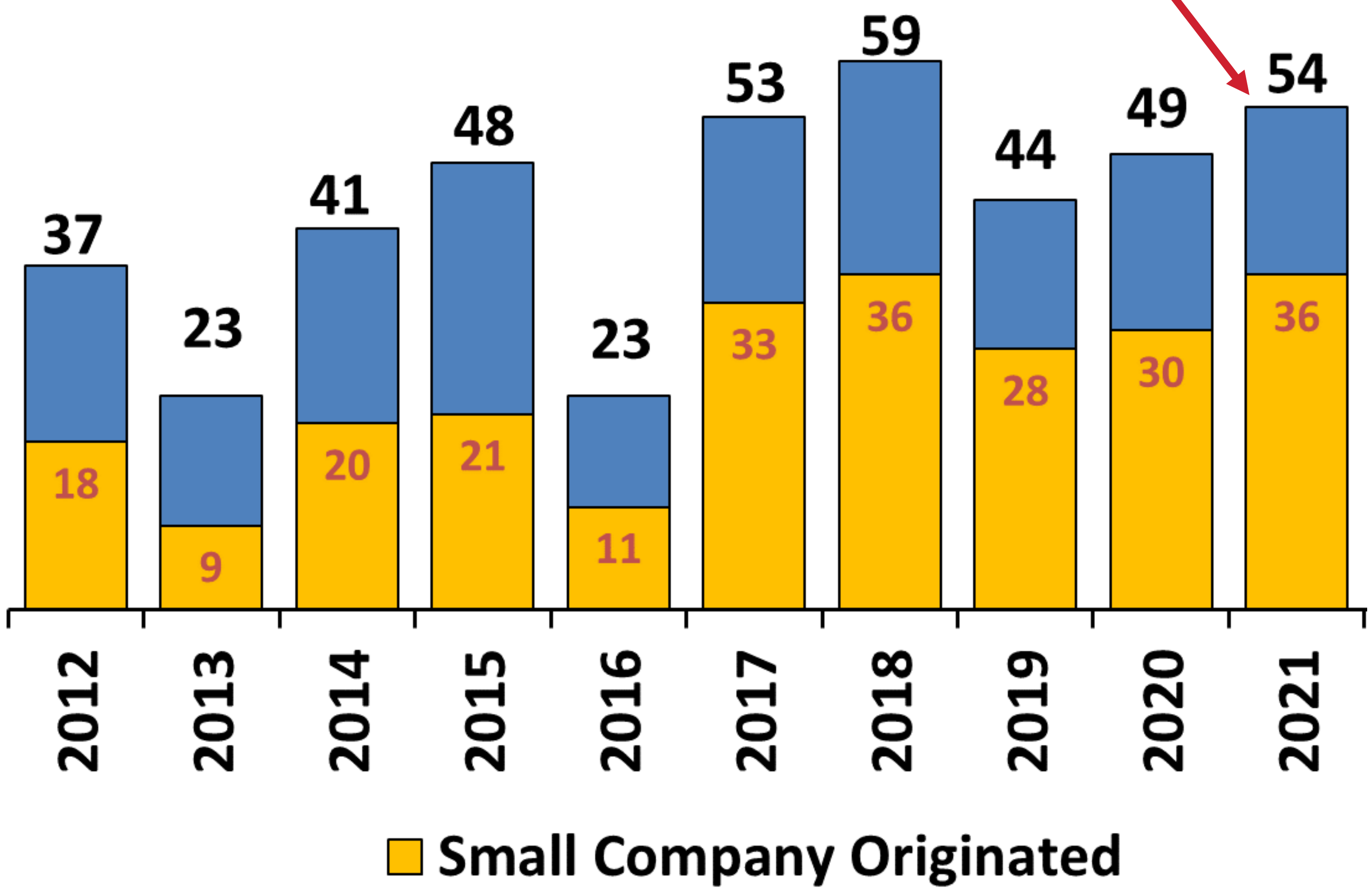
Therapeutic companies acquired for minimum $10M deal value

Database Source: Informa, Biomedtracker; BIO Industry Analysis, 2022

FDA Approvals
Clinical Pipeline

FDA Approvals for Novel Therapeutics

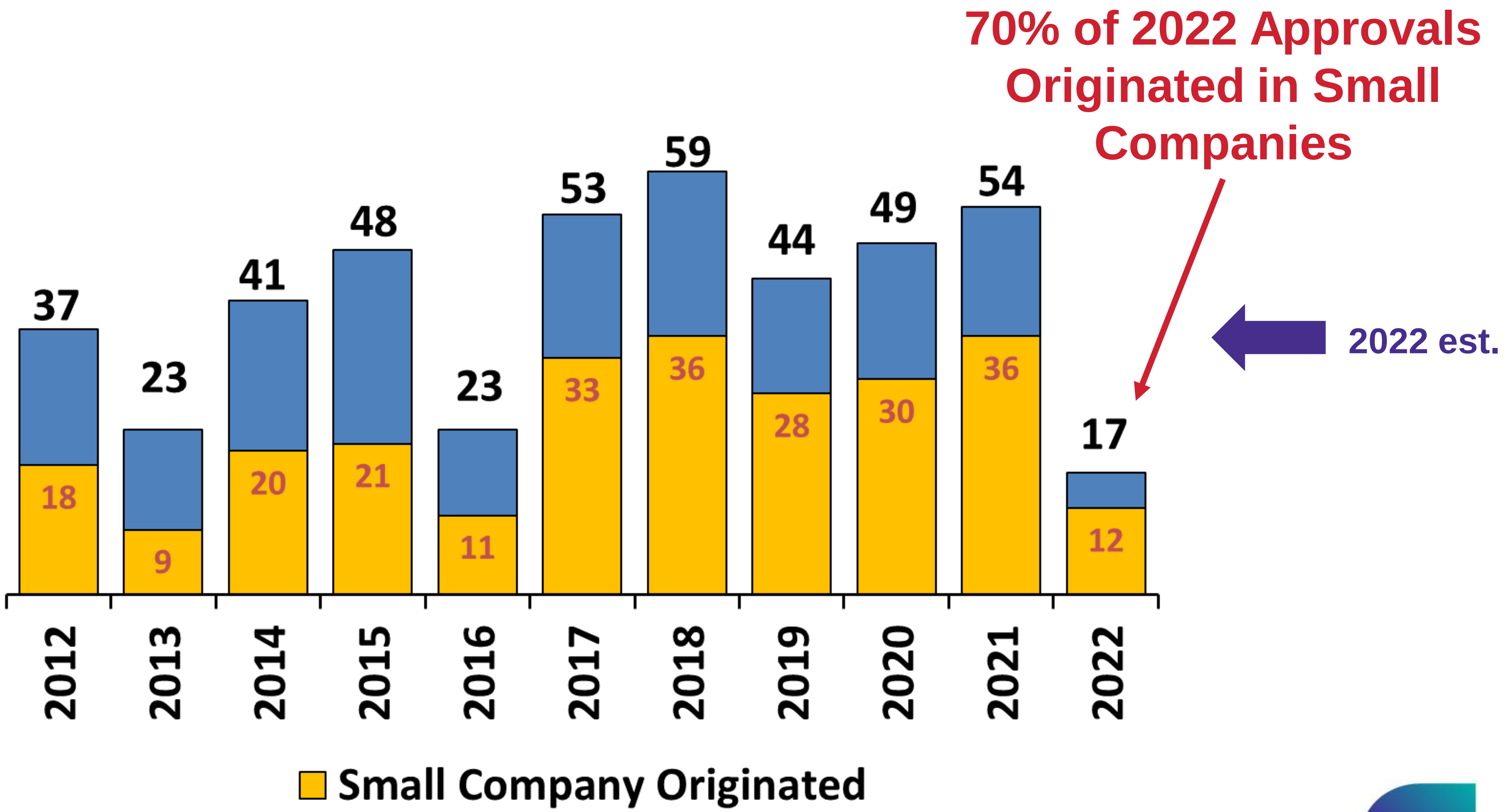
66% of 2021 Approvals Originated in Small Companies



Novel Drugs only, both CDER and CBER

Source: FDA.gov, Biomedtracker, EvaluatePharma, BIO Industry Analysis, 2022

FDA Approvals for Novel Therapeutics



Novel Drugs only, both CDER and CBER

Source: FDA.gov, Biomedtracker, EvaluatePharma, BIO Industry Analysis, 2022

FDA New Drug Approvals in 2022 YTD

17 approvals (as of June 7)

Drug - Company (Partner or Acquirer)	Type --> Target	Disease
Carvykti - JNJ (Legend)	CAR-T --> BCMA	Multiple myeloma
Spikevax - Moderna	mRNA vaccine --> Spike	Covid-19
KIMMTRAK - Immunocore (AZ)	Protein fusion --> TCR/gp100 + anti-CD3	Uveal Melanoma
Mounjaro - Lilly	Peptide --> GLP-1 + GIP	Type 2 Diabetes
VABYSMO - Roche	Mab (IgG1 bispecific) --> VEGF-A + Ang-2	Wet AMD
Opdualag (relatlimab) - BMS	Mab (IgG4) --> LAG-3	Metastatic Melanoma
ENJAYMO - Bioverativ (Sanofi)	Mab (IgG4) --> complement	Autoimmune Anemmia
VTAMA - Welichem (Dermavant)	Small molecule --> AhR (agonist)	Psoriasis
VONJO - S*BIO (CTI)	Small molecule --> JAK2 and STAT5	Myelofibrosis
CAMZYOS - MyoKardia (BMS)	Small molecule --> myosin (allosteric)	Cardiomyopathy (oHCM)
PLUVICTO - ABX (Novartis)	Small molecule --> PSMA (radiodrug)	Prostate cancer
ZTALMY - Ligand (Marinus)	Small molecule --> GABAAR (allosteric)	Seizure (Epilepsy)
VIVJOA - Mycovia	Small molecule --> lanosterol demethylase	Fungal infections
PYRUKYND - Agios	Small molecule --> PKR (activator)	PK Deficiency
Takecab - Phathom (Otsuka)	Small molecule --> H+/K+ ATPase	*H. pylori* infection
CIBINQO - Pfizer	Small molecule --> JAK1	Atopic Dermatitis
QUVIVIQ - Idorsia	Small molecule --> orexin receptor	Insomnia

= oncology

Novel Drugs only, both CDER and CBER

Source: FDA.gov, Biomedtracker, BIO Industry Analysis, 2022

Clinical Pipeline in 2022

6,918 Clinical Programs*

Up from 6,506 reported last year (+6.3%)

77% Small Company Originated

Disease	2021	2022	total
Oncology	2798	3000	202
Neurology	692	742	50
Infectious Disease	588	632	44
Other	460	501	41
Immunology	445	466	21
Endocrine	304	300	-4
Ophthalmology	239	250	11
Metabolic	231	240	9
Cardio	176	182	6
GI	171	173	2
Respiratory	146	150	4
Hematology	128	141	13
Psychiatry	128	141	13
Total	**6506**	**6918**	**412**

** Company drug-indication clinical programs intended to eventually reach FDA approval*

Source: Biomedtracker, BIO Industry Analysis, 2022

Summary for 2022 YTD

Region	Emerging Therapeutic Company Financing and Deals	2022 vs 2021 (YTD)	
		Trend in $	Trend in #
U.S	IPOs (R&D-stage)	-83%	-69%
	Follow-On Offerings (R&D-stage)	-81%	-83%
	Venture Capital (R&D-stage)	-47%	-27%
Ex-U.S.	IPOs (R&D-stage)	-80%	-65%
	Follow-On Offerings (R&D-stage)	-79%	-70%
	Venture Capital (R&D-stage)	-48%	-26%
Global	Out-Licensing (R&D-stage assets)	9%	-28%
	Acquisitions (R&D-stage companies)	-4%	-14%
	Acquisitions (Market-stage companies)	65%	133%

Industry Therapeutic Productivity	Trend in #
FDA Approvals	-23%
Clinical Pipeline	6%

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