MOSSADAMS

2024 Semiconductor Spotlight

AI Revolution Fuels New Investment in Chip Industry

CONTENTS

INTRODUCTION

Semiconductor Investment Trends Overview

The recent explosion of artificial intelligence (AI) applications has touched every industry, though none as uniquely and intensely as the semiconductor space.

Investment in semiconductors is driven by the technology's massive influence over the broader technology sector, the potential for significant upside from emerging applications, and recent heightened geopolitical implications.

The following report breaks down private investment trends for semiconductor companies across the three asset classes of venture capital (VC), private equity (PE), and M&A, including discussion of cross-border activity in top regions.

Key findings include:

- Data through Q1 2024 indicates a moderate slowdown in VC activity at the start of this year, following a four-year surge. Semiconductor start-ups still attract significant check sizes, including several Chinese companies with state backing.

- Q1 was a bright spot for VC exits, with $7.2 billion generated across 10 deals, up 130.5% year over year. Astera Labs accounts for a large portion of this total with its strong initial public offering (IPO) performance representing $4.8 billion.
- PE investment in semiconductors is nascent, with firms closing more minority-stake investments than traditional majority-stake buyouts. Just eight PE deals were recorded in Q1 of this year, suggesting continued hesitancy. Public sector support and industry maturation may spur greater PE involvement in semiconductor firms in the years to come.
- Strategic M&A deals allow firms to stay competitive and expand their offerings, and the steady flow of these transactions over the past decade demonstrates how these activities remain a priority. The first quarter of 2024 saw 21 transactions close compared to a record 29 logged in Q4 2021.
- Cross-border investment activity is at the mercy of the geopolitical landscape, but dealmakers continue to engage in an elevated number of transactions with foreign parties compared with pre-pandemic years. Activity did slow materially at the start of this year, however, with the fewest quarterly transactions closing since Q1 2020. Timelines for cross-border deals have extended due to uncertainty surrounding trade tensions and political risk in several regions.

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SECTION ONE

Semiconductor Industry Trends

GLOBAL COMPETITORS

The competitive landscape for semiconductors is intense, entrenched, and dominated by several global giants. According to **Omdia Research**, US-based Intel and NVIDIA accounted for 9.4% and 9.0% of global semiconductor revenue in 2023, respectively, while South Korea-based Samsung rounded out the top three with 8.1%.

These dominant names in end-product markets rely heavily on other players, however, including powerful and strategically critical chip manufacturers like Taiwan Semiconductor Manufacturing Company (TSMC) and Foxconn Technology Group—both based in Taiwan.

OVERCAPACITY CONCERNS

Industrial policies bolster global chip-making capacity and fund further research and development efforts while diversifying supply chains away from East Asia and concentrating reliance on the world's largest chip companies, but **overcapacity concerns persist**.

The United States, Europe, and China house the world's leading chip companies and have taken legislative steps to fortify their domestic chip supply chains and manufacturing abilities. The recent passing of the **CHIPS and Science Act** and the **European Chips Act** have granted billions to legacy giants such as Intel, promoting the construction of chip fabrication plants in the grantor's country.

In contrast, **China has long subsidized the industry**, but state-guided investments have yielded uncertain results while export controls exacerbate China's innovation problem. While companies in the United States push the technological frontier, Europe has strategically positioned itself as global companies' alternative location for manufacturing operations, and China has doubled down on becoming a leader in legacy chip production.

SEMICONDUCTOR MATERIAL STRIDES

Semiconductor materials and design research are making strides, and this bodes well for advancements in chip processing power and density. At the end of 2022, IBM researchers defined the two pillars that are crucial to constructing the elusive **one-nanometer chip**: materials and design.

That reality is likely approaching as **Intel** and **TSMC** have announced new manufacturing processes to produce 1.5-nanometer and 1.6-nanometer chips, respectively. The news coincides with breakthroughs in novel materials, including graphene and gallium carbide, as well as innovations in design, like monolithic 3-D integration. With sustained research momentum and downstream demand, **Moore's Law** still holds.

AI DEMAND FOR CHIPS

The AI wave has buoyed chip investment and demand. Revelations of new AI applications have led to surges in AI chip demand. A golden era for chips will also have positive spillover effects in the raw materials, software, and hardware spaces as the demand for material inputs and AI chip-driven products increases.

Abundant demand offers more than enough capital for chip companies to fund further innovative research, but whether the industry can keep up with the rapid pace of AI expansion and adoption is to be seen.

POLITICAL DEVELOPMENTS

All eyes are on Taiwanese President Lai Ching-te's recent inauguration, as his **policy stance** on cross-strait relations determines the fate of TSMC. President Ching-te reiterated continuity in Taiwan's approach toward China, but it's yet to be seen if his past pro-independence rhetoric will be translated into more disruptive policies that will put the country's silicon shield to the test.

With cross-strait tensions already aggravated, any political misstep from Taiwan or its allies may incite a conflict with China, implicating TSMC's main operations and, accordingly, the stability of the entire semiconductor supply chain.

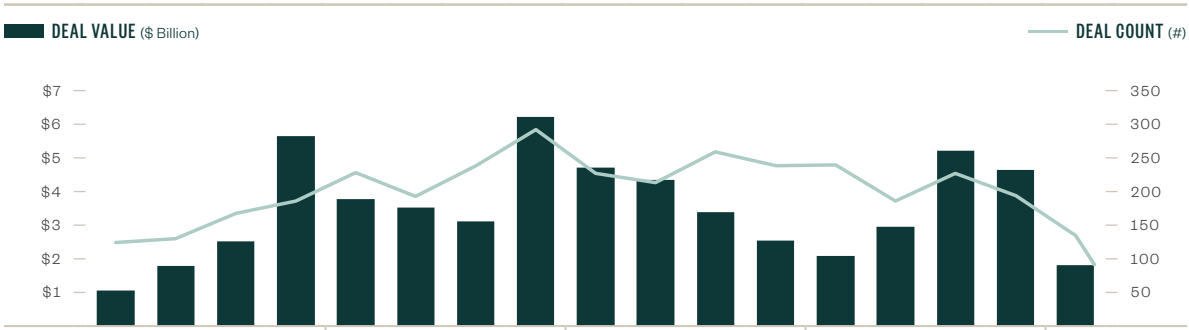
> "The semiconductor industry is becoming more and more essential to our day-to-day experience with the proliferation of chips in nearly all devices we use—home appliances, computers, cars, phones, etc. The essential nature of chips is driving geographic tensions, which has the potential to reshape the supply chain."
>
> – David Sage, Partner, Manufacturing & Consumer Products Practice

SECTION TWO

Investment & Market Overview

VC INVESTMENT: A FOUR-YEAR SURGE SLOWED, BUT STATE-BACKED INVESTORS IN CHINA SUSTAIN MOMENTUM

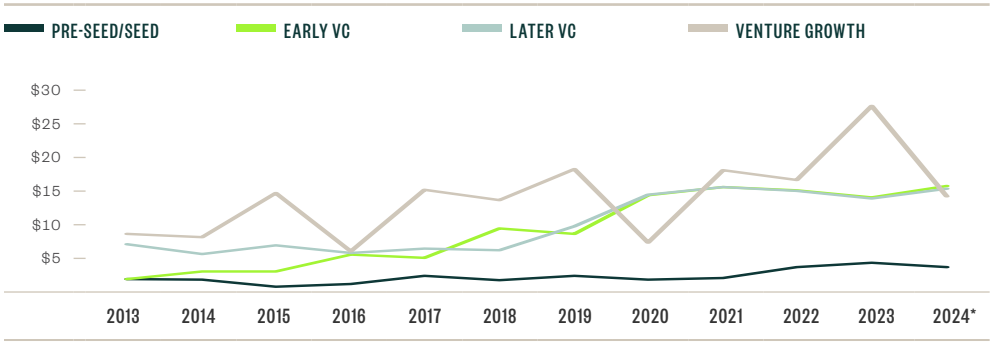
FIGURE 1: Semiconductor VC Deal Activity by Quarter



	2020				2021				2022				2023				2024*
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
VALUE	$1.0	$1.8	$2.5	$5.6	$3.7	$3.5	$3.1	$6.2	$4.7	$4.3	$3.4	$2.5	$2.1	$2.9	$5.2	$4.6	$1.8
COUNT	123	129	166	184	227	191	237	291	226	212	258	237	238	185	226	192	133

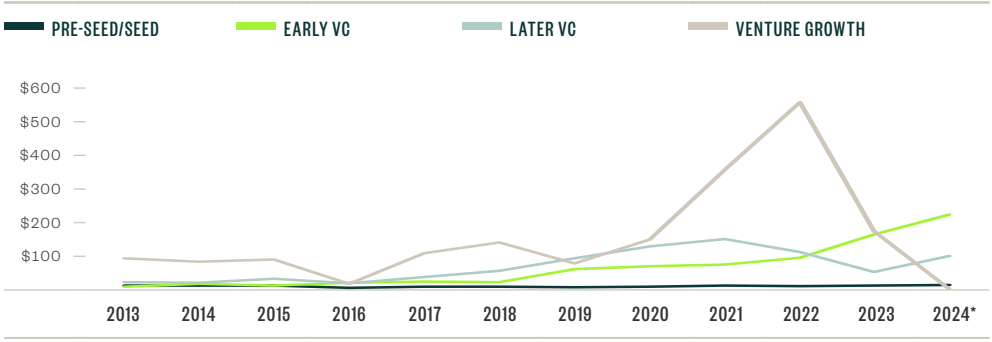
*As of 03/31/2024

FIGURE 2: Median Semiconductor VC Deal Value ($ Million) by Stage



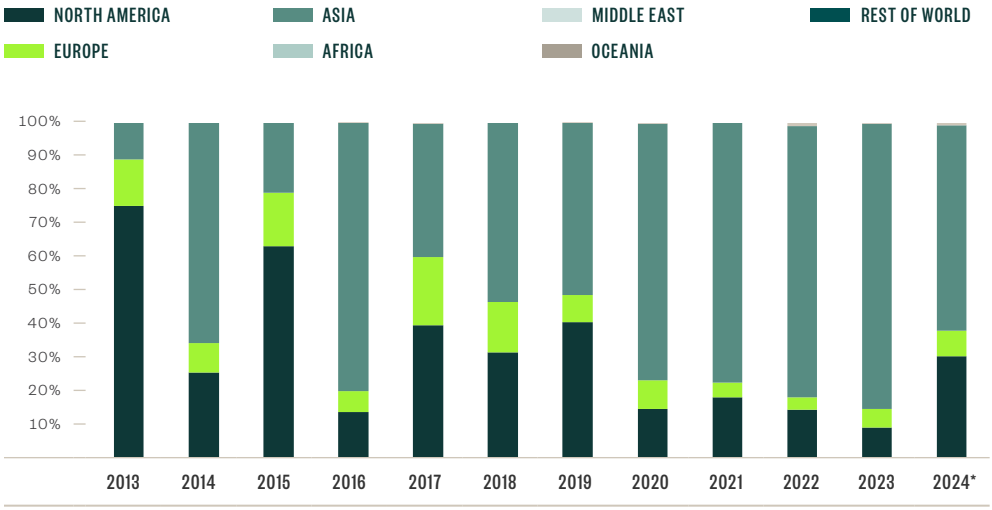
*As of 03/31/2024

FIGURE 3: Median Semiconductor VC Pre-Money Valuation ($ Million) by Stage



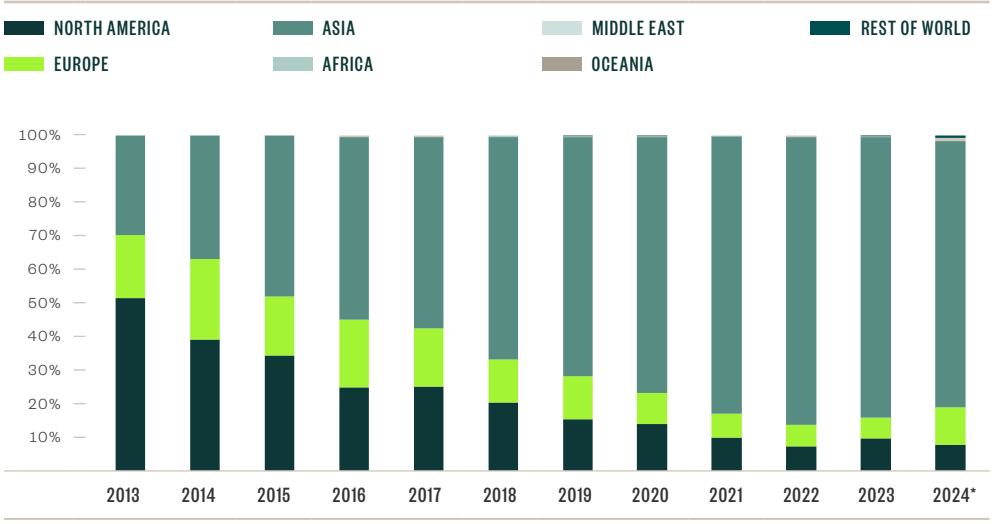
*As of 03/31/2024

FIGURE 4: Share of Semiconductor VC Deal Value by Region



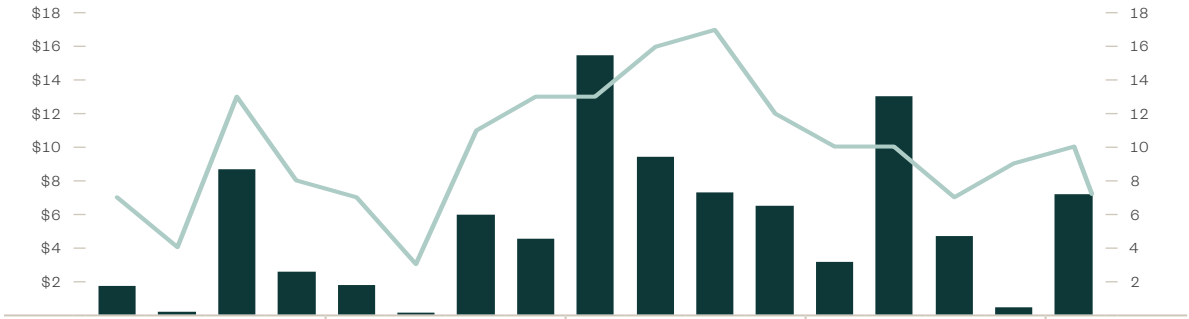
*As of 03/31/2024

FIGURE 5: Share of Semiconductor VC Deal Count by Region



*As of 03/31/2024

FIGURE 6: Semiconductor VC Exit Activity by Quarter



	2020				2021				2022				2023				2024*
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
VALUE	$1.7	$0.1	$8.6	$2.6	$1.7	$0.1	$5.9	$4.5	$15.5	$9.4	$7.3	$6.5	$3.1	$13.0	$4.6	$0.4	$7.2
COUNT	7	4	13	8	7	3	11	13	13	16	17	12	10	10	7	9	10

*As of 03/31/2024

VC dealmaking for semiconductor companies swelled over the past five years, with rapidly expanding applications for the technology driving greater interest from private investors. However, activity tapered off in Q1 2024, highlighting a slower start to this year for industry innovators.

Start-ups operating in the semiconductor space collectively received more than $10 billion in VC funding each year since 2020 across fewer than 60 deals annually, highlighting how some well-positioned players are attracting massive **financing flows** from their VC backers. The largest market leaders aren't the only ones benefiting from greater focus on the industry. The median VC deal size for the industry exceeded $15 million for both the early- and late-stage cohorts in Q1 2024, compared with all VC-backed startups in the United States, for example, which saw median VC deal sizes below $6 million for both cohorts in the same period.

Later-stage players faced a sharper correction than their early-stage counterparts last year, with the median early-stage valuation rising by nearly two-thirds and the median late-stage valuation declining by more than half. Meanwhile, deal sizes trended downward for both categories since peaking in 2021 but ticked upward again in Q1 of this year.

Between 19 and 40 VC megadeals over $100 million closed each year between 2020 and 2023, but only four such deals closed in Q1 this year, suggesting that VC firms may have already made their largest bets and are shifting to an operational focus rather than to more rapid deployment of fresh capital. Slower fundraising trends have also contributed to sluggishness in new VC deal closings across industries.

Cumulative deal value in the first quarter of 2024 reached $1.8 billion, which represents a 61.1% decline from the previous quarter and the lowest quarterly total since Q2 2020. However, last year also had a slower start, with $2.1 billion raised in the first quarter, suggesting that there's still time for annual figures to catch up.

The slowdown is underscored by heightened geopolitical uncertainty and the critical role that semiconductors play on the international stage. The broader Asia region dominates VC funding rounds in the semiconductor space, with the region increasing its presence over the past several years. Deals in Asia accounted for 79.7% of total VC deal count in Q1 2024 compared with 11.3% for Europe and 7.5% for North America.

Public sector investment into certain newly formed companies contributes to some inflation of these early-stage deal values. Examining the largest VC deals over the past 18 months reveals continued strong investment flows into Chinese companies with heavy participation from large state-backed investors, including Hefei Industry Investment Group, Shenzhen Capital Group, and SINO-IC Capital.

SINO-IC manages the mammoth China Integrated Circuit Industry Investment Fund family, referred to as the **Big Fund**, with over $100 billion available to deploy across three vintages. Together with Hefei, SINO-IC wrote the largest VC deal in the space last year for memory wafer manufacturer Changxin Xinqiao, totaling $2 billion for the company's first recorded venture round and contributing to a post-money valuation of over $6 billion.

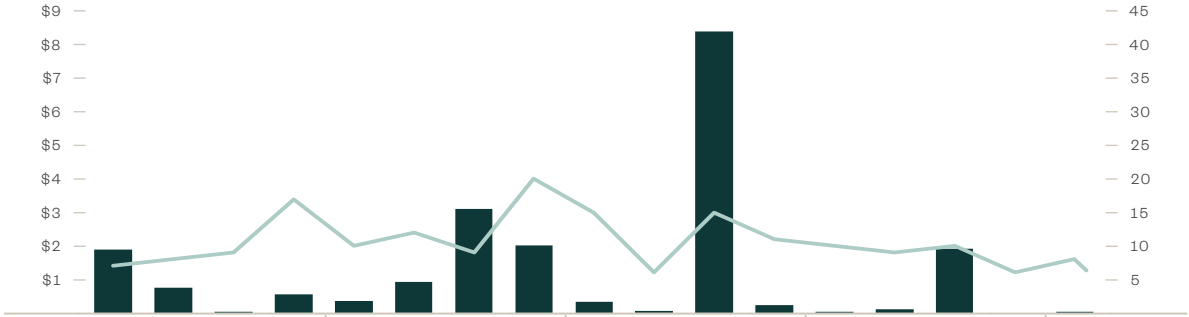
Globally, exits for semiconductor start-ups are off to a strong start in 2024 with $7.2 billion generated across five acquisitions and five public listings. Annualizing this Q1 figure yields a 2024 value of $28.6 billion, which would represent a rise of 35.1% from 2023's annual figure if momentum holds.

Roadblocks for VC-backed exits include continued slowness for IPOs, with weakness in the Hong Kong stock market. Semiconductor startups are opting to raise more capital and delay exits, though the Chinese government has vowed to support the IPO market by **easing controls**, including restrictions on overseas listings.

Despite the headwinds, two Chinese startups had IPOs in Q1 and United States-based Astera Labs performed well in its March 2024 **IPO**, as investors are eager to engage with AI-enabled companies across several asset classes.

PE INVESTMENT: SLOWER TO ADOPT, BUT MAY PROVE A POWERFUL FORCE IN THE NEXT STAGE OF INDUSTRY MATURATION

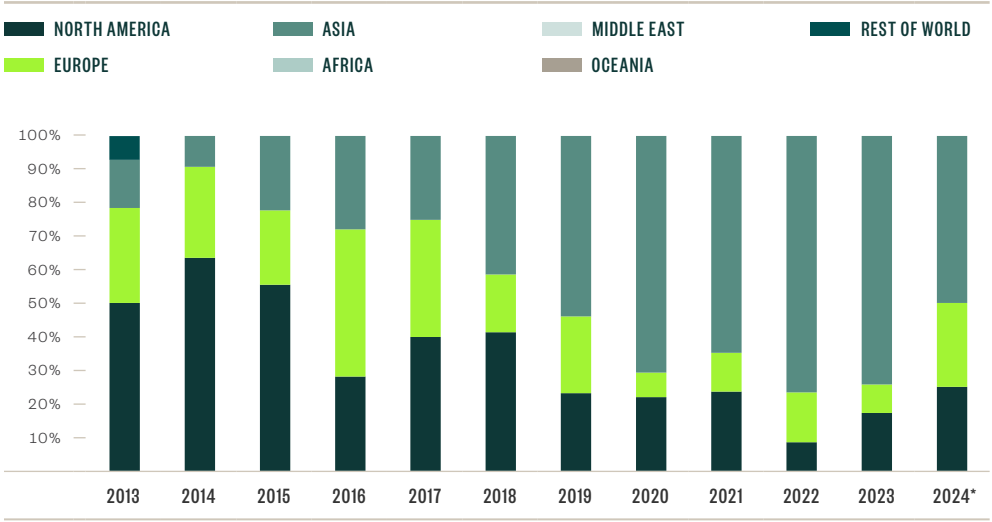
FIGURE 7: Semiconductor PE Activity by Quarter



	2020				2021				2022				2023				2024*
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
VALUE	$1.9	$0.8	$0.0	$0.6	$0.4	$0.9	$3.1	$2.0	$0.3	$0.1	$8.4	$0.2	$0.0	$0.1	$1.9	$0.0	$0.0
COUNT	7	8	9	17	10	12	9	20	15	6	15	11	10	9	10	6	8

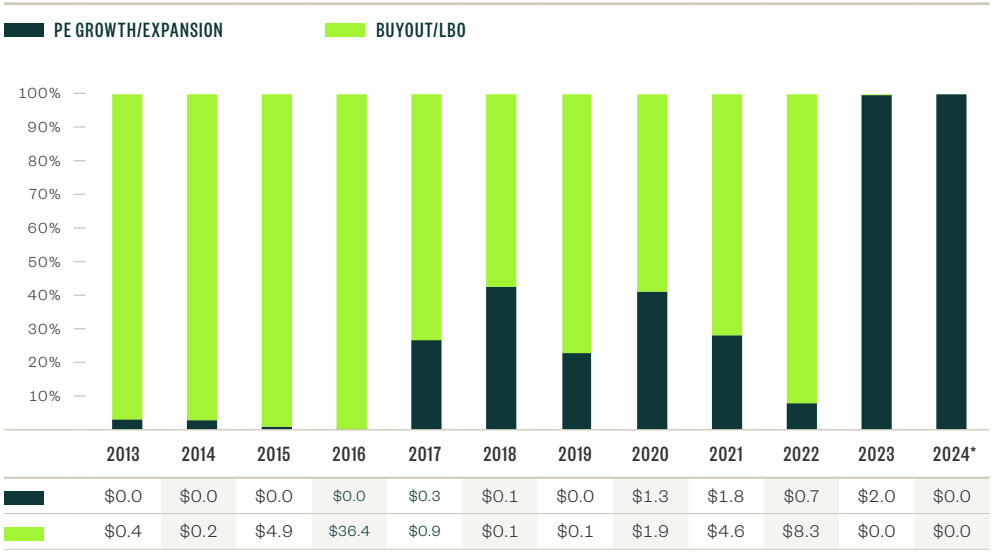
*As of 03/31/2024

FIGURE 8: Share of Semiconductor PE Deal Count by Region



*As of 03/31/2024

FIGURE 9: Share of Semiconductor PE Deal Count by Type



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024*
	$0.0	$0.0	$0.0	$0.0	$0.3	$0.1	$0.0	$1.3	$1.8	$0.7	$2.0	$0.0
	$0.4	$0.2	$4.9	$36.4	$0.9	$0.1	$0.1	$1.9	$4.6	$8.3	$0.0	$0.0

*As of 03/31/2024

PE activity in the semiconductor space is muted with just 35 deals compared to 841 VC deals in 2023. However, PE firms took notice of the industry's potential and increased their footprint following the pandemic-era private investment surge and went on to close at least 35 deals each year since 2020.

PE transaction sizes in the space are particularly opaque, contributing to low deal value data. Like the VC ecosystem, Asia accounts for the majority of PE deals historically, representing more than 50% of global deal count since 2019. However, Asian PE deal count dropped materially in Q1 of this year with just four deals logged compared to 26 in 2023, underscoring heightened scrutiny in the industry where venture funding is the favored route.

PE firms have made several notable minority-stake growth investments into semiconductor companies over the past 18 months, indicating that PE players are warming up to the industry through nontraditional avenues. Since 2019, more than half of all PE deals closed in the space fall under the growth-expansion category,

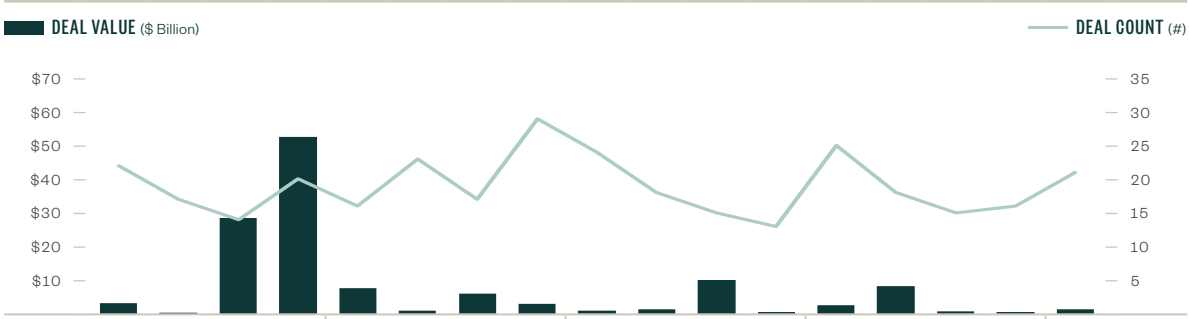
compared with most other industries where traditional buyouts typically make up the lion's share of activity within the asset class.

Recent activity bolstering semiconductor production, including public sector initiatives and ecosystem maturation, may provide additional momentum for PE involvement in the coming years.

Opportunities for take-private deals may emerge as the industry continues to mature with legacy firms being forced to implement more nimble strategies to remain competitive. Platform creation opportunities could also emerge as smaller niche players, supported by the current surge of venture funding, find their footing.

M&A ACTIVITY: INDUSTRY LEADERS CONSOLIDATE TO KEEP PACE WITH COMPETITORS–AND THEY CAN'T AFFORD TO SLOW DOWN

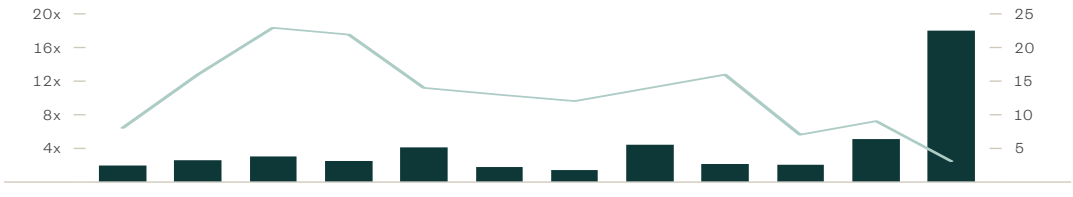
FIGURE 10: Semiconductor Strategic M&A Deal Activity by Quarter



	2020				2021				2022				2023				2024*
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
VALUE	$3.0	$0.2	$28.4	$52.6	$7.5	$0.8	$6.0	$2.9	$0.8	$1.2	$10.0	$0.5	$2.5	$8.2	$0.7	$0.6	$1.2
COUNT	22	17	14	20	16	23	17	29	24	18	15	13	25	18	15	16	21

*As of 03/31/2024

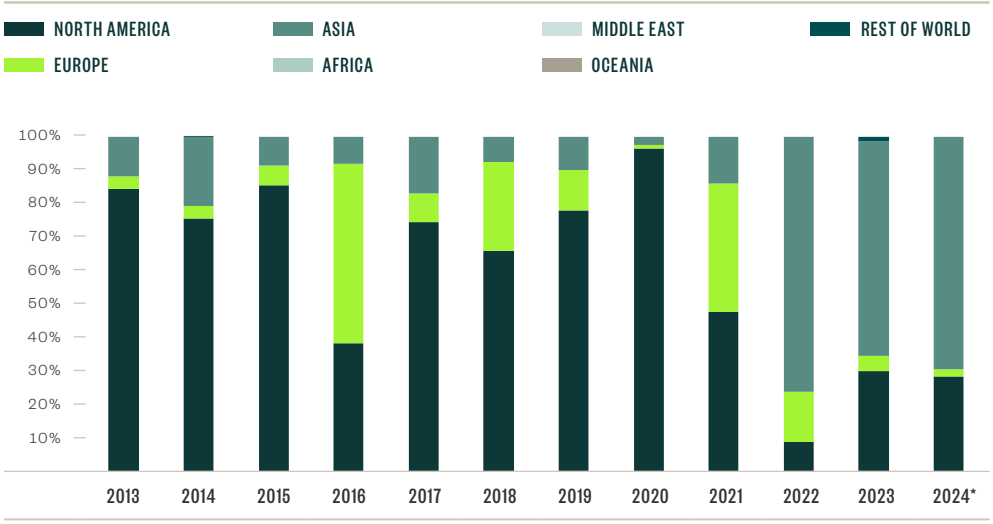
FIGURE 11: Median Strategic M&A Multiples



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024*
EV/REVENUE	1.9X	2.5X	3.0X	2.4X	4.0X	1.7X	1.4X	4.4X	2.1X	2.0X	5.1X	18.1X
COUNT	8	16	23	22	14	13	12	14	16	7	9	3

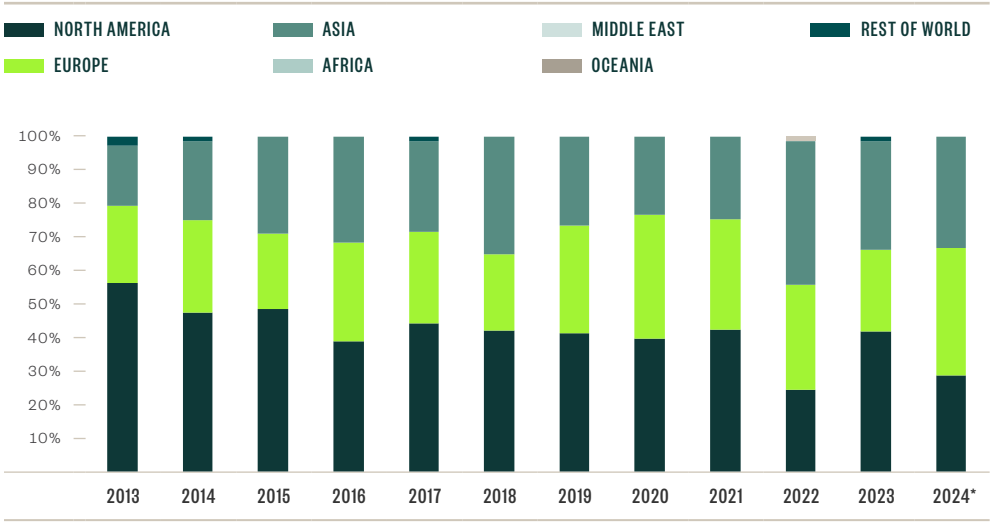
*As of 03/31/2024

FIGURE 12: Share of Semiconductor Strategic M&A Deal Value by Region



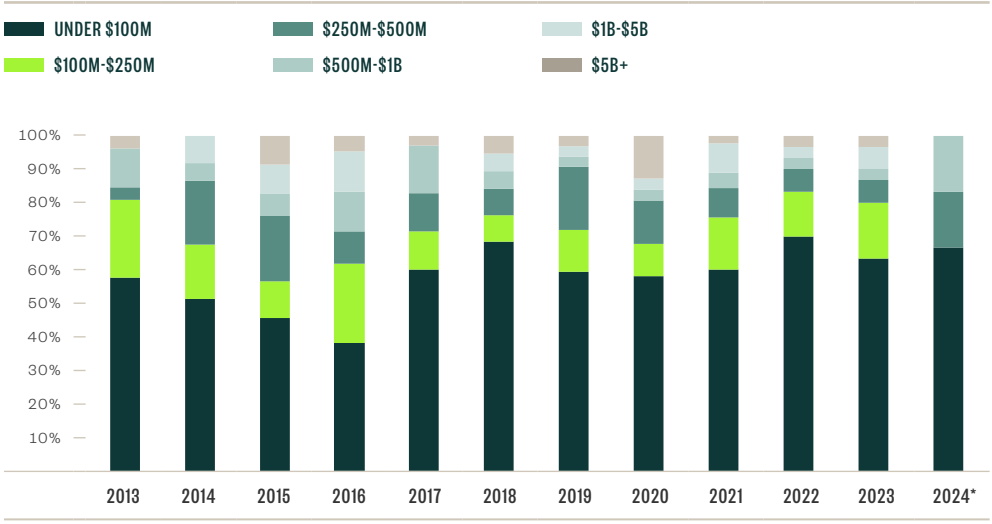
*As of 03/31/2024

FIGURE 13: Share of Semiconductor Strategic M&A Deal Count by Region



*As of 03/31/2024

FIGURE 14: Share of Semiconductor Strategic M&A Deal Count by Size Bucket



*As of 03/31/2024

Strategic M&A activity in the semiconductor space is more robust compared with traditional PE transactions, with $12.0 billion closed across 74 deals in 2023, as well as more than a $1 billion closed in Q1 2024, representing a quarter-over-quarter doubling of value to start 2024.

Sample sizes for enterprise value/revenue data are notably low, but the median multiple shot up from 5.1x in 2023 to 18.1x in Q1 2024, demonstrating the sky-high valuations that certain players in the space have recently garnered.

Large outlier deals occasionally result in spikes in annual deal activity and represent important strategic moves by incumbent industry giants that have shaped the competitive landscape:

- In 2015, Avago acquired Broadcom for $37 billion to create a diversified communications semiconductor company. **Broadcom went on to purchase VMware** in 2023, demonstrating a more generalized strategy compared with other specialized players that are choosing to enact niche strategies.
- In 2016, SoftBank took UK-based chip designer **ARM** private for over $32 billion. The company proceeded to file for IPO in September 2023 with relatively strong stock performance since, driven by customizable designs that are particularly popular among its big-name tech clients including Apple, NVIDIA, Amazon, and more. SoftBank maintains a majority ownership stake.
- In 2020, Advanced Micro Devices, Inc. (AMD) acquired Xilinx for $35 billion to compete with Intel, continuing a **years-long battle** for PC-building market share.

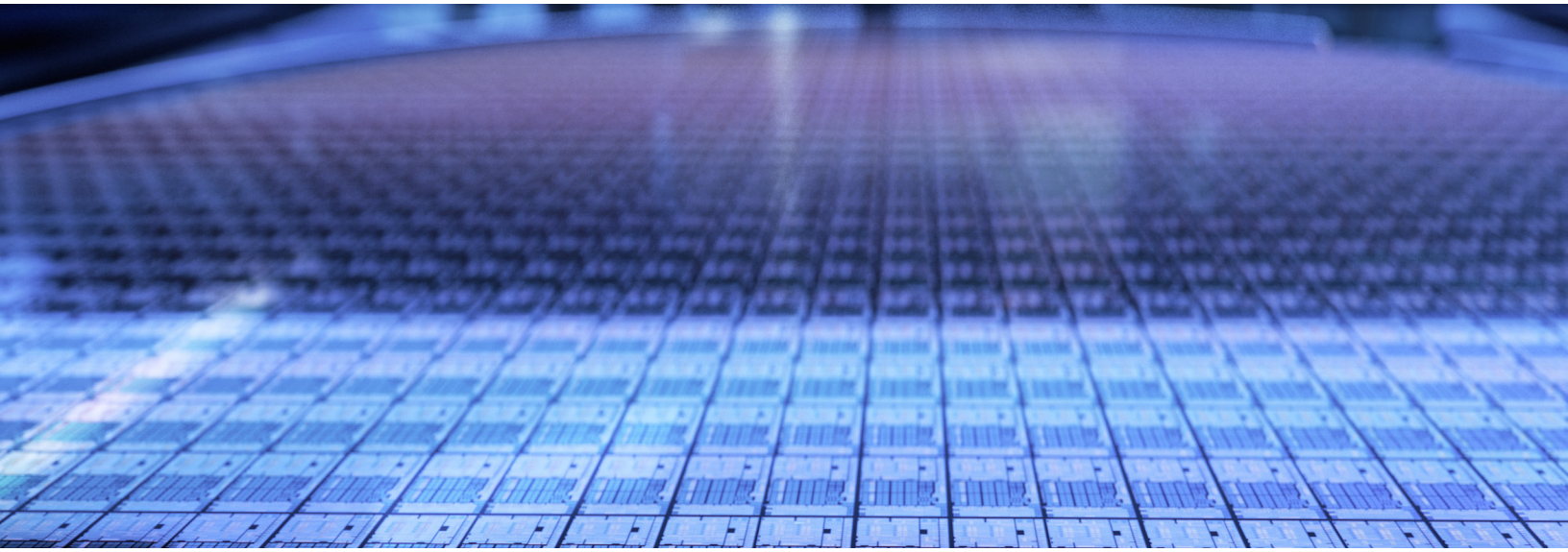
Since 2020, no individual M&A deal in the semiconductor space has exceeded $10 billion, though rising valuations and intensifying competition could change this in the second half of the year.

Compared with VC and PE activity, strategic M&A deals are more evenly spread throughout the top global regions of North America, Europe, and Asia. Global industry leaders close most of the headline-grabbing deals, but companies across the board are using strategic acquisitions to keep up with the competition and enter new markets, with most transactions falling on the smaller end of the size spectrum.

The top M&A deals closed over the past 18 months also demonstrate greater global variety with individual acquisitions north of $100 million each closing in Japan, the United States, China, Canada, the United Kingdom, and Brazil in that period.

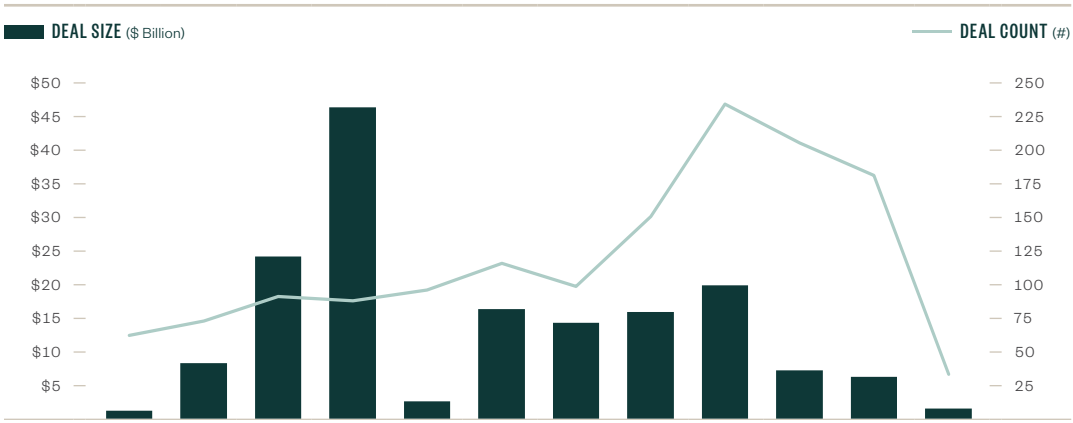
Top countries for semiconductor M&A deal value in 2023 include Japan, the United States, the United Kingdom, and China, each with more than $1 billion in transactions last year.

Despite being home to the dominant global chip manufacturer TSMC, Taiwanese acquirers close fewer M&A deals historically. Cross-strait relations and implications for TSMC and other global manufacturers are top of mind as Taiwanese President Lai Ching-te was sworn into office in May 2024. Deal activity may pick up as the political dust settles and more regulatory clarity emerges, though foreign investors are particularly wary as tensions remain high.



CROSS-BORDER DEAL FLOW IN FOCUS

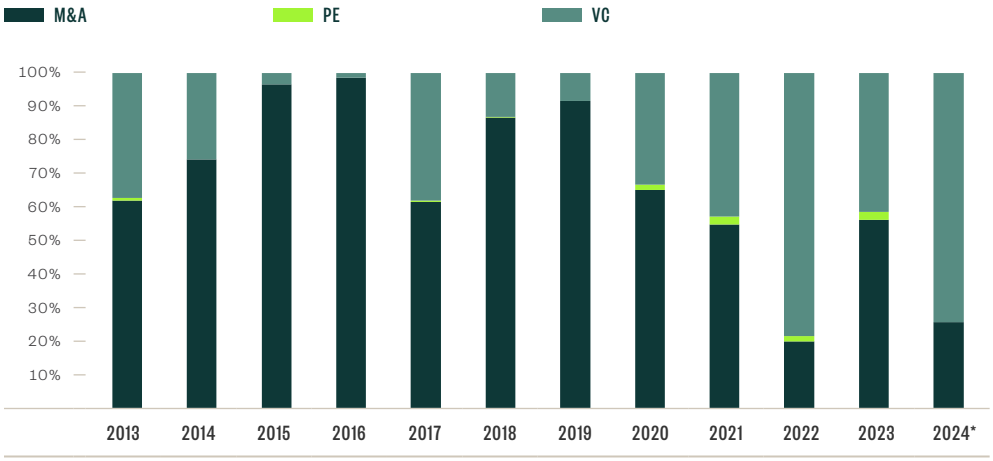
FIGURE 15: Semiconductor Private Cross-Border Investment Activity



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024*
SIZE	$1.1	$8.2	$24.2	$46.6	$2.6	$16.3	$14.3	$15.9	$19.9	$7.2	$6.2	$1.4
COUNT	62	73	91	88	96	116	99	151	235	206	182	33

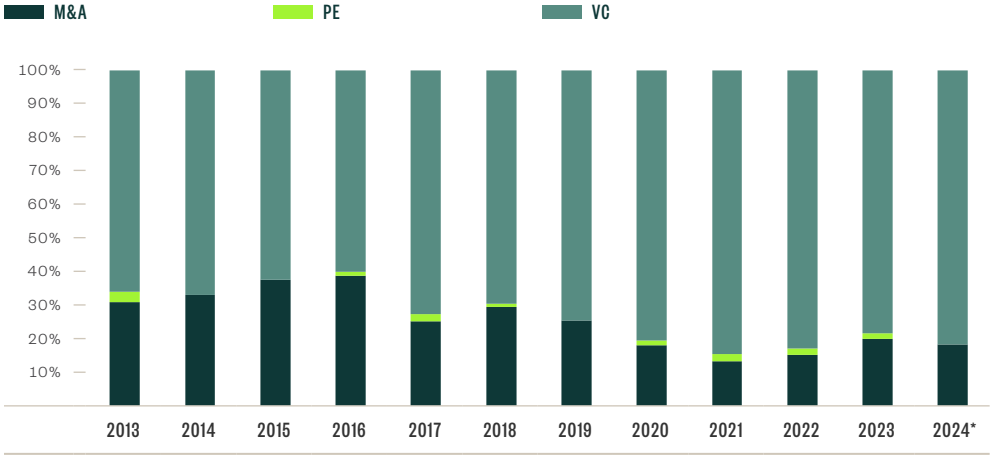
*As of 03/31/2024

FIGURE 16: Semiconductor Private Cross-Border Deal Value by Type



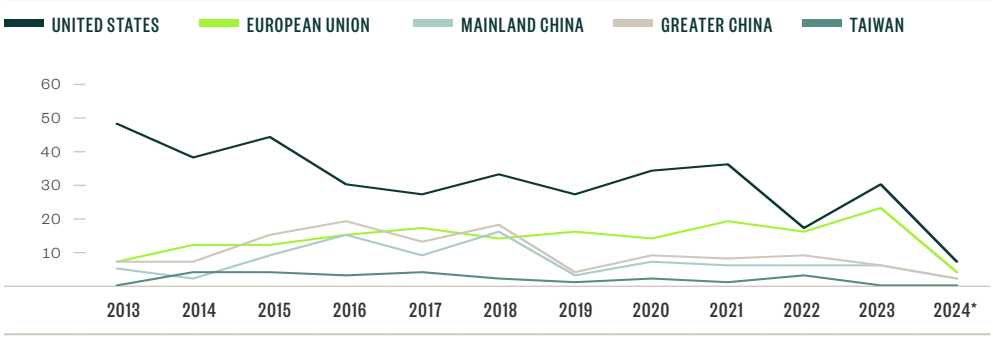
*As of 03/31/2024

FIGURE 17: Semiconductor Private Cross-Border Deal Count by Type



*As of 03/31/2024

FIGURE 18: Semiconductor M&A Deal Count by Acquirer's Country



*As of 03/31/2024

Cross-border private market dealmaking for semiconductors faces geopolitical headwinds in the current climate, but still more than 150 such deals have closed each year since 2020, representing an elevated level of activity over the past four years. Quarterly trends show that engagements with foreign parties are slowing, however, with only 33 deals closing in Q1 2024 compared to 44 in Q4 2023 and 51 in Q3 2023.

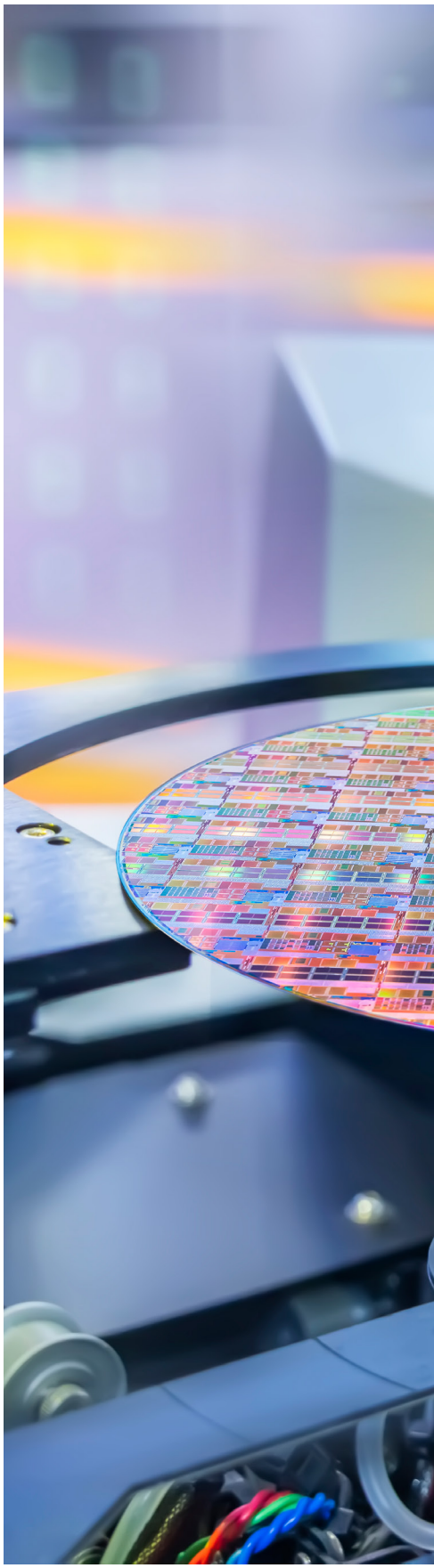
Given its status as the predominant private source of capital for semiconductor companies, VC deals unsurprisingly account for the majority of cross-border deals as well, though the significance of certain strategic acquisitions results in the M&A category driving large portions of total cross-border deal value.

Notable cross-border M&A transactions include United Kingdom-based Bosch's $1.5 billion purchase of United States-based TSI Semiconductors in April 2023. This deal unlocked eligibility for Bosch to obtain additional federal funding through the **CHIPS and Science Act**, which reportedly has $6 billion left for deployment as of late May 2024.

New federal funding initiatives across regions like the United States and the European Union may emerge, as the semiconductor supply chain remains a top priority.

METHODOLOGY

Standard PitchBook methodology regarding venture transactions and venture-backed exits was used for all datasets, and similarly for PE or other private investment types. Full details can be **found here**.



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