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Drawing Capital

Semiconductors

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Semiconductor Companies & Hardware Engineering

Presented by:

Sagar Joshi and Jugal Lodaya

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About

Drawing Capital is an innovation-focused private investment firm headquartered in Silicon Valley, CA.

Drawing Capital aims to capture the expansion of a technology-forward world by investing in leaders that we believe carry undervalued growth. Our expertise in finance and data science enables us to participate in investment opportunities in public markets not captured by passive investing.

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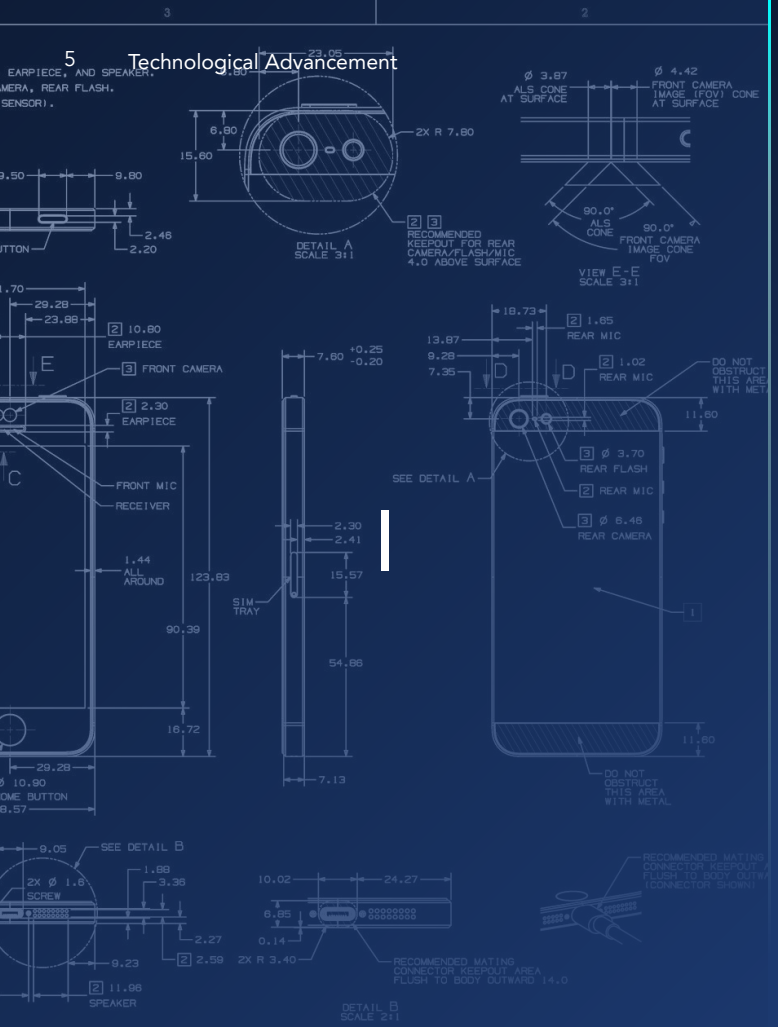

Technological Advancement

- Moore’s Law
- Computational power per constant dollar
- Expansion in the depth and diversity of computing

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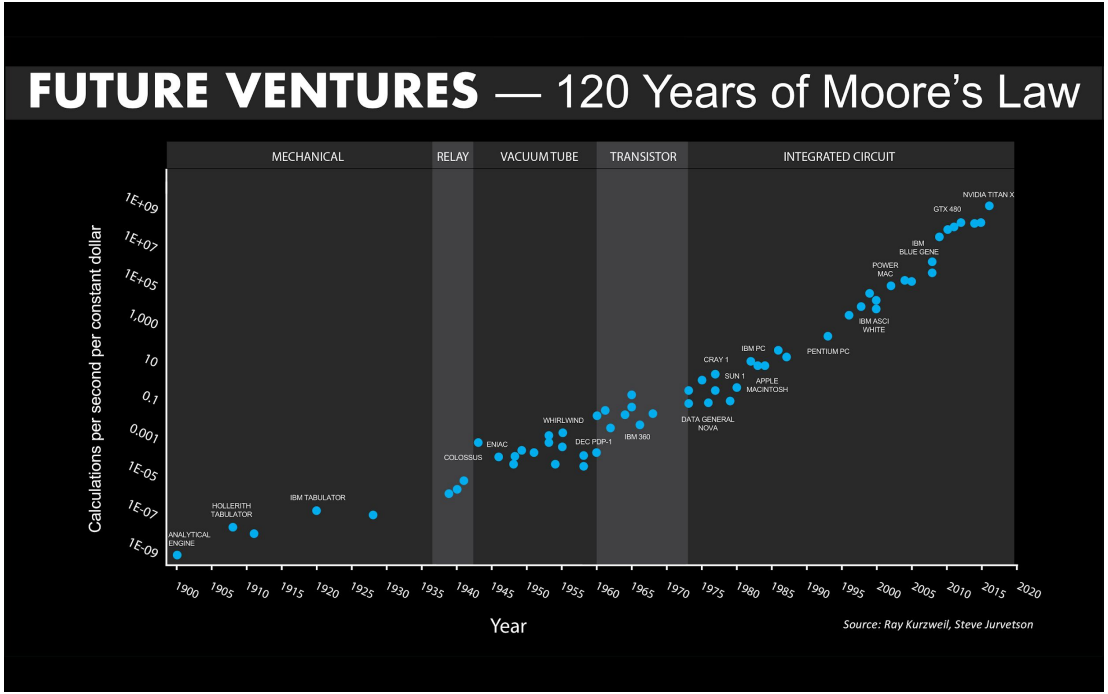
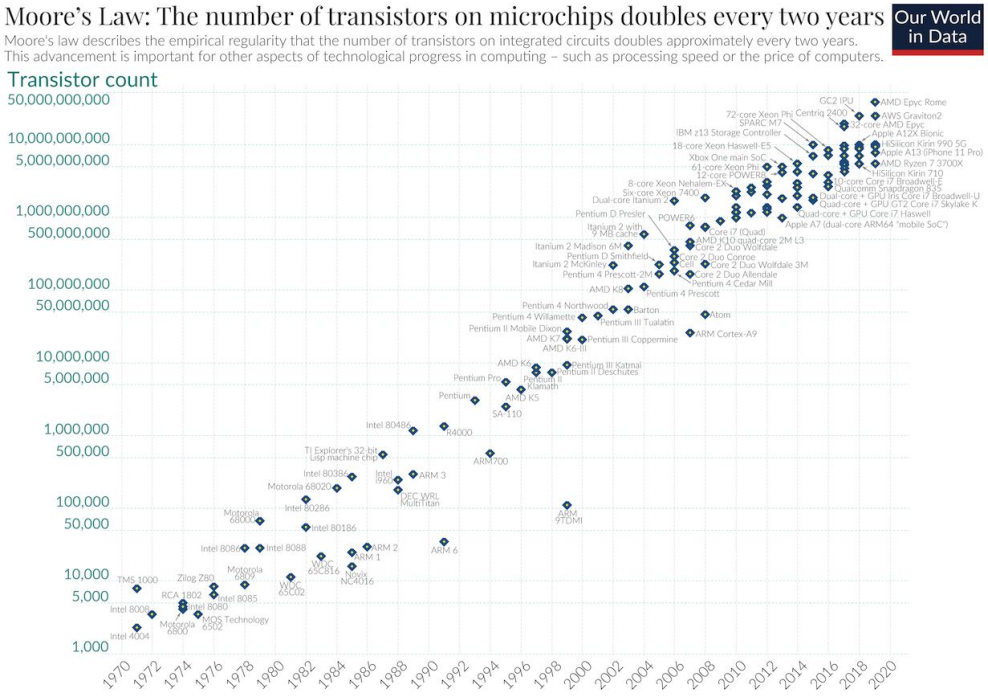
Computational Power Per Constant Dollar & Technological Progress



Data Source: Future Ventures, Steve Jurvetson, and Ray Kurzweil

Advancements of Chips Over Time



Data Source: Our World in Data, https://ourworldindata.org/technological-progress

Diversity, Depth, and Breadth are Expanding in Computing

IoT Connectivity	ML & Deep Learning	Edge Networks	Cloud Computing
CPUs	GPUs	HPC	Networking
Data Centers	Super-computers	Memory & Storage	Smart Sensors
Biotech Computing	Digital DNA Data Storage	Bitcoin Mining	Custom AI Chips

II

Semiconductor Categories

- A select group of companies have dominant market share in specific semiconductor categories.
- We have identified 12 semiconductor categories of focus.
- A dispersion in historical stock price performance exists across semiconductor companies.

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Consolidation & Concentration in Semiconductor Categories

CPU Intel | AMD	**GPU** Nvidia | AMD | Intel	**Hardware Languages** Verilog | VHDL	**EDA (Electronic Design Automation)** Cadence | Synopsys | Siemens
FPGA (Field Programmable Gate Arrays) Xilinx (AMD) | Altera (Intel)	**Design Cores** ARM | Imagination Technologies	**Semiconductor Equipment** ASML | LAM Research | Applied Materials | KLA-Tencor	**Raw Materials** GlobalWafers | SUMCO
Foundries & Manufacturing TSMC | UMC | SMIC | Global Foundries	**Conglomerates** Qualcomm | Broadcom | Texas Instruments | Samsung	**Flash Memory** Samsung | Micron | Seagate | SK Hynix | Toshiba Memory | SanDisk (Western Digital)	**Innovative & Emerging Chip Categories** AI & ML | Autonomous Vehicles

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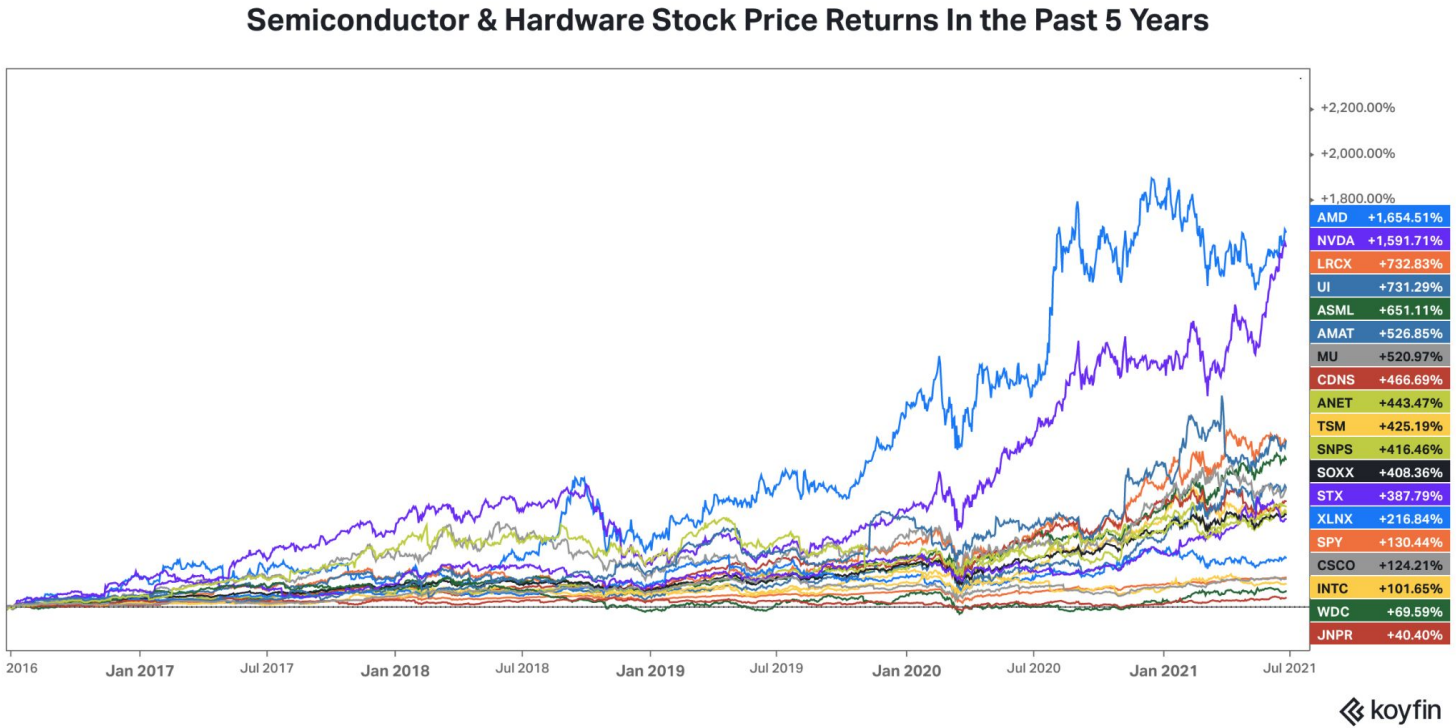
Historical Stock Price Performance of Semiconductor Stocks

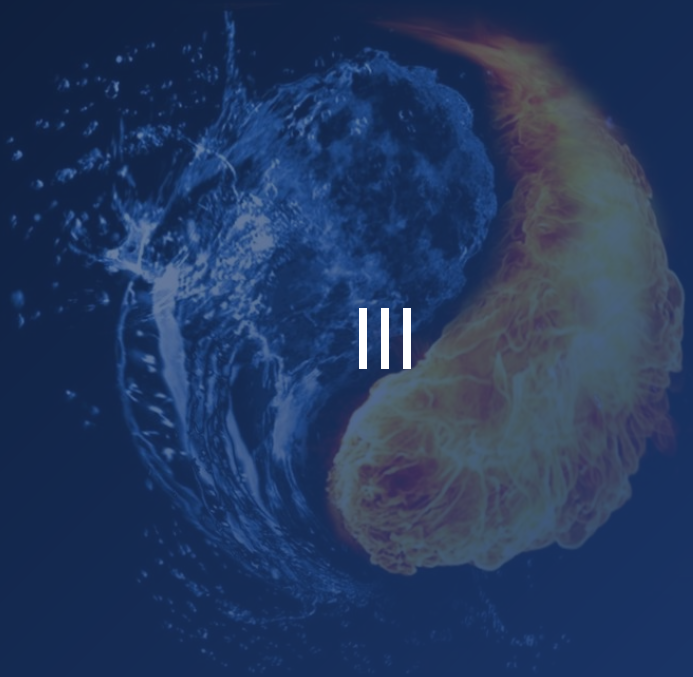


Past performance is not indicative of future results. Any stock, options or futures symbols displayed are for illustrative purposes only and are not intended to portray recommendations.
Data Source: Koyfin, https://app.koyfin.com/

Significant Business Growth for NVIDIA & AMD

	FY 2016	LTM as of 6/27/2021
NVIDIA's Revenue, Operating Cash Flow & Gross Margin	➢ $5.010 billion ➢ $1.175 billion ➢ 56.11%	➢ $19.256 billion ➢ $6.787 billion ➢ 63.26%
AMD's Revenue, Operating Cash Flow & Gross Margin	➢ $4.319 billion ➢ $81.0 million ➢ 23.22%	➢ $11.422 billion ➢ $2.034 billion ➢ 44.79%

Past performance is not indicative of future results. Any stock, options or futures symbols displayed are for illustrative purposes only and are not intended to portray recommendations.
Data Source: Koyfin, https://app.koyfin.com/



Historical Mergers & Acquisitions

- Significant multi-billion dollar M&A demonstrate both the growing opportunity set and industry consolidation.
- Large M&A brings regulatory scrutiny.

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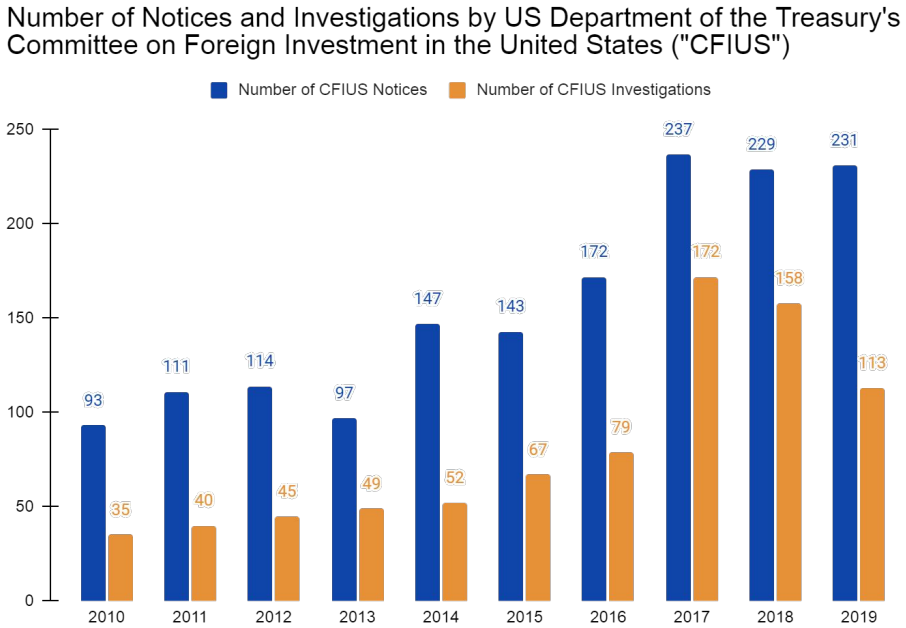
Examples of Semiconductor M&A Deals

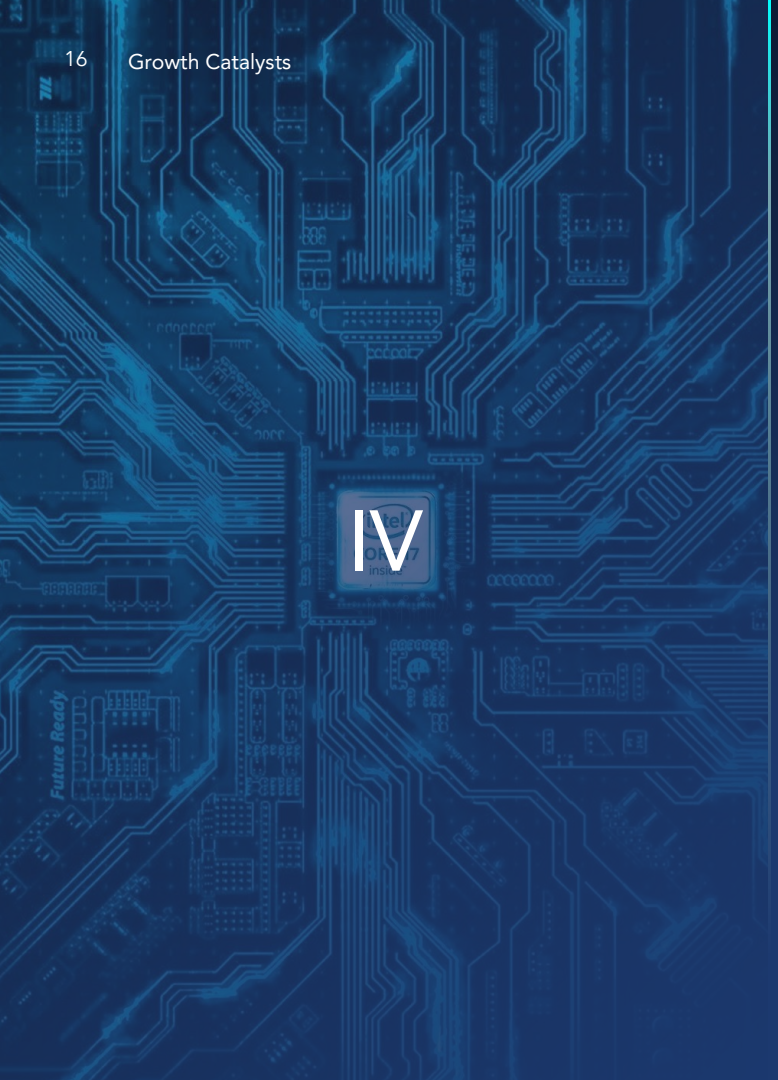
Acquisition Announcements	Estimated Deal Value ($B)
Broadcom announces acquisition of Qualcomm (November 2017)[failed]	130
Dell announces acquisition of EMC (October 2015)	67
Qualcomm announces acquisition of NXP Semiconductor (October 2016)[failed]	47
NVIDIA announces acquisition of ARM (September 2020)	40
Avago announces acquisition of Broadcom (May 2015)	37
AMD announces acquisition of Xilinx (October 2020)	35
SoftBank announces acquisition of ARM (July 2016)	32
Analog Devices announces acquisition of Maxim Integrated (July 2020)	20.9
Broadcom announces acquisition of CA Technologies (July 2018)	18.9
Bain Capital & Investor Group announces acquisition of Toshiba Memory (September 2017)	18
Intel announces acquisition of Altera (June 2015)	16.7
Intel announces acquisition of Mobileye (March 2017)	15.3
Broadcom announces acquisition of Symantec Enterprise Security (August 2019)	10.7
Infineon announces acquisition of Cypress Semiconductor (June 2019)	10
Marvell announces acquisition of Inphi (October 2020)	10
SK Hynix announces acquisition of Intel's NAND Memory Business (October 2020)	9
Microchip Technology announces acquisition of Microsemi (March 2018)	8.35
NVIDIA announces acquisition of Mellanox (March 2019)	6.9
Renesas announces acquisition of Integrated Device Technology (IDT) (September 2018)	6.7
Marvell announces acquisition of Cavium (November 2017)	6
Broadcom announces acquisition of Brocade Communication Systems (November 2016)	5.9
AMD announces acquisition of ATI (July 2006)	5.4
Siemens announces acquisition of Mentor Graphics (November 2016)	4.5
GlobalWafers announces acquisition of Siltronic (December 2020)	4.5
ON Semiconductor announces acquisition of Fairchild Semiconductor (November 2015)	2.4
Intel announces acquisition of Habana Labs (December 2019)	2
NXP Semiconductor announces acquisition of Marvell's WiFi and Bluetooth Assets (May 2019)	1.76
Qualcomm announces acquisition of NUVIA (January 2021)	1.4
Marvell announces acquisition of Avera Semiconductor (May 2019)	0.6

Data Source: Corporate announcements and press releases.

Mergers & Acquisitions Bring Regulatory Scrutiny



Data Source: US Department of Treasury, https://home.treasury.gov/system/files/206/CFIUS-Public-Annual-Report-CY-2019.pdf



Growth Catalysts

- The top 3 companies in each semiconductor industry category have significant market share, making it easier to maintain pricing power and drive margin expansion.
- Application-based innovation is driving value creation for customers, the end consumer, and shareholders.
- A virtuous cycle of hardware powering the digital economy increases in flywheel benefits over time.

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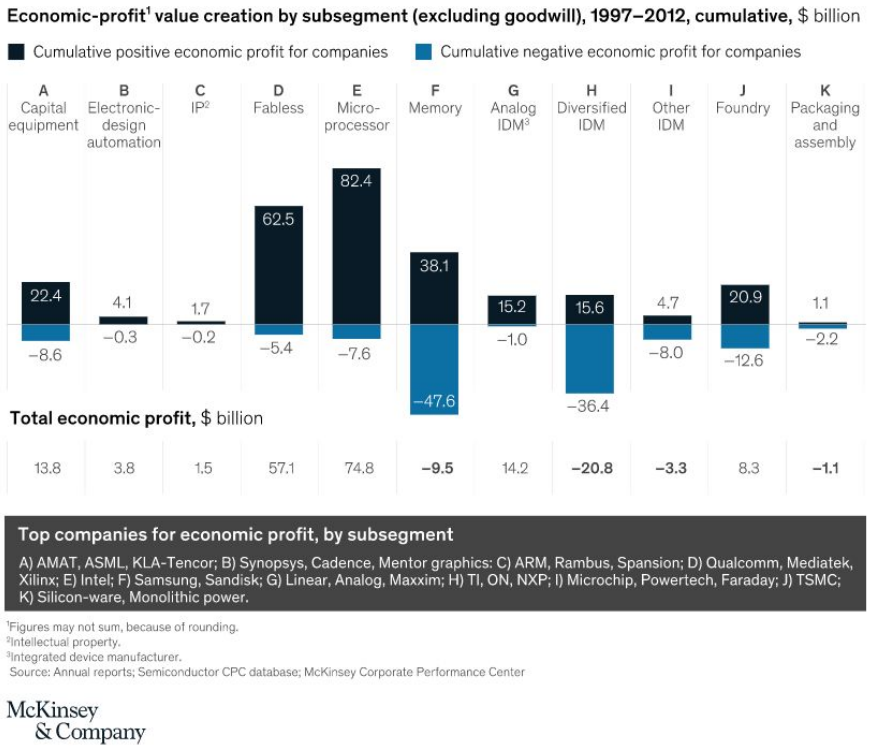
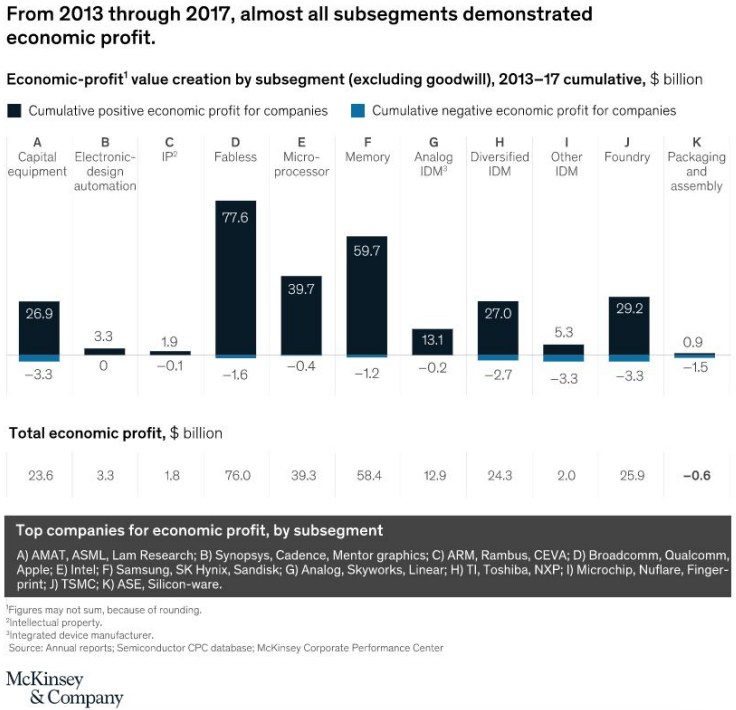
Difficult Environment for Economic Profits from 1997-2012



Data Source: McKinsey & Company, https://www.mckinsey.com/industries/semiconductors/our-insights/whats-next-for-semiconductor-profits-and-value-creation

Economic Profits Returned for Hardware in 2013-2017

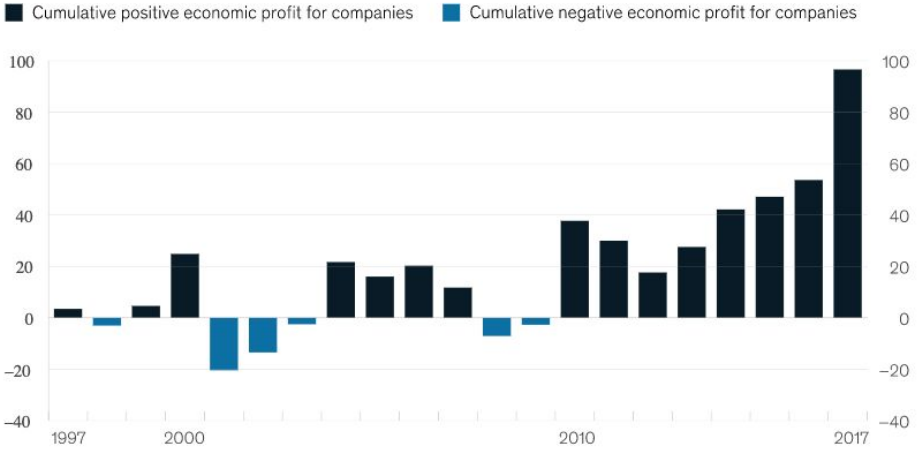


Data Source: McKinsey & Company, https://www.mckinsey.com/industries/semiconductors/our-insights/whats-next-for-semiconductor-profits-and-value-creation

Economic Profits for the Semiconductor Industry are Trending Upwards Since 2010

Within the semiconductor industry, down cycles have been milder and peaks have been higher in past few years.

Economic-profit value creation by all subsegments (excluding goodwill), $ billion

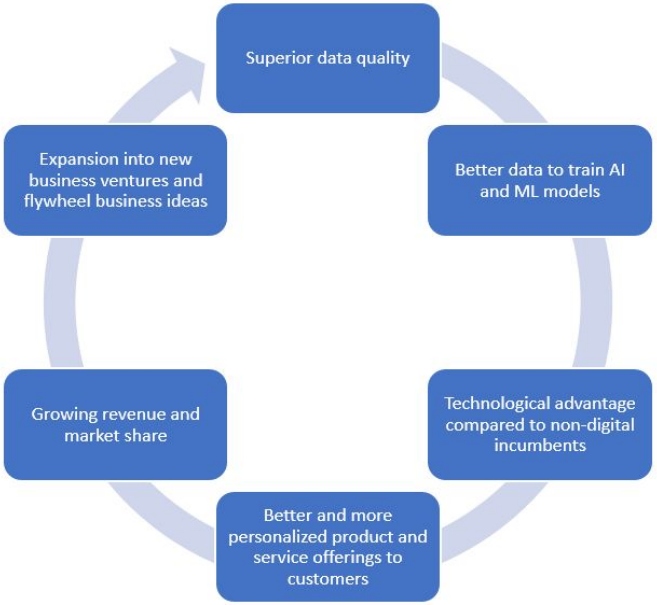


Source: Annual reports; Semiconductor CPC database; McKinsey Corporate Performance Center

McKinsey & Company

Data Source: McKinsey & Company, https://www.mckinsey.com/industries/semiconductors/our-insights/whats-next-for-semiconductor-profits-and-value-creation

Hardware Powers the Virtuous Cycle for Internet & Digital Businesses



Why Now?

1

Growing Demand

Application-based innovation across industries is driving large semiconductor demand.

2

Business Success

Pioneering focus on engineering, product quality, and innovation drive value creation.

3

Technical Leadership

Emphasis on hardware engineering, not financial engineering, is important for long-term semiconductor success.

4

East-West Tensions

Maintaining semiconductor excellence in America promotes intellectual capital, national pride, and national security.

5

Industry Consolidation

The top 2-3 companies in each semiconductor category have significant market share, which can drive pricing power and margin expansion.

6

Ancillary Benefits

A successful and thriving semiconductor industry with innovation drives an economic multiplier effect and a virtuous cycle for digital businesses.

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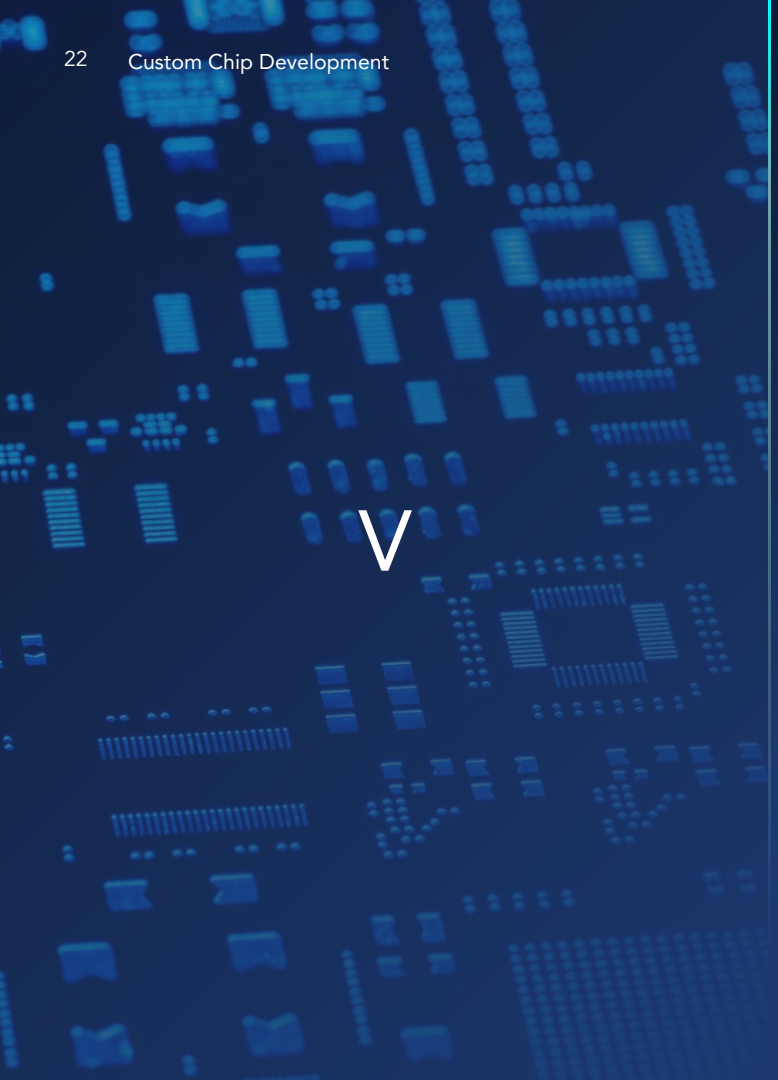

V

Custom Chip Development

- Better integration of hardware and software
- Unbundling of generic chips into specialized chips
- Vibrant innovative ecosystem of startups and incumbent hardware companies
- Rise of AI & ML and necessity for large-scale computing resources is driving transformative progress in chips

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Benefits of Different Hardware Supply Chains

Outsourcing Hardware

1. Outsourcing of expertise, manufacturing resources, and significant capex
2. Industry standards
3. High speed-to-market
4. Globalized supply chains & cost savings

In-House Custom Hardware

1. Unbundling generalized chips into specialized chips
2. Improved integration of hardware & software
3. Custom specifications to meet specific requirements
4. Competitive advantage

VI

Sample Companies

- We curated a sample list of industry-leading businesses and exciting startups within semiconductors.
- Significant technological advancement and product updates are ongoing for all of these companies mentioned in the next 2 slides.

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Examples of Startups & Private Companies in the Semiconductor Industry

SambaNova

Cerebras Systems

Groq

Mythic

Wave Computing

Flex Logix Technologies

Graphcore

Adapteva

Untether AI

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Sample List of Semiconductor Companies

Semiconductor Category	Example Company or Product
CPUs	Intel ($INTC) and AMD ($AMD)
GPUs	NVIDIA ($NVDA) and ATI Graphics by AMD ($AMD)
Electronic Design Automation (EDA)	Cadence ($CDNS) and Synopsys ($SNPS)
Semiconductor Equipment	ASML ($ASML), LAM Research ($LRCX), Applied Materials ($AMAT), KLA-Tencor ($KLAC)
Conglomerates	Qualcomm ($QCOM), Broadcom ($AVGO), Texas Instruments ($TXN), Samsung
Raw Materials	GlobalWafers and SUMCO
Design Cores	ARM and Imagination Technologies
Foundries & Manufacturing	TSMC, UMC, SMIC, Global Foundries
Networking	Cisco Systems ($CSCO), Arista ($ANET), Ubiquiti ($UI), Juniper Networks ($JNPR), Extreme Networks ($EXTR)
Flash Memory	Samsung, SK Hynix, Toshiba Memory, Micron ($MU), Seagate ($STX), Western Digital / SanDisk ($WDC)

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Summary

1. The rise in artificial intelligence, machine learning, and application-specific tech-enabled advancement is driving transformative progress in chips.

2. The categorization of semiconductor companies is helpful to understand the semiconductor industry landscape. There is significant expansion in the diversity, depth, and breadth of computing today.

3. There exists an innovative ecosystem of dominating large-scale industry leaders and a thriving set of semiconductor startups.

4. A virtuous cycle of hardware powering the digital economy continues to grow and compound at scale. A thriving semiconductor ecosystem in America creates positive flywheel effects and an economic multiplier effect.

5. The intersection between rationalized business models, high demand for innovation, significant tailwinds and demand in GPUs, an active M&A market, and the unbundling of generic chips into specialized chips presents a very compelling opportunity set for the engineering community and the investment community.

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