Hitech Semiconductor Industry Operating Benchmarks

Operational and market capitalization data for 103 Semiconductor companies

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worldlocity

Version

VERSION	DATE	NOTES
2021.1.1	04.01.21	Initial version, dated 04.01.21
2021.2.1	06.25.21	Updated financial and market cap data for 06.25.21. Removed companies that merged or were taken private.
2021.3.1	11.30.21	Updated financial and market cap data for 11.30.21. Removed companies that merged or were taken private.
2022.1.1	01.01.22	Updated financial and market cap data for 01.01.22. Added companies and removed those that merged or were taken private.
2022.2.1	05.16.22	Updated financial and market cap data for 05.16.22. Added companies and removed those that merged or were taken private.
2022.2.2	10.07.22	Updated financial and market cap data for 10.07.22. Added companies and removed those that merged or were taken private.
2023.1.1	12.01.23	Updated financial and market cap data for 12.01.23. Added companies and removed those that merged or were taken private.
2025.1.1	12.02.25	Updated financial and market cap data for 12.02.25. Added companies and removed those that merged or were taken private.

Versioning convention: This document is versioned as follows: **YYYY.N.n**, where **YYYY** is the year, **N** is the major release number, and **n** is the minor release number. A major release includes one or more of the following: the number of companies changes; reports and analyses change; financial and market cap information are updated, and a new date is attached to the report. A minor fixes errors, including data errors, formatting errors, and inconsistencies.

Contents

2025 Semiconductor Industry Report: Key Takeaways

- The Semiconductor industry 3-year CAGR is 9.8% (overall dollars growth). The average company 3-year CAGR is 3.7%.
- The average Semiconductor company has gross margins of 40.3%, invests 14.9% of revenue in selling, general, and administrative expense, 16.0% in research and development, and generates 10.8% operating margin, 20.3% EBITDA margin, 4.3% free cash flow, and 12.1% return on invested capital.
- The Semiconductor company average inventory turns is 3.4. The median is 2.5. The difference between the average and the median indicates a few outliers raise the average. The median is more in line with the industry operational structure.
- The average Semiconductor company has 55.7% PP&E, and 37.3% in goodwill and intangibles, both as a percentage of revenue. Goodwill and intangibles are a proxy for mergers and acquisitions; based on this measure, Semiconductor is higher than average in M&A activity. While Semiconductor is traditionally considered an asset-intensive industry, it also has high IP content, leading to high gross margins and significant goodwill and intangible assets.
- As expected, Semiconductor companies that lead in operating profit, net profit, cash flow, and return on investment (ROA, ROIC, economic profit) are also leaders in market cap multiple.
- Semiconductor companies with higher inventory turns tend to have significantly lower market cap multiples than companies with lower inventory turns. This is an indication that inventory turns is a poor indicator of company market performance. (Note: controlling for gross margin yields the same conclusion).
- Semiconductor companies with higher IP content in their products invest more in R&D, have higher gross margins, and significantly higher market cap multiples. There is a symbiotic relationship between gross margin and R&D investment: higher R&D investment leads to more differentiated products and higher gross margins; on the other hand, differentiated products create higher gross margins, which allows for higher R&D investment. Companies in a low gross margin trap may have challenges breaking out of it without multi-year increases in R&D investment (or M&A).
- Historical analysis (using aggregate data and ratios) reflects the recent AI boom in the semiconductor industry. Growth, profitability, cash flow, and all forms of return on investment are significantly above their historical averages. The semiconductor industry is a long-cycle boom-and-bust type industry, so it will be interesting to see how this plays out over the course of the next several years.
- Individual operational measures are poor statistical predictors of market cap multiple. Quartile analysis was performed to contrast the operational characteristics of market cap multiple leaders with others.
- Market cap multiple leaders have cap multiples that are 2.6X average and 15.8X laggards. Leaders have significantly higher gross margins, invest significantly more in R&D, and generate significantly higher operating margins, cash flow, and return on investment (ROA, ROIC, and economic profit).
- From a supply chain management perspective, data in this report supports the thesis that market leaders run their supply chains with more of a profit center mentality than a cost center mentality, which has historically been the case. This further suggests supply chain management has evolved to a sophisticated multivariate decision science, rather than a unidimensional cost management function.
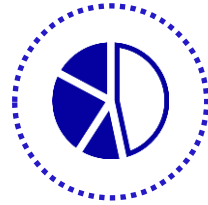
Data Set

Information on the companies and the data set used in the analysis.

Data Set

COMPANIES

The data set includes 103 publicly-traded Semiconductor companies.

103

REVENUE

Aggregate revenue for companies in the data set is $0.9 trillion for the latest reporting fiscal year as of the date on the cover of this report.

$0.9T

MARKET CAPITALIZATION

Aggregate market cap for companies in the data set is $11.1 trillion as of date on the cover of this report.

$11.1T

Notes:
1. Unless otherwise noted, all company financial data are based on trailing twelve months results as of the date on the cover of this report.
2. All market capitalizations are as of the date on the cover of this report.
3. M=million; B=billion; T=trillion.
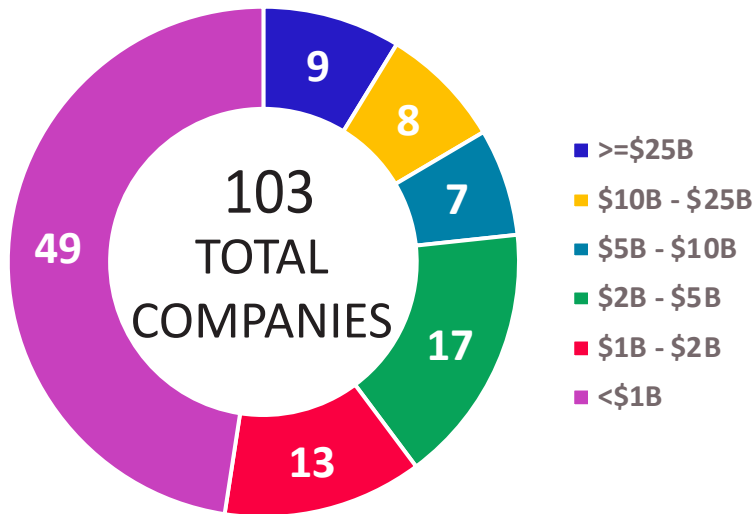
Data Set
Companies included in this report

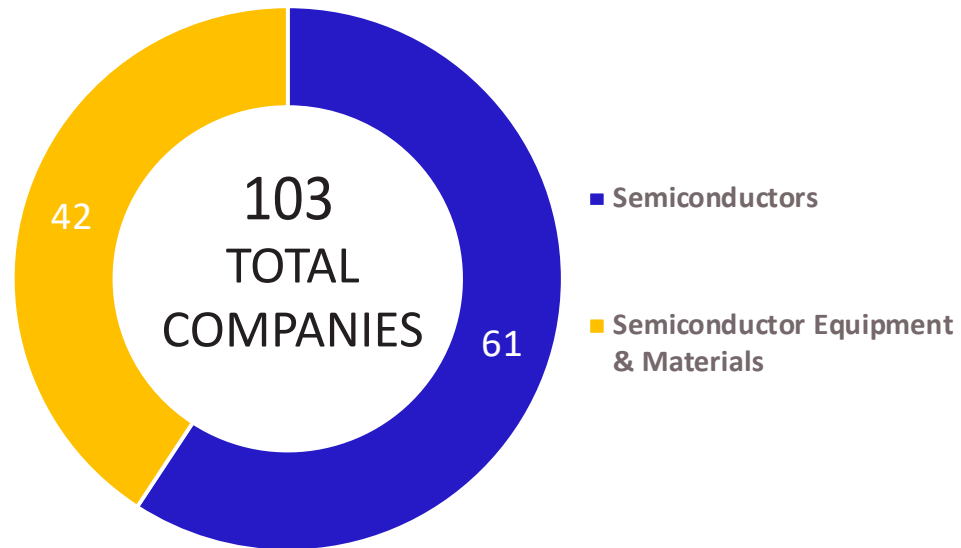|				
Advanced Micro Devices	CMC Materials Inc	MagnaChip Semiconductor	Qualcomm Inc	Texas Instruments Inc
Advantest Corp	Cohu Inc	Marvell Technology Grou	Rambus Inc	Tokyo Electron Ltd
Aixtron SE	Cree Inc	Maxim Integrated Produc	Renesas Electronics Cor	Tower Semiconductor Ltd
Allegro Microsystems In	Daqo New Energy Corp	MaxLinear Inc	Rohm Co Ltd	Ultra Clean Holdings In
Alpha & Omega Semicondu	Dialog Semiconductor PL	MediaTek Inc	Sanken Electric Co Ltd	United Microelectronics
Ambarella Inc	Diodes Inc	Meyer Burger Technology	Semtech Corp	Universal Display Corp
Amkor Technology Inc	Disco Corp	Microchip Technology In	Shanghai Fudan Microele	Veeco Instruments Inc
ams AG	Entegris Inc	Micron Technology Inc	Silicon Laboratories In	Vishay Intertechnology
Analog Devices Inc	FormFactor Inc	Monolithic Power System	Silicon Motion Technolo	Xilinx Inc
Applied Materials Inc	Himax Technologies Inc	NeoPhotonics Corp	Siltronic AG	Xperi Holding Corp
ASE Technology Holding	Ichor Holdings Ltd	Nordic Semiconductor AS	SK Hynix Inc	
ASM International NV	Infineon Technologies A	Nova Measuring Instrume	Skyworks Solutions Inc	
ASM Pacific Technology	Inphi Corp	NVIDIA Corp	SMART Global Holdings I	
ASML Holding NV	Intel Corp	NXP Semiconductors NV	Soitec SA	
Axcelis Technologies In	IPG Photonics Corp	ON Semiconductor Corp	STMicroelectronics NV	
BE Semiconductor Indust	KLA Corp	Onto Innovation Inc	SUESS MicroTec SE	
Broadcom Inc	Kulicke & Soffa Industr	Oxford Instruments PLC	SUMCO Corp	
Brooks Automation Inc	Lam Research Corp	Photronics Inc	Synaptics Inc	
ChipMOS TECHNOLOGIES In	Lattice Semiconductor C	Power Integrations Inc	Taiwan Semiconductor Ma	
Cirrus Logic Inc	MACOM Technology Soluti	Qorvo Inc	Teradyne Inc	

Data Set
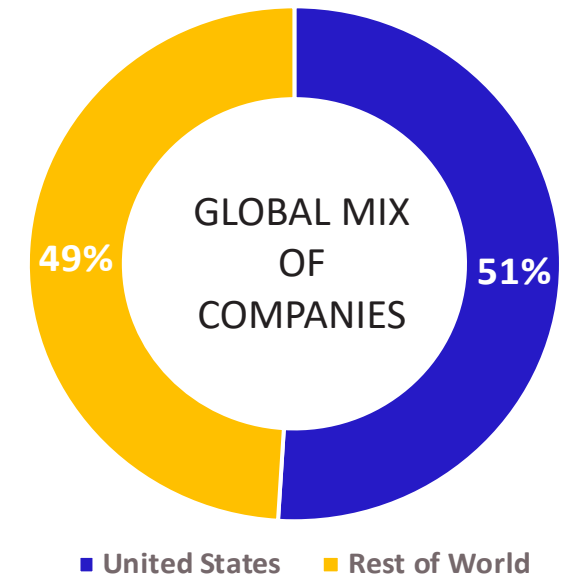## *Company distribution*

BY ANNUAL REVENUE

103 TOTAL COMPANIES

9
8
7
17
13
49

- >=$25B
- $10B - $25B
- $5B - $10B
- $2B - $5B
- $1B - $2B
- <$1B

MEDIAN REVENUE = $1,109M

BY SUB-INDUSTRY

103 TOTAL COMPANIES

42
61

- Semiconductors
- Semiconductor Equipment & Materials

GEOGRAPHIC REGION

GLOBAL MIX OF COMPANIES

49%
51%

- United States
- Rest of World

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Data Set
Index of key metrics included in this report

This report provides analysis of the following variables (and derivatives) for trailing twelve months (TTM) results and for the past ten years.

OPERATIONS	ASSETS	CASH FLOW	ROI	VALUATION
REVENUE	TOTAL ASSETS	OPERATING CASH FLOW	RETURN ON ASSETS (ROA)	MARKET CAPITALIZATION
GROWTH RATE	CASH AND CASH EQUIVALENTS	FREE CASH FLOW	RETURN ON INVESTED CAPITAL (ROIC)	ENTERPRISE VALUE (EV)
GROSS MARGIN	DEBT AND DEBT RATIOS	CAPITAL EXPENDITURES (CAPEX)	RETURN ON CAPITAL EMPLOYEED (ROCE)	MARKET CAP / REVENUE
SALES AND MARKETING	EQUITY	DAYS IN RECEIVABLES	ECONOMIC PROFIT (EP)	ENTERPRISE VALUE / REVENUE
GENERAL AND ADMINISTRATIVE	PROPERTY, PLANT, AND EQUIPMENT (PP&E)	DAYS IN PAYABLES	RETURN ON OPERATING ASSETS (ROOA)	MARKET CAP / EBITDA
RESEARCH & DEVELOPMENT	GOODWILL & INTANGIBLES	INVENTORY TURNS	RETURN ON FIXED ASSETS (ROFA)	ENTERPRISE VALUE / EBITDA
REVENUE PER EMPLOYEE	OPERATING ASSETS	CASH CONVERSION CYCLE	RETURN ON PHYSICAL ASSETS (ROPA)	MARKET CAP / NET INCOMEE
STOCK COMPENSATION	INVESTED CAPITAL			ENTERPRISE VALUE / NET INCOME
GROSS MARGIN ROI	CAPITAL EMPLOYED			
TURN AND EARN	INVENTORY			
	DEFERRED TAX ASSETS			
	RECEIVABLES			
	PAYABLES			

PROFIT
OPERATING PROFIT
NET OPERATING PROFIT AFTER TAXES (NOPAT)
EARNINGS BEFORE INTEREST AND TAXES (EBIT)
EARNINGS BEFORE INTEREST, TAXES, AND AMORTIZATION (EBITDA)
ADJUSTED EBITDA
NET PROFIT
TAX RATE

Notes:
1. For definitions and notes on these metrics and their use in this report, refer to the **Appendix**.

Data Set
Three different analysis approaches in this analysis

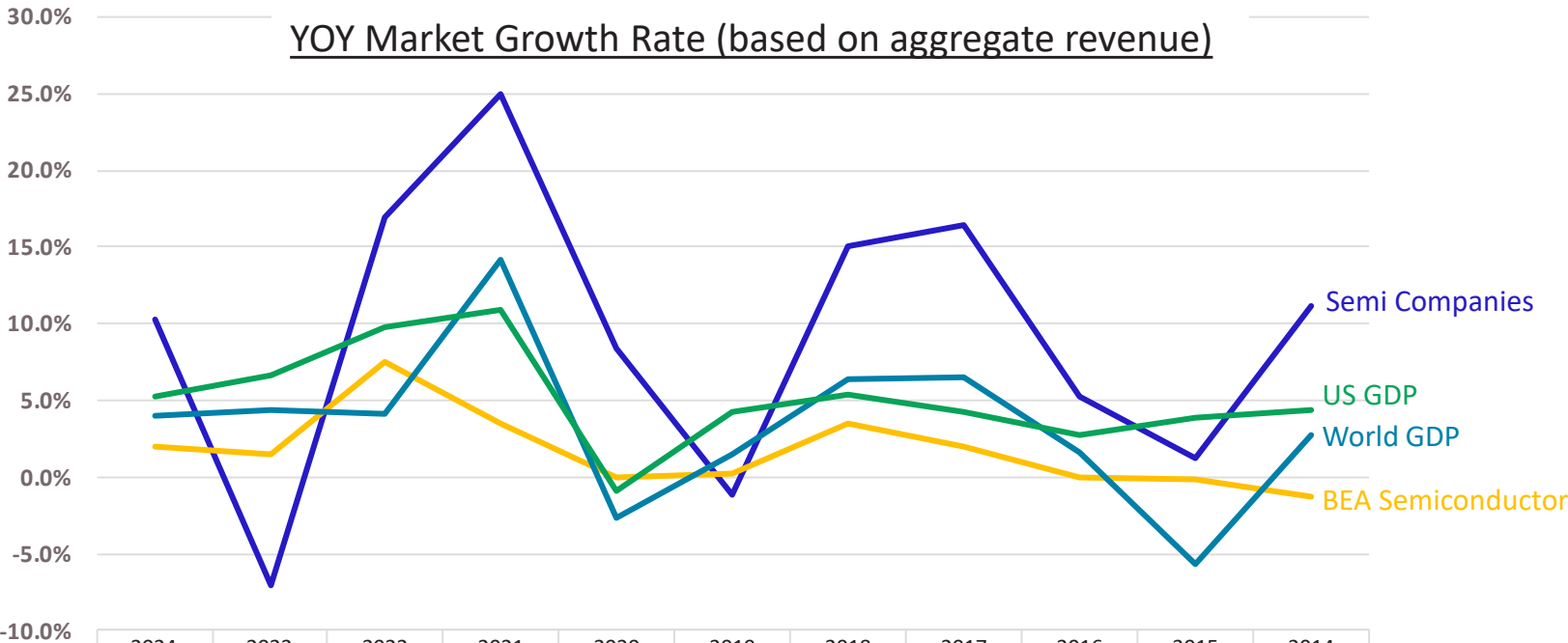| APPROACH	DESCRIPTION	EXAMPLE	GOOD FOR
1. Aggregate averages	Averages are computed by adding up all numbers from all companies. For example, the gross margin for the industry would be the sum of all revenue for all companies minus the sum of all COGS for all companies (divided by the sum of all revenue for all companies).	Average Gross Margin % = (sum of all revenues minus sum of all COGS) / sum of all revenues	Overall industry structure and operations; smooths outliers.
2. Averages of percentages	Averages are computed by taking the averages of all percentages for all the companies. For example, the average gross margin % is the sum of all gross margin %s for all companies divided by the number of companies.	Average Gross Margin % = (sum of all gross margin %s) / (number of companies)	Comparison across companies.
3. Quartile analysis	The market cap multiples of all companies are divided into quartiles. The operating characteristics of the top quartile companies are compared to the others. Likewise, measures for each company are divided into quartiles and the average market cap multiple within each quartile is shown.	1) Isolate each quartile of market cap multiples; compare gross margin of leaders to others. 2) Isolate each quartile of gross margin; display average market cap multiple within each gross margin quartile.	Understanding characteristics of leaders.

Overall Market

Summary of the market using the companies in this report as a proxy for the overall Semiconductor market. Charts in this section use the "aggregate averages" approach.

YOY Market Growth Rate (based on aggregate revenue)

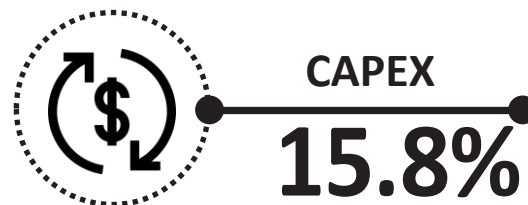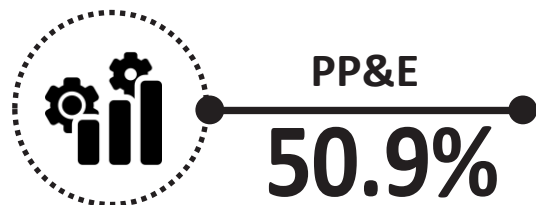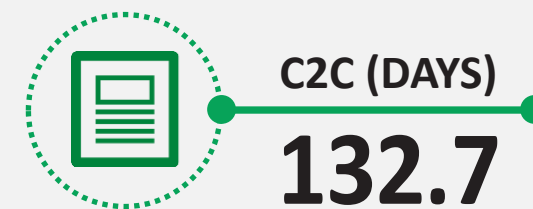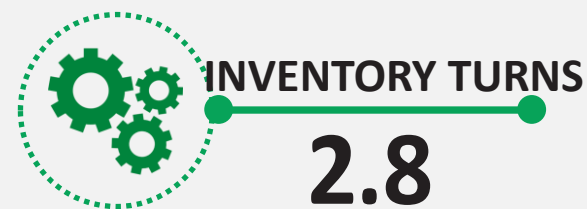|	2024	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014
Hitech Semi Companies	10.3%	-7.1%	17.0%	25.0%	8.4%	-1.1%	15.1%	16.5%	5.2%	1.3%	11.1%
BEA Hitech Semi Output	1.9%	1.4%	7.5%	3.4%	-0.1%	0.2%	3.5%	2.0%	0.0%	-0.1%	-1.3%
World GDP (current $)	4.0%	4.4%	4.1%	14.2%	-2.7%	1.5%	6.4%	6.5%	1.6%	-5.6%	2.8%
US GDP (current $)	5.3%	6.6%	9.8%	10.9%	-0.9%	4.3%	5.3%	4.3%	2.8%	3.9%	4.3%

NOTES & INSIGHTS

- Semiconductor market CAGR for the past decade was significantly higher than the global current dollar GDP growth rate. CAGR is skewed because of the volatility and dislocation caused by the pandemic.
- BEA numbers are for US domestic output only. They are shown here for comparison purposes only. The BEA also does not explicitly have a semiconductor industry; industry output is considered part of computers. These numbers probably understate semiconductor growth.

Notes:
1. "Semiconductor Companies" represents all companies in the data set for which there are year-over-year revenue numbers. The number of companies varies from year-to-year based on companies going public and some companies merging or being taken private as the decade progresses.
2. "BEA Semiconductor Output" growth is calculated from the US Bureau of Economic Analysis (https://apps.bea.gov/iTable/iTable.cfm?reqid=150&step=2&isuri=1&categories=gdpxind), GDP by Industry. Semiconductor output as defined here is based on output of the following sub-industries: Computer and electronic products. BEA updates its past numbers periodically, so past reports may not reflect the same past BEA numbers.
3. World GDP and US GDP numbers are sourced from The World Bank (data.worldbank.org)
4. World GDP and US GDP growth rates are based on *current* dollars. This means they have not been adjusted for inflation. *Current* numbers are used to ensure apples-to-apples comparisons with Semiconductor market growth rates. Note that GDP growth rates are typically reported in constant dollars pegged to a certain year in order to account for the effect of price inflation. Thus, GDP growth rates commonly reported in media are typically lower than those shown here.

Analysis Summary
Operational ratios based on aggregate data, TTM[1]

3-YEAR CAGR[2]
14.9%

GROSS MARGIN
52.3%

MARKET CAP[3]
12.8X

NET PROFIT
27.8%

R&D
13.2%

SG&A
7.2%

INVENTORY TURNS
2.8

C2C (DAYS)
132.7

PP&E
50.9%

CAPEX
15.8%

FREE CASH FLOW
21.1%

ROIC
22.4%
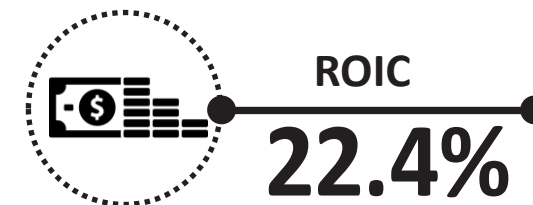
Notes:
1. All revenue and cost numbers are aggregate values for all companies for the trailing twelve months (TTM) as of the date on the cover of this report.
2. Growth rate is based on total dollars growth of the industry over the past four years.
3. Market capitalization ratio is aggregate market capitalization for all companies as of the date on the cover of this report divided by total revenue for all companies on TTM basis.

Overall Market
Historical key metrics based on aggregate data, past ten years

NOTES & INSIGHTS

- This chart shows the operational structure of the industry today and for the past decade.
- Most metrics were relatively steady up until recently when all forms of profitability, cash flow, and return on investment rose significantly. This shows the effect that AI is having on the industry.
- The semiconductor industry is a long-cycle boom-and-bust type industry, so it will be interesting to see how the recent AI boom plays out over the course of the next several years.

	METRIC	TTM	2024	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	AVG14-24	2013	2000
OPERATIONS	Growth Rate (3YRCAGR)	14.9%	9.8%	9.4%	12.9%	12.0%	9.0%	8.4%	9.9%	8.6%	5.2%	1.3%	11.1%	8.9%		
	Gross Margin	52.3%	47.3%	45.6%	48.5%	46.9%	44.2%	45.2%	46.8%	46.0%	44.2%	45.5%	45.2%	45.9%	42.8%	47.3%
	SG&A % of Revenue	7.2%	9.0%	9.0%	8.4%	8.6%	9.3%	9.7%	9.4%	10.5%	11.2%	10.6%	11.5%	9.8%	12.9%	12.4%
	R&D % of Revenue	13.2%	15.4%	15.4%	13.3%	13.3%	14.5%	14.6%	13.8%	14.6%	15.6%	15.1%	15.1%	14.6%	15.8%	10.0%
	Inventory Turns (COGS/Inv)	2.8	2.7	2.6	3.0	3.5	3.5	3.7	3.6	3.7	3.9	3.9	4.1	3.5	3.9	4.5
	Days in Inventory	131.2	133.9	137.8	121.1	104.4	103.5	99.4	100.1	97.9	92.6	94.5	90.1	106.8	92.8	81.6
	Revenue / Employee ($K)	$721	$551	$504	$563	$526	$429	$416	$435	$404	$364	$356	$364	$447	$328	$297
PROFIT & CASH FLOW	Operating Income	33.0%	24.2%	22.8%	28.3%	26.4%	22.0%	22.4%	25.0%	22.5%	18.8%	20.5%	20.1%	23.0%	15.9%	25.1%
	Net Profit	27.8%	17.3%	19.4%	24.9%	22.8%	19.6%	18.6%	21.2%	16.6%	13.4%	16.6%	15.6%	18.7%	11.6%	22.4%
	EBITDA	42.9%	56.7%	34.7%	39.6%	38.4%	35.9%	36.0%	37.2%	34.7%	30.9%	32.0%	31.2%	37.0%	27.4%	36.2%
	Operating Cash Flow	37.0%	33.3%	29.9%	33.3%	36.0%	34.2%	33.7%	32.6%	29.2%	28.3%	27.0%	27.1%	31.3%	25.3%	26.8%
	FCF % of Revenue	21.1%	17.2%	11.8%	15.5%	19.5%	20.5%	18.6%	19.2%	16.7%	15.4%	15.7%	14.8%	16.8%	12.4%	6.7%
	CAPEX % of Revenue	15.8%	16.1%	18.1%	17.8%	16.5%	13.7%	15.1%	13.3%	12.5%	13.0%	11.3%	12.2%	14.5%	12.9%	20.1%
	Stock Compensation	3.5%	4.1%	3.4%	2.7%	2.4%	2.5%	2.5%	2.1%	2.3%	2.5%	2.3%	2.1%	2.6%	2.0%	
	Days in Receivables	56.7	53.7	50.0	53.7	54.3	51.6	52.2	51.1	51.6	48.5	46.4	48.5	51.0	46.9	70.9
	Days in Payables	55.1	54.6	50.8	57.9	52.9	50.8	46.5	49.8	51.2	47.8	44.7	50.2	50.7	50.5	68.9
	Cash-to-Cash Cycle (Days)	132.7	133.0	137.0	116.9	105.9	104.3	105.1	101.4	98.3	93.2	96.2	88.4	107.2	89.2	83.6
ASSETS	Property, Plant, Equipment %	50.9%	61.8%	63.8%	51.9%	50.3%	54.8%	53.6%	43.7%	45.0%	45.4%	42.2%	41.8%	50.4%	45.8%	48.1%
	Cash % of Revenue	38.8%	42.0%	41.4%	36.9%	40.8%	40.7%	32.5%	33.5%	49.3%	44.7%	46.4%	40.5%	40.8%	42.3%	41.2%
	Debt % of Revenue	38.2%	50.7%	48.5%	42.3%	45.9%	51.0%	47.8%	36.6%	45.3%	44.4%	39.1%	31.9%	44.0%	27.9%	19.0%
	Goodwill and Intangibles % of	42.2%	57.6%	49.2%	44.6%	45.2%	50.4%	53.9%	41.1%	47.3%	44.1%	30.6%	23.4%	44.3%	23.3%	9.7%
ROI	ROIC	22.4%	13.9%	13.4%	19.2%	18.8%	15.2%	14.9%	19.5%	16.3%	13.1%	16.4%	19.7%	16.4%	14.7%	55.2%
	ROCE	23.1%	13.4%	13.0%	18.4%	17.6%	13.8%	14.8%	19.1%	14.3%	12.1%	14.5%	15.8%	15.2%	11.8%	21.7%
	ROA	14.9%	7.9%	9.3%	13.4%	12.4%	10.2%	10.1%	13.5%	8.9%	7.2%	9.8%	10.0%	10.3%	7.1%	15.7%
	ROOA	20.3%	12.3%	12.0%	16.8%	16.0%	12.9%	12.8%	16.7%	13.7%	11.8%	15.2%	17.3%	66.5%	12.9%	24.1%
	EP	17.8%	9.1%	4.1%	16.0%	15.9%	9.9%	7.9%	12.6%	9.7%	5.4%	8.6%	9.7%	9.9%	6.1%	17.0%

Analysis Summary

Charts that summarize key variables in the report. Charts in this section use the "averages of percentages" approach. In other words, it shows the averages of all percentages for all companies. (These numbers will differ from industry structural numbers in the previous section)

Analysis Summary
Average and median for different variables, TTM

The table below contains the average and median values for the 103 companies investigated. This shows that the average Semiconductor company operates with a gross margin of *40.3%*, spends *14.9%* of revenue on SG&A, *16.0%* on R&D, and has inventory turns of *3.4*, operating income of *10.8%*, net income of *7.8%*, free cash flow of *4.3%*, and return on invested capital of *12.1%*.

	REVENUE (TTM)		OPERATIONS				PROFIT AND CASH			
	Annual Revenue ($M)	3-Year CAGR	Gross Margin	SG&A	R&D	Inventory Turns	Operating Income	Net Income	Free Cash Flow	ROIC
Average	$8,449	3.7%	40.3%	14.9%	16.0%	3.4	10.8%	7.8%	4.3%	12.1%
Median	$1,109	0.6%	41.4%	13.8%	12.6%	2.5	11.4%	7.3%	11.3%	7.1%

Notes:
1. TTM = trailing twelve months. All revenue and cost numbers are based on trailing twelve months results as of the date on the cover of this report. This report provides the averages of the percentages of all companies, including outliers.
2. Growth rate is based on the past four years of financial results
3. All percentage numbers are a percentage of revenue. Average is the average of all the percentages for each of the companies.

Analysis Summary
Average values by revenue quartile, TTM[1]

Market cap multiples and gross margins are consistent across the revenue bands. Smaller companies spend more money on SG&A. Larger companies have larger operating margins, net margins, and ROIC.

All numbers are averages within each quartile

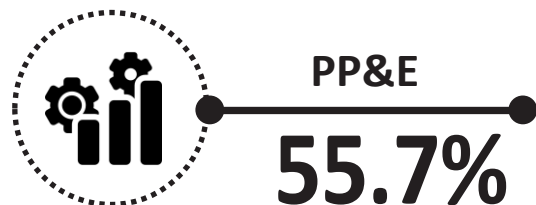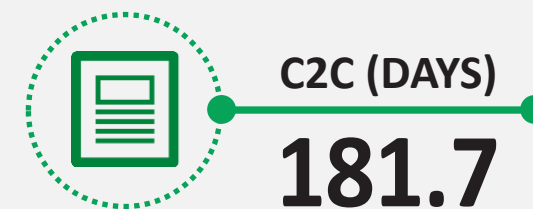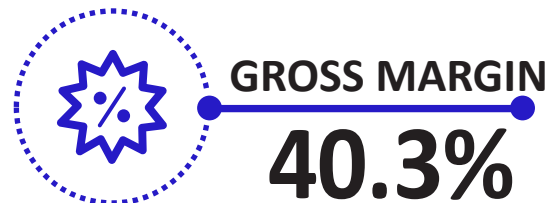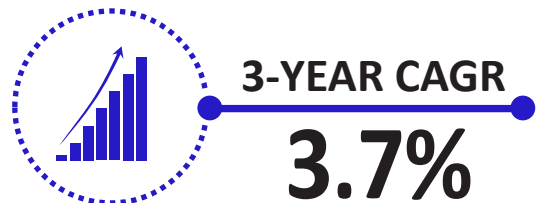|	#	REVENUE (TTM)		MKT CAP	OPERATIONS				PROFIT AND CASH			
		Revenue($M)	3-Year CAGR	Mkt Cap/ Revenue	Gross Margin	SG&A	R&D	Inventory Turns	Operating Income	Net Income	Free Cash Flow	ROIC
Quartile 4	26	$29,736	6.1%	9.6	47.4%	10.3%	15.3%	3.6	23.8%	18.7%	17.7%	23.8%
Quartile 3	26	$2,491	0.1%	4.0	33.4%	13.5%	9.6%	3.3	11.7%	9.6%	2.6%	11.9%
Quartile 2	25	$827	7.3%	7.4	41.2%	14.5%	17.5%	2.8	9.4%	5.8%	-5.4%	10.1%
Quartile 1	26	$450	1.4%	6.2	39.1%	21.4%	21.8%	3.7	-1.9%	-3.0%	2.1%	2.4%

REVENUE QUARTILES ($M)

Quartile 4 >= $4,187
Quartile 3 >= $1,109 , < $4,187
Quartile 2 >= $655 , < $1,109
Quartile 1 < $655

Notes:
1. TTM = trailing twelve months. All revenue and cost numbers are based on trailing twelve months results as of the date on the cover of this report. This report provides the averages of the percentages of all companies, including outliers.
2. Growth rate is based on the past four years of financial results
3. All percentage numbers are a percentage of revenue. Average is the average of all the percentages for each of the companies.

Analysis Summary
Average numbers for the entire data set, TTM[1]
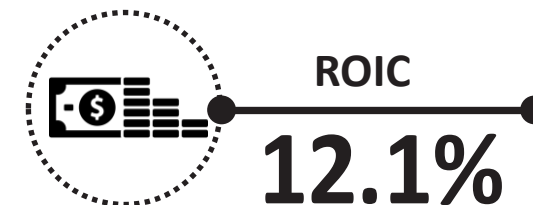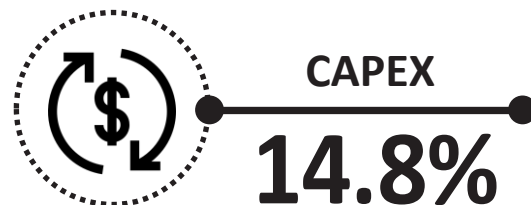
3-YEAR CAGR
3.7%

GROSS MARGIN
40.3%

MARKET CAP
6.8X

NET PROFIT
7.8%

R&D
16.0%

SG&A
14.9%

INVENTORY TURNS
3.4

C2C (DAYS)
181.7

PP&E
55.7%
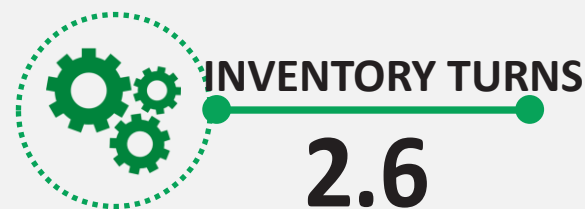
CAPEX
14.8%

FREE CASH FLOW
4.3%

ROIC
12.1%

Notes:
1. All revenue and cost numbers are based on trailing twelve months (TTM) results as of the date on the cover of this report for all companies in the data set.
2. All ratios shown here are averages of the ratios of each company.

Analysis Summary
Average numbers for the <u>top-quartile market cap[1] multiple leaders</u>

3-YEAR CAGR[2]
13.8%

GROSS MARGIN
60.1%

MARKET CAP
17.4X

NET PROFIT
24.4%

R&D
19.5%

SG&A
15.3%

INVENTORY TURNS
2.6

C2C (DAYS)
200.4

PP&E
23.7%

CAPEX
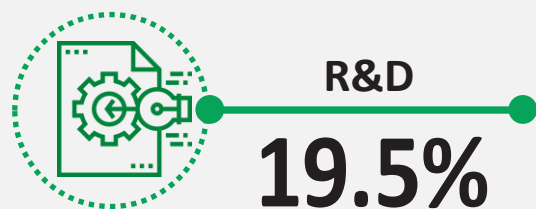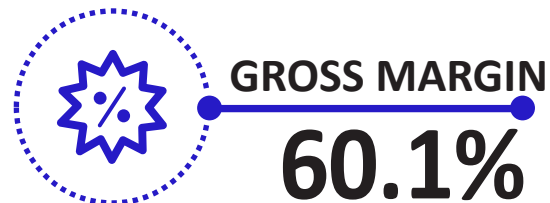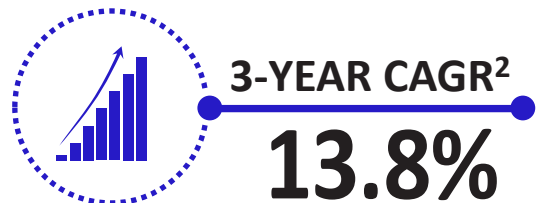## 7.5%

FREE CASH FLOW
25.4%

ROIC
29.1%

<u>Notes:</u>
1. All revenue and cost numbers are based on trailing twelve months (TTM) results as of the date on the cover of this report for all companies in the top quartile of market cap multiple performance.
2. All ratios shown here are averages of the ratios of each company.

Analysis Summary
Key metric benchmarks and relationship to market cap multiple

Average metric value within the quartile and corresponding average market cap within the quartile

n=103 METRIC	INDUSTRY BENCHMARKS			MARKET CAP MULTIPLE	
	Q4 AVG	MEDIAN	Q1 AVG	Q4 AVG	Q1 AVG
OPERATIONS 3-Year CAGR	25.3%	0.6%	-13.7%	12.0	3.6
Gross Margin	61.6%	41.4%	15.1%	14.8	2.2
SG&A	26.4%	13.8%	5.6%	9.6	6.2
R&D	33.5%	11.4%	4.0%	11.4	3.7
PROFIT Operating Margin	33.1%	11.4%	-12.4%	12.4	4.4
EBITDA Margin	40.5%	20.7%	-1.0%	10.4	4.1
Net Profit Margin	30.8%	7.3%	-16.7%	14.6	5.0
CASH Free Cash Flow	28.4%	11.3%	-31.5%	13.8	2.2
CAPEX % of Revenue	43.0%	6.4%	2.5%	4.7	7.0
PP&E (net) % of Revenue	147.0%	26.7%	11.2%	3.4	10.7
ROI ROIC % of Revenue	37.4%	7.1%	-5.1%	10.7	4.6
ROCE % of Revenue	33.6%	7.0%	-4.0%	12.9	5.0
ROA % of Revenue	20.0%	3.9%	-5.3%	12.9	5.0
EP % of Revenue	19.5%	0.3%	-20.7%	12.1	4.5
ROOA % of Revenue	43.1%	7.3%	-6.3%	12.5	4.6
ROPA % of Revenue	103.6%	15.4%	-22.4%	14.9	4.3
C2C Inventory Turns	7.0	2.5	1.3	4.8	7.8
Payables (days)	297.4	148.3	64.3	7.7	4.6
Receivables (days)	89.8	65.1	36.9	6.7	7.4
Cash-to-Cash (days)	116.9	152.8	71.1	4.8	5.9

← Gross margin is important to market performance, indicating product superiority and pricing power are paramount.

← All forms of profitability have the strong correlation to market performance.

← All forms of ROI are strong indicators of market performance.

← Inventory turns and cash-to-cash (days) correlate little or negatively with market performance

Notes:
1. All metric numbers are based on trailing twelve months (TTM) results as of the date on the cover of this report. Market capitalization numbers are as of the date on the cover of this report.
2. This chart uses the averages and medians of the percentages of each company within a quartile and across the entire data set. Q4=top quartile; Q1=bottom quartile.
3. Source of all data is Calcbench and YCharts and Worldlocity analysis.

Market cap multiple quartile comparison

This chart compares the operating characteristics of each market cap multiple quartile in order to glean insights into what cap leaders do differently. It summarizes the difference between the top and bottom quartiles in order to draw contrasts.

	n=103 METRIC	DATA SET AVG	QUARTILE (AVGS WITHIN EACH MKT CAP QUARTILE)				DIFFERENCE TOP-BOTTOM
			TOP (Q4)	Q3	Q2	BOTTOM (Q1)	
	Market Cap Multiple	6.8	17.4	5.7	2.8	1.1	15.8X
OPERATIONS	1-Year Growth	3.7%	13.8%	1.5%	1.8%	-2.7%	16.5 pps
	Gross Margin	40.3%	60.1%	42.5%	36.8%	21.6%	38.4 pps
	SG&A	14.9%	15.3%	15.6%	17.7%	11.3%	4.0 pps
	R&D	16.0%	19.5%	19.2%	17.8%	7.7%	11.8 pps
PROFIT	Operating Profit	10.8%	26.4%	8.7%	2.3%	5.4%	21.0 pps
	Net Profit	7.8%	24.4%	4.4%	-0.1%	2.1%	22.2 pps
	EBITDA	20.3%	32.4%	20.1%	13.3%	15.0%	17.4 pps
CASH	Inventory Turns	3.4	2.6	3.5	3.1	4.4	-1.8 Turns
	C2C Cycle (days)	181.7	200.4	182.8	187.1	155.6	44.7 Days
	Net Cash	11.4%	30.0%	14.6%	10.2%	-9.3%	39.3 pps
	CAPEX	14.8%	7.5%	25.0%	8.3%	18.4%	-10.9 pps
	Free Cash Flow	4.3%	25.4%	-7.0%	5.6%	-6.6%	32.0 pps
ROI	ROA	6.1%	15.7%	4.5%	2.2%	1.7%	14.0 pps
	ROIC	12.1%	29.1%	9.1%	4.3%	5.4%	23.7 pps
	EP	0.1%	13.2%	-0.2%	-9.4%	-3.6%	16.8 pps
	ROOA	13.9%	34.0%	10.3%	5.6%	5.4%	28.6 pps
	ROPA	29.7%	87.9%	17.1%	4.0%	8.5%	79.4 pps

NOTES & INSIGHTS

- Leaders have market cap multiples that are 2.6X average, and 15.8X laggards.
- Leaders have significantly higher gross margins and investments in R&D. This is perhaps a chicken-and-egg question: does the higher investment in R&D result in a higher gross margin product, or does the higher gross margin product allow for a higher investment in R&D? It is likely a symbiotic and self-reinforcing relationship.
- Leaders excel in all forms of profitability, cash flow, and return on investment.
- Paradoxically, cap leaders do not lead in inventory turns. Cap laggards are more likely to lead in inventory turns than cap leaders. This is likely because cap leaders are managing their supply chains as profit centers and cap laggards are solely focused on cost.
- All financial numbers are for the trailing twelve months as of the date on the cover of this report. All market cap numbers are as of the date on the cover of this report.

Appendix

Additional supporting material and notes.

1 **Primary data sources** for the analysis are YCharts and Worldlocity research using data publicly available through the Internet.

2 **Company data filtering** - Companies included in this analysis are filtered based on available financial, operational, and market cap data. Generally, companies must have revenue, COGS, and market cap data to be included in the analysis.

3 **Industry classification** - companies are classified to industries using 1) Morningstar industry classifications; 2) Global Industry Classification System (GICS); and 3) Manual adjustments in those cases where either Morningstar is incorrect, GICS is incorrect, or both are incorrect. Both Morningstar and GICS are incorrect in a small percentage of cases. An attempt has been made to correct all of these, but there are probably still a small number of companies that may misclassified.

4 **TTM** = trailing twelve months = last four fiscal quarters.

5 **Weighted Average Cost of Capital (WACC)** = represents a company's average cost of raising funds from both debt and equity, weighted by their portion of the firm's capital structure. It's essentially the company's hurdle rate for new investments. WACC for each industry and each year is as reported by Aswath Damodaran, NYU Stern Business School. This is reported annually in January using data from the previous year. For a given year, this analysis uses the values reported in January for that year and uses the data set for US companies, only. Global WACC numbers for each industry will be slightly higher.

6 **Tax Rates** used in any financial calculations (for example NOPAT) are global industry averages for the money-making companies in each industry, as reported each year by Aswath Damodaran, NYU Stern Business School. This is reported annually in January using data from the previous year. For a given year, this analysis uses the values reported in January for that year.

7 **Gross Profit** = Revenue minus Cost of Goods Sold (COGS)

8 **Gross Margin** = Gross profit divided by Revenue

9 **Operating Income** = Gross profit minus operating costs, which typically include sales and marketing, general and administrative, and research and development costs.

10 **EBIT** = earnings before interest and taxes

11 **EBITDA** = earnings before interest, taxes, and amortization. EBITDA is calculated as operating income plus depreciation and amortization.

12 **Adjusted EBITDA** = EBITDA plus stock compensation.

13 **Net Operating Profit After Taxes (NOPAT)** = Operating Income times (1 minus Tax Rate). NOPAT is used in some ROI equations to focus on the operating aspects of a company, while also recognizing the reality of taxes.

14 **Free Cash Flow** = operating cash flow minus CAPEX.

15 **Cash** = cash, cash equivalents, and marketable securities.

16 **Non-Operating Cash and Cash Equivalents** is calculated as Cash and Cash Equivalents minus 3.5% times Revenue. The assumption here is that 3.5% of revenue is the amount of cash needed to fund opeations. The amount of operating cash for each company and industry may be different, but this rule of thumb is used for scalability across a large number of companies. In those cases where the Non-Operating Cash and Cash Equivalents results in a negative number, it is set to zero.

17	**Total Debt** = short-term debt, the current portion of long-term debt, long-term debt, borrowings under credit facility, capital lease obligations, convertible notes, and deferred rent.
18	**Operating Assets** = total receivables + inventories + deferred tax assets + Net PP&E + goodwill and intangibles. Operating assets are the assets needed to drive operations in a manufacturing, distribution, retail, transportation or other company engaged in supply chains. Deferred Tax Assets are considered part of operating assets since they were created by opeating activities and represent a future tax savings. Receivables are included because they are a direct result of operations. Goodwill and Intangibles are included because they are presumably used in the producing, selling, and distributing goods and services.
19	**Capital Employed** = Total Assets minus Current Liabilities, or alternatively, Shareholders Equity plus Non-Current Liabilities. This is intended to capture all the long-term capital invested in the business.
20	**Invested Capital** = Total Debt + Total Equity minus Non-Operating Cash and Cash Equivalents. In those cases where equity is negative, equity is set to zero. Invested capital is intended to represent the amount of capital invested in a buinsess by shareholders and debtholders. Non-operating cash is subtracted in order to arrive at the net debt invested in the business.
21	**Return on Assets (ROA)** = Net Income divided by Total Assets.
22	**Return on Invested Capital (ROIC)** = NOPAT (defined above) divided by Invested Capital (defined above). If a company's Invested Capital is negative, ROIC is meaningless and not calculated for that company.
23	**Return on Capital Employed (ROCE)** = EBIT (defined above) dividied by capital employed (defined above). If a company's Capital Employed is negative, ROCE is meaningless and not calculated for that company.
24	**Economic Profit (EP)** = Net Operating Profit after Taxes (NOPAT) minus Weighted Average Cost of Capital (WACC) times Invested Capital. WAAC, NOPAT, and invested Capital are defined above. EP is also known as Economic Value Added (EVA). EVA is a trademark of Stern Value Management. A company is deemed to be creating value if its EP is greater than zero. The idea is that the cost of capital represents a hurdle rate for investors and debtholders and must be exceeded by NOPAT in order for value to be created.
25	**Return on Operating Assets (ROOA)** = NOPAT / Operating Assets. ROOA is a measure of operational efficiency and can be used to compare the supply chain operational efficiency of different companies.
26	**Return on Fixed Assets (ROFA)** = Operating Profit divided by Property, Plant, and Equipment (PP&E, net of depreciation). ROFA is sometimes used as supply chain metric to show how much operating profit is being generated by a company's fixed assets.
27	**Return on Physical Assets (ROPA)** = Operating Profit divided by (PP&E (net) plus Inventory). ROPA is sometimes used as a supply chain metric to show how much operating profit is being generated by a company's physical assets.
28	**Inventory Turns** = COGS (end of period) divided by Inventory (end of period). A more precise definition is the average COGS over a period divided by average Inventory over that period. In this analysis, the end of period (typically the end of the most recent fiscal year, or trailing twelve months (TTM)) is used for ease of calculation and scalability.

29	**Gross Margin ROI = GMROI** = Gross Profit divided by Inventory. GMROI is typically used in the retail industry to understand how much gross profit is generated by a certain amount of inventory. Diferent product lines and products will have different GMROI values. In this analysis we use Gross Profit and Inventory at the end of a reporting period. A more precise calculation would use the average inventory over the reporting period.
30	**Turn and Earn** = Inventory Turnover times Gross Margin %. Turn and Earn is a metric that shows the tradeoff between inventory turns and gross margin. High gross margin targets with low inventory turns can result in the same results as low gross margin targets with high inventory turns. In the automotive retail business, "Earn" has a double meaning - it also means that the faster you turn inventory, the more product allocation you will "earn" from the manufacturer.
31	**Cash-to-Cash (C2C)** = Days in Receivables plus Days in Inventory minus Days in Payables. This is also called the Cash Convesion Cycle (CCC).
32	**Capital Expenditures (CAPEX)** = gross CAPEX, in other words it does not net out the sale of assets.
33	**Enterprise Value (EV)** = Market Capitalization plus Total Debt minus Cash.
34	**Mergers and Acquisitions** - In the case of companies formed from mergers, the oldest company is used to designate the resultant company founding year.
35	**Depreciation** is the systematic allocation of a fixed asset over its useful lifetime. The useful life of production and other machinery for accounting purposes is typically somewhere between 7 and 20 yars. Enterprise software, can be a significant part of the fixed asset base of companies, typically has a useful life for depreciation purposes of 3-10 years. This does not apply to Software as a Service (SaaS) or subscription software, which are treated as an expense, not an asset that has to be depreciated.
36	**Amortization** is the expensing of the cost of an intangible asset over time. Intangible assets include goodwill, intellectual property, patents, and software. Amortization is a non-cash charge that shows up in various elements of a company's income statement. The costs of obtaining a contract - typically sales commissions - are also amortized under accounting standards ASC 606 and IFRS 15.
37	**Allocation of Depreciation and Amortization** - Most companies allocate depreciation and amortization costs to individual cost buckets, including COGS, SG&A, and R&D. This is done based on where the depreciated or amortized asset is used. For example, depreciation of manufacturing equipment, which is used in production, would be allocated to COGS, while the amortization of intellectual property used in sales and marketing would be allocated to that cost bucket. Some subset of companies explicitly show depreciation and amortization costs on the income statement after the other cost buckets. No attempt was made to reallocate these costs for this subset of companies. This has the effect of understating COGS, SG&A, and R&D for those companies.
38	**3-Year Compound Annual Growth Rate (CAGR)** is based on the past four years of annual financial data.
39	**Market Capitalization** is based on the stock prices as of the date on the cover of this report for each company. Market Cap to Revenue Ratios or Enterprise Value to Revenue ratios are market capitalization divided by trailing twelve months (TTM) revenue through the most recently reported fiscal quarter as of the date on the cover of this report.

40	**Mergers and Acquisitions** - Individual company YOY numbers may be distorted due to mergers and acquisitions. No attempt has been made to normalize for mergers, acquisitions, and divestitures.
41	**All Financial Data** is based on what has been reported as of the date on the cover of this report. Data is captured for Trailing Twelve Months (last four quarters) and for the last fiscal year that occurred on or before the calendar year end (12/31) for each year.
42	**Historical data** is the past eleven fiscal years for all companies. The number of companies grows for each year in the historical analysis, as more companies became public across the decade.
43	**Aggregate Inventory Turns** is calculated as follows: sum of all COGS for all companies in an industry divided by sum of all inventories for all companies in an industry at the end of the calendar year or for the most recent trailing twelve months (TTM). The aggregate COGS number that is used for aggregate inventory calculations is the sum of COGS for those companies that have non-zero inventory. This has been found to be more accurate due to missing inventory data for certain companies in out years (several years beyond the present).
44	**Research and Development** - A good percentage of companies in various industries do not report research and development separately on their income statements. In these companies, R&D is included in COGS. This has the effect of overstating COGS for those companies, which by extension understates their gross margins and overstates their inventory turns. Aerospace & Defense, Automotive, Industrials, and Hitech Electronics are the industries in which a significant number of companies do not report R&D separately, and in which R&D represents a significant percentage of revenue. R&D as a percentage of revenue in these industries can average 4%-8% of revenue. This can result in understating aggregate and average gross margins for an industry and overstating aggregate and average inventory turns. No attempt has been made to normalize for this effect (it will be studied in later reports). Other industries that have significant R&D such as Hitech Semiconductors, Pharmaceuticals, and Medical Equipment have this problem, but only for a small percentage of companies that do not report R&D.

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