PitchBook

QUANTITATIVE RESEARCH

VC Emerging Opportunities

Early-stage investment attractiveness across technology verticals

2023

Overview

In the dynamic VC investment landscape, trends in emerging technology verticals can shift quickly. This report can help investors stay on top of those trends by providing them with a quantitative approach to vertical analysis that blends bottom-up and top-down perspectives. The ultimate goal is to provide investors with an objective way to compare risks and opportunities in early-stage startup investments (seed, Series A, and Series B) across and within verticals, thereby enabling well-informed portfolio allocation decisions.

At the core of this analysis lies the PitchBook VC Exit Predictor, a machine learning model that predicts the probability that a startup will ultimately be acquired, go public, or not exit. This tool serves as the foundation for our bottom-up analysis by allowing us to aggregate individual company predictions into a vertical-level assessment, which provides valuable insights into the potential risks and return opportunities associated with each vertical.

Our top-down analysis complements the insights provided by the VC Exit Predictor by tracking and synthesizing important macroeconomic-level trends across verticals. Indicators in this analysis include deal activity, valuations, published patent activity, top-ranked investor participation, and employee growth.

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PitchBook Data, Inc.

John Gabbert Founder, CEO

Nizar Tarhuni Vice President, Institutional Research and Editorial

Daniel Cook, CFA Head of Quantitative Research

Paul Condra Head of Emerging Technology Research

Research

Andrew Akers, CFA
Senior Quantitative Research Analyst
andrew.akers@pitchbook.com

Contact

pbinstitutionalresearch@pitchbook.com

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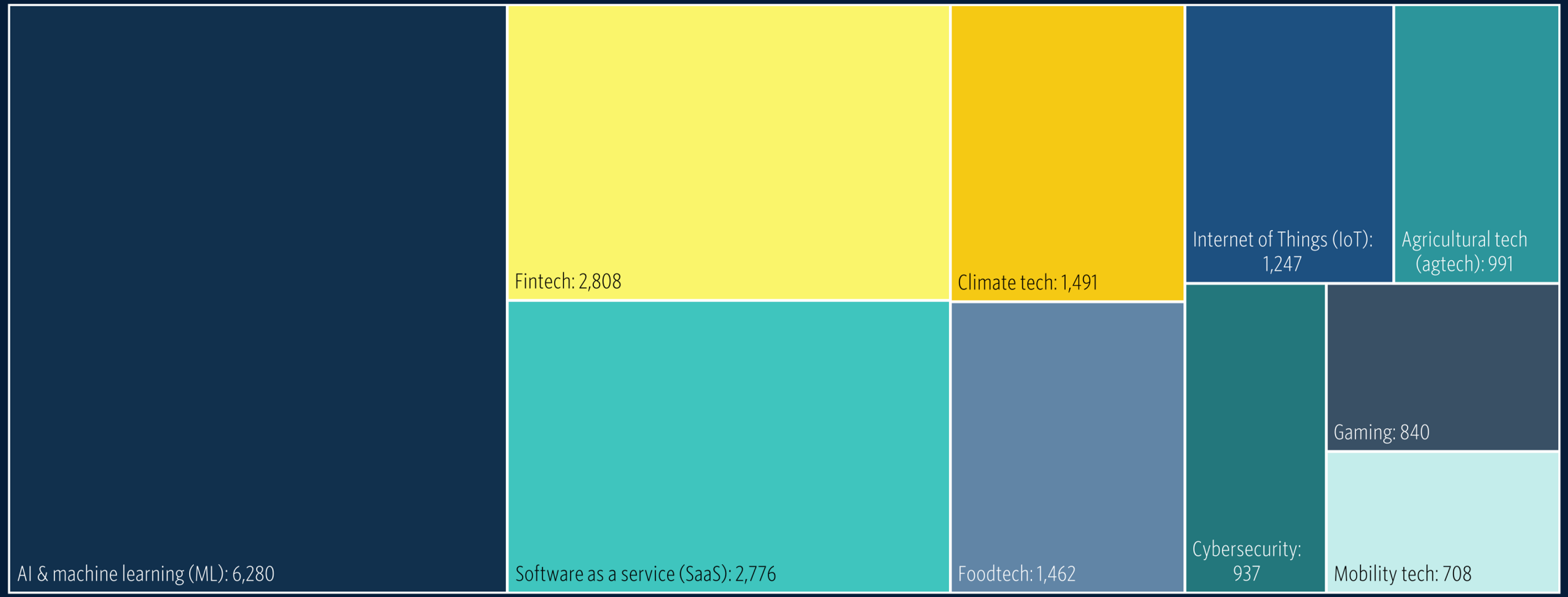
Introduction

The emerging tech opportunity set of the top 10 largest verticals covered by our analyst team

Early-stage VC-backed company count by vertical*



Source: PitchBook • Geography: Global • *As of December 31, 2023

Note: Data includes only early-stage companies that have had at least two rounds of VC funding. Vertical membership is manually curated by PitchBook analysts.

Contextualizing the opportunity set: Deal value trends

Trailing 12-month (TTM) early-stage VC deal value ($B) by quarter

	2021				2022				2023*			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Agtech	$3.9	$4.4	$5.4	$5.7	$6.4	$6.6	$6.1	$6.1	$5.3	$4.8	$4.5	$4.1
AI & ML	$33.6	$39.7	$45.9	$52.1	$55.6	$55.0	$50.5	$44.4	$37.4	$33.4	$32.9	$31.3
Climate tech	$7.3	$9.0	$10.7	$12.3	$14.0	$14.5	$14.2	$13.8	$12.2	$11.4	$10.7	$9.7
Cybersecurity	$5.0	$5.8	$6.8	$7.8	$8.7	$8.4	$7.5	$6.7	$5.6	$5.1	$5.0	$4.9
Fintech	$14.0	$17.0	$20.5	$23.3	$25.0	$24.7	$22.1	$19.8	$16.5	$14.7	$14.2	$12.1
Foodtech	$6.3	$7.7	$9.3	$10.9	$11.4	$11.4	$10.1	$8.6	$7.1	$6.3	$6.0	$5.2
Gaming	$2.8	$3.6	$4.4	$5.8	$7.1	$8.0	$8.2	$7.0	$5.4	$4.0	$3.5	$3.1
IoT	$7.9	$8.8	$10.0	$10.5	$10.5	$9.6	$8.5	$7.5	$6.1	$6.0	$5.6	$5.0
Mobility tech	$7.8	$9.0	$10.3	$10.5	$10.7	$9.6	$7.8	$6.8	$5.2	$4.6	$4.6	$4.2
SaaS	$20.2	$24.9	$29.3	$32.4	$35.9	$36.6	$35.9	$33.0	$27.5	$24.3	$21.6	$18.5

Source: PitchBook • Geography: Global • *As of December 31, 2023

Note: Data estimations are applied to the most recent 12 months to account for lagged data collection.

Contextualizing the opportunity set: Pre-money valuations

Median TTM early-stage VC pre-money valuation ($M) by quarter

	2021				2022				2023*			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Agtech	$14.3	$16.0	$16.9	$18.8	$19.2	$21.7	$21.0	$23.0	$24.5	$22.5	$24.4	$25.6
AI & ML	$21.8	$25.0	$28.3	$31.7	$33.7	$34.0	$34.4	$35.0	$33.6	$35.4	$36.9	$38.2
Climate tech	$17.1	$19.7	$24.8	$25.8	$29.3	$31.6	$31.5	$33.9	$33.3	$36.1	$40.3	$48.4
Cybersecurity	$28.9	$29.9	$31.8	$34.7	$39.0	$40.5	$39.9	$37.1	$34.9	$37.6	$35.3	$42.2
Fintech	$21.6	$25.0	$27.4	$29.4	$32.5	$31.4	$33.6	$31.8	$30.1	$30.0	$30.5	$34.0
Foodtech	$13.7	$16.4	$18.3	$22.1	$24.0	$24.7	$23.0	$22.4	$23.8	$26.0	$25.8	$32.5
Gaming	$17.2	$23.3	$26.1	$27.6	$31.5	$34.9	$33.4	$38.4	$34.4	$31.3	$29.9	$30.1
IoT	$20.6	$22.0	$22.8	$25.4	$29.5	$30.3	$31.2	$30.8	$29.8	$32.6	$38.0	$43.3
Mobility tech	$41.5	$42.6	$42.4	$44.1	$45.7	$53.2	$68.6	$78.9	$74.9	$76.1	$77.9	$75.2
SaaS	$36.3	$41.0	$46.5	$50.5	$57.6	$62.3	$62.7	$63.5	$59.3	$56.5	$54.5	$57.1

Source: PitchBook • Geography: Global • *As of December 31, 2023

Note: Due to lower valuation disclosures in recent quarters amid an increase in down rounds, the medians may be biased to the upside.

While deal activity in the VC space cooled drastically in 2023, valuations for completed deals were stable or increased in most verticals. SaaS, mobility tech, and gaming were the only verticals that experienced a drop in pre-money valuations compared with 2022.

Select vertical highlights

SaaS

- From the bottom-up analysis that looks at expected exit rates and returns, SaaS is a clear positive standout. Early-stage SaaS companies are expected to successfully exit at a 78.2% rate—a net 13.7% higher than the second-ranked vertical.
- In terms of the expected successful exit rate, SaaS companies have been the top-ranked vertical for at least the past seven years.
- The SaaS early-stage investment opportunity set is relatively large, with nearly 3,000 companies currently eligible for a VC exit prediction. This is second only to AI & ML.
- Innovation, as measured by the relative share of published patents, has stalled. In 2023, SaaS companies' share of published patents fell to a two-year low of 12.2%.

Climate tech

- Climate tech companies have seen the largest improvement in expected relative success rates and returns over the past several years. Since 2017, the vertical improved from the worst to sixth best with respect to relative expected returns.
- While 2023 was a difficult year for VC deal activity, climate tech fared better compared with other verticals. TTM early-stage deal volume fell 29.1% in 2023—a net 7.7% higher than the cross-vertical average.
- Climate tech companies registered the largest increase in the share of published patents in 2023. Their net share increased a net 1.0% to 11.5%, which is the highest share since 2019.
- Climate tech companies had the highest median employee growth in 2023, at 20.0%—a net 8.8% higher than the cross-vertical average.

Gaming

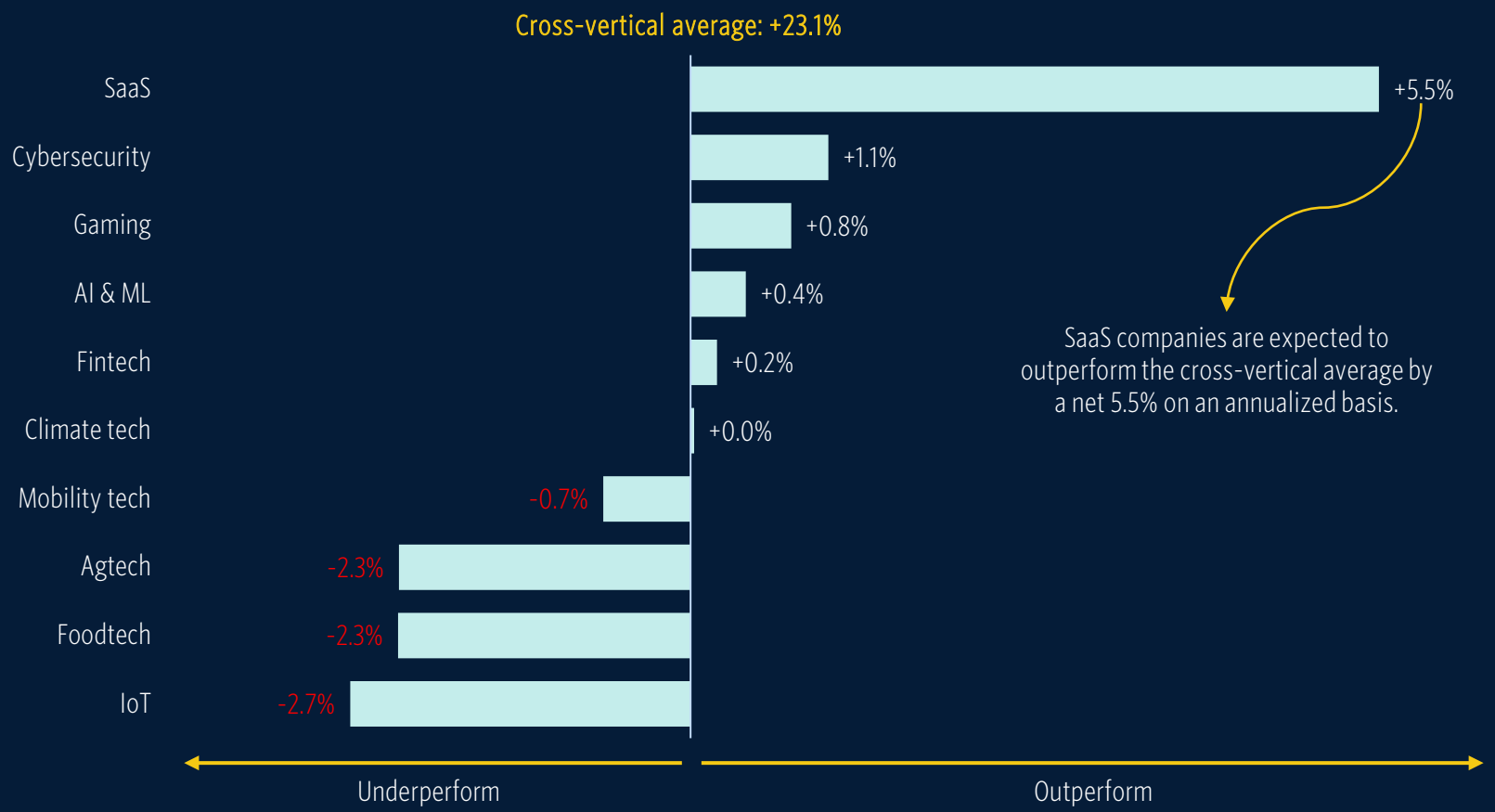
- After surging momentum in 2020 and 2021, the gaming vertical has been hit especially hard during the current VC deal activity slowdown. Early-stage deal activity fell 55.8% in 2023, which is by far the worst among all verticals.
- Gaming companies have also been trimming headcounts. Median employee growth declined 6.2% in 2023—the worst among all verticals and one of only three with negative growth.
- Early-stage valuations also came under pressure, with the median pre-money valuation down 37.6% in 2023—another metric in which the vertical ranks last.
- Despite negative top-down indicators, gaming ranks third in the bottom-up analysis of expected successful exit rates and returns. This is in part driven by continued top-ranked investor participation.

Bottom-up analysis

In this section, we analyze expected exit outcomes and relative returns across verticals based on a bottom-up aggregation of exit predictions for individual companies.

Our analysis suggests that early-stage SaaS companies are likely to materially outperform the average vertical...

Annualized expected returns relative to the cross-vertical average*



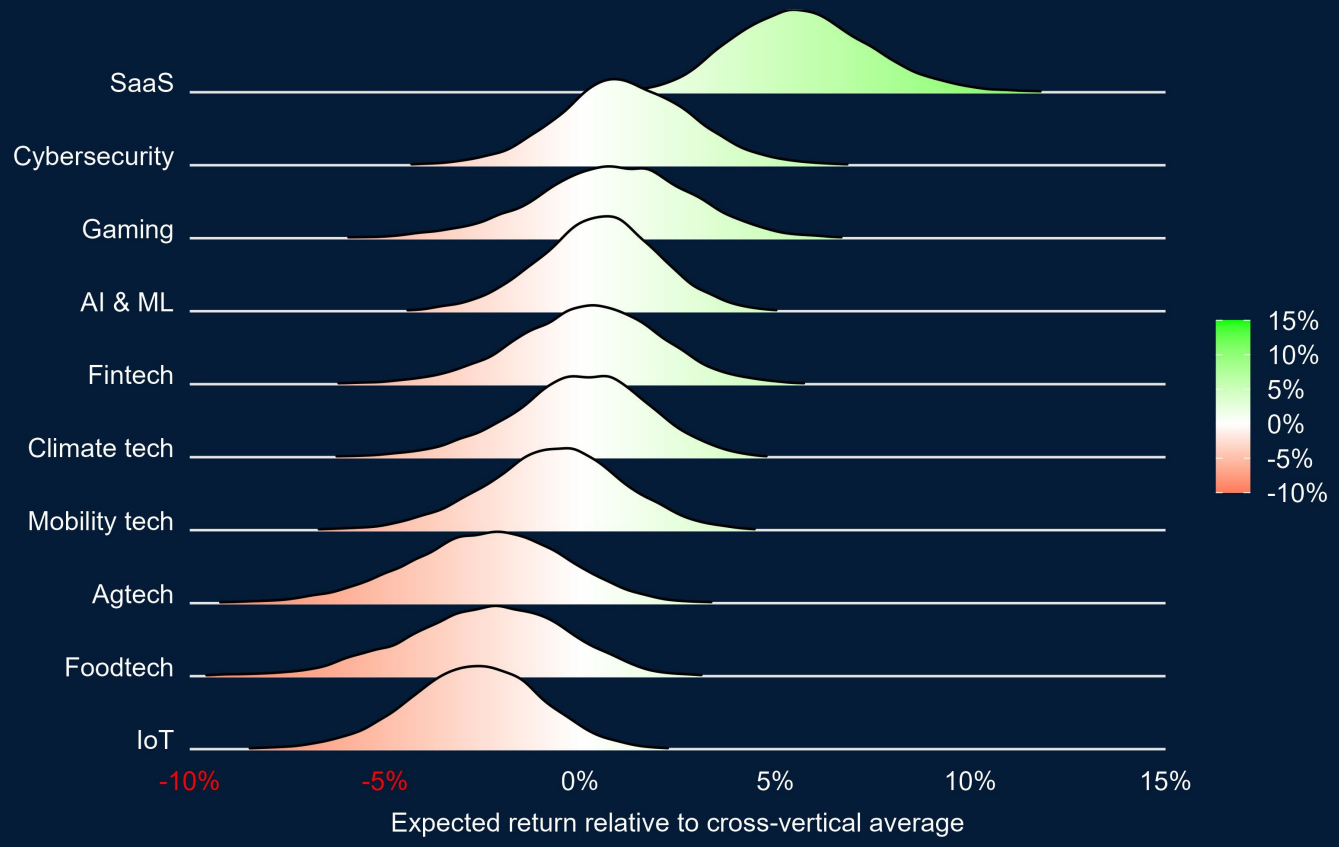
Source: PitchBook • Geography: Global • *As of December 31, 2023

Expected returns for each vertical are based on an aggregation of the expected returns for the underlying companies. Company-level returns are determined from the exit type predictions and historical returns by series. For more information, please see page 15 and the VC Exit Predictor methodology located in the PitchBook Help Center.

It is important to note that the cross-vertical average return of 23.1% is provided as a historical baseline value and should not be relied on as a forecast. This baseline value is derived from the average of deal-level return data from 2000 to 2021 and can vary significantly based on the environment at any given time. The relative returns for each vertical, however, are a more robust forward-looking measure because they are unaffected by factors that impact the entire VC ecosystem, such as interest rates, available funding, and economic growth.

...while the agtech, foodtech, and IoT verticals are likely to underperform.

Distributions of relative annualized expected returns based on Monte Carlo simulations*



Source: PitchBook • Geography: Global • *As of December 31, 2023

To assess the uncertainty of the relative expected returns shown on the prior page, we ran 10,000 Monte Carlo simulations that randomly generated exit outcomes for each company based on the exit probabilities from the VC Exit Predictor. At each iteration, we then used the random exit outcomes to calculate the return for each vertical. We assumed that exit outcomes between pairs of companies were positively correlated—the degree to which was based on a single common factor, as well as factors for each vertical.

This analysis suggests that there are three tiers of verticals based on expected performance. SaaS is expected to outperform with high confidence, while agtech, foodtech, and IoT are expected to underperform. Meanwhile, the remaining verticals form a middle tier wherein the relative performance outcomes are much less certain.

The relative return outlook for SaaS companies has been trending higher over the past several years, while expectations for IoT and mobility tech companies have worsened.

Annualized expected returns for early-stage companies relative to the cross-vertical average

	2017	2018	2019	2020	2021	2022	2023*
Agtech	-1.6%	-2.3%	-2.3%	-2.5%	-2.4%	-2.5%	-2.3%
AI & ML	+0.9%	+1.1%	+1.2%	+1.0%	+0.6%	+0.6%	+0.4%
Climate tech	-2.2%	-1.9%	-2.2%	-1.4%	-1.0%	-0.8%	+0.0%
Cybersecurity	+0.3%	+0.4%	+0.8%	+0.9%	+0.4%	+0.7%	+1.1%
Fintech	+0.4%	+0.3%	+0.7%	+0.2%	+0.6%	+0.5%	+0.2%
Foodtech	-1.2%	-1.2%	-1.5%	-1.6%	-1.5%	-2.1%	-2.3%
Gaming	+0.2%	+0.1%	-0.5%	-0.8%	+0.1%	+0.8%	+0.8%
IoT	-1.4%	-1.0%	-1.5%	-1.6%	-2.2%	-2.7%	-2.7%
Mobility tech	+1.4%	+1.2%	+1.2%	+1.3%	+0.8%	+0.2%	-0.7%
SaaS	+3.2%	+3.3%	+4.1%	+4.5%	+4.6%	+5.2%	+5.5%

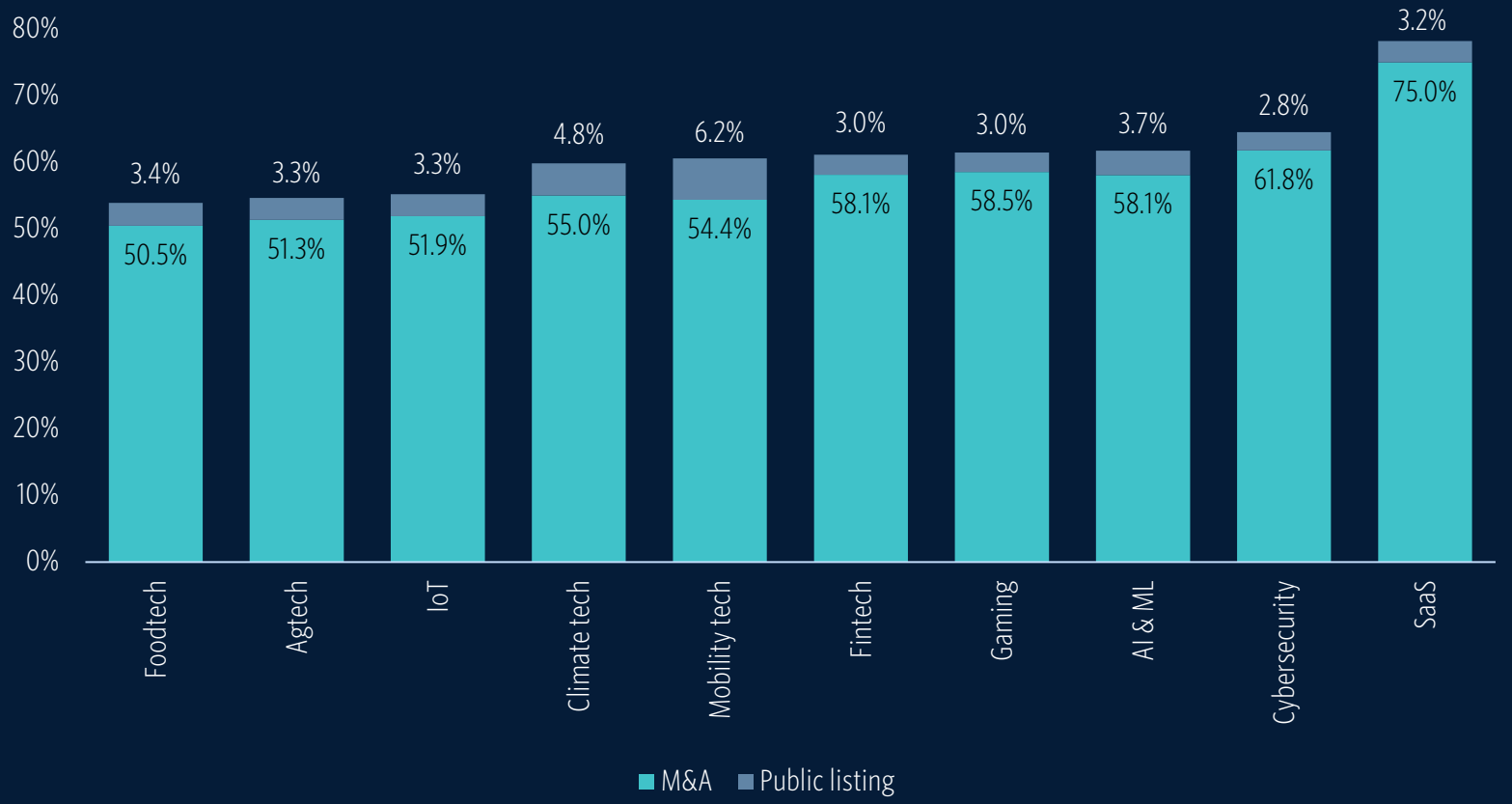
While SaaS stands out as the top vertical, climate tech has seen the most improvement, going from the worst-ranked vertical at the end of 2017 to the sixth-ranked vertical at the end of 2023.

Source: PitchBook • Geography: Global • *As of December 31, 2023

Note: Historical predictions are derived from models trained only on prior data relative to the year-end prediction date. Conditional formatting is applied across verticals each year.

The key driver of relative return expectations across verticals is the differences in expected exit rates by type, which are based on individual company predictions from the VC Exit Predictor...

Expected share of exits for early-stage companies by successful exit type*



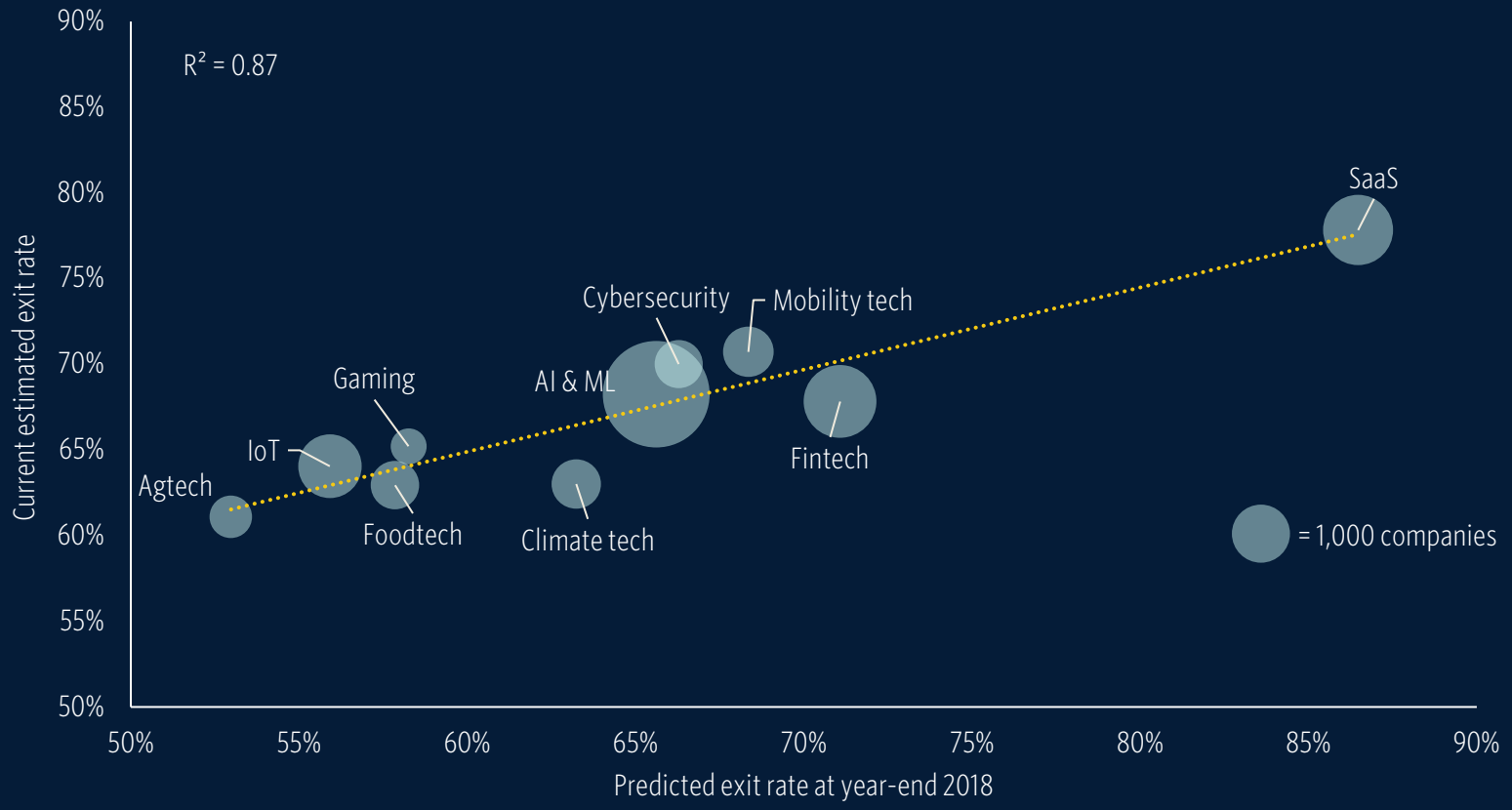
The SaaS vertical is a clear standout of the bottom-up analysis. Early-stage SaaS companies are expected to exit at a rate of 78.2%—a net 13.7% higher than the second-ranked vertical, cybersecurity.

Source: PitchBook • Geography: Global • *As of December 31, 2023

Note: Data includes only early-stage companies and is based on individual company predictions from the PitchBook VC Exit Predictor.

...that have historically done a good job of predicting differences in exit rates across verticals.

Predicted exit rate for eligible early-stage companies at year-end 2018 versus current estimated exit rate*



Source: PitchBook • Geography: Global • *As of December 31, 2023

Note: The current estimated exit rate is based on both companies that have exited and current exit predictions for those that are still VC-backed. R^2 excluding SaaS is 0.69.

To get a sense of how well the VC Exit Predictor does at estimating differences in exit outcomes across verticals, we looked at results from a backtest conducted for eligible companies at the end of 2018. A model was trained using only known exit outcomes at the time, and then predictions were made for each company. The predicted success rate for each vertical was calculated as the average predicted success rate of the underlying individual companies.

Fast-forward five years, and we can evaluate the quality of these predictions, as shown in the accompanying chart. Because using only companies that have exited would create a biased sample as successful exits take longer to materialize than failures, we also included those that are still VC-backed using updated exit predictions with current information.

Vertical return expectations are derived from individual company exit rates and historical return assumptions.

Hypothetical example of a vertical's return expectations

	Latest financing stage	Predicted M&A probability	Predicted IPO probability	Historical average M&A return	Historical average IPO return	Historical M&A holding period (years)	Historical IPO holding period (years)	Expected payout given M&A exit*	Expected payout given IPO exit*	Expected total payout*
Company A	Seed	15.0%	3.0%	35.9%	45.3%	5.2	5.9	$4.9	$9.1	$1.0
Company B	Series A	60.0%	6.0%	30.5%	34.5%	4.6	4.4	$3.4	$3.7	$2.3
Company C	Series B	45.0%	13.0%	28.6%	30.7%	4.3	3.7	$2.9	$2.7	$1.7

Expected total payout $= (15\% \times \$4.9) + (3\% \times \$9.1) = \$1.0$

Total payouts conservatively assume that no exits are a total loss.

Historical average returns are calculated for each financing stage (seed, Series A, etc.)

Expected payout $= (1 + 28.6\%)^{4.3} = \$2.9$

Average expected holding period

$$\text{Annualized expected vertical return} = \left(\frac{\$1.0 + \$2.3 + \$1.7}{\$3}\right)^{(1/4.7)} - 1 = 11.5\%$$

Companies are equally weighted

Source: PitchBook

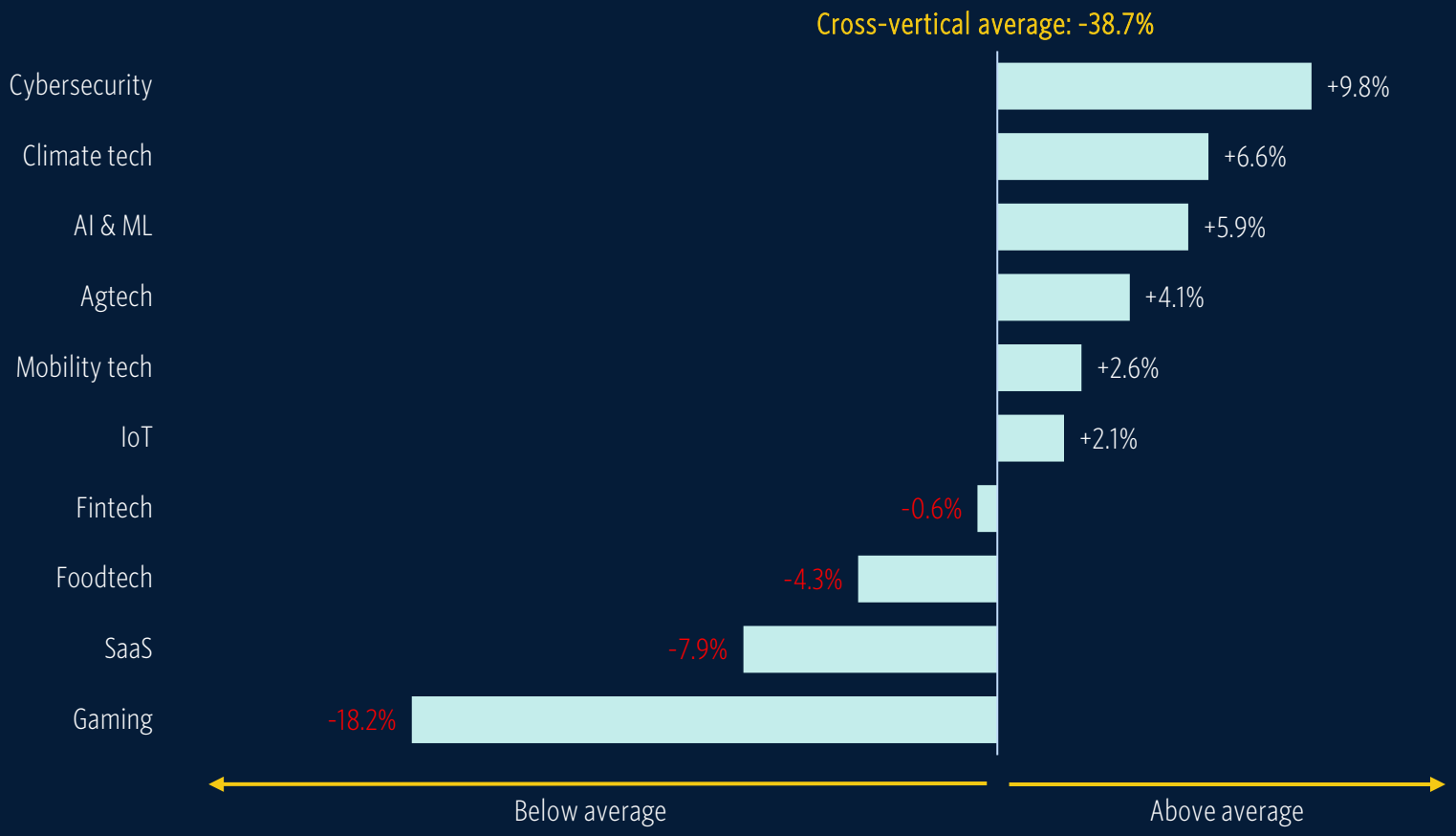
Note: For illustrative purposes only. The historical returns consider ownership dilution for each series. Expected payouts are expressed per $1 of the initial investment.

Top-down analysis

In this section, our analysis of short-term cross-vertical trends in key areas complements the bottom-up, company-level analysis.

Deal value declined sharply across all verticals in 2023, but gaming was hit particularly hard, with deal volumes declining by 55.8% compared with 2022...

TTM change in early-stage VC deal value relative to the cross-vertical average*

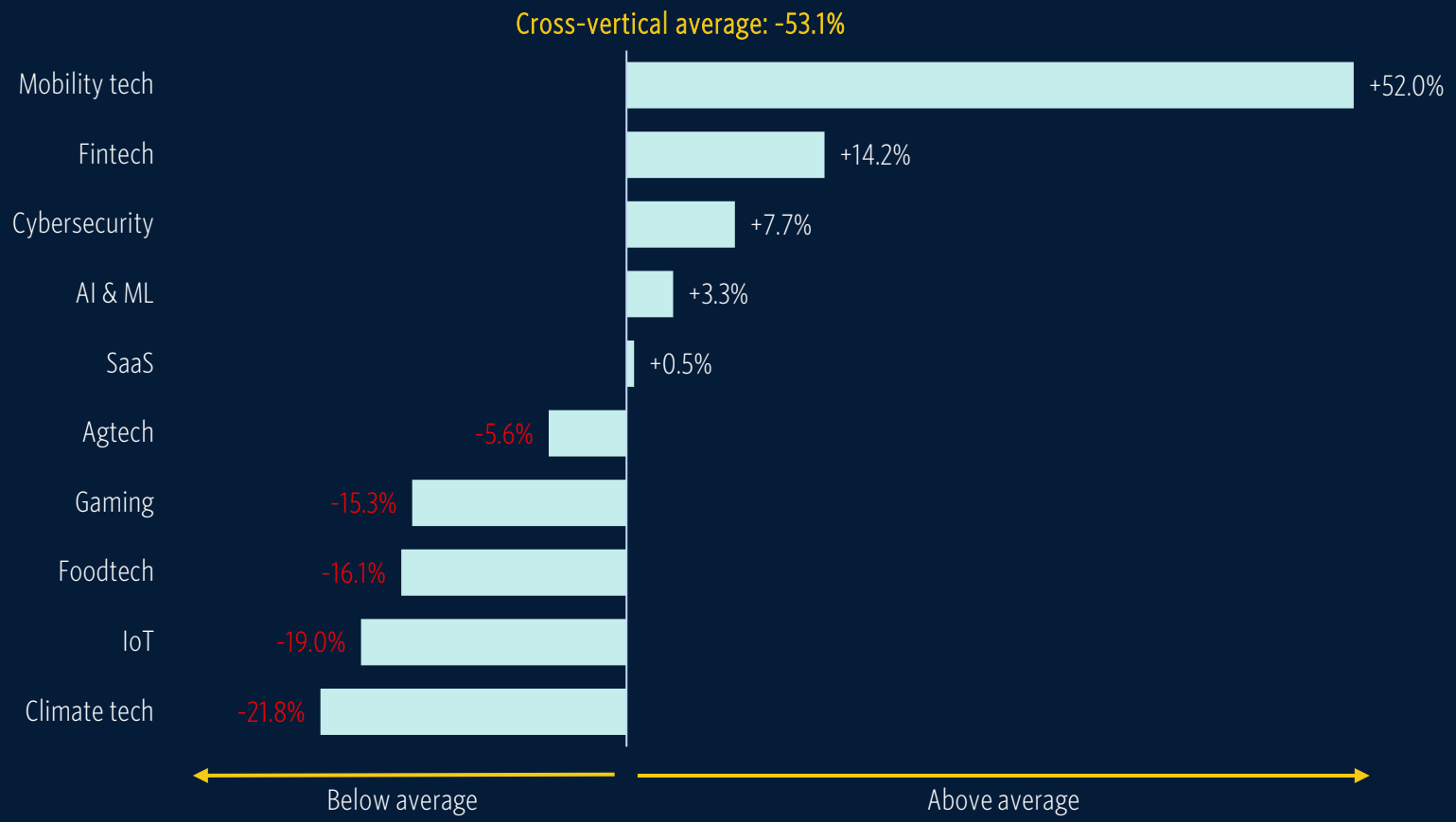


Source: PitchBook • Geography: Global • *As of December 31, 2023

Note: Data estimates are applied to the most recent 12 months to account for lagged data collection.

...while first-time financings in mobility tech have weathered the storm.

TTM change in first-time VC financing count relative to the cross-vertical average*

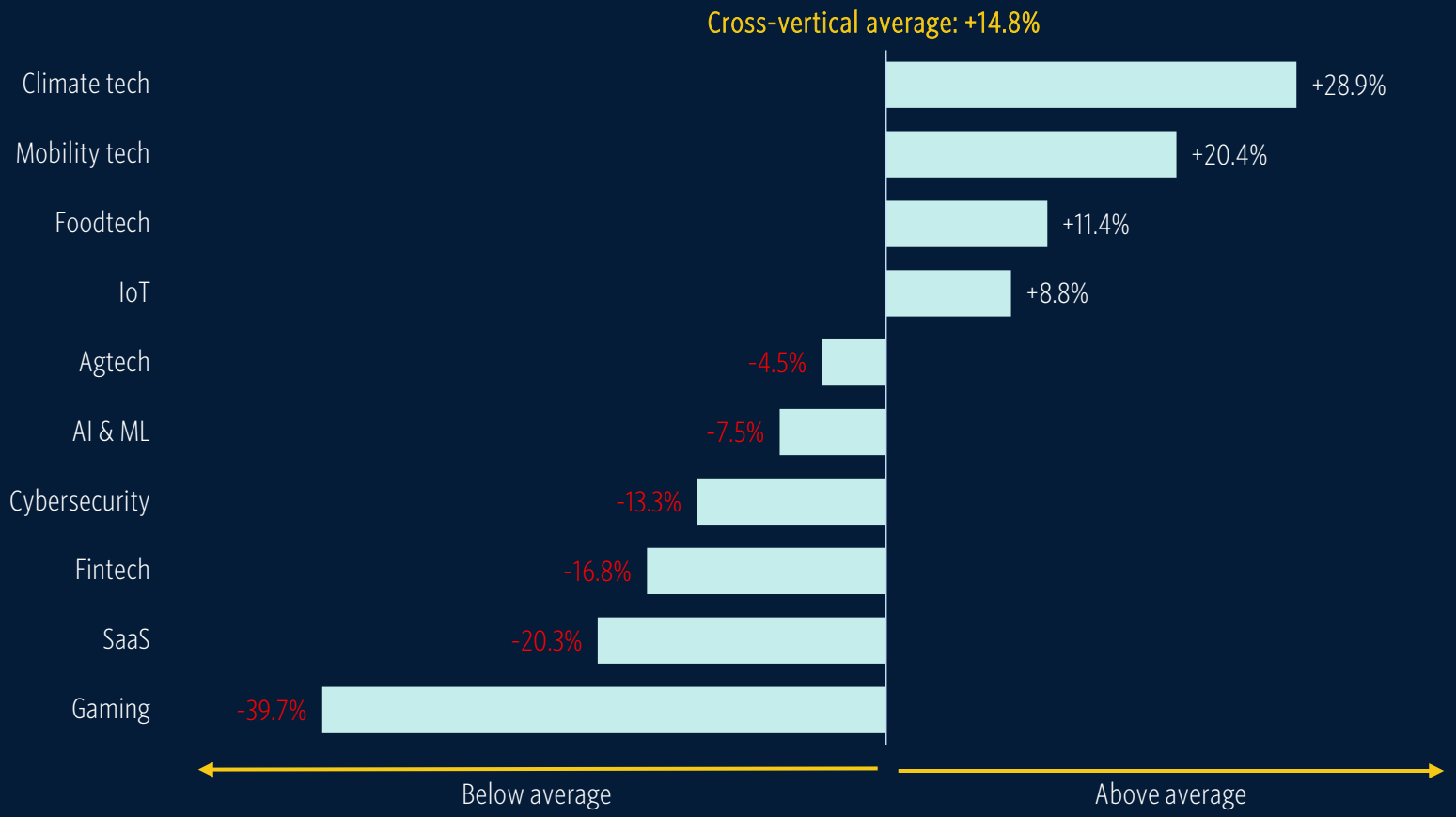


Source: PitchBook • Geography: Global • *As of December 31, 2023

Note: Data estimates are applied to the most recent 12 months to account for lagged data collection. Because there can be delays in tagging newly financed companies to verticals, the vertical average is likely biased to the downside.

Pre-money valuation growth in climate tech, mobility tech, foodtech, and IoT has outpaced the cross-vertical average.

TTM change in median early-stage pre-money valuation relative to the cross-vertical average*

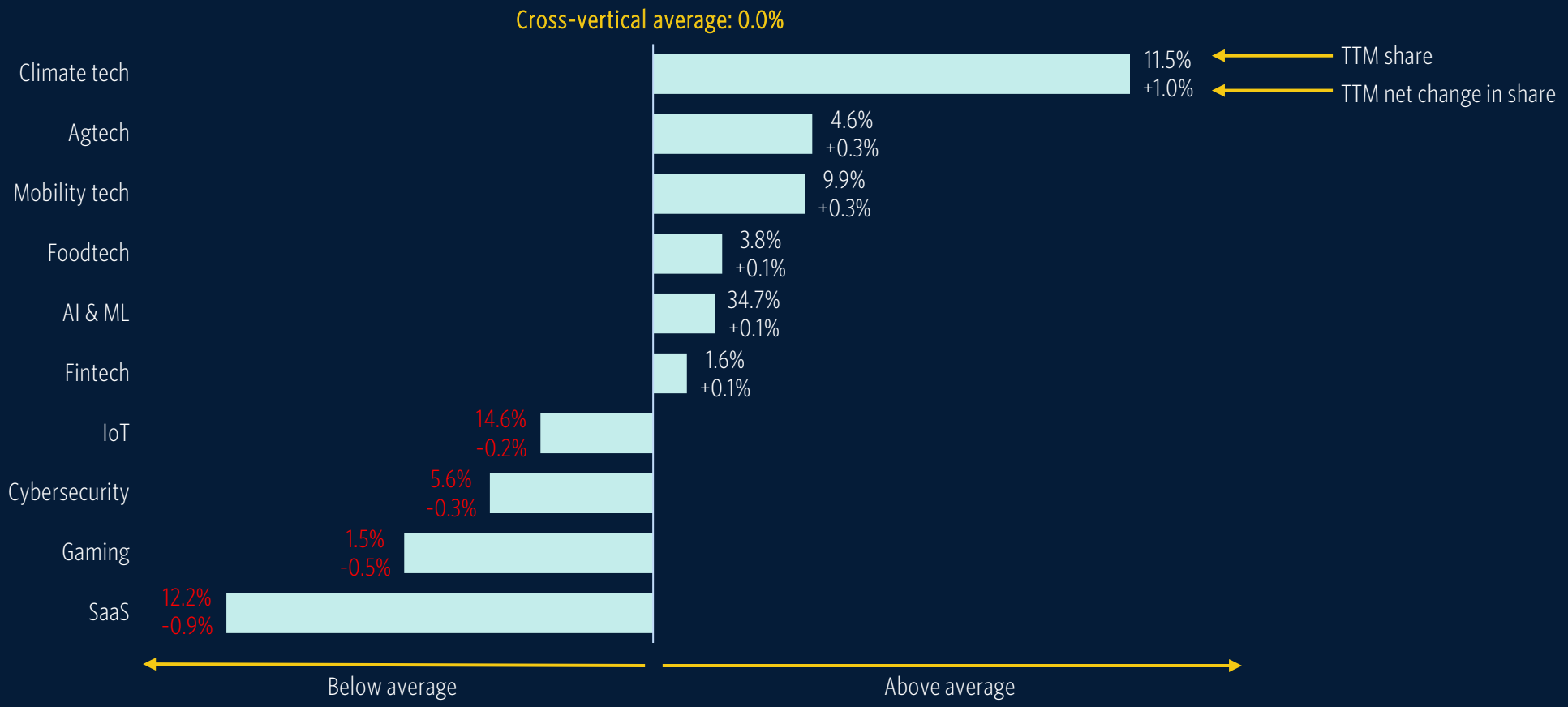


Source: PitchBook • Geography: Global • *As of December 31, 2023

Note: Percentage changes in seed and early-stage valuations are calculated separately and then aggregated using a weighted average.

While the AI & ML sector represents a dominant 34.7% of total patents filed, that level is relatively unchanged year over year.

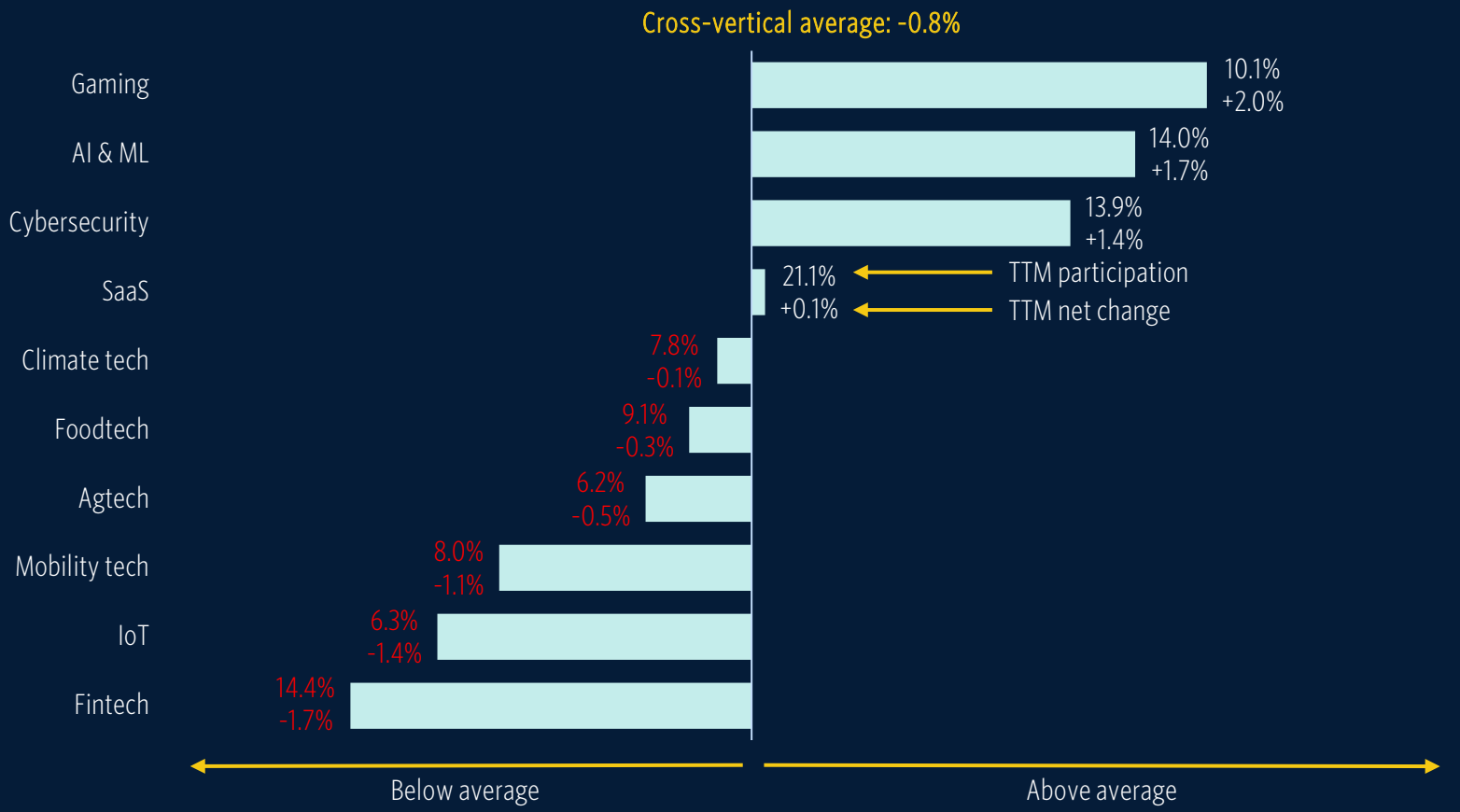
TTM net change in the share of published patents*



Source: PitchBook • Geography: Global • *As of December 31, 2023

Despite falling investment activity and valuations, top-ranked investors are still bullish on gaming...

TTM net change in top-ranked investor participation relative to the cross-vertical average*

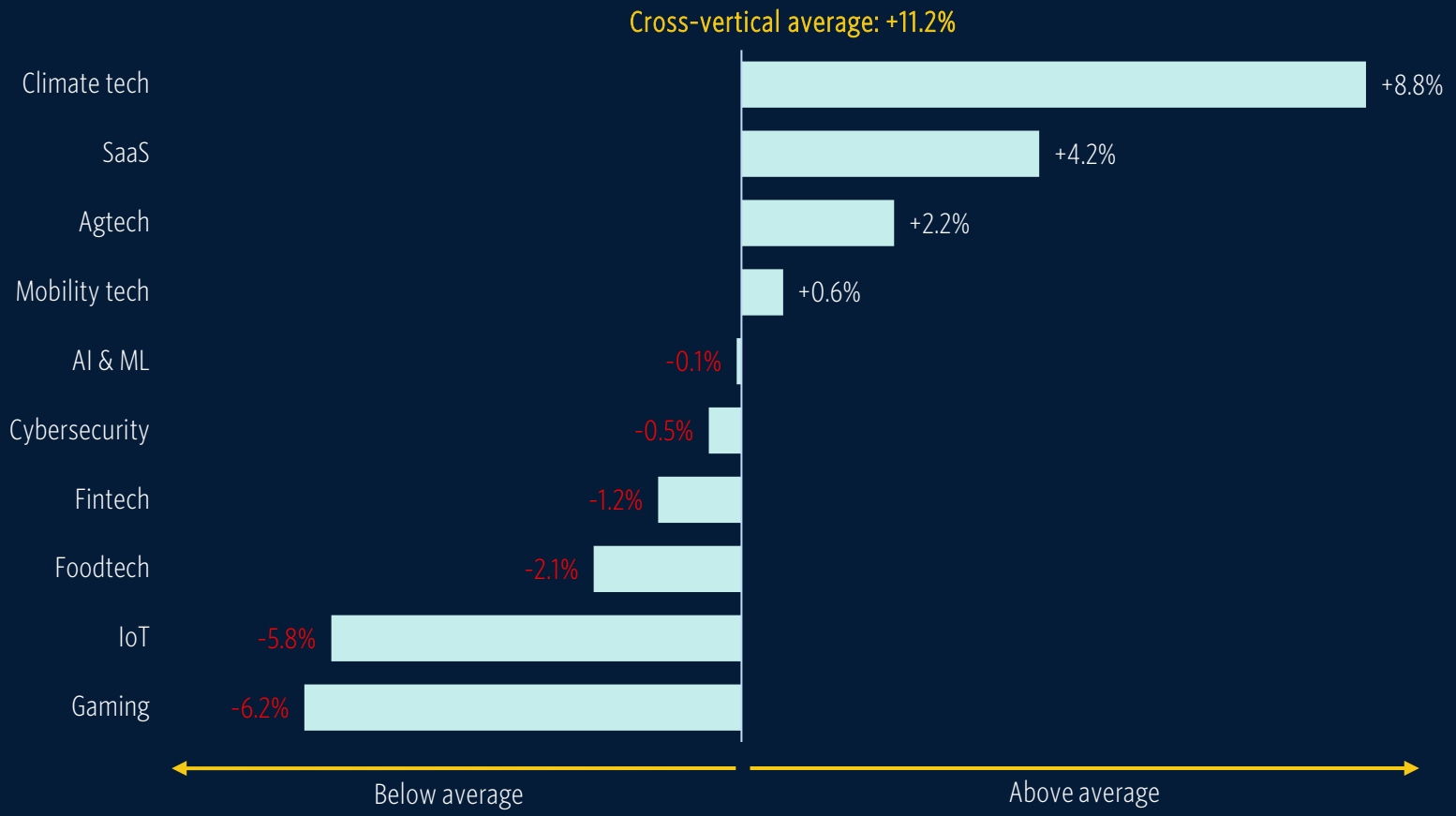


Top-ranked investors are those that are in the top decile based on the investor network score that is used as an input to the VC Exit Predictor. For more details, please see the methodology document. "Participation" is defined as the share of total deals in the trailing 12 months in which a top-ranked investor was involved.

Source: PitchBook • Geography: Global • *As of December 31, 2023

...even as employee growth has stalled. Meanwhile, climate tech, SaaS, agtech, and mobility tech companies have all experienced above-average payroll growth.

Median TTM employee growth relative to the cross-vertical average*

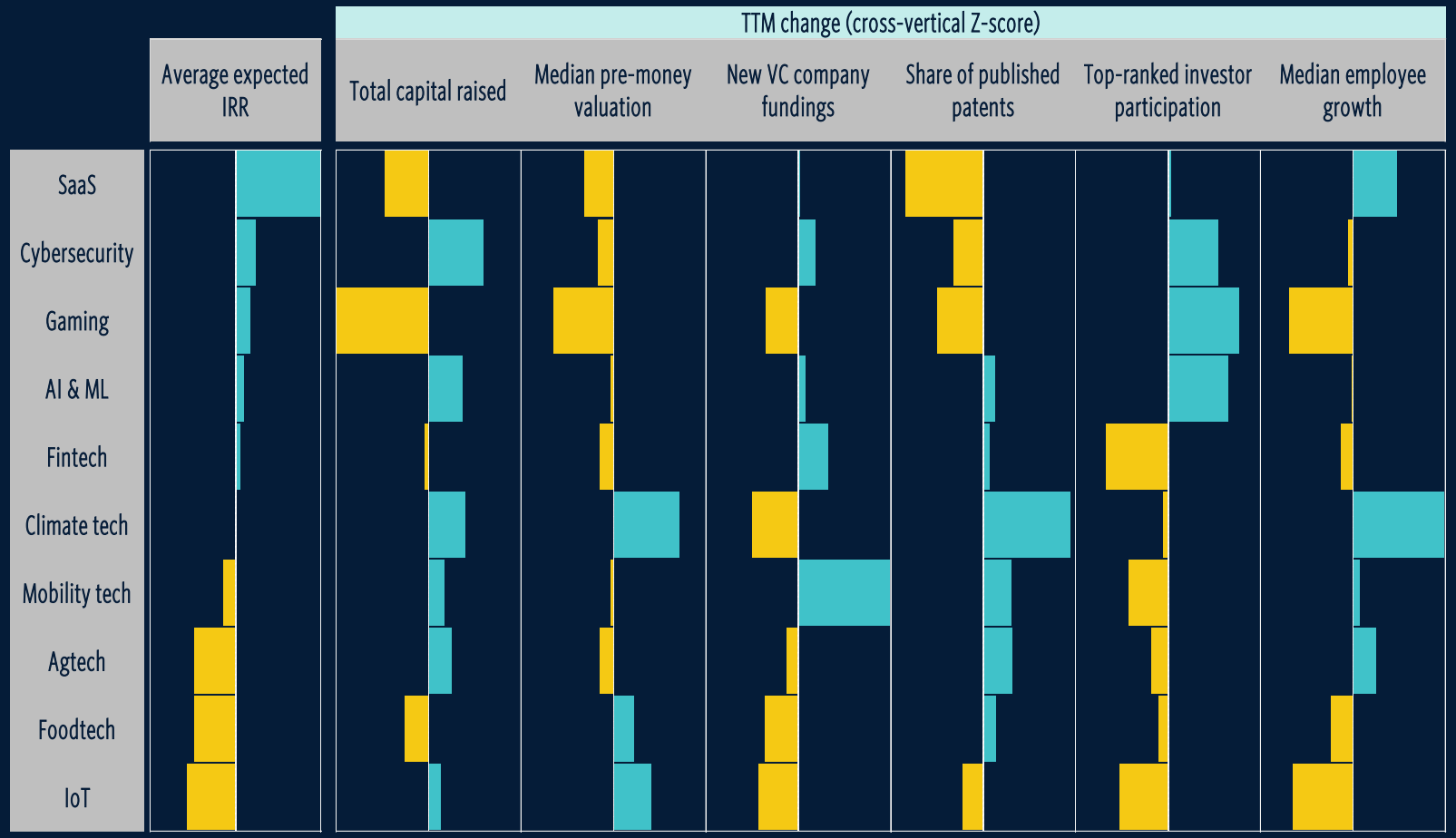


Source: PitchBook • Geography: Global • *As of December 31, 2023

Note: Employee growth is calculated at the company level by comparing the latest data point from the current year with the latest data point from the prior year.

Cross-vertical summary

Summary of bottom-up and top-down analyses



Source: PitchBook • Geography: Global • *As of December 31, 2023

This table summarizes the annual 2023 values for each of the previously covered metrics and is sorted by the average expected return. The length of each bar represents the cross-vertical Z-score, wherein the maximum and minimum lengths are +/- 2 standard deviations, respectively. The center of each column is zero.

Individual vertical analyses

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Agtech

For the latest in-depth agtech research, click here.

Alex Frederick
Senior Analyst, Emerging Technology
alex.frederick@pitchbook.com

Introduction

The agtech sector consists of technologies that focus on increasing crop yield, improving farming efficiency and resilience, and providing financial resources for agricultural operations. These technologies include a broad range of products and services, such as software, biotech inputs, sensors, machinery, and indoor farming equipment. For plants, the scope of agtech spans from the technologies used to develop new seed varietals and traits to the machines used to harvest crops. Our purview of animal agtech extends from breeding to livestock monitoring tools.

Agtech venture activity ended 2023 on a sour note, with quarterly deal counts decelerating to the lowest point since Q3 2019. The agtech vertical was not immune to broader challenges impacting the VC asset class. Despite a Q4 rally in most global public indexes, private markets continue to face a challenging exit environment. Despite a few scant tech IPOs, the IPO window has not yet reopened. Interest rates remain elevated, thus discouraging M&A activity. However, in the near term, we expect agtech to outperform the broader VC asset class. Maintaining food security and food sovereignty are critical global issues that are made more challenging by climate change, geopolitical conflict, supply chain disruptions, growing populations, and labor shortages. Agtech will continue to play a critical role in addressing these challenges.

VC activity

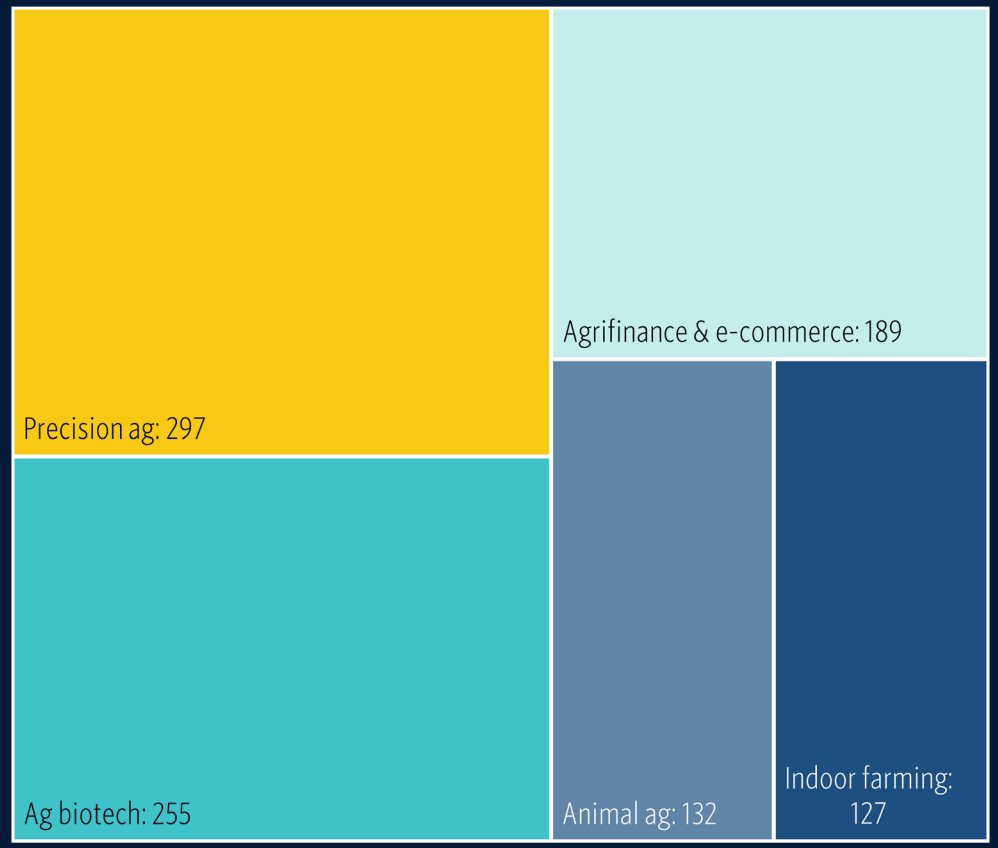
- Overall funding: Q4 was in line with the downward trend of investment activity. Deal values totaled $1.4 billion—down 34.7% QoQ. Deal counts reached 181—down 17.4% QoQ.
- Notable VC deals: Farmers Business Network (FBN) raised the largest deal in Q4, with a $154.9 million late-stage round. Other notable rounds include imagery analytics provider Quantum Systems' $67.2 million Series B and AI-breeding monitoring provider Orbem's $31.8 million Series A.
- Notable VC exits: Ag robotics provider Clearpath Robotics was acquired by Rockwell Automation for $454.5 million. Additionally, decision-support-platform provider ITK was acquired by Innoval for €45.0 million, and bio-fungicide producer Peptyde Bio was acquired by Invaio.
- Investment focus areas: Agribusiness marketplaces saw the greatest total deal value in Q4. Led by FBN's $154.9 million round, we recorded $313.6 million invested across 21 deals. The drones & imagery analytics category saw the greatest deal count, with $271.6 million invested across 22 deals.

Notable events and emerging trends

- Generative AI (GenAI): One of the biggest tech trends of 2023 has applicability in agriculture as well. Farm management platforms like FBN are beginning to implement GenAI tools to make data more accessible and insights more actionable. Indoor farm intelligence provider Gardin is using GenAI to develop synthetic images of crops to train its own AI model. Many other agricultural applications for GenAI likely exist and have not yet been discovered or disclosed.
- Regenerative agriculture: The term is gaining traction in the agrifood industry. Several large food companies, including JBS, PepsiCo, Nestle, and Sodexo, have pledged funds to encourage farmers to adopt regenerative ag practices. Agtech software platforms, biologicals, drones, and robotics are enablement technologies critical to adoption at scale.
- Livestock methane reduction: Companies like Mootral, Blue Ocean Barns, and CH4 Global are utilizing synthetic biology and precision fermentation to cultivate methane inhibitors from red seaweed, which presents a promising avenue for mitigating methane emissions from livestock. VC funding to scale production further underscores the growing interest in this sustainable solution.

Agtech overview

Agtech early-stage VC company count by segment with a VC exit prediction (minimum two VC funding rounds)*

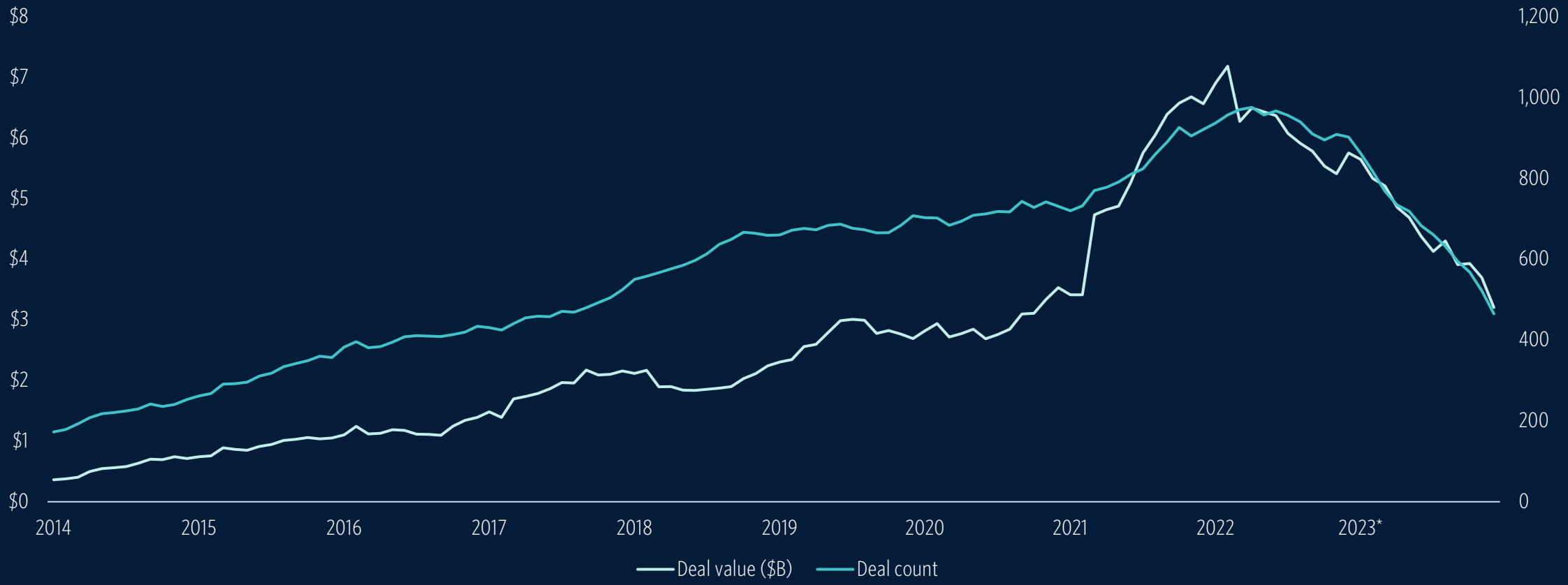


Agtech metrics summary*

	Value	TTM change	Relative score
Annualized expected return**	20.8%	-0.3%	
Total capital raised	$3.8B	-34.6%	
New VC company fundings	127	-58.6%	
Median pre-money valuation	$26.5M	+13.2%	
Share of published patents	4.6%	+0.3%	
Top-ranked investor participation	6.2%	-1.3%	
Median employee growth	13.3%	-6.7%	

Source: PitchBook • Geography: Global • *As of December 31, 2023
**Expected returns are derived from historical return assumptions and company-level exit predictions. See page 15 for more details.
Note: The length of the relative score bars is based on cross-vertical Z-scores of the TTM change (except expected IRR and median employee growth), wherein the maximum and minimum lengths are +/- 2, respectively. The center of the column is zero.

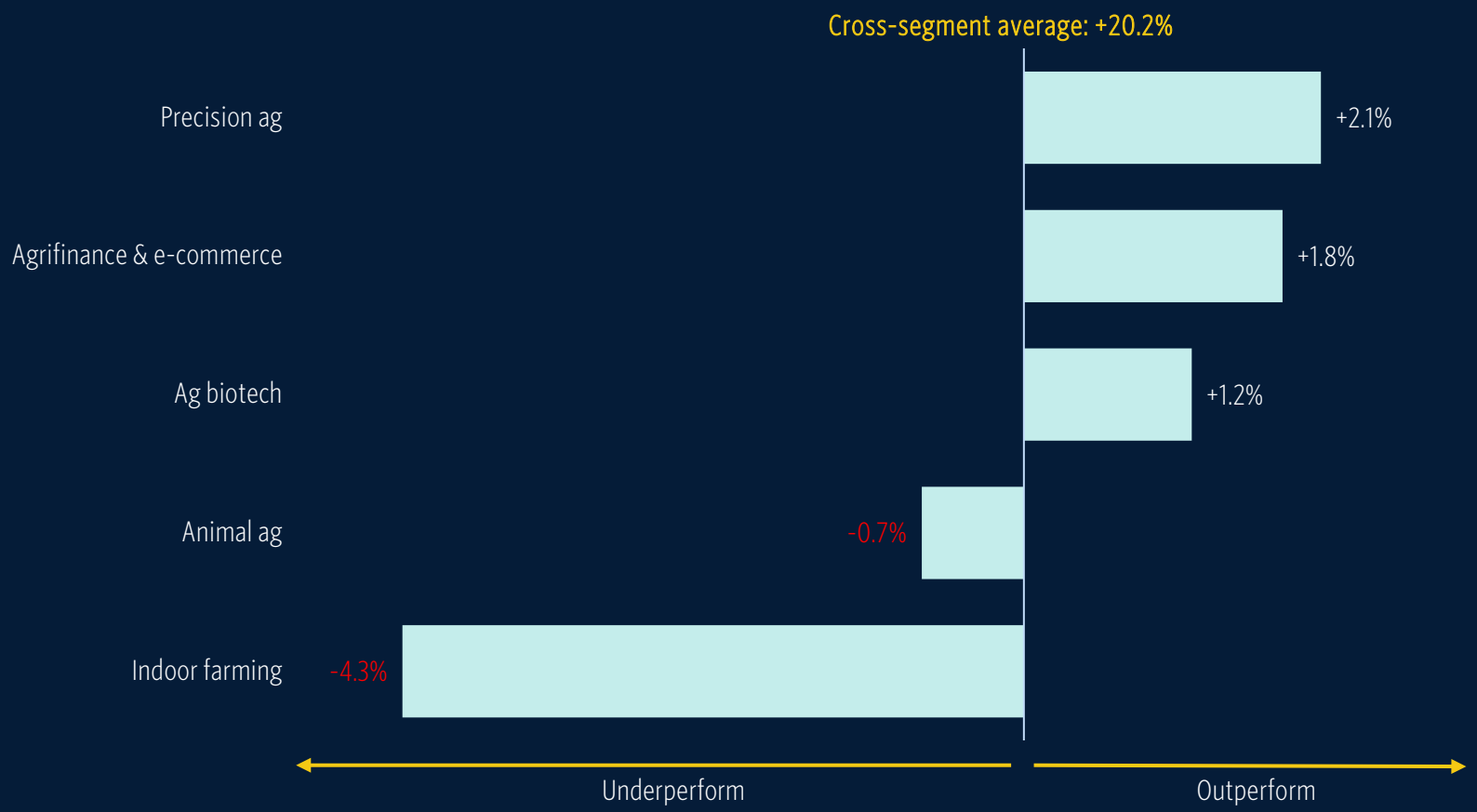
TTM agtech early-stage VC deal activity



Source: PitchBook • Geography: Global • *As of December 31, 2023

Investment attractiveness of agtech early-stage companies by segment

Annualized expected returns relative to the cross-segment average*



Source: PitchBook • Geography: Global • *As of December 31, 2023

Expected returns for each segment are based on an aggregation of the expected return for the underlying companies. Company-level returns are determined from the exit-type predictions and historical returns by series. For more information, please see page 15 and the VC Exit Predictor methodology located in the PitchBook Help Center.

It is important to note that the cross-segment average of 20.2% is provided as a historical baseline value and should not be relied on as a forecast. This baseline value is derived from the average of deal-level return data from 2000 to 2021 and can vary significantly based on the environment at any given time. The relative returns for each segment, however, are a more robust forward-looking measure because they are unaffected by factors that impact the entire agtech vertical.

Individual company highlights: North America

North America agtech early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
Silvec Biologics	Ag biotech	65%	1%	55	+38
Grubbly Farms	Animal ag	85%	1%	88	+38
ChrysaLabs	Precision ag	81%	2%	86	+33
Chippin	Ag biotech	55%	1%	43	+32
Agtonomy	Precision ag	61%	15%	87	+32
RealmFive	Ag biotech	68%	4%	70	+27
Mast Reforestation	Precision ag	79%	16%	77	+27
Agragene	Ag biotech	73%	3%	77	+26
EIO Diagnostics	Animal ag	74%	1%	72	+24
Hydrosat	Precision ag	79%	1%	81	+23

Please use this saved search for a complete, dynamic list of agtech companies.

Source: PitchBook • Geography: North America • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

Individual company highlights: Europe

Europe agtech early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
Quanturi	Precision ag	80%	5%	91	+84
Bionema	Ag biotech	73%	1%	68	+53
BirdsEyeView	Agrifinance & e-commerce	76%	1%	76	+48
Myfood	Indoor farming	65%	2%	57	+39
Yagro	Agrifinance & e-commerce	73%	1%	70	+36
Kuva Space	Precision ag	75%	11%	96	+33
Spherag	Precision ag	65%	1%	55	+30
Brilliant Planet	Ag biotech	76%	2%	77	+29
CattleEye	Animal ag	84%	1%	87	+26
Baia	Agrifinance & e-commerce	75%	1%	73	+24

Please use this saved search for a complete, dynamic list of agtech companies.

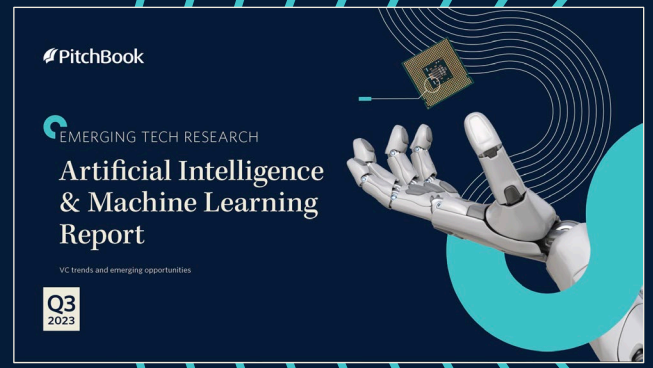
Source: PitchBook • Geography: Europe • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

AI & ML

For the latest in-depth AI & ML research, click here.

Brendan Burke
Senior Analyst, Emerging Technology
brendan.burke@pitchbook.com



Introduction

GenAI offers an opportunity for the future of AI technology yet does not benefit all existing vendors equally. Many legacy companies' prospects have dimmed as their AI models become obsolete and business models struggle to keep up with the latest techniques. AI & ML companies operate across segments to bring academic innovations to market.

Each segment has different prospects based on the extent of competition and technological progress. These segments include:

- Horizontal platforms, which empower end users to build and deploy AI & ML algorithms across a variety of use cases. These platforms apply scientific advances in AI & ML research directly to commercial applications. Companies in this segment have differentiated AI & ML approaches and are built with AI & ML from the ground up—also referred to as AI-first. Furthermore, some horizontal platforms are used to improve AI & ML algorithms but do not use AI & ML themselves.
- Vertical applications in AI & ML, which address specific problems within industries and are not always AI-first. Many startups in this category design a solution to an industry problem using software and integrate AI & ML to optimize some part of their product.
- AI & ML semiconductors, which include companies focused on design and software-based optimization of computing hardware, including both semiconductors and sensors.
- Autonomous machines, which can perform tasks in human-present environments without explicit human control. These machines synthesize ML, computer vision, and datasets of the physical world such as navigation.

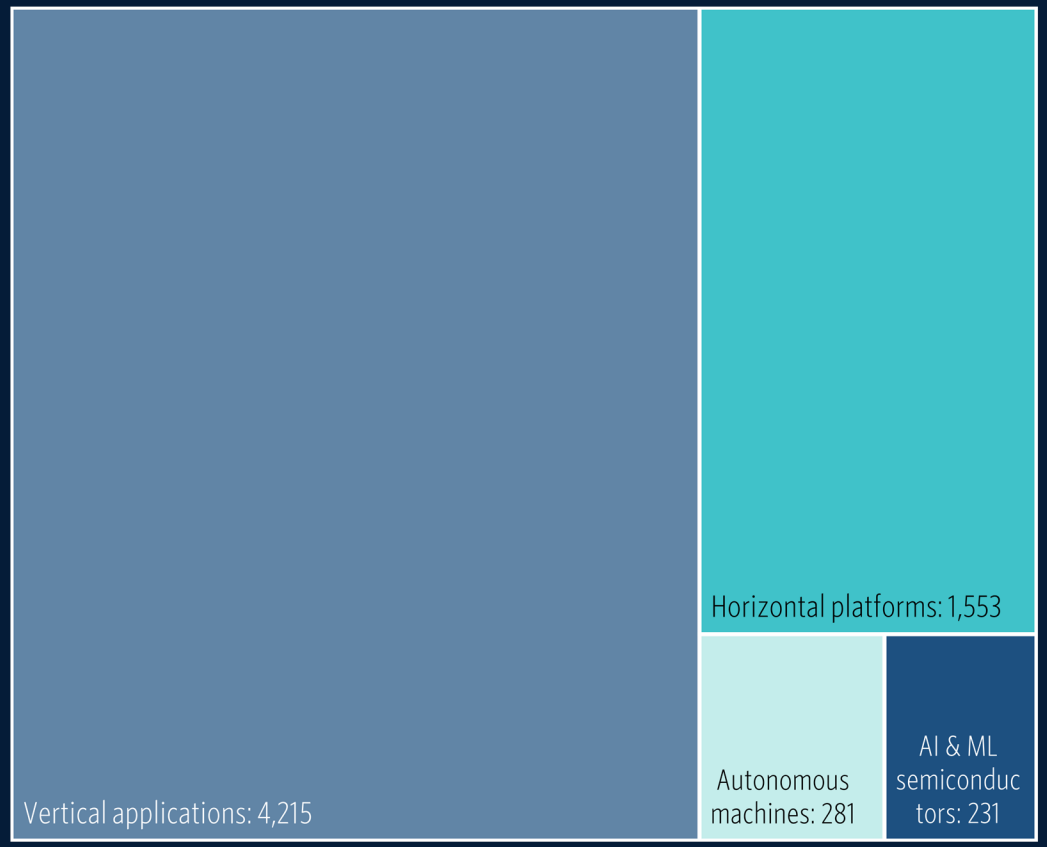
Competitive dynamics differ across each segment. In semiconductors, Nvidia has emerged as a clear leader, which challenges startups to commercialize. In horizontal platforms, tech giants including Alphabet, Amazon, Meta, and Microsoft develop models and the infrastructure needed to deploy them. In vertical applications, legacy vendors in each industry update their software to integrate AI. Autonomous machines offers startups greenfield opportunities, given limited deployments of autonomous vehicles, drones, and intelligent robotics.

Returns in horizontal platforms and vertical applications trend toward the market average because of their increasing role in the marketplace. AI & ML VC funding increased to 36.7% of all US VC deal activity in 2023 after never exceeding 25% previously. The vertical contributed 44.4% of new unicorns in 2023. These large deals derive primarily from the horizontal platforms and vertical applications segments, which create some of the largest companies in all of private markets. OpenAI, a horizontal platform company building foundation models, reached an estimated $85.0 billion valuation in 2023 in a secondary transaction while raising $10.3 billion in VC. The scope of AI & ML VC deals contributes to an outsized share of the market.

Autonomous machines and semiconductors deviate more greatly from the average returns given their smaller scale and greater risk. Companies in both segments commercialize hardware and build novel AI models. Semiconductor startups have suffered from macroeconomic headwinds, competition, and execution risk in building costly new computing platforms. Autonomous machine startups have found suitable use cases in national defense, real estate inspection, and warehouse management. Simultaneously, state-of-the-art AI methods are progressing in robotics given new discoveries in computer vision and reinforcement learning that can support improved machine performance.

AI & ML overview

AI & ML early-stage VC company count by segment with a VC exit prediction (minimum two VC funding rounds)*



AI & ML metrics summary*

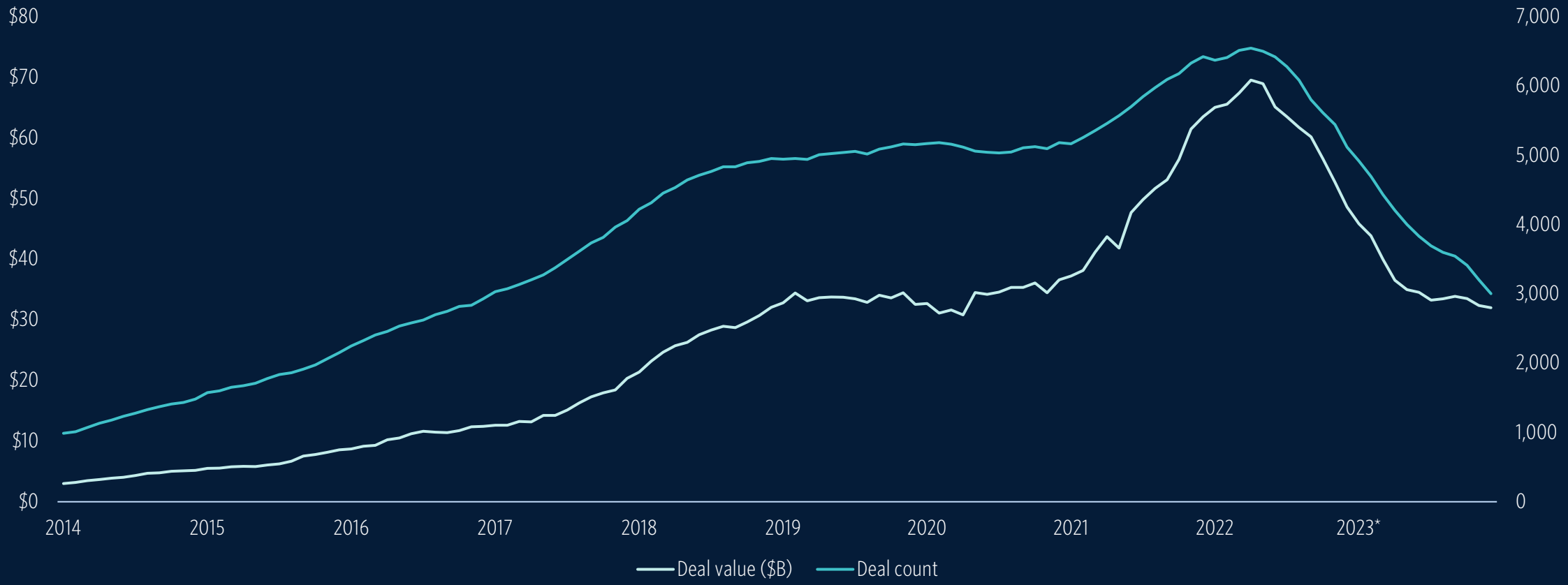
	Value	TTM change	Relative score
Annualized expected return**	23.6%	-0.7%	
Total capital raised	$28.5B	-32.8%	
New VC company fundings	775	-49.7%	
Median pre-money valuation	$38.1M	+13.5%	
Share of published patents	34.7%	+0.1%	
Top-ranked investor participation	14.0%	+0.8%	
Median employee growth	11.1%	-11.1%	

Source: PitchBook • Geography: Global • *As of December 31, 2023

**Expected returns are derived from historical return assumptions and company-level exit predictions. See page 15 for more details.

Note: The length of the relative score bars is based on cross-vertical Z-scores of the TTM change (except expected IRR and median employee growth), wherein the maximum and minimum lengths are +/- 2, respectively. The center of the column is zero.

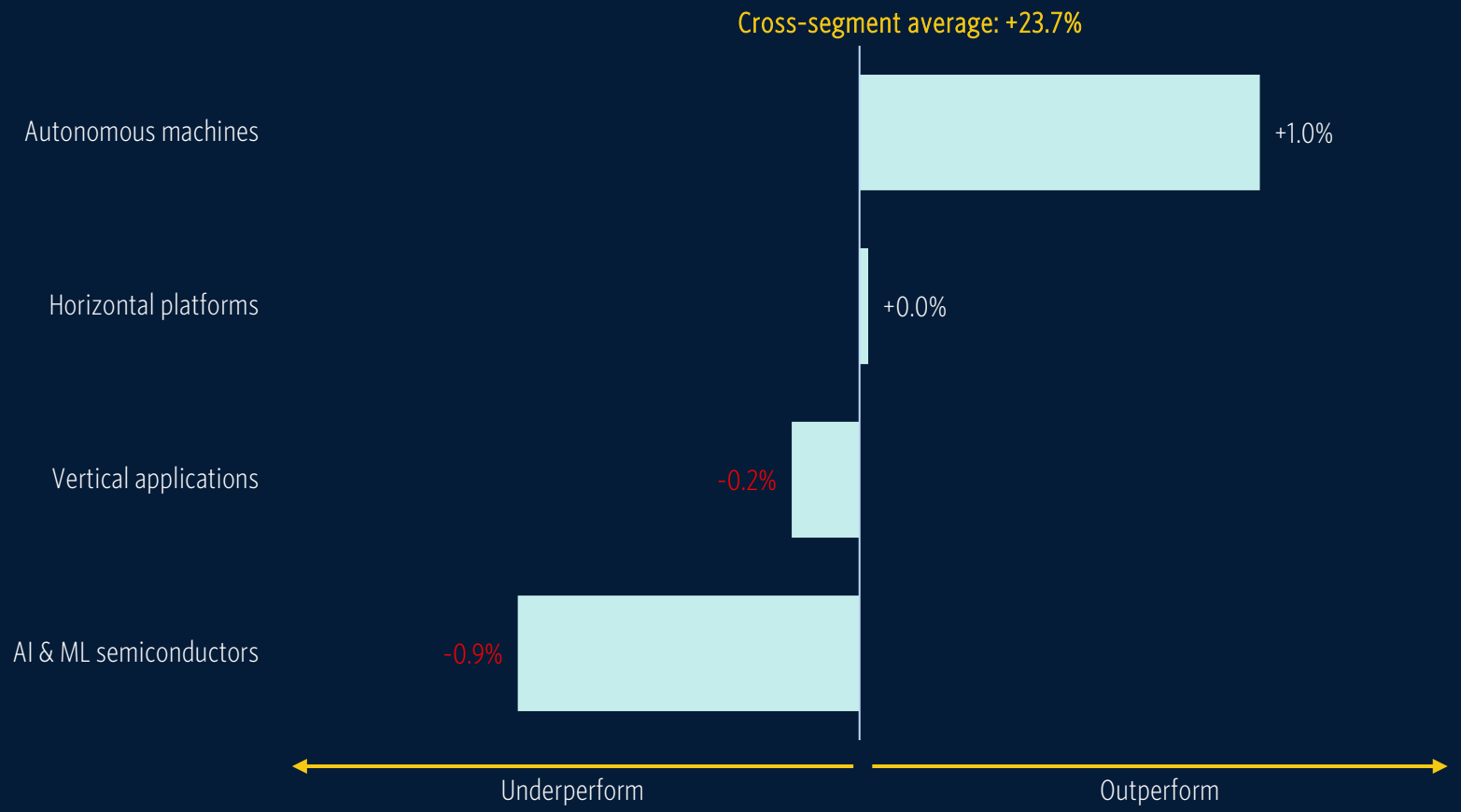
TTM AI & ML early-stage VC deal activity



Source: PitchBook • Geography: Global • *As of December 31, 2023

Investment attractiveness of AI & ML early-stage VC companies by segment

Annualized expected returns relative to the cross-segment average*



Source: PitchBook • Geography: Global • *As of December 31, 2023

Expected returns for each segment are based on an aggregation of the expected returns for underlying companies. Company-level returns are determined from the exit-type predictions and historical returns by series. For more information, please see page 15 and the VC Exit Predictor methodology located in the PitchBook Help Center.

It is important to note that the cross-segment average of 23.7% is provided as a historical baseline value and should not be relied on as a forecast. This baseline value is derived from the average of deal-level return data from 2000 to 2021 and can vary significantly based on the environment at any given time. The relative returns for each segment, however, are a more robust forward-looking measure because they are unaffected by factors that impact the entire AI & ML vertical.

Individual company highlights: North America

North America AI & ML early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
Superfluid Dx	Vertical applications	87%	4%	97	+89
Satisfi Labs	Horizontal platforms	87%	1%	91	+73
Walaris	Autonomous machines	73%	1%	71	+70
Ketryx	Vertical applications	87%	1%	91	+68
CloudMedx	Vertical applications	80%	1%	81	+53
GPMS	Vertical applications	79%	2%	83	+49
Base Operations	Horizontal platforms	80%	1%	81	+47
Steppingblocks	Vertical applications	75%	7%	87	+46
Marine Thinking	Vertical applications	68%	1%	60	+45
Snappr	Vertical applications	85%	1%	89	+45

Please use this saved search for a complete, dynamic list of AI & ML companies.

Source: PitchBook • Geography: North America • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

Individual company highlights: Europe

Europe AI & ML early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
UltraWis	Horizontal platforms	83%	3%	90	+82
LUMA Vision	Vertical applications	75%	11%	97	+64
GGPredict	Horizontal platforms	80%	1%	82	+59
Safegrid	Vertical applications	79%	1%	80	+51
nuvo	Horizontal platforms	85%	1%	88	+48
Panaxium	Vertical applications	57%	10%	69	+43
Delicious Data	AI & ML semiconductors	77%	2%	78	+42
MultiplAI Health	Vertical applications	68%	6%	76	+41
One AI	Horizontal platforms	67%	8%	78	+40
Mobilus Labs	Vertical applications	86%	1%	89	+39

Please use this saved search for a complete, dynamic list of AI & ML companies.

Source: PitchBook • Geography: Europe • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

Climate tech

For the latest in-depth climate tech research, click here.

John MacDonagh
Senior Analyst, Emerging Technology
john.macdonagh@pitchbook.com

Introduction

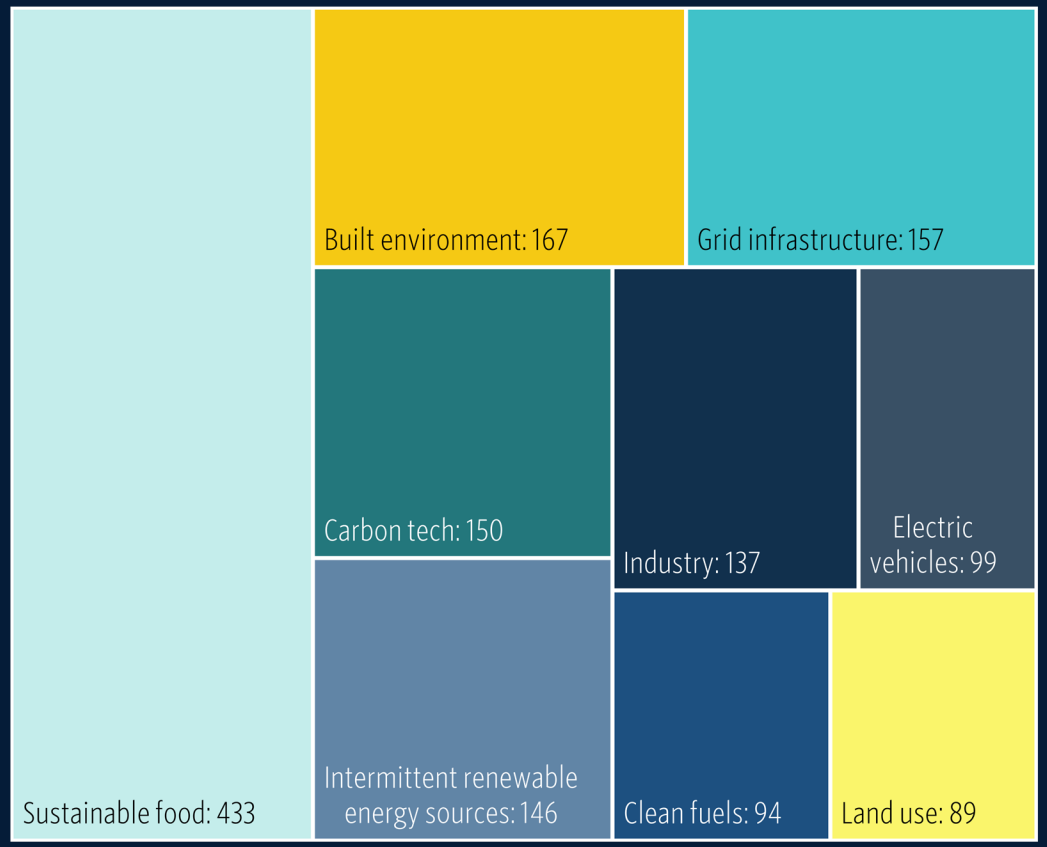
Climate tech includes a diverse range of technologies and applications that focus on climate change mitigation either by reducing greenhouse gas emissions from various industries and processes or by removing previously emitted carbon dioxide from the atmosphere. Key sectors of focus for climate tech include mobility & transport, energy generation & distribution, industrial processing & manufacturing, food & agriculture, and the built environment. Many climate technologies provide alternative processes to conventional high-carbon processes, as is the case for renewable energy sources and chemical production without using fossil fuel resources. Others are compatible with existing high-carbon processes, such as capturing carbon from industrial or energy-producing facilities.

Regulation and policy are critical factors driving adoption of climate technologies, many of which otherwise represent more costly processes than conventional methods, particularly considering the developing nature of certain technologies in the sector. Regulatory support has increased dramatically in the last few years, though initiatives such as the EU's Emissions Trading System (ETS) have been in place for longer and are increasing their requirements each year to maintain pressure to decarbonize. The ETS is compliance based; it requires companies in certain sectors to either meet certain carbon targets or purchase additional carbon allowances. To meet these targets, companies may instead implement climate technologies or switch to low-carbon inputs. Other regions focus more on incentivization rather than compliance. For example, the US passed the Inflation Reduction Act in 2022, which contains approximately $370 billion in climate tech support in the form of grants and tax credits.

VC investment in climate tech grew rapidly between 2021 and the end of 2022; it was influenced by market conditions for VC overall, plus growing global acceptance of the need to mitigate climate change. Consumer interest in low-carbon alternatives for food, consumer goods, and transport has increased, as have pledges at the country, city, and corporate levels. While pledges on their own are not meaningful without further planning and implementation of actions, country-level pledges are often the catalyst for changes to the regulatory and policy environment. Technological advancement is also critical in some segments of climate tech, and developments to battery technologies in particular have allowed deployment of electric vehicles with capabilities expected by users. Similarly, rooftop solar panels have developed to the point that they are now more widely considered economically viable, particularly given the high, volatile energy prices seen from 2022 onward. Since the end of 2022, though, the challenging market conditions for VC overall have dampened deal activity in the sector.

Climate tech overview

Climate tech early-stage VC company count by segment with a VC exit prediction (minimum two VC funding rounds)*

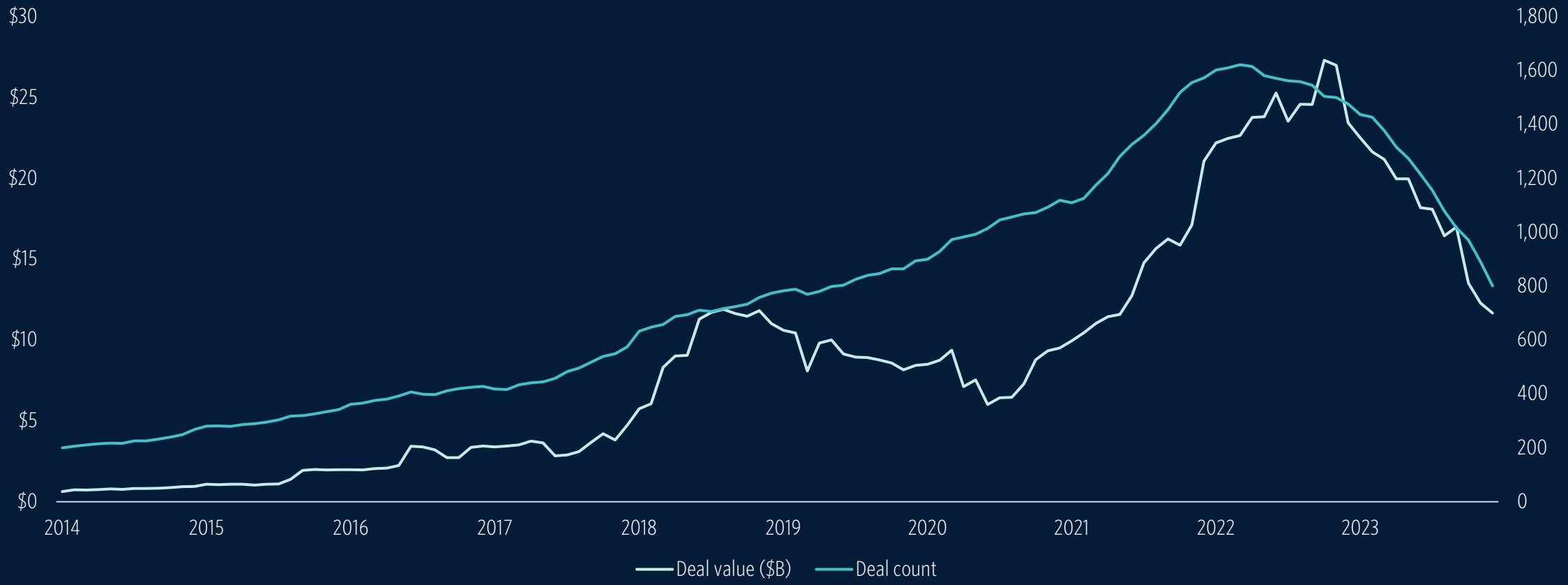


Climate tech metrics summary*

	Value	TTM change	Relative score
Annualized expected IRR**	23.2%	+0.3%	
Total capital raised	$8.8B	-32.1%	
New VC company fundings	129	-74.9%	
Median pre-money valuation	$51.0M	+44.9%	
Share of published patents	11.5%	+1.0%	
Top-ranked investor participation	7.8%	-1.0%	
Median employee growth	20.0%	-9.8%	

Source: PitchBook • Geography: Global • *As of December 31, 2023
**Expected returns are derived from historical return assumptions and company-level exit predictions. See page 15 for more details.
Note: The length of the relative score bars is based on cross-vertical Z-scores of the TTM change (except expected IRR and median employee growth), wherein the maximum and minimum lengths are +/- 2, respectively. The center of the column is zero.

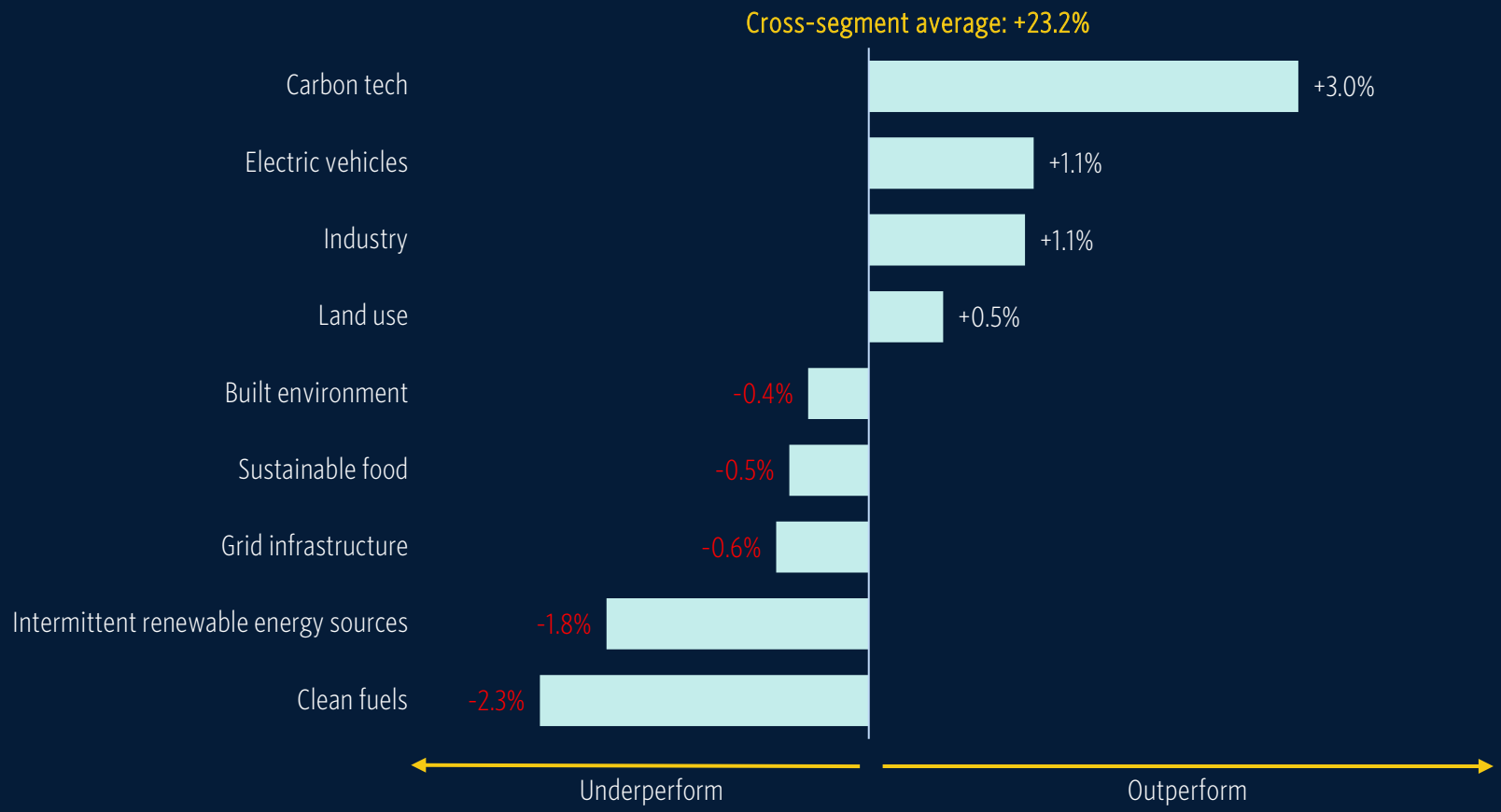
TTM climate tech early-stage VC deal activity



Source: PitchBook • Geography: Global • *As of December 31, 2023

Investment attractiveness of climate tech early-stage VC companies by segment

Annualized expected returns relative to the cross-segment average*



Source: PitchBook • Geography: Global • *As of December 31, 2023

Expected returns for each segment are based on an aggregation of the expected returns for underlying companies. Company-level returns are determined from the exit-type predictions and historical returns by series. For more information, please see page 15 and the VC Exit Predictor methodology located in the PitchBook Help Center.

It is important to note that the cross-segment average of 23.2% is provided as a historical baseline value and should not be relied on as a forecast. This baseline value is derived from the average of deal-level return data from 2000 to 2021 and can vary significantly based on the environment at any given time. The relative returns for each segment, however, are a more robust forward-looking measure because they are unaffected by factors that impact the entire climate tech vertical.

Individual company highlights: North America

North America climate tech early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
EnerVenue	Grid infrastructure	74%	7%	85	+58
Nevados Engineering	Intermittent renewable energy sources	71%	1%	67	+45
GDI	Industry	80%	1%	81	+44
Idle Smart	Electric vehicles	81%	1%	83	+37
Element Energy	Grid infrastructure	14%	76%	83	+34
Shiru	Sustainable food	78%	3%	83	+34
Enginuity Power Systems	Built environment	32%	46%	99	+34
Mozza	Sustainable food	63%	1%	52	+33
Lingrove	Industry	85%	3%	61	+32
Coreshell	Grid infrastructure	80%	1%	82	+31

Source: PitchBook • Geography: North America • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

Please use these saved searches for a complete, dynamic list of climate tech companies: carbon & emissions tech and clean energy.

Individual company highlights: Europe

Europe climate tech early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
Sweetch Energy	Dispatchable energy sources	59%	23%	98	+50
HappyVore	Sustainable food	75%	3%	79	+47
eologix sensor technology	Intermittent renewable energy sources	81%	2%	85	+46
Novatron Fusion	Dispatchable energy sources	75%	5%	82	+41
Carbon Collect	Carbon tech	53%	3%	44	+35
Energy Dome	Grid infrastructure	10%	77%	77	+33
Hydro X	Electric vehicles	50%	4%	44	+32
Exnaton	Intermittent renewable energy sources	81%	1%	82	+31
Hyperion Robotics	Built environment	75%	5%	82	+30
SchrottBienen	Industry	62%	1%	51	+28

Please use these saved searches for a complete, dynamic list of climate tech companies: carbon & emissions tech and clean energy.

Source: PitchBook • Geography: Europe • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

Cybersecurity

For the latest in-depth cybersecurity research, click here.

Brendan Burke
Senior Analyst, Emerging Technology
brendan.burke@pitchbook.com

Introduction

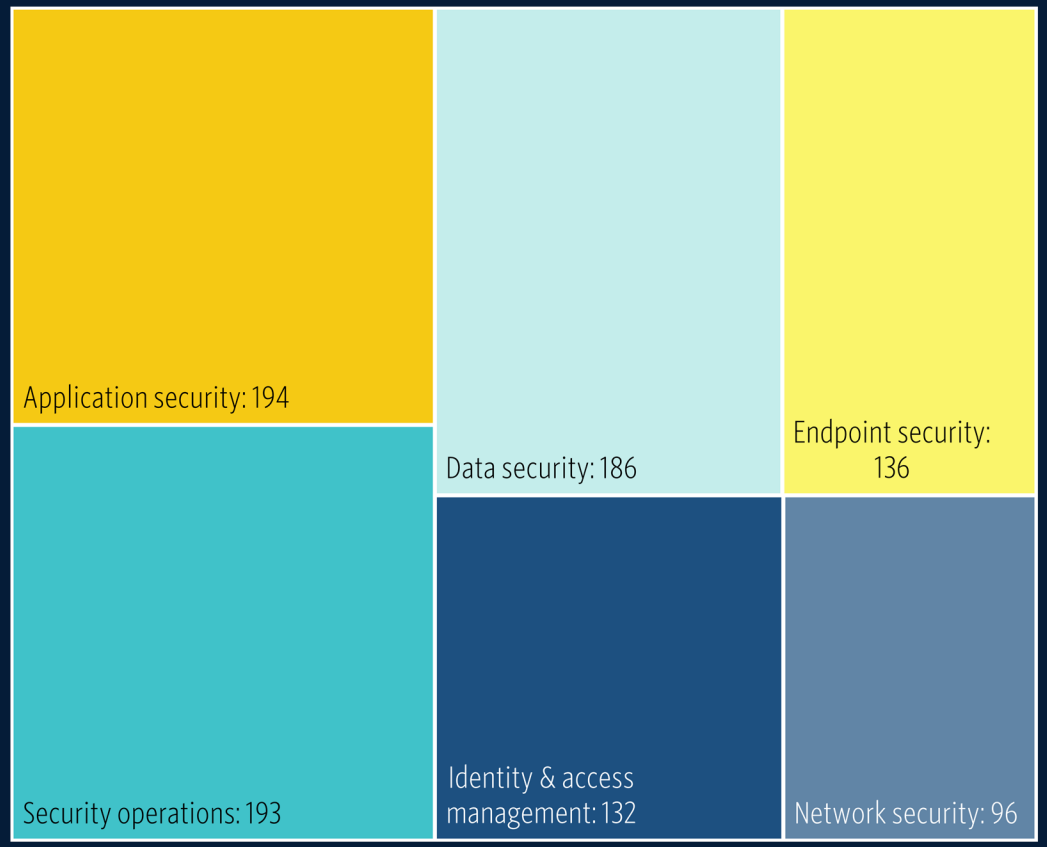
Cybersecurity (also known as information security) refers to technology and services that protect enterprises from digital threats to business operations. Segments of the market commonly addressed by private vendors include:

- Application security, which encompasses technologies and services that address the vulnerabilities of software programs. Common vulnerabilities include data requests within applications, injection of malicious scripts into existing code, and contamination of log file entries and HTTP headers.
- Data security, which uses encryption, monitoring, filtering, blocking, and remediating technologies to address the risks of inadvertent or accidental data loss and the exposure of sensitive data.
- Endpoint security, which refers to the protection of data communicated through and stored in devices at the network edge, detection of attacks on edge devices, and responses to these attacks by utilizing forensic analysis and breach remediation.
- Identity & access management (IAM) software, which enables management of employee and customer details, as well as permissions across the enterprise network.
- Network security, which includes software and hardware that protects enterprise network infrastructure from digital attacks. The segment focuses on the traffic entering the enterprise perimeter and moving laterally among network nodes.
- Security operations technology, which aids the critical functions of the enterprise's security operations center (SOC) or equivalent entity in utilizing the tools in other segments.

These segments differ in market maturity, end user spending, and risk prioritization. Enterprise networks are expanding via the cloud and remote workstations, which is creating an uncertain landscape for cybersecurity leaders. Application security and endpoint security benefit from the diffusion of enterprise workloads more so than network and data security. Even so, each segment has distinct market leaders and competitive dynamics that change the investment outlook for startups in the space.

Cybersecurity overview

Cybersecurity early-stage VC company count by segment with a VC exit prediction (minimum two VC funding rounds)*

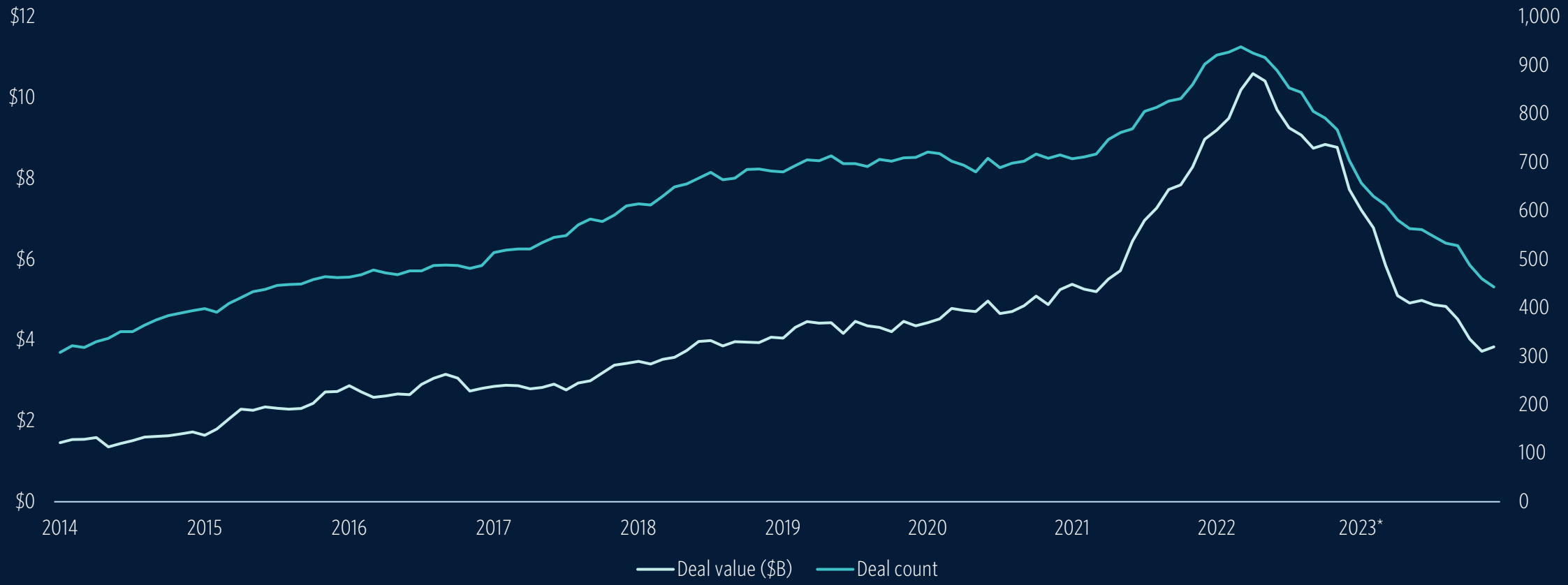


Cybersecurity metrics summary*

	Value	TTM change	Relative score
Annualized expected return**	24.3%	-0.1%	
Total capital raised	$4.5B	-28.9%	
New VC company fundings	138	-45.3%	
Median pre-money valuation	$40.6M	+9.4%	
Share of published patents	5.6%	-0.3%	
Top-ranked investor participation	13.9%	+0.5%	
Median employee growth	10.7%	-9.5%	

Source: PitchBook • Geography: Global • *As of December 31, 2023
**Expected returns are derived from historical return assumptions and company-level exit predictions. See page 15 for more details.
Note: The length of the relative score bars is based on cross-vertical Z-scores of the TTM change (except expected IRR and median employee growth), wherein the maximum and minimum lengths are +/- 2, respectively. The center of the column is zero.

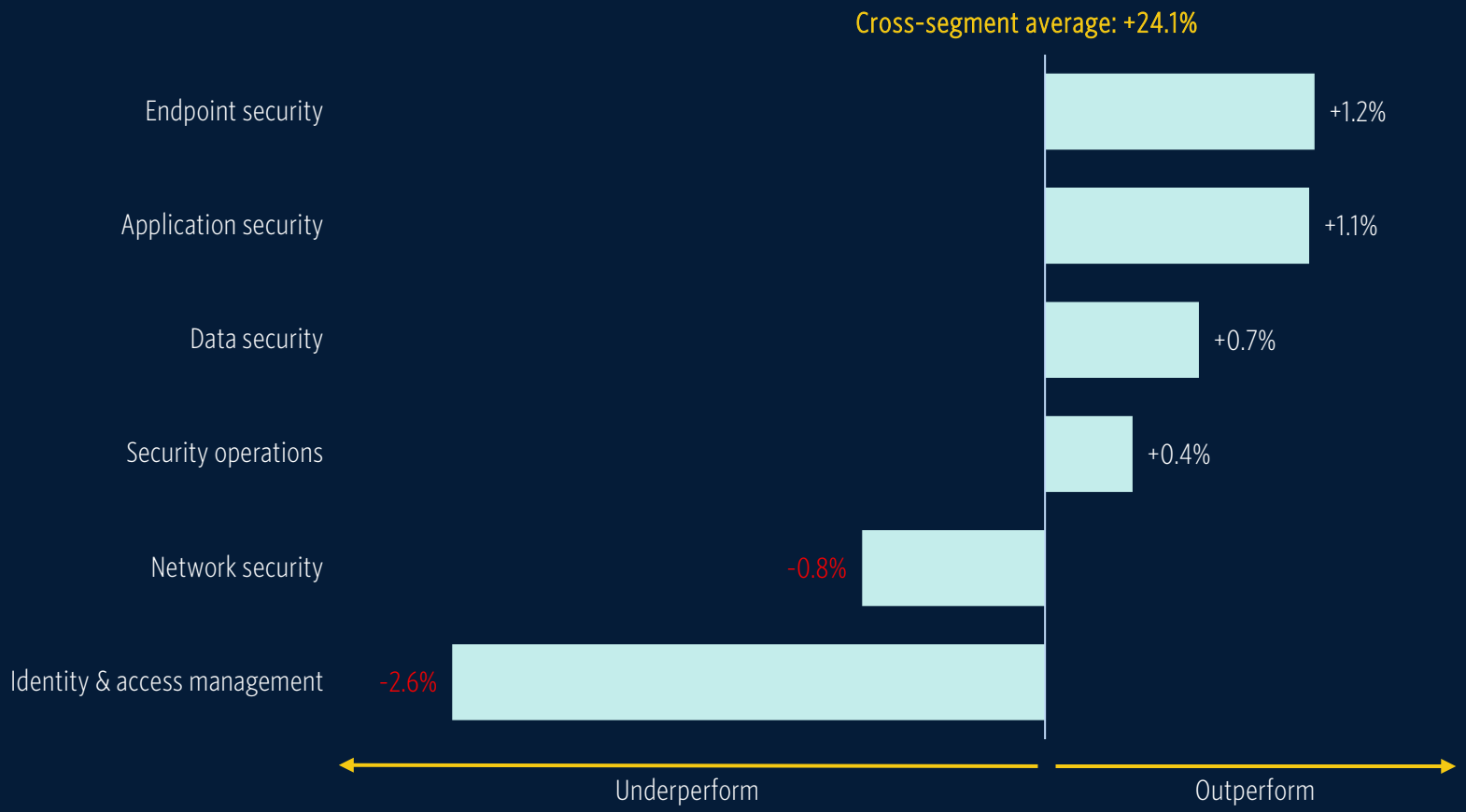
TTM cybersecurity early-stage VC deal activity



Source: PitchBook • Geography: Global • *As of December 31, 2023

Investment attractiveness of cybersecurity early-stage VC companies by segment

Annualized expected returns relative to the cross-segment average*



Source: PitchBook • Geography: Global • *As of December 31, 2023

Expected returns for each segment are based on an aggregation of the expected returns for underlying companies. Company-level returns are determined from the exit-type predictions and historical returns by series. For more information, please see page 15 and the VC Exit Predictor methodology located in the PitchBook Help Center.

It is important to note that the cross-segment average of 24.1% is provided as a historical baseline value and should not be relied on as a forecast. This baseline value is derived from the average of deal-level return data from 2000 to 2021 and can vary significantly based on the environment at any given time. The relative returns for each segment, however, are a more robust forward-looking measure because they are unaffected by factors that impact the entire cybersecurity vertical.

Individual company highlights: North America

North America cybersecurity early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
Magic Labs	Identity & access management	68%	23%	99	+54
TrustLogix	Data security	71%	1%	66	+48
SecureCo	Identity & access management	67%	3%	64	+30
Kondukto	Application security	62%	1%	51	+29
Dasera	Data security	90%	1%	95	+27
Corsha	Application security	72%	1%	67	+21
HYAS	Security operations	92%	1%	69	+21
NowSecure	Application security	87%	1%	60	+18
Opscura	Data security	79%	5%	28	+17
Galvanick	Endpoint security	67%	1%	59	+17

Please use this saved search for a complete, dynamic list of cybersecurity companies.

Source: PitchBook • Geography: North America • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

Individual company highlights: Europe

Europe cybersecurity early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
Salvador Technologies	Endpoint security	80%	1%	81	+61
Nym	Data security	80%	1%	81	+50
Interlock	Network security	83%	1%	86	+42
C2	Security operations	63%	1%	52	+29
ONEKEY	Endpoint security	65%	1%	55	+29
GuardKnox	Endpoint security	46%	5%	41	+27
Nanitor	Security operations	77%	1%	77	+25
DynaRisk	Security operations	69%	1%	61	+23
Cydome	Endpoint security	81%	2%	84	+22
Xertified	Endpoint security	62%	1%	52	+21

Please use this saved search for a complete, dynamic list of cybersecurity companies.

Source: PitchBook • Geography: Europe • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

Fintech

For the latest in-depth fintech research, click here.

Rudy Yang
Senior Analyst, Emerging Technology
rudy.yang@pitchbook.com

Introduction

The fintech industry remains one of the most well-funded spaces, with a wide range of investment opportunities. The sector comprises products and services that help businesses and consumers transact, budget, borrow, lend, and invest and is enabled by the ongoing development of new software, apps, application programming interfaces (APIs), and cloud technologies.

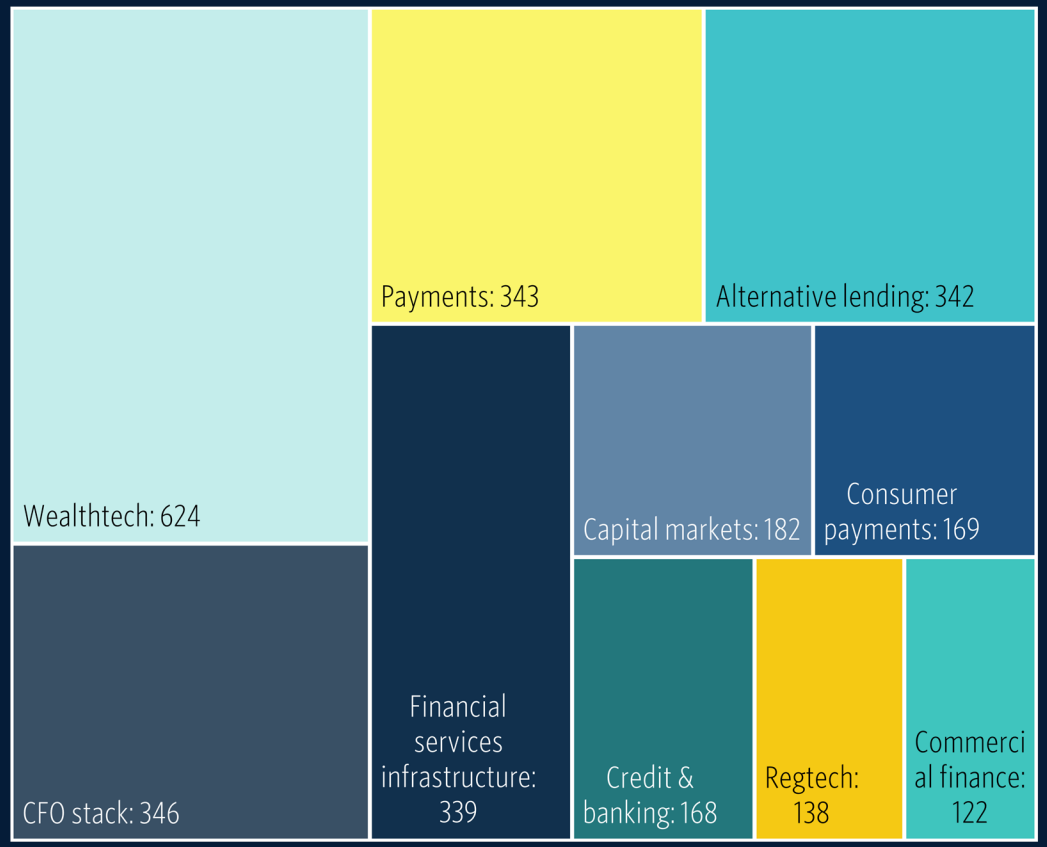
Innovation within financial services has continued for several decades—with early examples including the development of the electronic fund transfer system, automated teller machines, and credit cards. Further innovation was spurred following the global financial crisis, as financial institutions came under extreme pressure and some consumers lost trust in banks, which resulted in the creation of alternative methods to store and obtain money. However, much of today's fintech development has been spurred by the COVID-19 pandemic.

In the low-interest-rate environment following the pandemic, the fintech industry entered a boom cycle. However, the sector is now experiencing a period of normalization. VC deployment is retracing to pre-pandemic levels, while valuations in both public and private markets are mean reverting. In addition, exits levels have decelerated, while public listings have essentially come to a halt. Macroeconomic challenges have also hampered consumer wealth and slowed business growth. The current market environment thus sees investments significantly biased toward B2B companies, which often deliver more predictable revenue streams and capture higher margins.

Greater diligence from investors has encouraged business models to prioritize growth *and* profitability, thus helping to separate practicality from hype. At the industry's current inflection point, startups and investors are eyeing emerging opportunities in GenAI, instant payments, and open banking & finance. The evolving regulatory environment has also encouraged financial institutions and startups to tighten their compliance and risk management controls.

Fintech overview

Fintech early-stage VC company count by segment with a VC exit prediction (minimum two VC funding rounds)*

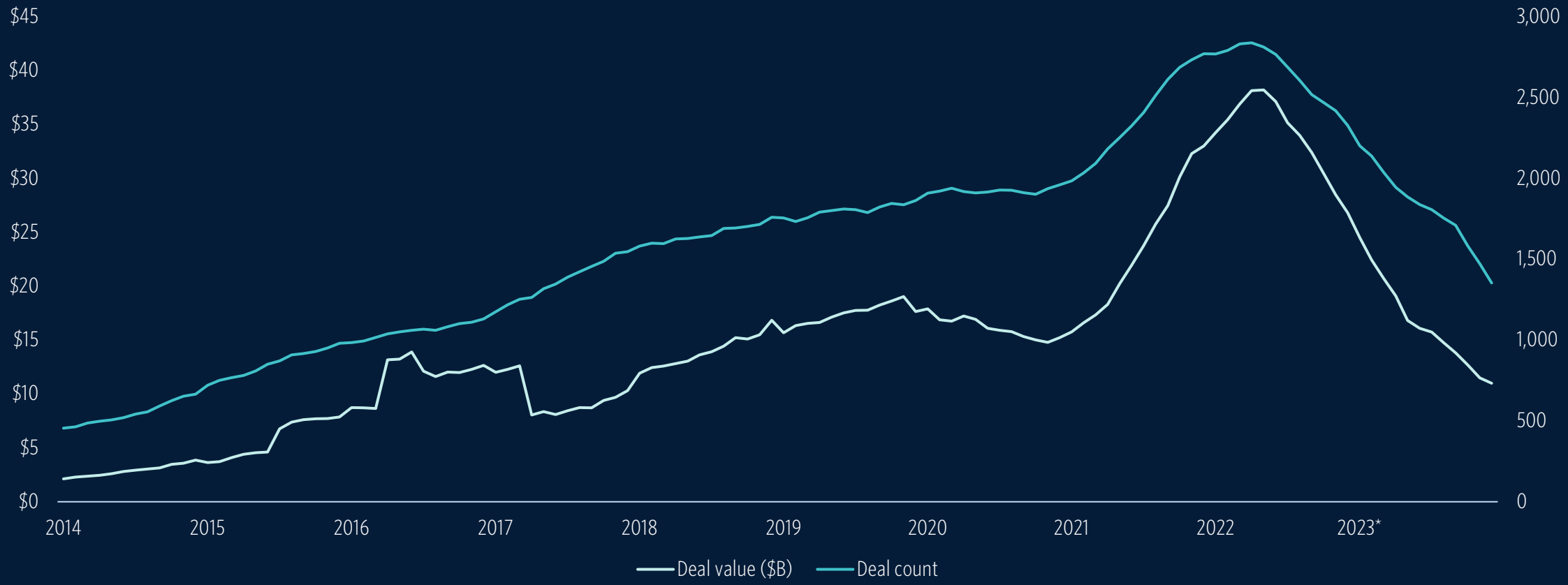


Fintech metrics summary*

	Value	TTM change	Relative score
Annualized expected return**	23.4%	-0.9%	
Total capital raised	$11.1B	-39.3%	
New VC company fundings	456	-38.9%	
Median pre-money valuation	$34.1M	+6.1%	
Share of published patents	1.6%	+0.1%	
Top-ranked investor participation	14.4%	-2.6%	
Median employee growth	10.0%	-23.3%	

Source: PitchBook • Geography: Global • *As of December 31, 2023
**Expected returns are derived from historical return assumptions and company-level exit predictions. See page 15 for more details.
Note: The length of the relative score bars is based on cross-vertical Z-scores of the TTM change (except expected IRR and median employee growth), wherein the maximum and minimum lengths are +/- 2, respectively. The center of the column is zero.

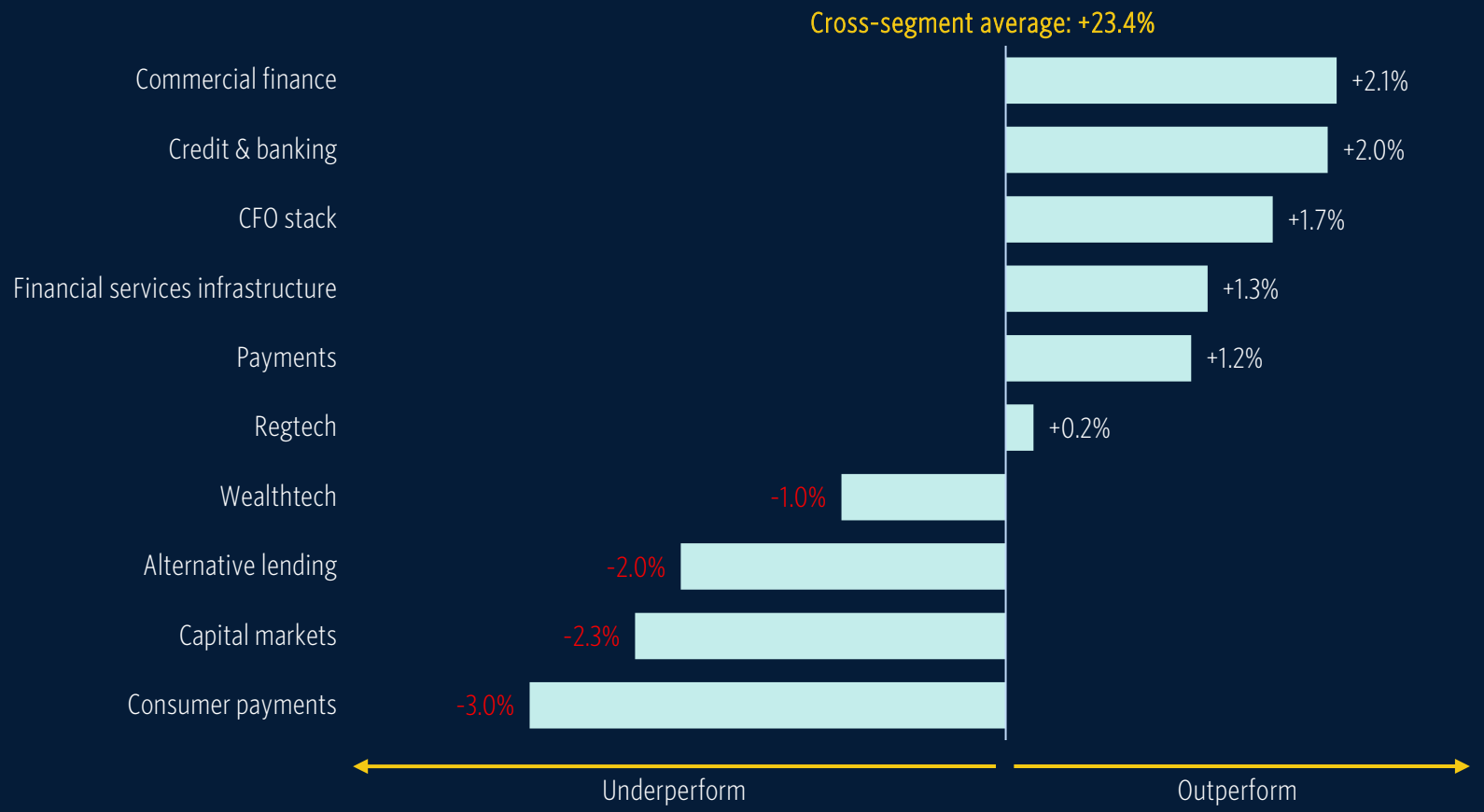
TTM fintech early-stage VC deal activity



Source: PitchBook • Geography: Global • *As of December 31, 2023

Investment attractiveness of fintech early-stage VC companies by segment

Annualized expected returns relative to the cross-segment average*



Source: PitchBook • Geography: Global • *As of December 31, 2023

Expected returns for each segment are based on an aggregation of the expected returns for underlying companies. Company-level returns are determined from the exit-type predictions and historical returns by series. For more information, please see page 15 and the VC Exit Predictor methodology located in the PitchBook Help Center.

It is important to note that the cross-segment average of 23.4% is provided as a historical baseline value and should not be relied on as a forecast. This baseline value is derived from the average of deal-level return data from 2000 to 2021 and can vary significantly based on the environment at any given time. The relative returns for each segment, however, are a more robust forward-looking measure because they are unaffected by factors that impact the entire fintech vertical.

Individual company highlights: North America

North America fintech early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
MoneyHash	Financial services infrastructure	83%	1%	86	+40
Hedonova	Wealthtech	57%	12%	73	+32
Stonks	Wealthtech	77%	1%	77	+32
VeriFast	Regtech	69%	1%	62	+31
Lenme	Alternative lending	46%	1%	34	+29
Hardbacon	Wealthtech	67%	1%	58	+29
Shur	Wealthtech	45%	1%	33	+26
Fractional	Wealthtech	65%	2%	58	+25
Moov	Financial services infrastructure	84%	1%	55	+25
Pipe	Commercial finance	19%	60%	59	+24

Please use this saved search for a complete, dynamic list of fintech companies.

Source: PitchBook • Geography: North America • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

Individual company highlights: Europe

Europe fintech early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
SimpleEstate	Wealthtech	66%	2%	60	+51
Yumminn	Payments	69%	1%	62	+48
Swimbird	Wealthtech	73%	2%	71	+39
Omega	Payments	66%	1%	56	+38
Digiteal	CFO stack	74%	1%	72	+36
Proxymity	Financial services infrastructure	50%	31%	57	+32
Stellar Fusion	Wealthtech	52%	2%	41	+30
Citizen	Payments	78%	1%	78	+30
Klarpay	Payments	47%	1%	36	+29
SteadyPay	Credit & banking	74%	1%	71	+29

Please use this saved search for a complete, dynamic list of fintech companies.

Source: PitchBook • Geography: Europe • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

Foodtech

For the latest in-depth foodtech research, click here.

Alex Frederick
Senior Analyst, Emerging Technology
alex.frederick@pitchbook.com

Introduction

The foodtech sector includes technology-driven startups developing products and services that are changing the ways food has traditionally been discovered, purchased, delivered, prepared, and consumed.

Foodtech VC funding remained muted in Q3, yet innovation continues at the same bustling pace as previous quarters. In Q3, we explored emerging opportunities including food assembly robots and the impact of GLP-1 drugs on foodtech. Other key trends include the maturation of food delivery services, plant-based evolution, and the continued ways that AI is infiltrating the food economy.

The third-party food delivery space continues to mature. DoorDash continues to gain market share over its rivals. In September 2023, DoorDash achieved 65% market share in the US, followed by Uber Eats at 23%.[1] DoorDash's Q3 financial results indicated that revenues increased 27% YoY, while generally accepted accounting principles (GAAP) net loss is down to $75 million from $642 million in Q4 2022.[2] DoorDash's strong performance leaves little room for public competitors, let alone startups to gain footing. However, startup Chowbus differentiates itself by focusing on restaurant and grocery delivery from Asian vendors. The company raised a $16.2 million Series D in August 2023.

What is unclear is how many plant-based meals will be delivered in 2024 versus 2023. In the public sector, incumbent Beyond Meat continues to operate at a net loss and has cut revenue expectations twice. The company recently announced plans to cut 19% of its workforce to control costs.[3] In November, Josh Kobza, CEO of Restaurant Brands International, the parent company to Burger King, discussed Burger King's plant-based strategy, stating that demand for plant-based options was stable, but the company had no plans to launch any new offerings in the US.[4] Although plant-based VC funding is down significantly from its peak in Q3 2021, deal activity has been on the upswing; in Q3, funding increased for the second quarter in a row. And not all plant-based companies are focused purely on building consumer brands. NotCo, a plant-based food manufacturer, is developing AI-based product development software to help companies develop plant-based products. At scale, this software could provide a steady revenue stream with high margins to complement NotCo's food business.[5]

AI technology is infiltrating many other areas in the food system. In the realm of quick commerce, several high-profile restaurant chains are piloting drive-thru automation technologies that use GenAI, automatic speech recognition, natural language processing (NLP), and other tools that improve order fulfillment times, address labor shortages, and even upsell customers. Lead players, including Presto, SoundHound, and Valyant AI, have partnered with hundreds of restaurant locations. White Castle planned to roll out voice AI to over 100 locations by the end of 2024.[6] This is only one of the many ways that technology is shifting how consumers interact with restaurants.

1: "Which Company Is Winning the Restaurant Food Delivery War?" Bloomberg Second Measure, Michal Kaczmarski, November 13, 2023.

2: "DoorDash Releases Third Quarter 2023 Financial Results," DoorDash, November 1, 2023.

3: "Beyond Meat Slashes Workforce as Business Model Is Under Fire," Food Dive, Elizabeth Flood, November 3, 2023.

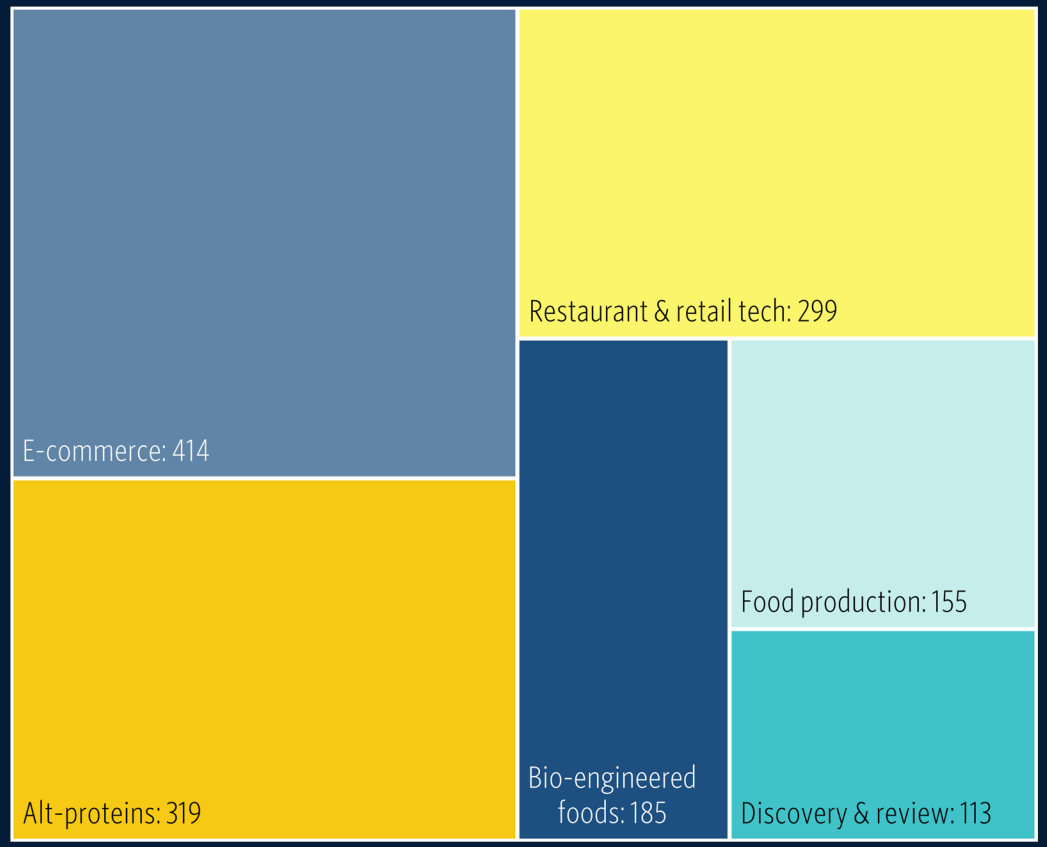
4: "Burger King Won't Offer More US Plant-Based Options in Near Term," Bloomberg, Deena Shanker, November 3, 2023.

5: "NotCo 2.0: Plant-Based Company Makes Bigger B2B Push to be the 'ChatGPT of Food,'" Food Navigator, Ryan Daily, November 7, 2023.

6: "White Castle to Roll Out Voice AI to Over 100 Drive-Thrus," Restaurant Dive, Julie Littman, August 2, 2023.

Foodtech overview

Foodtech early-stage VC company count by segment with a VC exit prediction (minimum two VC funding rounds)*

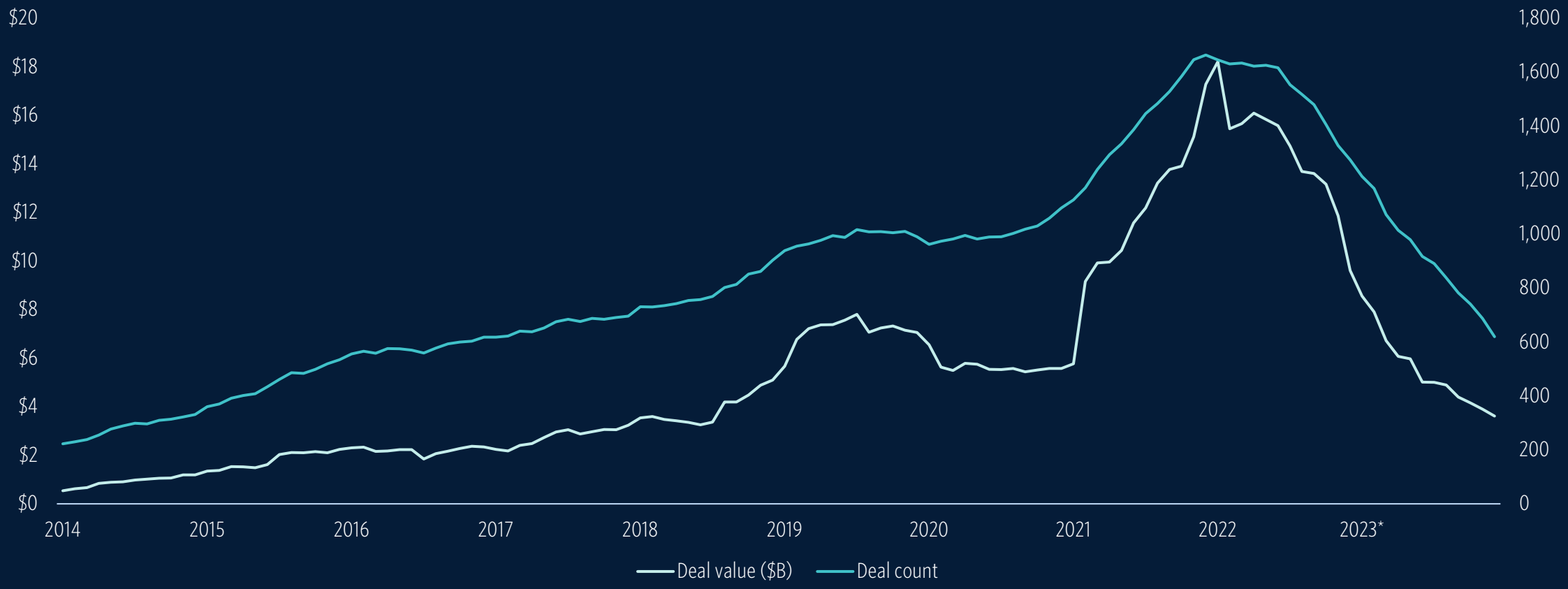


Foodtech metrics summary*

	Value	TTM change	Relative score
Annualized expected return**	20.8%	-0.8%	
Total capital raised	$4.6B	-43.0%	
New VC company fundings	133	-69.2%	
Median pre-money valuation	$31.3M	+30.2%	
Share of published patents	3.8%	+0.1%	
Top-ranked investor participation	9.1%	-1.1%	
Median employee growth	9.1%	-15.3%	

Source: PitchBook • Geography: Global • *As of December 31, 2023
**Expected returns are derived from historical return assumptions and company-level exit predictions. See page 15 for more details.
Note: The length of the relative score bars is based on cross-vertical Z-scores of the TTM change (except expected IRR and median employee growth), wherein the maximum and minimum lengths are +/- 2, respectively. The center of the column is zero.

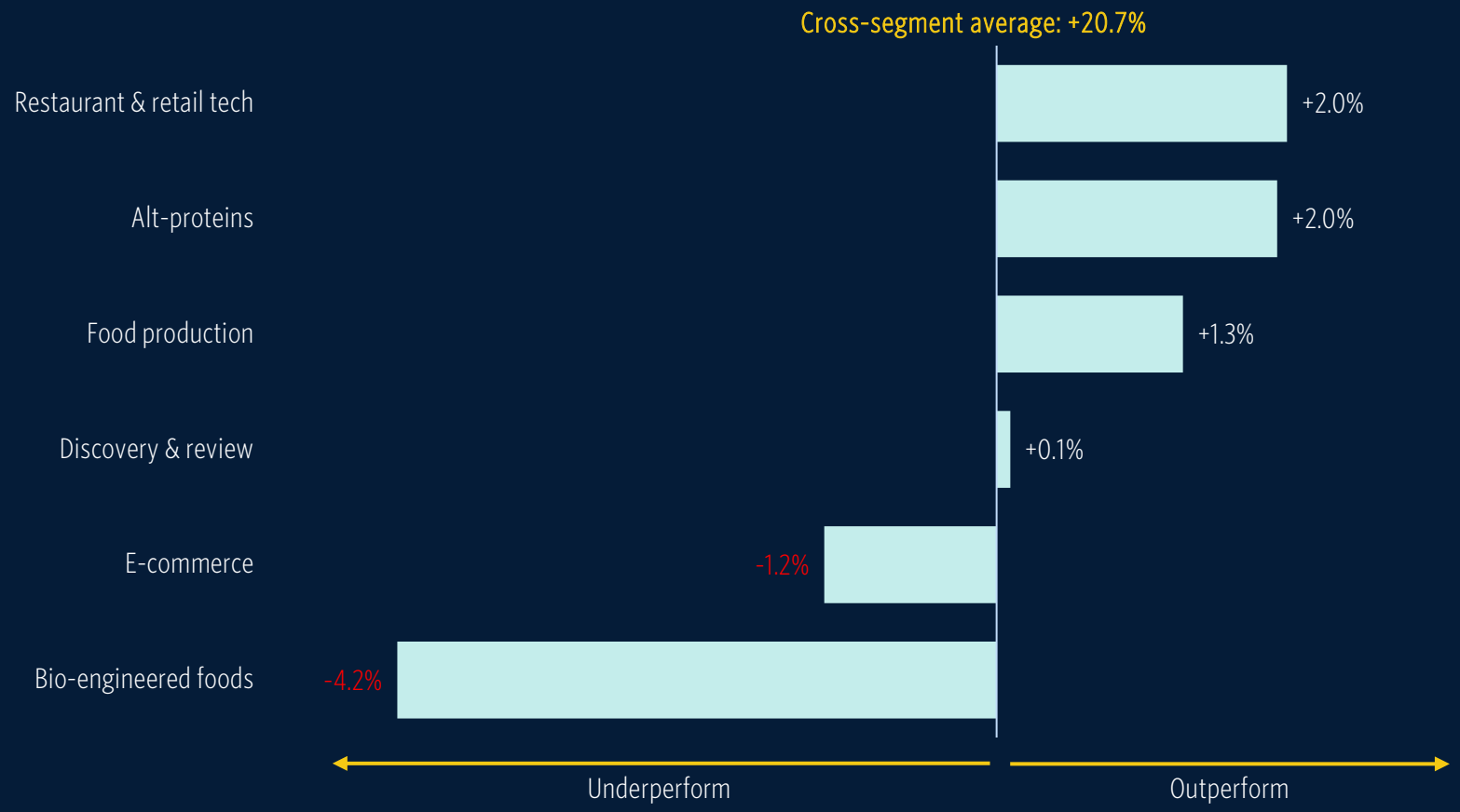
TTM foodtech early-stage VC deal activity



Source: PitchBook • Geography: Global • *As of December 31, 2023

Investment attractiveness of foodtech early-stage VC companies by segment

Annualized expected returns relative to the cross-segment average*



Source: PitchBook • Geography: Global • *As of December 31, 2023

Expected returns for each segment are based on an aggregation of the expected returns for underlying companies. Company-level returns are determined from the exit-type predictions and historical returns by series. For more information, please see page 15 and the VC Exit Predictor methodology located in the PitchBook Help Center.

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Individual company highlights: North America

North America foodtech early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
Backbar	Restaurant & retail tech	83%	1%	85	+48
A-Game	Bio-engineered foods	54%	4%	48	+43
Uproot Food Collective	E-commerce	57%	8%	60	+38
Tia Lupita	E-commerce	71%	2%	68	+31
Market Wagon	E-commerce	55%	1%	43	+30
Renewal Mill	Bio-engineered foods	66%	1%	57	+29
Grocery Shopii	E-commerce	62%	1%	51	+28
Cuzen Matcha	Restaurant & retail tech	61%	1%	50	+28
Shef	E-commerce	77%	7%	57	+24
Tso	E-commerce	69%	1%	62	+23

Please use this saved search for a complete, dynamic list of foodtech companies.

Source: PitchBook • Geography: North America • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

Individual company highlights: Europe

Europe foodtech early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
Milano Vice	Restaurant & retail tech	76%	3%	80	+39
Ruokaboksi	E-commerce	67%	4%	67	+34
Gstock	Restaurant & retail tech	62%	1%	51	+30
BiteMe Nutrition	Bio-engineered foods	60%	1%	48	+28
Gopick	Restaurant & retail tech	86%	1%	90	+24
Schrankerl	E-commerce	62%	1%	51	+22
Kaffe Bueno	Bio-engineered foods	73%	3%	75	+20
Playter	Restaurant & retail tech	72%	9%	88	+19
yhangry	E-commerce	50%	1%	38	+19
Waterdrop	Bio-engineered foods	58%	30%	68	+18

Please use this saved search for a complete, dynamic list of foodtech companies.

Source: PitchBook • Geography: Europe • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

Gaming

For the latest in-depth gaming research, click here.

Eric Bellomo
Analyst, Emerging Technology
eric.bellomo@pitchbook.com

Introduction

The gaming startup ecosystem spans the totality of the game development lifecycle and includes content development technologies, operational and monetization services, and access and experience platforms, as well as games themselves.

Gaming experienced a modest increase in both deal count and value in Q4, totaling 126 deals for $1.0 billion. However, both figures represent more substantial step-backs year over year and year to date. Gaming VC activity appears to have reached a nadir, with the last five quarters generating between $900.0 million and $1.3 billion in investment. Further, this level of activity likely represents a more realistic level of investment than the peak years of 2020 to 2022, which attracted nonendemic and "tourist" investors during the peak of Web3 and Metaverse hype-cycles.

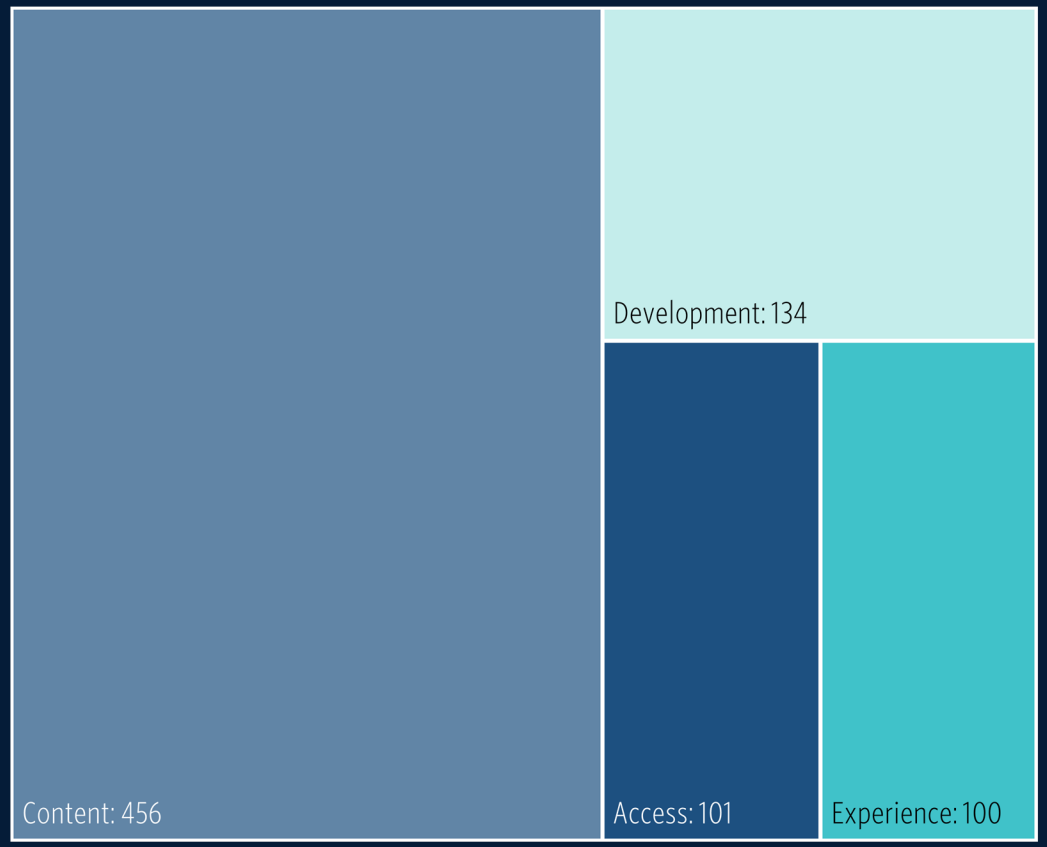
The "perfect storm" of low interest rates and consumers stuck inside during a pandemic has officially cleared, and many investors that sought exposure to games are liable to grapple with the time- and capital-intensive nature of game development. We expect some capital allocators to begin shifting their focus away from studios and toward more familiar business models, like SaaS platforms and developer tools. Nevertheless, the content segment continues to capture the largest portion of capital invested, followed by development startups. The gap did narrow QoQ: In Q3, content deals more than doubled the development segment, but the delta was half as large in Q4. The remaining segments each navigated depressed activity.

Pre-money valuation step-ups in 2023 finished below 2022 and fell across all stages YoY—except venture-growth deals, which held flat. Similarly, median deal sizes fell YoY in 2023 from $4.1 million to $3.6 million. Late-stage deals were the only category to increase, rising from $7.0 million to $7.9 million. Several subsegments faced fluctuations in investment. Hardware increased its share of investment with the access segment (attributable to an individual deal for Rokid). Distribution platforms remained a niche category, with only $23.5 million in investment. Epic's recent victory over Google signaled the potential for app store disruption, though this remains unlikely in the near term. The South Korean market has demonstrated the feasibility of alternatives to Apple and Google, but no competitors have truly emerged. The game engine subsegment also fell from $40.4 million in Q3 to $7.2 million in Q4. Unity's recent price increases underscored both the limitations of an Epic-Unity duopoly but also the significant moats both businesses have developed. Lastly, developer tools increased from $216.5 million raised to $281.5 million in Q4, which signals that investors may turn to "picks and shovels" tooling to maintain exposure to the gaming industry while mitigating the boom-or-bust game-development risk.

Exit activity ended 2023 on a muted note. Excluding Microsoft's acquisition of Activision Blizzard, exits totaled $5.5 billion across 38 deals. This was a YoY increase from $3.8 billion but the lowest figure since 2016's $2.3 billion. Q4 exits totaled $110.0 million over 16 deals—a QoQ decrease from Q3's $5.2 billion over 20 deals. We expect H1 2024 to largely extend this muted exit landscape. Although incumbents possess healthy cash balances, H1 is likely to produce only a series of smaller deals. Acquirers stand to benefit from startups facing valuation decreases, and 2024 exit value may be propped up by a small batch of outsized exits while the IPO window remains closed.

Gaming overview

Gaming early-stage VC company count by segment with a VC exit prediction (minimum two VC funding rounds)*

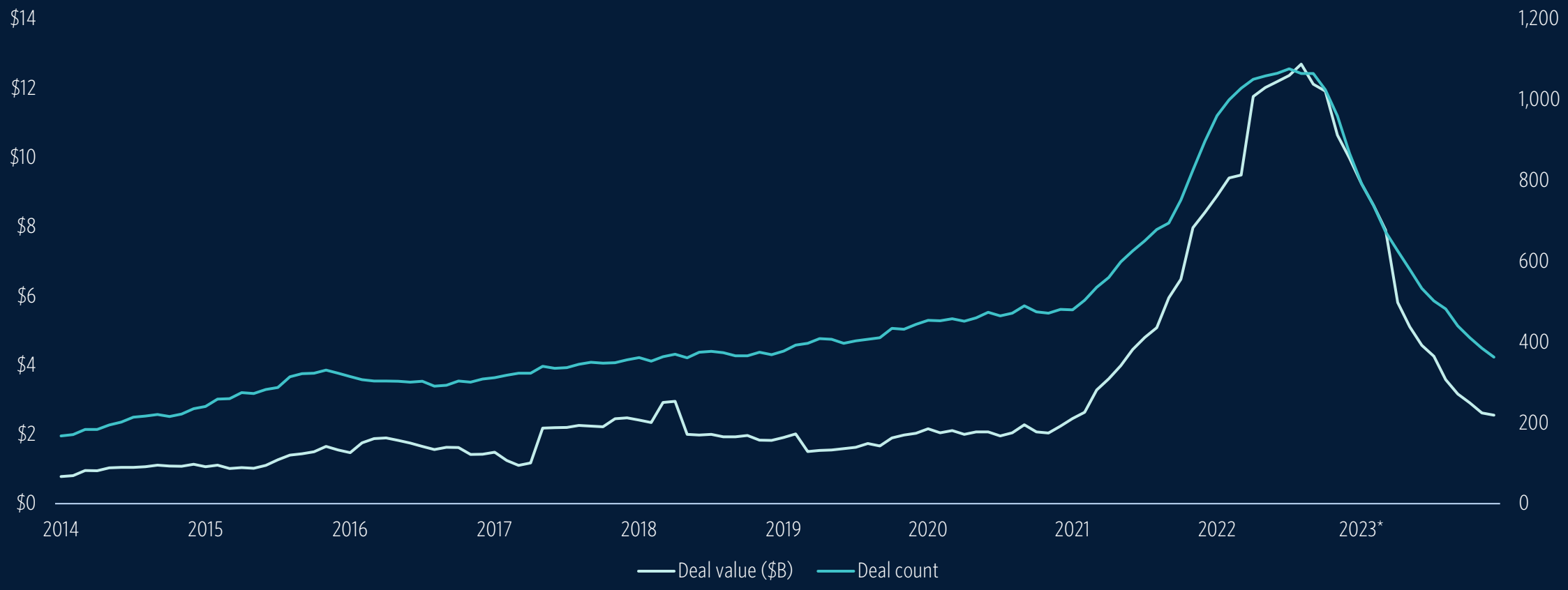


Gaming metrics summary*

	Value	TTM change	Relative score
Annualized expected return**	24.0%	-0.6%	
Total capital raised	$2.7B	-56.9%	
New VC company fundings	117	-68.4%	
Median pre-money valuation	$30.4M	-16.0%	
Share of published patents	1.5%	-0.5%	
Top-ranked investor participation	10.1%	+1.1%	
Median employee growth	5.0%	-23.8%	

Source: PitchBook • Geography: Global • *As of December 31, 2023
**Expected returns are derived from historical return assumptions and company-level exit predictions. See page 15 for more details.
Note: The length of the relative score bars is based on cross-vertical Z-scores of the TTM change (except expected IRR and median employee growth), wherein the maximum and minimum lengths are +/- 2, respectively. The center of the column is zero.

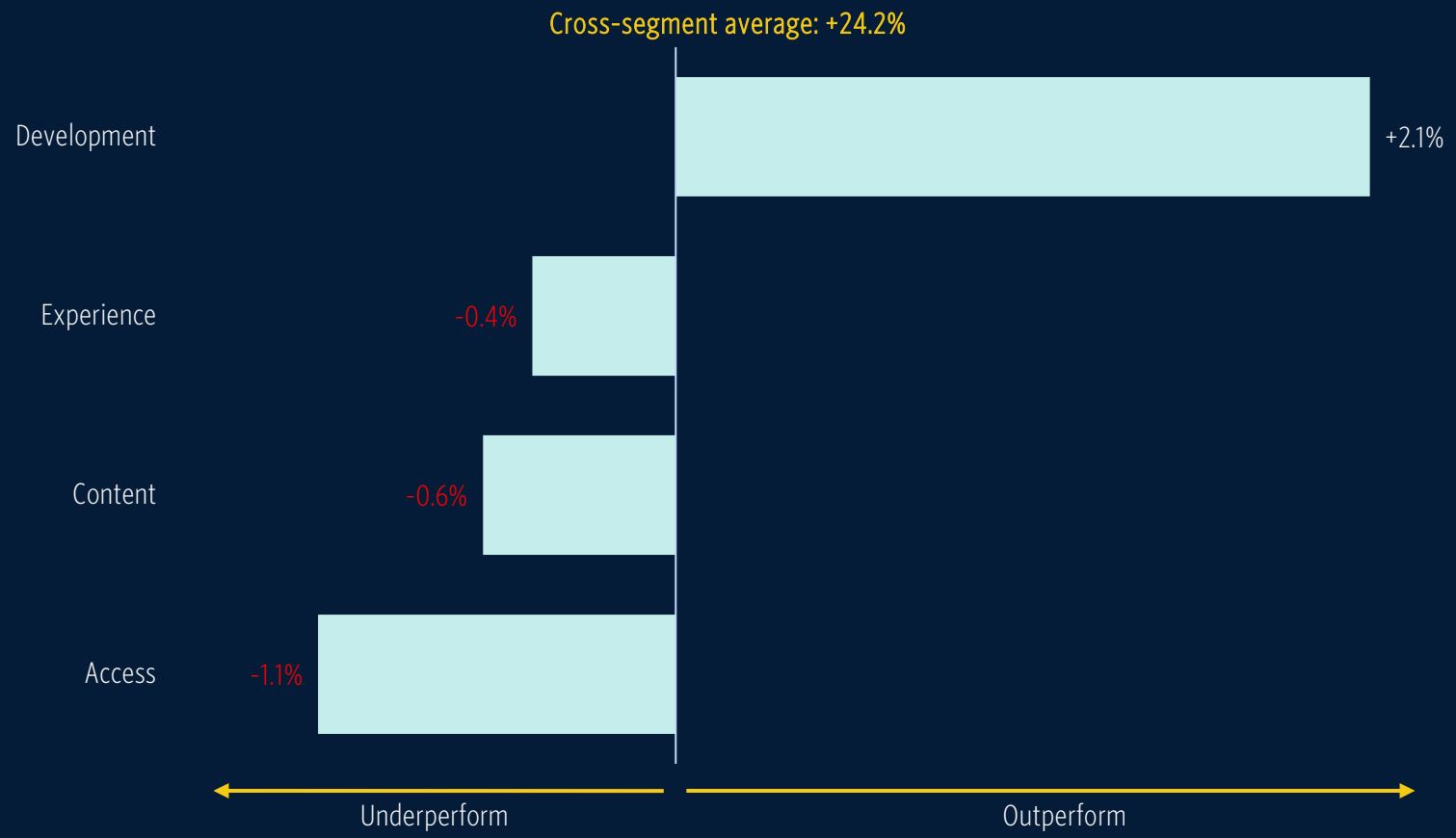
TTM gaming early-stage VC deal activity



Source: PitchBook • Geography: Global • *As of December 31, 2023

Investment attractiveness of gaming early-stage VC companies by segment

Annualized expected returns relative to the cross-segment average*



Source: PitchBook • Geography: Global
*As of December 31, 2023

Expected returns for each segment are based on an aggregation of the expected returns for underlying companies. Company-level returns are determined from the exit-type predictions and historical returns by series. For more information, please see page 15 and the VC Exit Predictor methodology located in the PitchBook Help Center.

It is important to note that the cross-segment average of 24.2% is provided as a historical baseline value and should not be relied on as a forecast. This baseline value is derived from the average of deal-level return data from 2000 to 2021 and can vary significantly based on the environment at any given time. The relative returns for each segment, however, are a more robust forward-looking measure because they are unaffected by factors that impact the entire gaming vertical.

Individual company highlights: North America

North America gaming early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
Metafy	Experience	79%	1%	79	+52
Allstar	Experience	90%	1%	95	+47
Mino Games	Content	87%	3%	64	+42
IKIN	Access	67%	18%	98	+37
Backbone	Access	79%	1%	80	+33
NFTICALLY	Experience	88%	1%	93	+32
Sanlo	Operations	77%	1%	77	+30
Kazoo Games	Content	76%	1%	75	+27
Web3Games	Access	58%	1%	46	+27
Arcade	Access	84%	1%	86	+26

Please use this saved search for a complete, dynamic list of gaming companies.

Source: PitchBook • Geography: North America • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

Individual company highlights: Europe

Europe gaming early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
Epulze	Access	87%	1%	93	+55
Ajuna	Development	78%	1%	79	+38
Lynx	Access	78%	2%	80	+34
The Sandbox	Content	15%	83%	57	+29
Just Wont Die	Content	81%	1%	82	+28
Tremau	Development	54%	1%	42	+28
Talewind	Content	77%	1%	77	+26
Spring Games	Content	76%	1%	75	+26
Game Story	Access	57%	1%	46	+25
Formation Games	Content	81%	1%	82	+24

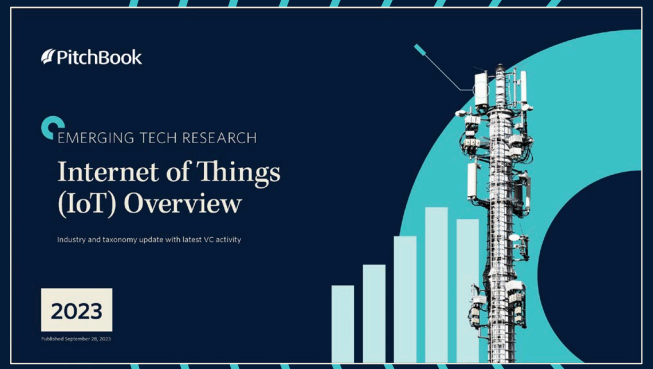
Please use this saved search for a complete, dynamic list of gaming companies.

Source: PitchBook • Geography: Europe • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

Internet of Things

For the latest in-depth IoT research, click here.



Brendan Burke
Senior Analyst, Emerging Technology
brendan.burke@pitchbook.com

Introduction

IoT includes devices with three key characteristics: sensing or actuation capabilities to either acquire data or turn on to send a signal; computation ability to enable data control; and communication with the internet. Phones, PCs, and tablets are excluded. We track both enabling technologies and use cases, including:

- IoT hardware, which refers to the underlying technology powering devices that collect and route data to IoT networks. Each IoT device must have three characteristics: sensing or actuation capabilities to either acquire data or turn the device on to send a signal; computation ability to, at a minimum, enable data control; and communication with the internet.
- IoT software, which includes platforms that are used throughout the IoT value chain to process data from edge devices through to the cloud and applications.
- Industrial IoT (IIoT) technologies, collectively referred to as "Industry 4.0," which allow for the digital and smart transformation of capital-intensive industries, including manufacturing, logistics, transportation, and energy production.
- Connected buildings providers, which develop sensors that enhance the built environment, including both building operations and occupant experience. We include both commercial and residential buildings in this segment because emerging technologies can be applied in both use cases.
- Connected services, which refers to IoT technologies that address basic consumer and municipal needs, including mobility, healthcare, and urban planning.

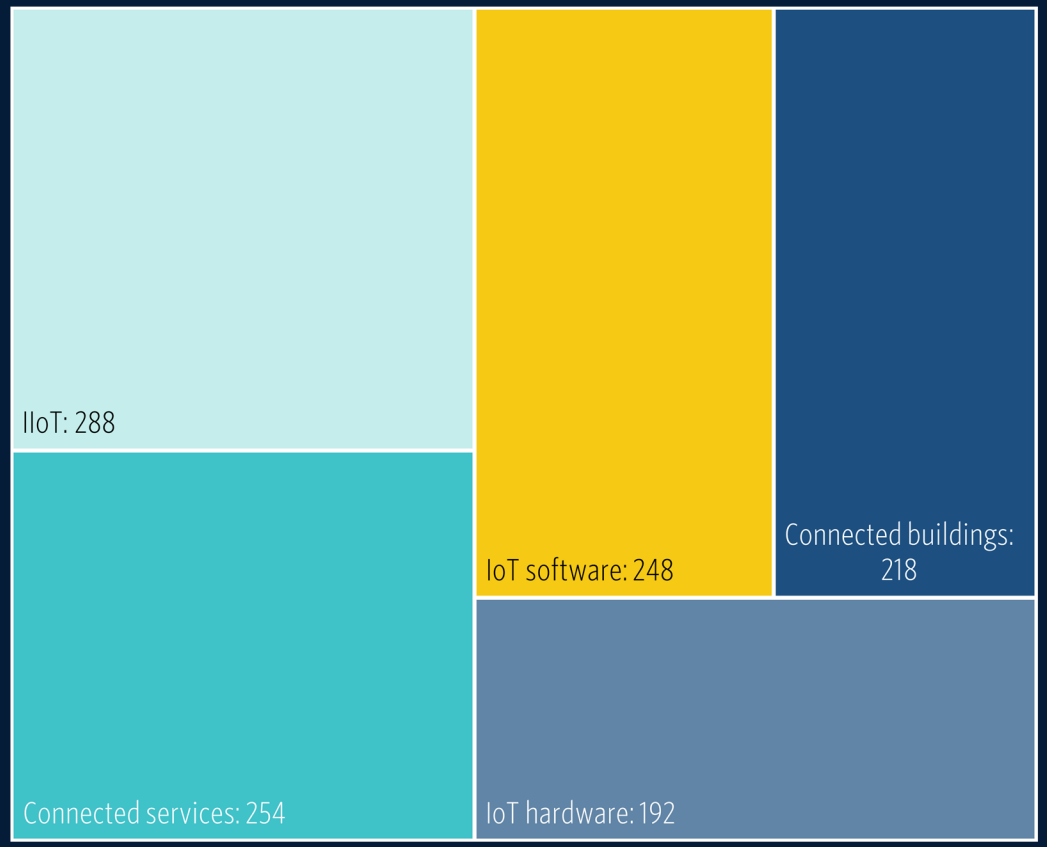
Networking is typically offered by large telecom companies and is thus excluded from this analysis.

The hardware-intensive nature of IoT presents challenges to scale for IoT companies. IoT businesses have longer sales cycles, lower gross margins, and more cyclical disruptions than conventional software startups. Startups can scale by building software analytics for existing hardware yet can suffer from walled gardens in the hardware ecosystem. Incumbents are better placed to take risks on new hardware form factors and provide complementary services for device integration. Incumbents consolidate large categories, including manufacturing automation, smart home, and healthcare monitoring, thus leaving startups to create new categories in fields such as edge AI, 5G, and wireless power.

We estimate the market opportunity for IoT startups (excluding services startups) in our use-case taxonomy reached $535.1 billion by year-end 2023, growing 9.9% over 2022. As we anticipated, in 2023, growth declined. Among use cases, smart cities and manufacturing & supply chain stand out for revenue growth. Use cases growing more than 20% in revenue in 2023 included manufacturing operations, connected heavy trucks, and residential electricity metering. In industrial IoT, the manufacturing & supply chain subsegment stood out in VC funding after lagging in the past given high incentives for reshoring manufacturing in the US. High growth in smart electricity meter deployment is restoring growth in energy & utilities, which is not yet attracting high VC funding to match. Low growth in connected vehicles, smart home, and smart cities is limiting VC investment.

IoT overview

IoT early-stage VC company count by segment with a VC exit prediction (minimum two VC funding rounds)*



IoT metrics summary*

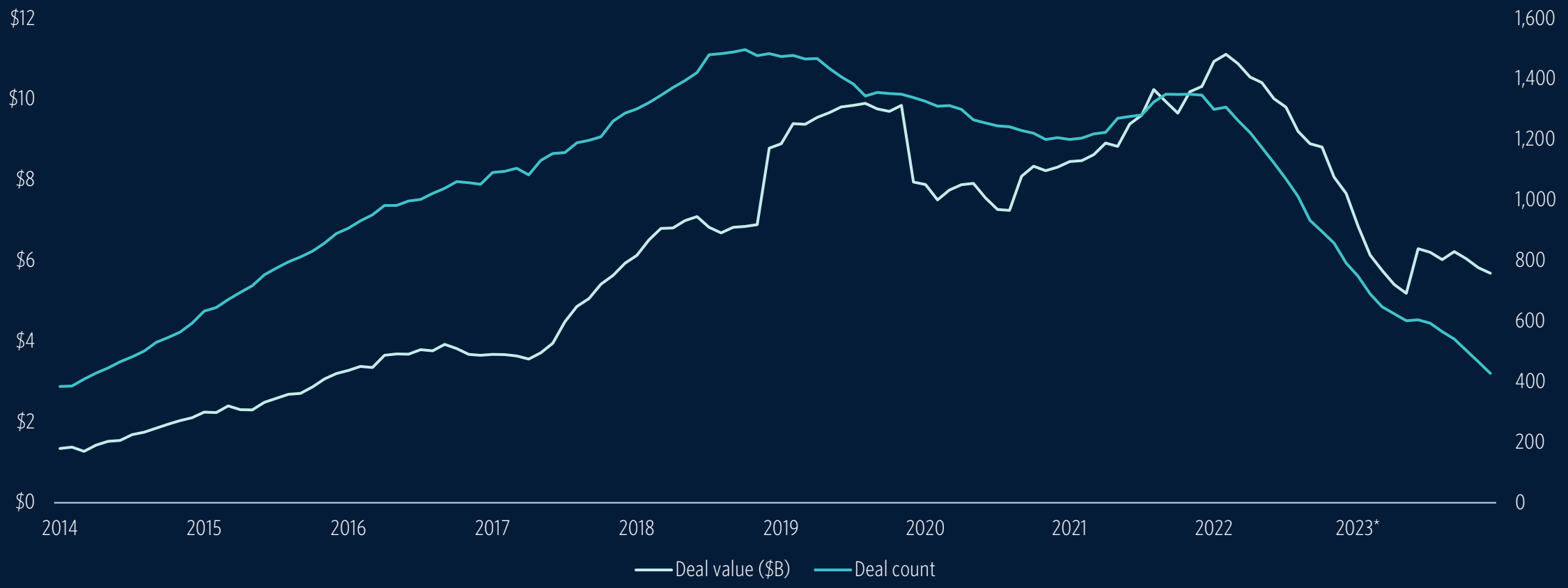
	Value	TTM change	Relative score
Annualized expected return**	20.4%	-0.6%	
Total capital raised	$4.5B	-36.6%	
New VC company fundings	39	-72.0%	
Median pre-money valuation	$40.5M	+20.7%	
Share of published patents	14.6%	-0.2%	
Top-ranked investor participation	6.3%	-2.2%	
Median employee growth	5.4%	-6.4%	

Source: PitchBook • Geography: Global • *As of December 31, 2023

**Expected returns are derived from historical return assumptions and company-level exit predictions. See page 15 for more details.

Note: The length of the relative score bars is based on cross-vertical Z-scores of the TTM change (except expected IRR and median employee growth), wherein the maximum and minimum lengths are +/- 2, respectively. The center of the column is zero.

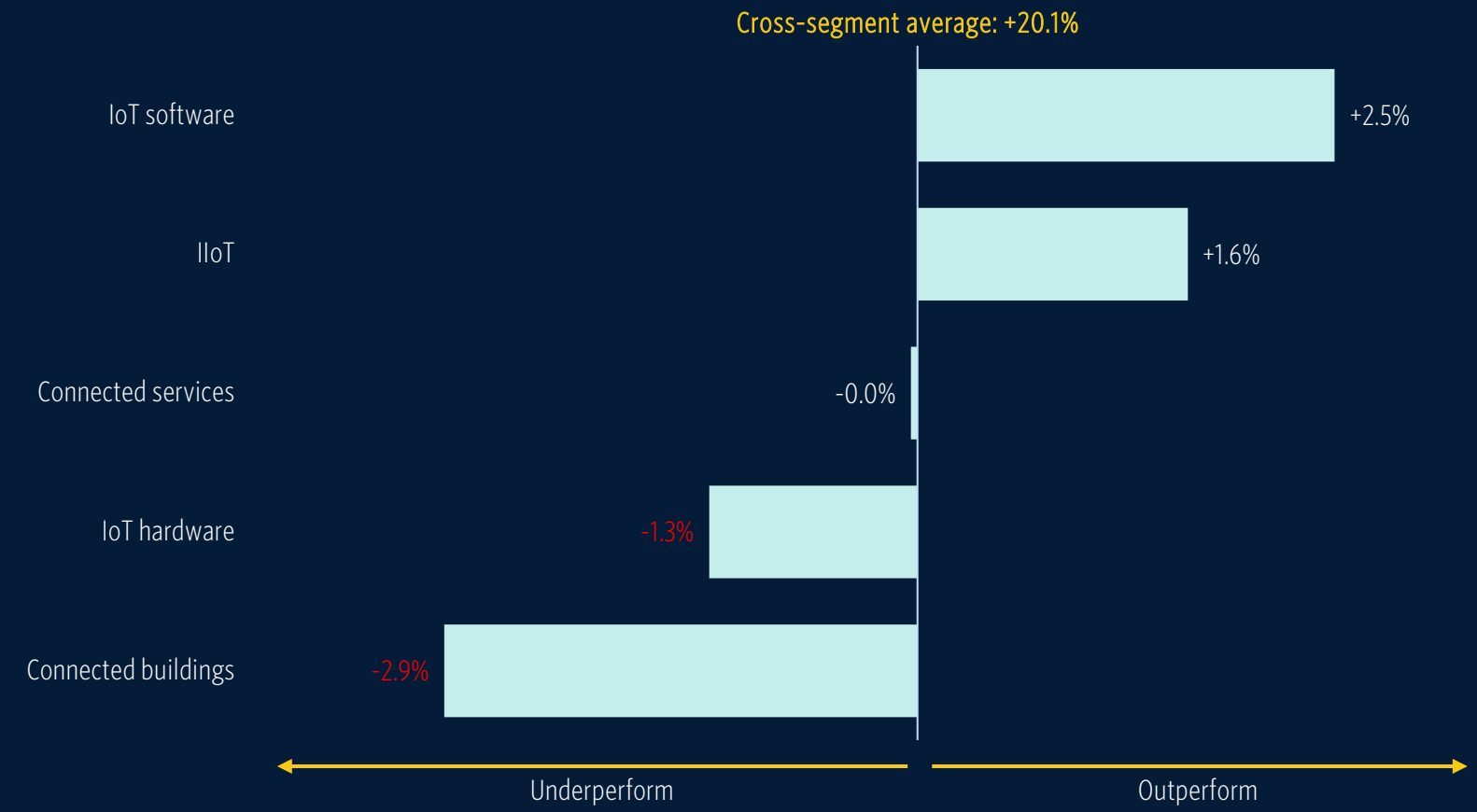
TTM IoT early-stage VC deal activity



Source: PitchBook • Geography: Global • *As of December 31, 2023

Investment attractiveness of IoT early-stage VC companies by segment

Annualized expected returns relative to the cross-segment average*



Source: PitchBook • Geography: Global • *As of December 31, 2023

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Individual company highlights: North America

North America IoT early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
mycashless	IoT hardware	76%	1%	75	+46
Transparent Path	IIoT	61%	1%	50	+29
FightCamp	Connected services	71%	20%	71	+24
Matrix Sensors	IoT hardware	45%	1%	33	+23
Enso Connect	Connected buildings	73%	1%	69	+23
Qvin	Connected services	66%	4%	64	+21
SVR Tracking	Connected services	85%	1%	58	+21
Somewear	IIoT	62%	1%	52	+20
Grovf	IoT hardware	40%	1%	29	+20
Validere	IIoT	81%	9%	65	+19

Please use this saved search for a complete, dynamic list of IoT companies.

Source: PitchBook • Geography: North America • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

Individual company highlights: Europe

Europe IoT early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
Sensfix	IoT software	75%	1%	74	+50
Hero Labs	Connected buildings	69%	1%	61	+38
Packwise	IIoT	78%	1%	79	+36
Biped	Connected services	58%	1%	46	+31
Bloq.it	Connected services	57%	1%	45	+31
Turnpike Group	Connected services	69%	1%	61	+31
PIN IoT	Connected services	67%	1%	59	+29
FourJaw Manufacturing Analytics	IIoT	85%	7%	67	+29
LÆMON	Connected services	49%	2%	38	+25
LightCode Photonics	Connected services	60%	1%	49	+25

Please use this saved search for a complete, dynamic list of IoT companies.

Source: PitchBook • Geography: Europe • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

Mobility tech

For the latest in-depth mobility tech research, click here.

Jonathan Geurkink
Senior Analyst, Emerging Technology
jonathan.geurkink@pitchbook.com

Introduction

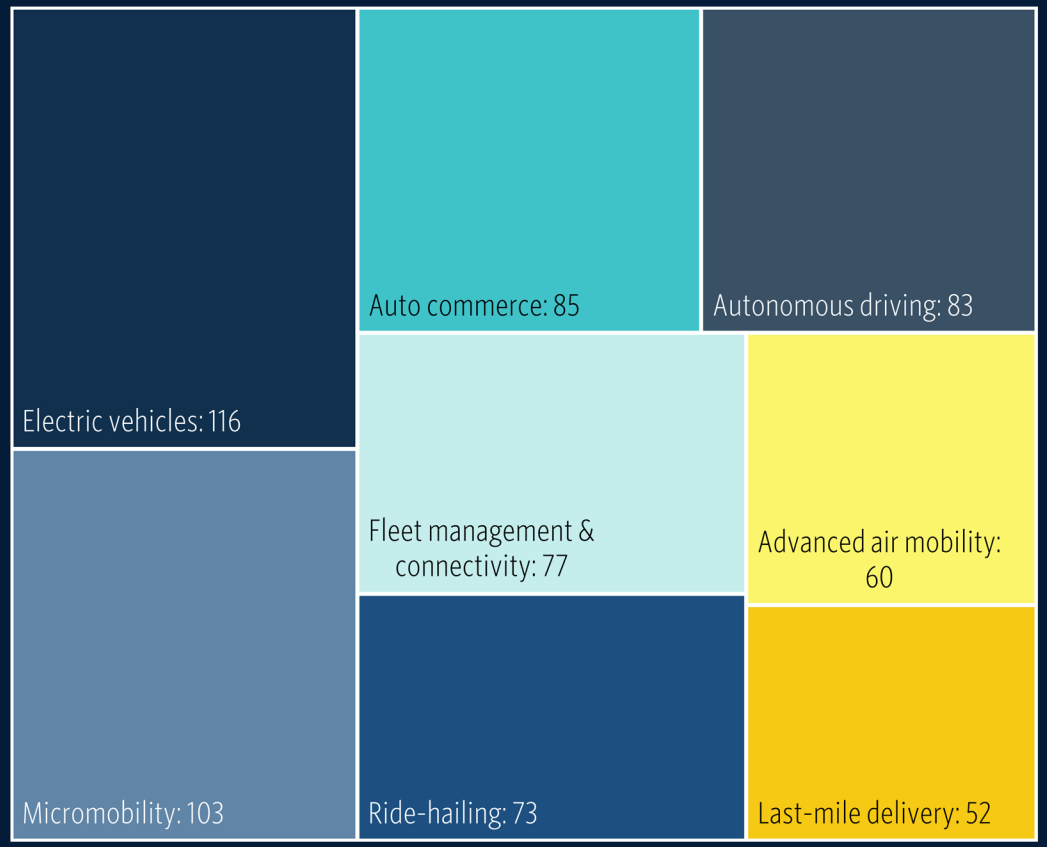
The mobility tech vertical is transforming the technology of transportation across its myriad forms through air, water, road, and rail. With the increase in efforts to stem greenhouse gas emissions to slow or hopefully reverse climate change, the effort to replace or reduce the use of fossil fuels in transportation has been a major theme in mobility tech in recent years. Electric vehicles and related technologies are central to this theme. The development of the internet, and in particular the growth and ubiquity of connected mobile computing, has also significantly impacted transportation. The rapid growth of Uber as it "blitzscaled"—or rapidly scaled and achieved market dominance of—the taxi and car service industries kicked off a global wave of investment in ride-hailing and digital dispatch apps and related last-mile delivery solutions. Further, the popularity of Airbnb and similar apps spawned numerous car-sharing applications across mobile devices and platforms. Another major example of the impact of compute power on transportation is the development of autonomous vehicles. More than $100 billion has been invested in the promise of driverless cars, trucks, trains, and airplanes within the past two decades.

VC activity in mobility tech has fallen in the past two years against the broader backdrop of softening in VC investment overall. Investor caution across mobility tech also stems from the weakness of recently public companies across several sectors within the vertical. The recent vintage of public electric vehicle companies has underperformed public market indexes significantly since their public debuts. Similar performances for newly public companies in subsegments such as autonomous driving hardware & sensors have contributed to private investor caution. Autonomous driving solutions targeted at specific niche opportunities to solve problems in constrained environments, however, continue to capture investor attention and capital.

Electric vehicle batteries and related technologies are also seeing positive flows as the industry continues to demand higher energy density and range. Segments that are hard to abate from an emissions standpoint, such as aerospace and heavy trucking, continue to see strong capital flows for technologies and solutions that address the unique needs of these sectors. Government support and mandates to spur climate initiatives have clouded the investment outlook somewhat as participants sift through the shifting impacts of new rules, regulations, and politics.

Mobility tech overview

Mobility tech early-stage VC company count by segment with a VC exit prediction (minimum two VC funding rounds)*

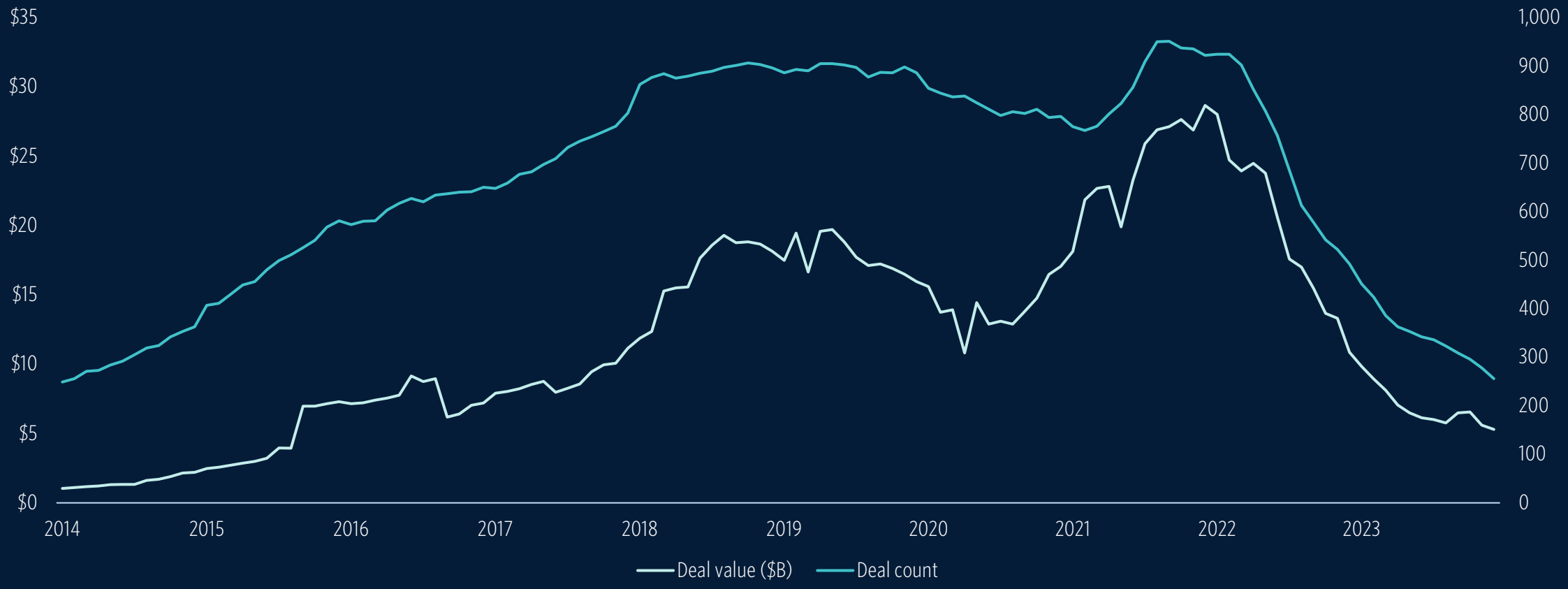


Mobility tech metrics summary*

	Value	TTM change	Relative score
Annualized expected return**	22.5%	-1.5%	
Total capital raised	$3.9B	-36.1%	
New VC company fundings	39	-1.1%	
Median pre-money valuation	$78.3M	+30.2%	
Share of published patents	9.9%	+0.3%	
Top-ranked investor participation	8.0%	-1.9%	
Median employee growth	11.8%	-13.2%	

Source: PitchBook • Geography: Global • *As of December 31, 2023
**Expected returns are derived from historical return assumptions and company-level exit predictions. See page 15 for more details.
Note: The length of the relative score bars is based on cross-vertical Z-scores of the TTM change (except expected IRR and median employee growth), wherein the maximum and minimum lengths are +/- 2, respectively. The center of the column is zero.

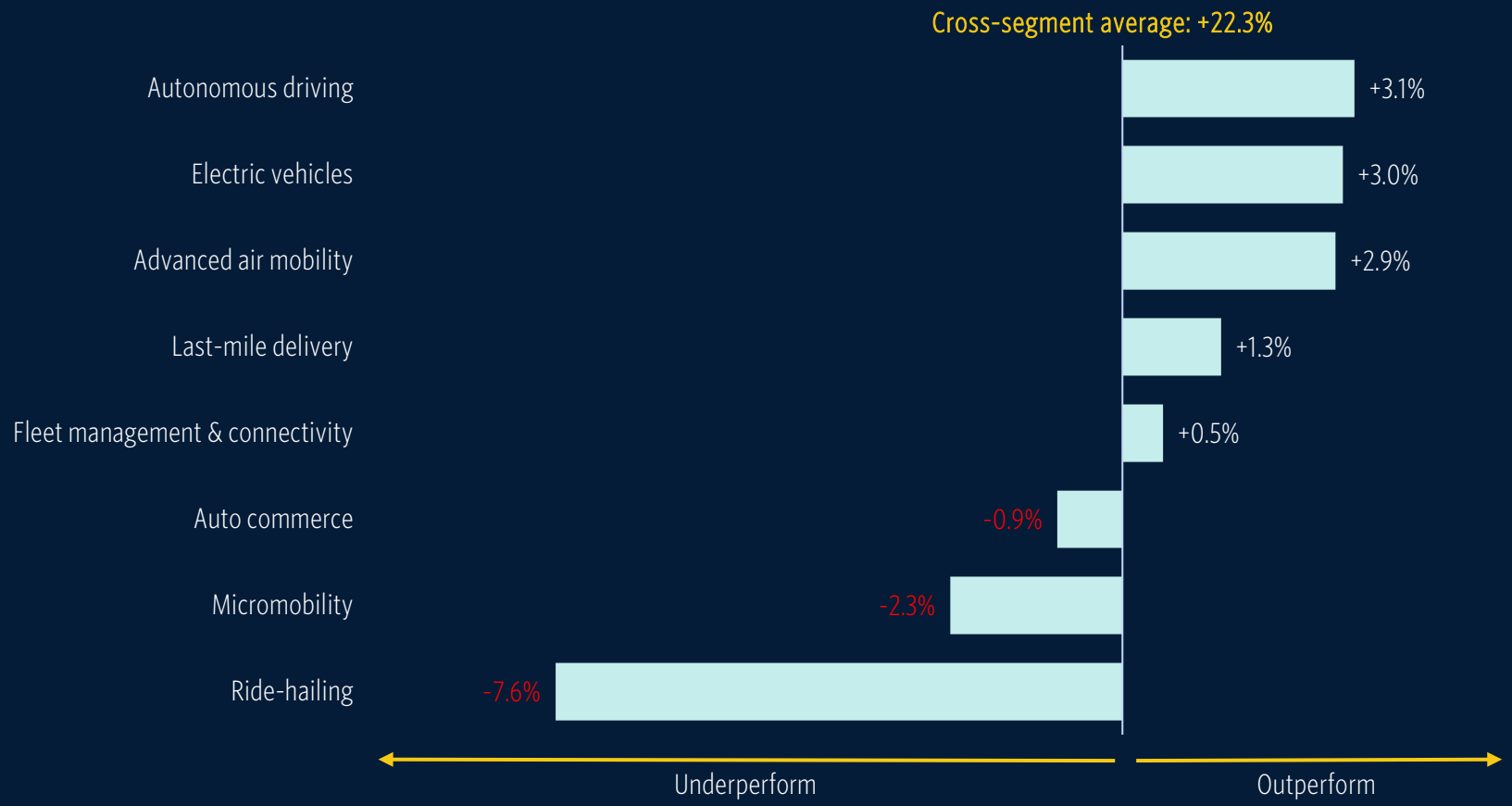
TTM mobility tech early-stage VC deal activity



Source: PitchBook • Geography: Global • *As of December 31, 2023

Investment attractiveness of mobility tech early-stage VC companies by segment

Annualized expected returns relative to the cross-segment average*



Source: PitchBook • Geography: Global • *As of December 31, 2023

Expected returns for each segment are based on an aggregation of the expected returns for underlying companies. Company-level returns are determined from the exit-type predictions and historical returns by series. For more information, please see page 15 and the VC Exit Predictor methodology located in the PitchBook Help Center.

It is important to note that the cross-segment average of 22.3% is provided as a historical baseline value and should not be relied on as a forecast. This baseline value is derived from the average of deal-level return data from 2000 to 2021 and can vary significantly based on the environment at any given time. The relative returns for each segment, however, are a more robust forward-looking measure because they are unaffected by factors that impact the entire mobility tech vertical.

Individual company highlights: North America

North America mobility tech early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
Soaring	Advanced air mobility	78%	1%	78	+37
Riders Share	Micromobility	83%	1%	87	+37
Empower	Ride-hailing	68%	4%	69	+34
Venus Aerospace	Advanced air mobility	72%	22%	99	+24
Pure Watercraft	Electric vehicles	38%	44%	59	+22
Sibros	Fleet management & connectivity	53%	33%	65	+20
Buckle	Auto commerce	78%	12%	66	+16
Zevvy	Auto commerce	72%	1%	67	+15
NanoGraf Technologies	Electric vehicles	69%	3%	43	+13
Transportant	Fleet management & connectivity	66%	1%	56	+12

Please use this saved search for a complete, dynamic list of mobility tech companies.

Source: PitchBook • Geography: North America • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

Individual company highlights: Europe

Europe mobility tech early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
eBikeLabs	Micromobility	65%	1%	55	+33
Cake	Micromobility	62%	6%	38	+30
XeroE	Last-mile delivery	67%	4%	66	+27
Bike Club	Micromobility	73%	10%	55	+18
One Moto	Micromobility	30%	2%	21	+16
Wingcopter	Advanced air mobility	23%	68%	82	+13
infiniDome	Fleet management & connectivity	86%	7%	34	+13
MoonBikes	Micromobility	76%	1%	74	+11
Taxi2Airport.com	Ride-hailing	90%	1%	95	+11
Zenride	Micromobility	67%	2%	63	+10

Please use this saved search for a complete, dynamic list of mobility tech companies.

Source: PitchBook • Geography: Europe • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

Software as a service

For the latest in-depth SaaS research, click here.

Derek Hernandez
Senior Analyst, Emerging Technology
derek.hernandez@pitchbook.com

Introduction

Our SaaS coverage is composed of two sectors: enterprise SaaS and infrastructure SaaS. Together, these address the modernization of traditional business practices. Our taxonomy for both is driven by a focus on fundamental business practices (enterprise SaaS), as well as the digital foundation of contemporary enterprises (infrastructure SaaS). Enterprise SaaS focuses on business functions that interact with customers and external stakeholders, as well as internal operations, observability, and support functions. Infrastructure SaaS includes software, databases, networks, and other resources that support the organization's business operations.

Enterprise SaaS

Enterprise SaaS is a broad horizontal sector united by its focus on providing business solutions. These can be as focused as bespoke solutions for specific industries, such as healthcare customer management & care, or as broad as sales or business intelligence services that can be used by any enterprise regardless of sector, geography, or customer base. This creates a massive total addressable market for companies to pursue, which is exemplified by established public companies such as Microsoft in the knowledge management services segment and Salesforce in the customer relationship management segment.

Enterprise solutions have existed for as long as enterprises themselves. They have universal challenges, including managing assets, human capital, and customer experience. Therefore, the taxonomy used in this report is based on historical delineations among these solutions. Within our enterprise SaaS vertical, we have defined our segments as:

- Customer relationship management: Marketing, sales, and customer service.
- Enterprise resource planning: Assets, human capital, and operations.
- Supply chain management: Planning, procurement, and execution.
- Analytic platforms: Business intelligence, AI, and geospatial analytics.
- Knowledge management systems: Content, authoring, and projects.
- Other application software: Various additional emerging solutions.

Introduction (continued)

Infrastructure SaaS

Infrastructure SaaS encompasses the complex digital processes that enable modern enterprises. These foundational solutions have caused analog workflows to become digital systems. Infrastructure SaaS includes application development and data creation & management, as well as IT and infrastructure services. These solutions are developed and sold by some of the largest software companies, including IBM, Broadcom, and Oracle, as well as hyperscalers such as Amazon, Microsoft, and Google, which package storage, network, and compute services. Nearly every sector of the economy today employs these solutions, especially with the tides of digital transformation, Big Data, and recent advancements in and adoptions of LLMs. Where enterprise SaaS solutions enable a firm to execute on its corporate goals—colloquially "front office"—infrastructure SaaS supports the increasingly complex "back office," which enables these digital approaches through application support, networking, IT, and storage solutions.

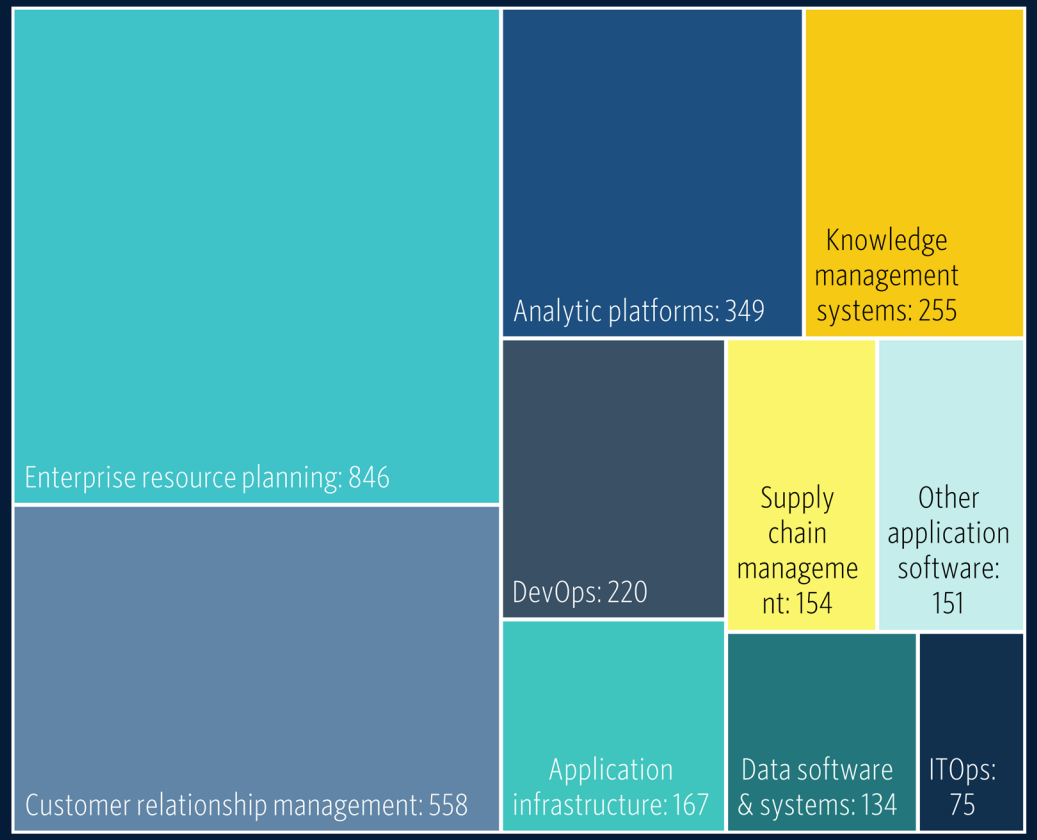
Infrastructure SaaS solutions enable the digital initiatives of every modern enterprise that produces, manipulates, stores, and manages data. This includes all enterprise applications and their related infrastructure, as well as the systems and processes composing an enterprise's digital structure. Within our infrastructure SaaS vertical, we define our segments as:

- Development operations (DevOps): All application development stages and cycles.
- Application infrastructure: Platforms and systems that enable applications.
- Data software & systems: The capture, ingestion, and management of data.
- Information technology operations (ITOps): Information technology services, resources, and processes.

Many software vendors are migrating their offerings from one deployment to another, such as on-premises, SaaS, and cloud. Our two SaaS verticals encompass all applications employed to support critical business processes, regardless of deployment type. Additionally, these solutions are often deployed as a suite of applications, as well as standalone products that support and enhance specific digital infrastructure practices. Both application suites and standalone offerings are common in all our segments.

SaaS overview

SaaS early-stage VC company count by segment with a VC exit prediction (minimum two VC funding rounds)*

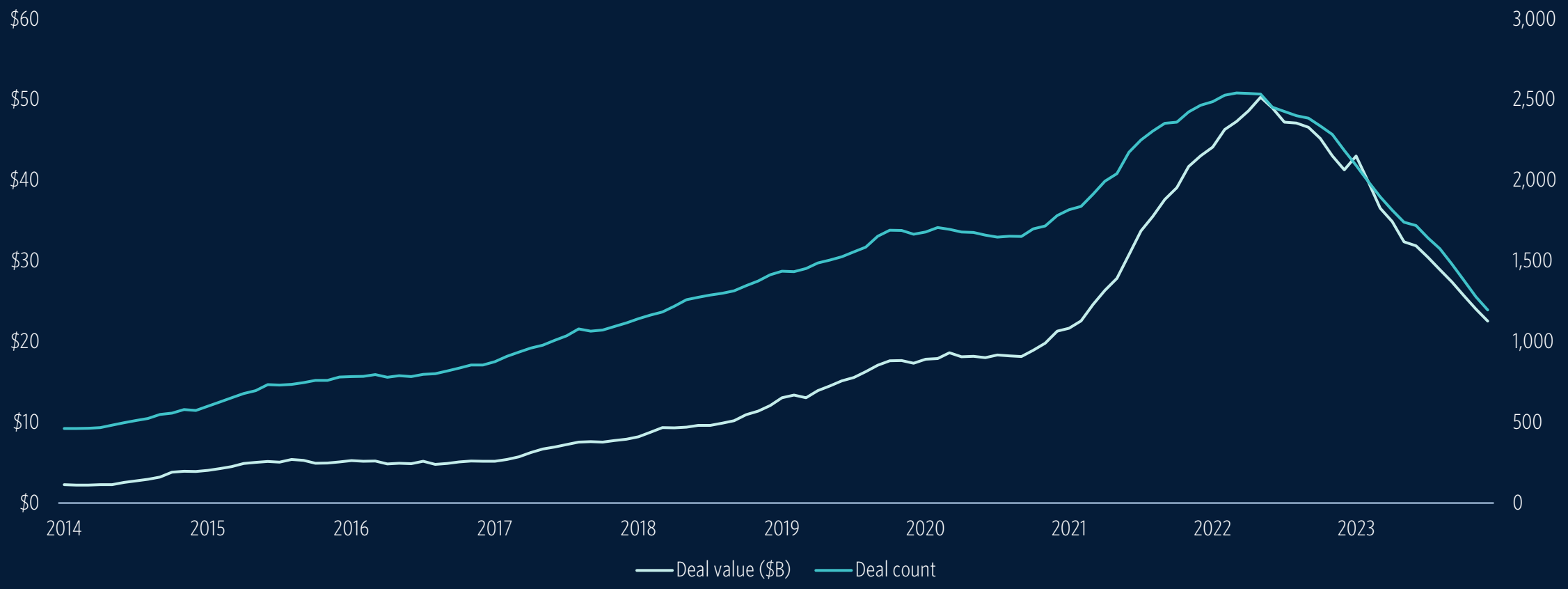


SaaS metrics summary*

	Value	TTM change	Relative score
Annualized expected return**	28.7%	-0.3%	
Total capital raised	$16.8B	-46.6%	
New VC company fundings	228	-52.5%	
Median pre-money valuation	$57.6M	-3.8%	
Share of published patents	12.2%	-0.9%	
Top-ranked investor participation	21.1%	-0.8%	
Median employee growth	15.4%	-24.0%	

Source: PitchBook • Geography: Global • *As of December 31, 2023
**Expected returns are derived from historical return assumptions and company-level exit predictions. See page 15 for more details.
Note: The length of the relative score bars is based on cross-vertical Z-scores of the TTM change (except expected IRR and median employee growth), wherein the maximum and minimum lengths are +/- 2, respectively. The center of the column is zero.

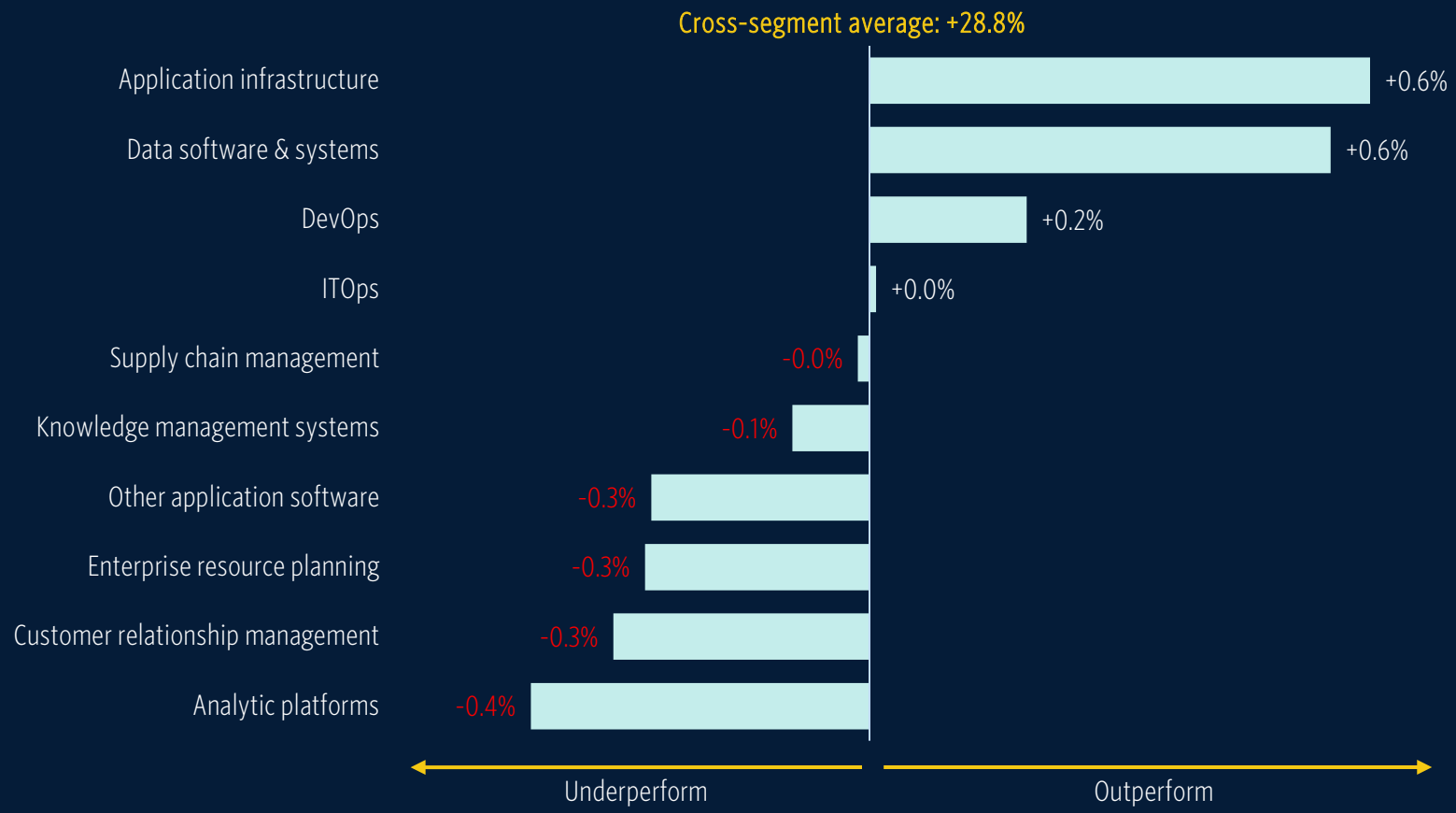
TTM SaaS early-stage VC deal activity



Source: PitchBook • Geography: Global • *As of December 31, 2023

Investment attractiveness of SaaS early-stage VC companies by segment

Annualized expected returns relative to the cross-segment average*



Source: PitchBook • Geography: Global • *As of December 31, 2023

Expected returns for each segment are based on an aggregation of the expected returns for underlying companies. Company-level returns are determined from the exit-type predictions and historical returns by series. For more information, please see page 15 and the VC Exit Predictor methodology located in the PitchBook Help Center.

It is important to note that the cross-segment average of 28.8% is provided as a historical baseline value and should not be relied on as a forecast. This baseline value is derived from the average of deal-level return data from 2000 to 2021 and can vary significantly based on the environment at any given time. The relative returns for each segment, however, are a more robust forward-looking measure because they are unaffected by factors that impact the entire SaaS vertical.

Individual company highlights: North America

North America SaaS early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
Aloft.ai	Enterprise resource planning	85%	1%	89	+72
BoomPop	Enterprise resource planning	80%	4%	89	+60
LayerZero	DevOps	27%	62%	79	+52
Aptos Labs	Application infrastructure	81%	1%	83	+48
Xano	DevOps	83%	1%	85	+40
Amenities	Customer relationship management	84%	1%	86	+33
Rx Redefined	Enterprise resource planning	69%	1%	61	+29
Hidden Road	Enterprise resource planning	76%	5%	84	+27
Airplane	Application infrastructure	92%	2%	71	+27
Caden	Analytic platforms	79%	1%	80	+26

Please use these saved searches for a complete, dynamic list of SaaS companies: enterprise SaaS and infrastructure SaaS.

Source: PitchBook • Geography: North America • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

Individual company highlights: Europe

Europe SaaS early-stage VC companies with the largest improvement in the VC Exit Predictor Opportunity Score over the past year*

Company	Segment	M&A probability	IPO probability	Opportunity Score	One-year change in Opportunity Score
Bware Labs	Application infrastructure	73%	1%	68	+35
Blobr	DevOps	80%	1%	81	+33
Plain.	DevOps	76%	1%	75	+26
aleph.im	Data software & systems	80%	1%	82	+25
Ground Truth Intelligence	Application infrastructure	77%	1%	77	+23
Legit Security	DevOps	86%	8%	73	+21
Fiberplane	DevOps	66%	1%	56	+14
Radix	DevOps	39%	1%	28	+13
Better Stack	ITOps	89%	1%	93	+12
xtype	DevOps	83%	1%	86	+12

Please use these saved searches for a complete, dynamic list of SaaS companies: enterprise SaaS and infrastructure SaaS.

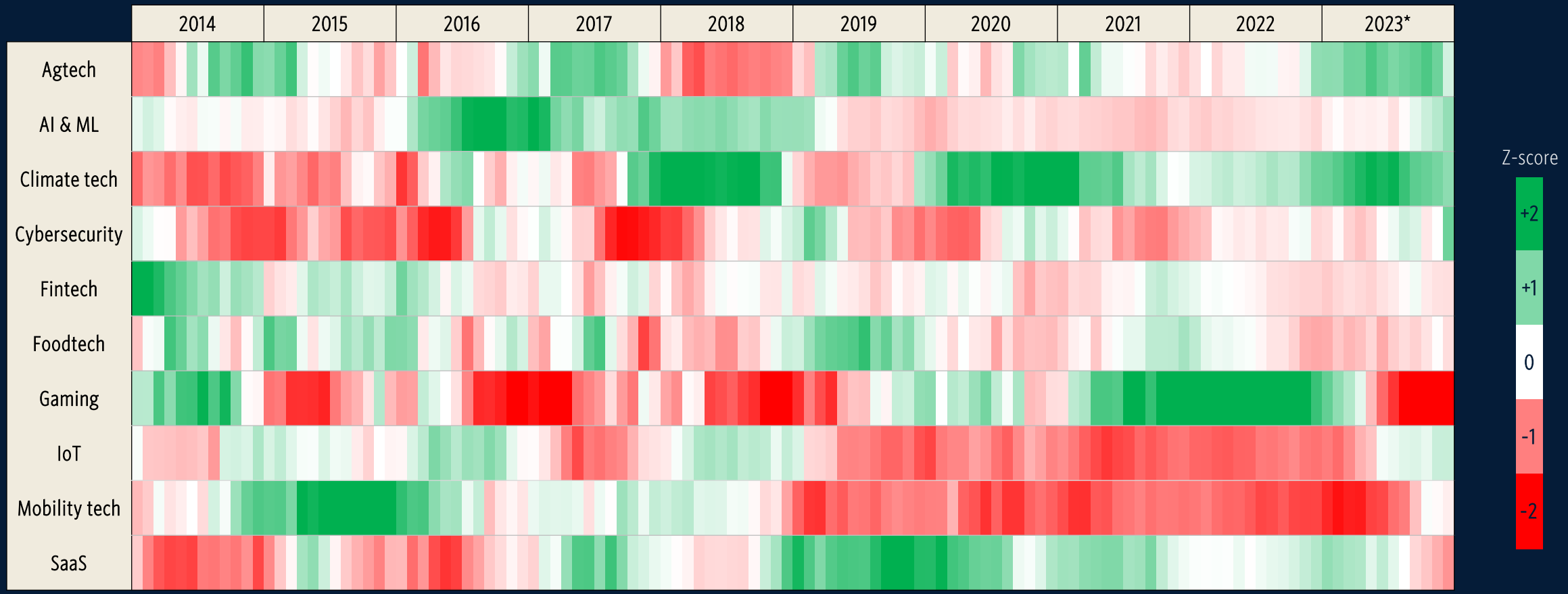
Source: PitchBook • Geography: Europe • *As of December 31, 2023

Note: Opportunity Scores are percentile rankings that were calculated relative to all companies included in this report.

Appendix: Historical trends in top-down metrics

Historical deal activity trends

Relative TTM change in early-stage VC deal value by sector

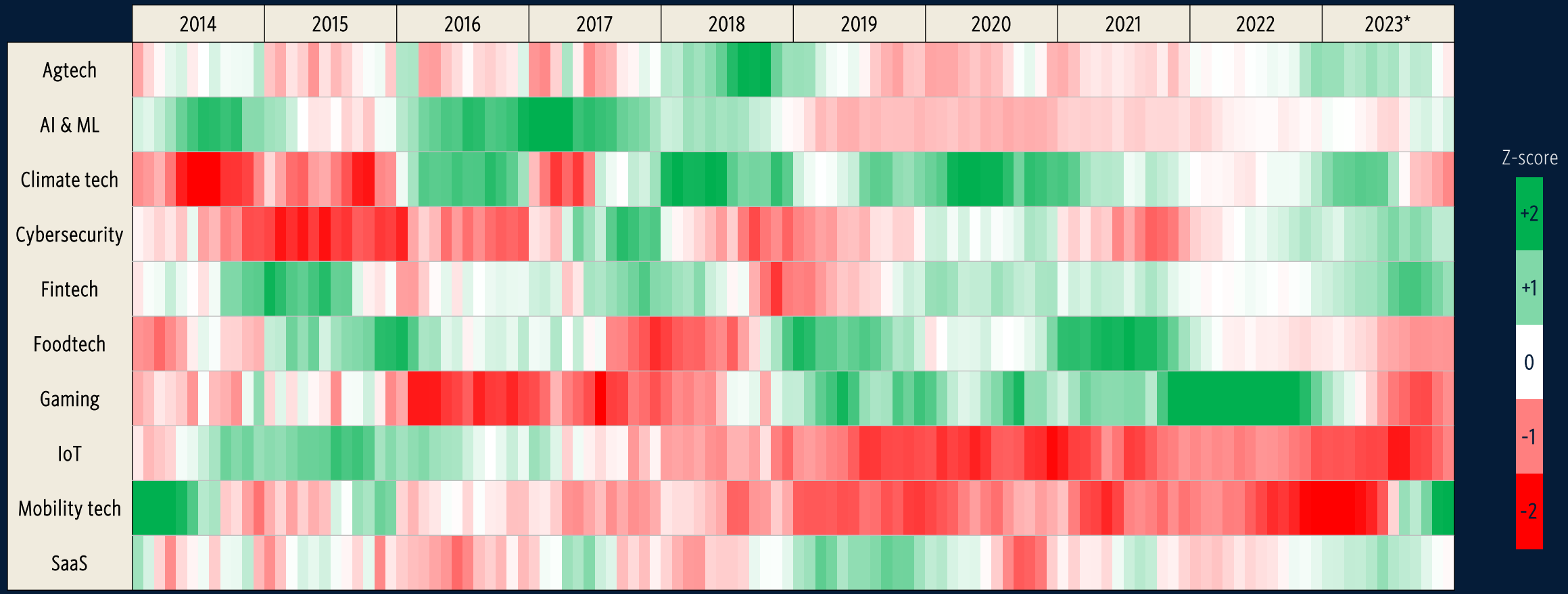


Source: PitchBook • Geography: Global • *As of December 31, 2023

Note: Conditional formatting is applied across verticals in each period to Z-score normalized values. Data estimations are applied to the most recent 12 months to account for lagged data collection.

Historical first-time VC financing trends

Relative TTM change in the number of first-time VC financings by sector

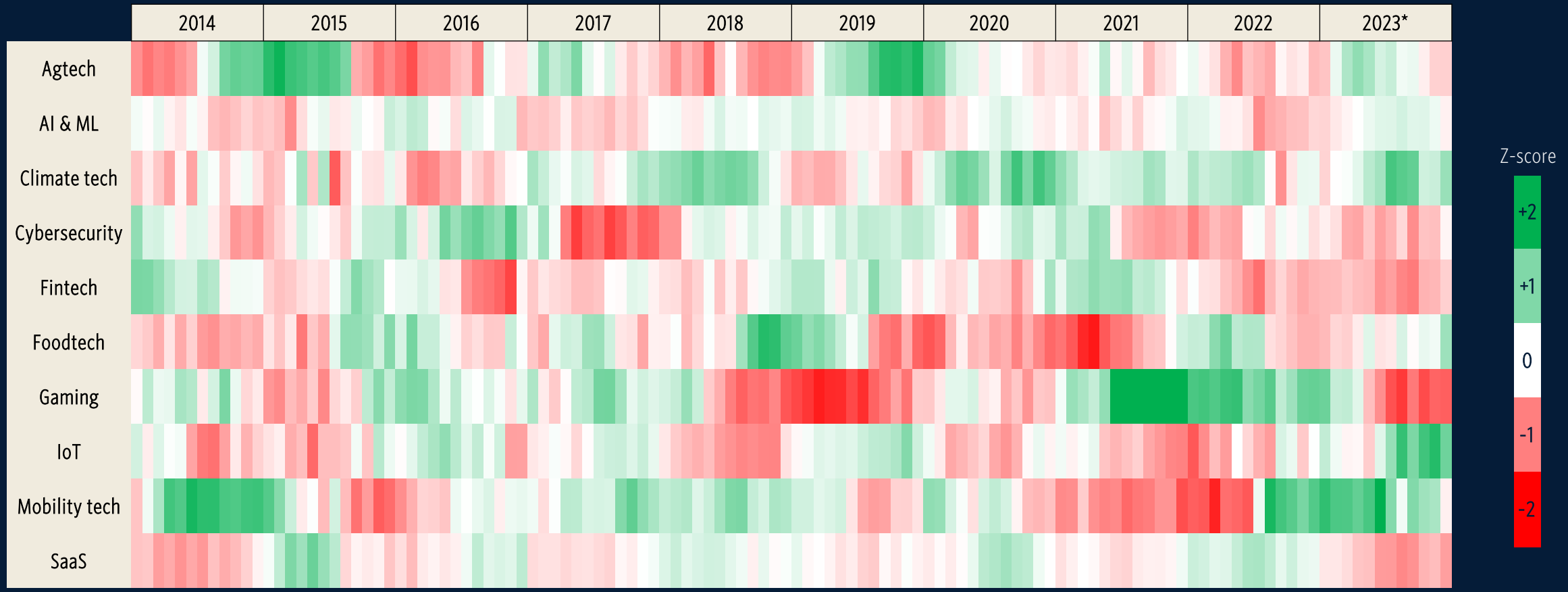


Source: PitchBook • Geography: Global • *As of December 31, 2023

Note: Conditional formatting is applied across verticals in each period to Z-score normalized values. Data estimations are applied to the most recent 12 months to account for lagged data collection.

Historical pre-money valuation trends

Relative TTM change in median early-stage VC pre-money valuations by sector

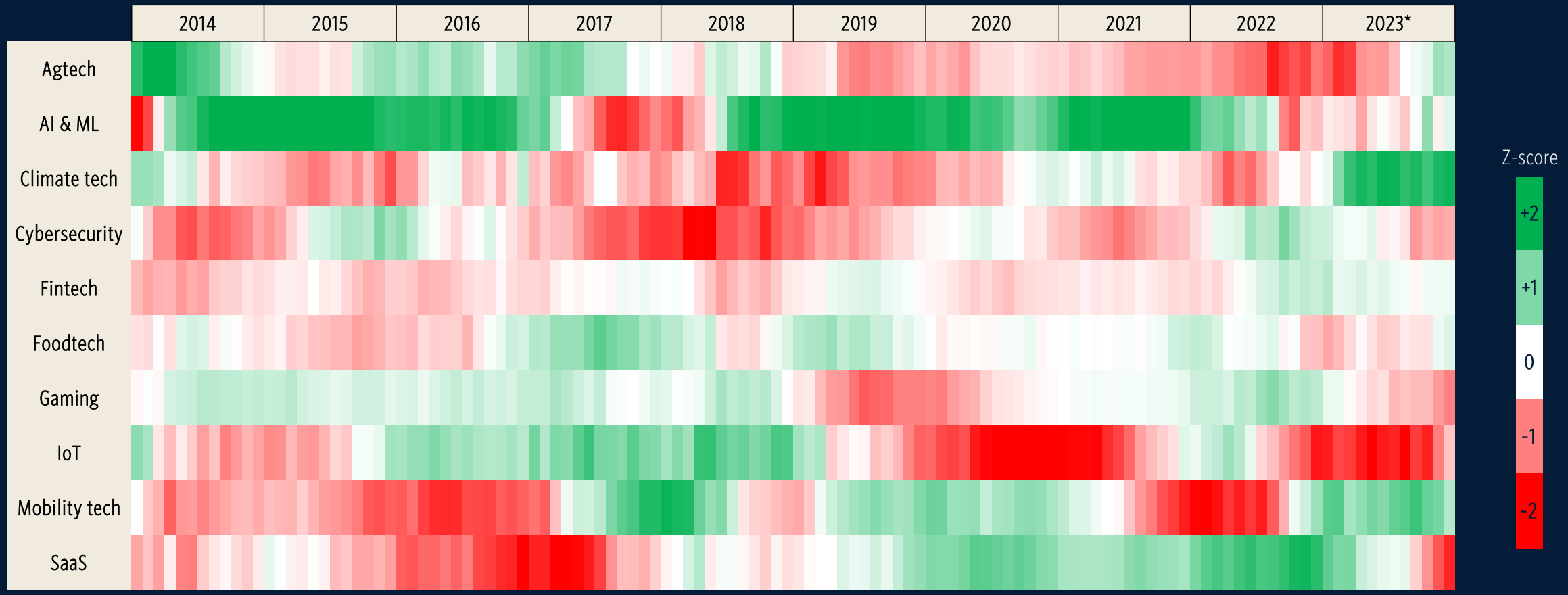


Source: PitchBook • Geography: Global • *As of December 31, 2023

Note: Conditional formatting is applied across verticals in each period to Z-score normalized values. Percentage changes in seed and early-stage valuations are calculated separately and then aggregated using a weighted average.

Historical patent activity trends

Relative TTM net change in the share of published patents by sector

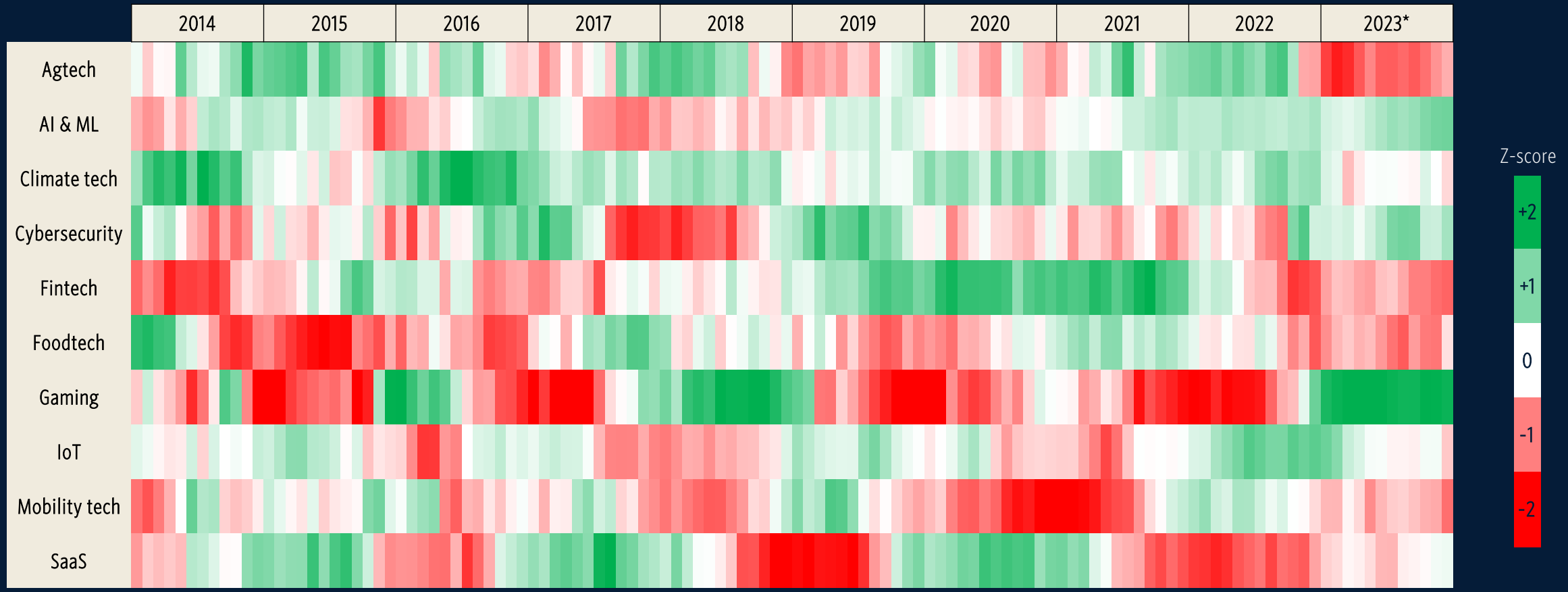


Source: PitchBook • Geography: Global • *As of December 31, 2023

Note: Conditional formatting is applied across verticals in each period to Z-score normalized values.

Historical top-ranked investor participation rate trends

Relative TTM top-ranked investor participation rate by sector



Source: PitchBook • Geography: Global • *As of December 31, 2023

Note: Conditional formatting is applied across verticals in each period to Z-score normalized values.

PitchBook VC Exit Predictor

The PitchBook VC Exit Predictor leverages machine learning and our vast database of information about VC-backed companies, financing rounds, and investors to objectively assess a startup's prospect of a successful exit. The primary component underpinning the score is a classification model that predicts the probability that a VC-backed startup will ultimately be acquired, go public, or not exit due to either failure or becoming self-sustaining. These probabilities are then used to calculate a naive expected return of an investment in the startup's next financing round using historical returns by series derived from capitalization table data. Finally, these expected returns are normalized across the VC universe by percentile ranking.

The final score for each currently VC-backed company is a number from zero to 100, wherein a score of 100 represents the most attractive and zero the least attractive. In this report, individual company exit and return predictions are aggregated to create a bottom-up analysis of specific emerging technology verticals. The aggregation is done by taking the average of individual exit type probabilities and returns to get an expected exit rate and return for an entire vertical. For example, if a vertical contained 100 companies with an average predicted successful exit probability of 60%, we would expect that 60 of them would eventually go on to successfully exit.

Historically, the aggregated exit predictions have done a good job of explaining relative differences in success rates across verticals. For example, when analyzing VC-backed companies at the end of 2018, the aggregated exit predictions were able to explain about 86% of the variability of observed success rates across verticals. However, there are certain limitations to the absolute expected success rates and returns. In particular, the expected returns are based solely on historical average returns, which means they will not capture periods wherein returns meaningfully deviate from average. Therefore, while the absolute expected returns can be used as a baseline, comparing differences in expected returns between verticals is more valuable.

For additional details, please see the technical documentation located in the PitchBook Help Center.

About PitchBook Industry and Technology Research

Independent, objective, and timely market intel

As the private markets continue to grow in complexity and competition, it's essential for investors to understand the industries, sectors, and companies driving the asset class.

Our Industry and Technology Research provides detailed analysis of nascent tech sectors so you can better navigate the changing markets you operate in—and pursue new opportunities with confidence.

Additional research

Eric Bellomo
eric.bellomo@pitchbook.com
Gaming
E-Commerce

Brendan Burke
brendan.burke@pitchbook.com
Internet of Things
Information Security
AI & ML

Aaron DeGagne
aaron.degagne@pitchbook.com
Medtech
Digital Health

Alex Frederick
alex.frederick@pitchbook.com
Agtech
Foodtech

Jonathan Geurkink
jonathan.geurkink@pitchbook.com
Supply Chain Tech
Mobility Tech

Kazi Helal
kazi.helal@pitchbook.com
Biopharma
Pharmatech

Derek Hernandez
derek.hernandez@pitchbook.com
Enterprise SaaS
Infrastructure SaaS

Ali Javaheri
ali.javaheri@pitchbook.com
Emerging Spaces

Robert Le
robert.le@pitchbook.com
Insurtech
Crypto

John MacDonagh
john.macdonagh@pitchbook.com
Carbon & Emissions Tech
Clean Energy Tech

Rebecca Springer
rebecca.springer@pitchbook.com
Healthcare Services
Healthcare IT

Rudy Yang
rudy.yang@pitchbook.com
Enterprise Fintech
Retail Fintech