
SEMICONDUCTORS: THE KEY TO UNLOCKING TODAY'S GLOBAL ECONOMY

Christopher Gannatti – Global Head of Research
01/25/2023

At WisdomTree, we spend a lot of time writing about resources. There are certain [commodity](#) resources that will help the world transition to greener sources of energy. There are certain food resources, necessary to feed a growing global population. There are certain monetary resources that allow different economies to secure different standards of living for their populations.

But one thing that events of 2022 made clear was that access to one type of thing—[semiconductors](#)—might be the key that unlocks further participation in the world's economy.

Follow the Money

“Follow the money” is an expression frequently used as a tool to help an observer better understand what is important in a given economic system. A quick look back at 2022 shows us¹:

- In September 2022, Intel pledged to invest at least \$20 billion in two new factories in Ohio to make semiconductors.
- In October 2022, Micron indicated it expected to spend \$20 billion by the end of the decade—and eventually perhaps \$100 billion over time—on a new manufacturing site in upstate New York.
- In December 2022, Taiwan Semiconductor Manufacturing Co. (TSMC), indicated a plan to increase investment in Arizona to around \$40 billion and build a second factory to create advanced chips.
- U.S. companies, generally, have pledged nearly \$200 billion for chip manufacturing projects since early 2020.
- China is working on a more than 1 trillion yuan (roughly \$143 billion) support package for its semiconductor industry, seeking to counter the impact of U.S. restrictions.²

On September 30, 2022, we had [Chris Miller, author of the recent bestselling book *Chip War, on the Behind the Markets* podcast](#). Chris' book gives an excellent historical foundation to help in understanding where we are today—that access to cutting-edge semiconductors is deemed to be the primary determinant in participating in the next phases of global economic growth during the 2020s. In his book, you see how this dynamic impacted³:

1. The Cold War—namely how the U.S. was able to allocate resources in ways that promoted the miniaturization of semiconductor technology, while the Soviet Union was unable to keep up.
2. The current dynamics we are seeing with China versus the United States—there are certain links in the semiconductor value chain that are currently in U.S. control, which means the U.S. can denote certain types of technologies that it doesn't want to end up in China. While it doesn't mean that China will never gain these technologies on its own, the degree of expertise required to attain them is expected to take both massive financial resources and years of time.

3. Japan's rise in the 1980s and subsequent stagnation, more or less, since then—Japan's companies went all-in on memory chips, which was deemed prescient in the 1970s and 1980s. Intel CEO Andy Grove's move toward logic chips—what we think of as central processing units (CPUs) today—was viewed as an existential bet. When the market shifted to valuing CPUs more highly and memory chips became commoditized, Japan was flat-footed.

4. Weapons—in recent military conflicts, one can see a notable difference, for instance between the NATO-supplied weapons Ukraine is using and Russia's standard arsenal. There is a reason why Ukraine has had the success that it has, despite its apparent disadvantages in terms of military might.

Illustrating the Cyclicity of Semiconductors

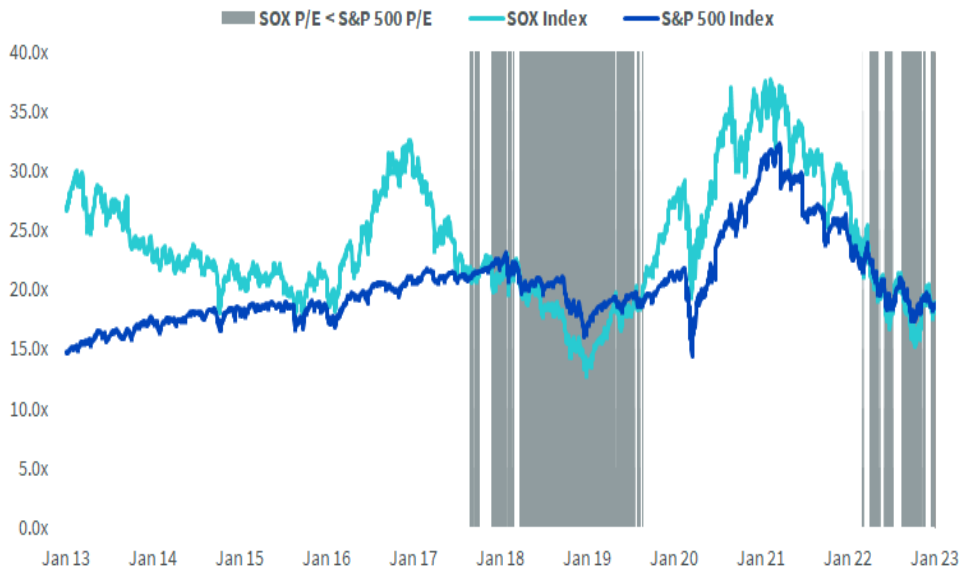
Even if people read the above and agree about the world's focus on semiconductors, the recent equity market performance of many of the stocks has been quite poor. While we wouldn't say we could pick the bottom, be it in the performance of semiconductor companies or really any others, it is always important to consider the larger context. Figure 1 looks at the [PHLX Semiconductor Sector Index \(SOX Index\)](#) to give an illustration of the [valuation](#) of semiconductor stocks.

- The run up in valuation of semiconductor stocks between roughly January 2019 and roughly January 2021 was significant. We see the [trailing price-to-earnings \(P/E\) ratio](#) go from a bit below 15.0 times to a bit about 35.0 times. This is possibly one reason why we've seen such a correction. The market seems to fluctuate around an average somewhere between 20.0 and 25.0 times—in each case when it has gotten above those levels, it has ultimately come back.

- The last time the P/E ratio of semiconductor companies was below that of the [S&P 500 Index](#) for a bit of time, it was followed by a run up in valuation. We cannot say for sure that this will always be the case, but we can note that the business activity of the companies does tend toward a boom-and-bust pattern. Demand outpaces supply, there is capital spending, capacity increases, and then eventually supply outpaces demand. Then, prices drop, capital expenditures go down and inventories eventually drop. And the cycle repeats and repeats.

- The difference, now, if there is one, is that interest rates are much higher and we are faced with what may be a general global recession. It doesn't mean we need semiconductors any less in the medium to long term, but it may impact the speed with which we work through this cycle. Short term, we may see a lot of [volatility](#), even if we believe in the long term, we could be looking at a strong opportunity.

Figure 1: Semiconductors Have a History of Trending Ups and Downs with Respect to Valuation (4/1/13–1/6/23)



Sources: WisdomTree, Bloomberg, 1/4/13–1/6/23. SOX Index is the Philadelphia Stock Exchange Semiconductor Index. P/E ratio stands for the trailing 12-month price-to-earnings ratio.

Thematic Universe or Semiconductor Universe?

In 2021, WisdomTree put together its [Thematic Universe](#)—a classification system through which we are able to look at sensible groupings of thematic investment strategies. This is really our attempt to bring orderly updates to the gigantic menu of options that growth-oriented equity investors face today.

Among our more than 40 different thematic sub-clusters, shown in figure 1, we pose one simple question: Can you find even one of these topical areas that could bring scale and excel WITHOUT making use of semiconductors?

The diversity of semiconductors is truly astonishing. Certain parts of our daily lives are being facilitated by older, less capable semiconductors, while other parts are being powered by chips much closer to the cutting edge. If anyone is thinking about smartphones, the more capable models of the iPhone 14 are running 4 nanometre chips, which is close to the most advanced level the world can currently make.⁴

Figure 2: WisdomTree’s Thematic Universe

Technological Shifts		Demographic & Social Shifts		Geopolitical Shifts		Environmental Pressures	
Disruptive Technologies	Hyper Connectivity & Digitalization	Demographic Shifts	Social Shifts	Globalization	Multi-Polarity	Climate Change & Sustainability	Limited Resources
Artificial Intelligence & Big Data	Cloud Computing	Aging Population	Education	Global Logistics	China's Rise	Decarbonization	Agriculture
Rise of China Tech		Millennials & Gen Z	Equality, Inclusion & Diversity		Polarization	Protect Biodiversity	Natural Resources
Blockchain	Cybersecurity		Rise of the Middle Class		Rise of Tension	Sustainable Mobility	
Health Tech	Digital Health		Rise of EM Consumer			Sustainable Energy Production	
Industry 4.0	Digital Infrastructure		Wellness			Sustainable Energy Storage	
Next Gen Communications	Fintech & Digitalization of Finance					Sustainable Food	
Robots & Automation	Gaming & Entertainment					Sustainable Cities	
Semiconductors	Internet of Things					Sustainable Resource Management	
Smart Materials & Nano Tech	Metaverse					Extreme Events	
Space	Platforms & Digital Markets						
	Social Media & Media						

Source: WisdomTree. Classification as of WisdomTree's quarterly market analysis, 9/30/22. Darker shaded boxes indicate areas where WisdomTree has a thematic strategy that may reasonably be considered as part of that grouping.

We would make sure to note, even if each of the clusters requires semiconductors, that not all of the clusters would require access to the world's MOST ADVANCED semiconductors. You might have seen the articles about the U.S. restricting Nvidia from selling its A100 chips to China. But when people are unable to source new vehicles because of a lack of semiconductors, it wouldn't be correct to assume that most chips in cars are on the same level of the A100. There are chips that could cost more than \$1,000, and there are chips that can cost closer to \$1—and everything in between.

2023—An Entry Point for Semiconductors (or Related Thematic Strategies)?

In 2022, we spent a lot of time talking about [cybersecurity](#). Even if the share prices of the companies, generally, did not perform well, the story of cybersecurity being a necessity was and remains very clear. We argue that, if we continue to live in a world where electronics are touching our lives many times daily, the story of semiconductors being a necessity is even clearer. However, even if we can make a case that we always need semiconductors, the share price performance of the companies is still not always positive.

As we noted earlier, semiconductors have historically been characterized by a high degree of cyclicity—meaning lots of booms and busts as opposed to a path of steadily increasing returns. Both 2019 and 2020 were quite positive years, leading to companies increasing capital expenditures, which leads to increasing the supplies of

semiconductors, which eventually leads to supply outpacing demand and prices of different chips falling. All semiconductors are not created equal—there is one source of demand for the Nvidia A100 chips used in datacentres to train the most advanced [artificial intelligence \(AI\)](#) models, whereas there is a different source of demand for the inexpensive chips used in high volumes in the automotive industry. There were different arguments advanced about how in or out of sync the different types of semiconductor demand might or might not be,⁵ but the general trend of share price performance was more negative than positive in 2022.

Then, suddenly, in November 2022, we (and many others) saw Warren Buffett’s Berkshire Hathaway place an investment of more than \$4 billion in TSMC.⁶ Any investment in TSMC can have myriad underlying drivers, but, broadly speaking, most modern conveniences that we enjoy in the Western world would face significant headwinds without the benefit of TSMC’s products.

At WisdomTree, we can’t say we can call the bottom on semiconductors, but we can say that few things capture as much of the world’s focus...and money. We tend to like semiconductors tied to specific, advanced functions, like semiconductors specifically designed for autonomous driving applications or to aid in training advanced AI models. While people can decide on individual companies, we think that AI cannot exist without semiconductors, so it’s possible for those interested to gain diversified exposure to semiconductors participating in this specific area.

The [WisdomTree Artificial Intelligence and Innovation Fund \(WTAI\)](#) includes within its strategy a focus on specific semiconductor companies aiming to use their hardware to advance AI and deep learning.

¹ Source: Unless otherwise stated within these bullets, Don Clark & Ana Swanson, “U.S. Pours Money into Chips, but Even Soaring Spending Has Limit,” *The New York Times*, 1/1/23.

² Source: Julie Zhu, “Exclusive: China Readying \$143 billion package for its Chip Firms in Face of U.S. Curbs,” *Reuters*, 12/14/22.

³ Source: Christopher Miller, *Chip War: The Fight for the World’s Most Critical Technology*. Simon & Schuster, Inc. 2022.

⁴ Source: Cheng Ting-Fang, “TSMC Reaffirms ‘Commitment to Taiwan’ Despite U.S. Chip Push,” *Financial Times*, 1/3/23.

⁵ Source: Sundstrom et al, “Semiconductors: A Less Cyclical Future,” PIMCO Blog, 6/10/22.

⁶ Source: Eric Platt, “Warren Buffett’s Berkshire Hathaway Buys \$4bn Stake in Chipmaker TSMC,” *Financial Times*, 11/15/22.

Important Risks and Disclosure Related to this Article

There are risks associated with investing, including the possible loss of principal. The Fund invests in companies primarily involved in the investment theme of artificial intelligence (AI) and innovation. Companies engaged in AI typically face intense competition and potentially rapid product obsolescence. These companies are also heavily dependent on intellectual property rights and may be adversely affected by loss or impairment of those rights. Additionally, AI companies typically invest significant amounts of spending on research and development, and there is no guarantee that the products or services produced by these companies will be successful. Companies that are capitalizing on Innovation and developing technologies to displace older technologies or create new markets may not be successful. The Fund invests in the securities included in, or representative of, its Index regardless of their investment merit and the Fund does not attempt to outperform its Index or take defensive positions in declining markets. The composition of the Index is governed by an Index Committee and the Index may not perform as intended. Please read the Fund’s prospectus for specific details

regarding the Fund's risk profile.

Click [here](#) for a full list of WTAI's Fund holdings. Holdings are subject to change and risk.

For standardized performance and the most recent month-end performance click [here](#) NOTE, this material is intended for electronic use only. Individuals who intend to print and physically deliver to an investor must print the monthly performance report to accompany this blog.

Related Blogs

- + [What's Happening in Semiconductors—The Next Chapter](#)
- + [Many Megatrends Depend on Semiconductors. What's Happening in the Space?](#)

Related Funds

- + [WisdomTree Artificial Intelligence and Innovation Fund](#)
- + [WisdomTree Cloud Computing Fund](#)
- + [WisdomTree Cybersecurity Fund](#)
- + [WisdomTree Battery Value Chain and Innovation Fund](#)

View the online version of this article [here](#).

IMPORTANT INFORMATION

U.S. investors only: Click [here](#) to obtain a WisdomTree ETF prospectus which contains investment objectives, risks, charges, expenses, and other information; read and consider carefully before investing.

There are risks involved with investing, including possible loss of principal. Foreign investing involves currency, political and economic risk. Funds focusing on a single country, sector and/or funds that emphasize investments in smaller companies may experience greater price volatility. Investments in emerging markets, currency, fixed income and alternative investments include additional risks. Please see prospectus for discussion of risks.

Past performance is not indicative of future results. This material contains the opinions of the author, which are subject to change, and should not to be considered or interpreted as a recommendation to participate in any particular trading strategy, or deemed to be an offer or sale of any investment product and it should not be relied on as such. There is no guarantee that any strategies discussed will work under all market conditions. This material represents an assessment of the market environment at a specific time and is not intended to be a forecast of future events or a guarantee of future results. This material should not be relied upon as research or investment advice regarding any security in particular. The user of this information assumes the entire risk of any use made of the information provided herein. Neither WisdomTree nor its affiliates, nor Foreside Fund Services, LLC, or its affiliates provide tax or legal advice. Investors seeking tax or legal advice should consult their tax or legal advisor. Unless expressly stated otherwise the opinions, interpretations or findings expressed herein do not necessarily represent the views of WisdomTree or any of its affiliates.

The MSCI information may only be used for your internal use, may not be reproduced or re-disseminated in any form and may not be used as a basis for or component of any financial instruments or products or indexes. None of the MSCI information is intended to constitute investment advice or a recommendation to make (or refrain from making) any kind of investment decision and may not be relied on as such. Historical data and analysis should not be taken as an indication or guarantee of any future performance analysis, forecast or prediction. The MSCI information is provided on an "as is" basis and the user of this information assumes the entire risk of any use made of this information. MSCI, each of its affiliates and each entity involved in compiling, computing or creating any MSCI information (collectively, the "MSCI Parties") expressly disclaims all warranties. With respect to this information, in no event shall any MSCI Party have any liability for any direct, indirect, special, incidental, punitive, consequential (including loss profits) or any other damages (www.msci.com)

Jonathan Steinberg, Jeremy Schwartz, Rick Harper, Christopher Gannatti, Bradley Krom, Tripp Zimmerman, Michael Barrer, Anita Rausch, Kevin Flanagan, Brendan Loftus, Joseph Tenaglia, Jeff Weniger, Matt Wagner, Alejandro Saltiel, Ryan Krystopowicz, Jianing Wu, and Brian Manby are registered representatives of Foreside Fund Services, LLC.

WisdomTree Funds are distributed by Foreside Fund Services, LLC, in the U.S. only. You cannot invest directly in an index.

DEFINITIONS

Commodity: A raw material or primary agricultural product that can be bought and sold.

Semiconductor: A semiconductor is a material product usually comprised of silicon, which conducts electricity more than an insulator, such as glass, but less than a pure conductor, such as copper or aluminum. Their conductivity and other properties can be altered with the introduction of impurities, called doping, to meet the specific needs of the electronic component in which it resides.

PHLX Semiconductor Index (SOX): A Philadelphia Stock Exchange capitalization-weighted index composed of the 30 largest U.S. companies primarily involved in the design, distribution, manufacture, and sale of semiconductors.

Valuation: Refers to metrics that relate financial statistics for equities to their price levels to determine if certain attributes, such as earnings or dividends, are cheap or expensive.

Trailing Price-to-earnings (P/E) ratio: Trailing Price-to-earnings (P/E) ratio: Share price divided by trailing 12-month earnings per share. Lower numbers indicate an ability to access greater amounts of earnings per dollar invested.

S&P 500 Index: Market capitalization-weighted benchmark of 500 stocks selected by the Standard and Poor's Index Committee designed to represent the performance of the leading industries in the United States economy.

Volatility: A measure of the dispersion of actual returns around a particular average level.

Thematic investing: A form of investment which aims to identify macro-level trends, and the underlying investments that stand to benefit from the materialisation of those trends

cybersecurity: Refers to the measures taken to protect devices, networks, and data from unauthorized access and criminal use

Artificial intelligence: machine analysis and decision-making.