THEMATIC 2024 MID-YEAR UPDATE

Insights from BlackRock

iShares by BlackRock

Thematic update – What's next for AI and geopolitics?

Key takeaways

01

Finding leaders of tomorrow

Investors may want to look beyond today's market leaders to seek diversification and resiliency in their portfolios, uncovering underappreciated assets poised to benefit from mega forces that can potentially drive long term growth.

02

Artificial Intelligence (AI): A picks and shovels approach

Integration across industries is driving massive demand for AI's Infrastructure: data centers, semiconductors, and raw materials. This buildout, thought to continue through 2030, will require significant infrastructure investment, across semiconductors, energy, and metals like copper.

03

Geopolitics: Tech and supply chains at the center of a global election year

Geopolitical fragmentation requires an evaluation of overseas dependence and a focus on U.S. reshoring. Shifting supply chains and varied demographics create strategic prospects across markets.

> **"As the AI buildout propels a potentially historic capital expenditure cycle, investors could be poised to unearth opportunities across industries amid greater geopolitical fragmentation.**

Jay Jacobs
U.S. Head of Thematic and Active ETFs, at BlackRock

Seeking opportunities beyond today's market leaders

"In a market characterized by great dispersion, equity investors can look beyond recent market leaders to pinpoint beneficiaries both within and beyond mega-cap tech and AI"

Jeff Shen, PHD BlackRock Systematic Equities Co-CIO

U.S. and international equity markets have demonstrated resilience, flirting with all-time highs, despite significantly reduced expectations in the number of U.S. Federal Reserve (Fed) rate cuts in 2024 and lingering inflation worries. This performance, however, has been narrowly concentrated at both the stock and sector levels, including in AI, tech, and emerging markets.

We believe investors may want to look beyond today's market leadership to find underappreciated areas that may be well-positioned to benefit from powerful secular tailwinds, or mega forces, that can potentially drive long-term growth. In the short-term, we believe two mega forces, in particular, have the potential to reshape the global economy and could reach critical inflection points: 1) the transformative potential of artificial intelligence (AI) and it's catalyzation of a historic cycle of capital expenditure; and 2) the growing impact of geopolitics on trade and technology amid a wave of elections globally.

In our 2024 Mid-Year Thematic Update, we focus on these two mega forces and highlight where we believe the most compelling opportunities lie. Within AI, we look to the "picks-and-shovels" of this technology amid tremendous demand for hardware, digital infrastructure, and power. Within geopolitics, we look to potential beneficiaries of changing supply chains, including a domestic focus on tech and manufacturing, as well as emerging market up-and-comers.

Artificial Intelligence: Picks and shovels propel what could be the largest infrastructure investment in history

AI has transcended "buzzword status," with businesses across all sectors looking to quickly integrate the technology.. The reach of AI is enormous: it's estimated that over 80% of enterprises will have used generative AI by 2026, up from less than 5% in 2023, noting the technology can improve efficiency and enhance products & services[1]. Companies have different AI platforms to choose from (ChatGPT, Claude, etc), but virtually all paths of greater AI adoption are set to accelerate demand.

"2023 marked the onset of a new industrial revolution. We are now building ever-larger AI factories to manufacture intelligence. This buildout phase is only in its second year and I expect it to continue throughout the decade, to become the largest infrastructure investment in history"

Tony Kim, BlackRock Head of Fundamental Equities Global Technology

We are facing what may become one of the largest infrastructure efforts in world history, driven by the explosive growth of AI adoption. There is immediate and tremendous demand for data centers that must be built with AI workloads in mind, and the computing power and data storage necessary to support AI's growth. Jensen Huang, CEO of Nvidia, estimates that the shift from general-purpose computing to accelerated computing is expected to require at least US$1 trillion of investment , and believes we are only 5% into this buildout[2]. In our view, the market is underestimating the amount of money that will be spent on the development of data centers over the next 5-6 years.

Our Fundamental Equities team sees AI servers as costing roughly 40 times the cost of traditional data centers of the past and could require about US$10 billion-US$12 billion to build each gigawatt of additional data center power[3].

Despite their high cost, data centers are in high demand. The world's largest tech companies like Microsoft, Google, and Amazon are considered "hyperscalers" given their influence and abilities to shape AI's development[4], it's no surprise they are leading the data center buildout thus far. Microsoft alone is rumored to be spending US$100 billion on a single AI data center[5]. In time, we believe Tier 2 cloud providers, or those that are indirect partners of Microsoft, enterprises, and even sovereign nations will also increase their spending on construction for AI data centers.

The potential beneficiaries of this historic capex cycle are vast, ranging from operators and suppliers of data centers to a broad range of semiconductors, as well as electric power infrastructure and critical materials.

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Artificial Intelligence (AI)

Worldwide AI "chips" revenue is expected to jump to US$71 billion in 2024, a 33% surge from 2023[6].

Markets and headlines have largely focused on one type of semiconductor critical to AI called a Graphics Processing Unit (GPU), which performs complex computations in parallel. GPUs are crucial for training large language models or (LLMs), like ChatGPT. GPUs are not the only type of chip that may benefit from broader AI adoption. Additional potential beneficiaries include:

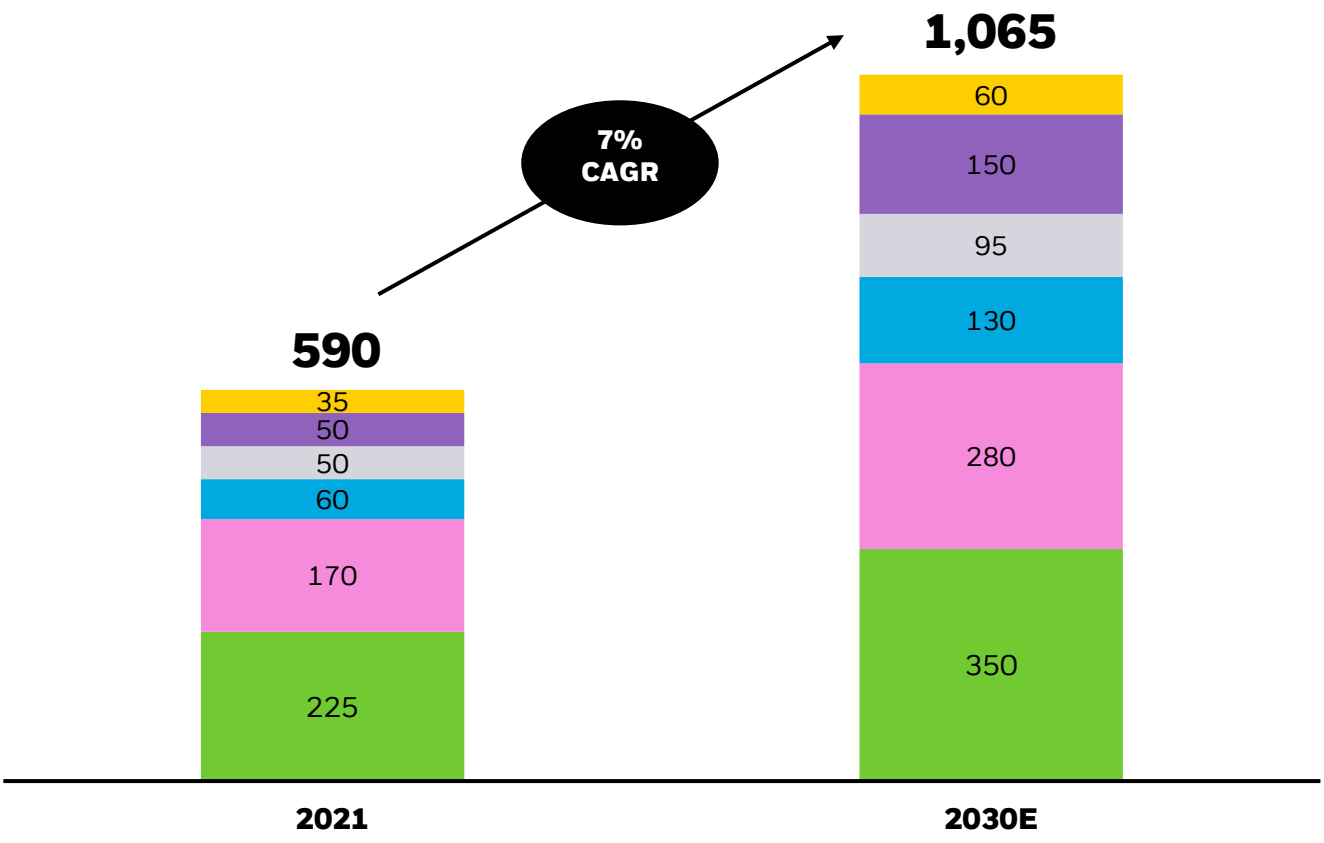
- CPUS, networking chips, and memory chips
- Semiconductor equipment and packaging
- Field-programmable gate arrays (FPGAs)
- Application-specific integrated circuits (ASICS)

FPGAs for example can handle various AI tasks simultaneously, such as real-time language translation and image recognition, due to their reprogrammable nature. While, ASICs are custom-built for single, specialized AI workloads, like neural network process in autonomous vehicles.

All the aforementioned potential beneficiaries play a critical role in the AI ecosystem.

We believe the AI opportunity is bigger than just one semiconductor company. The industry is projected to achieve US$1 trillion dollars in revenue by 2030, with computing and data storage driving 25% net growth[7]. As such, the broader semiconductor sub-industry could be well positioned amid this AI capex ramp up.

The global semiconductor industry is projected to reach US$1 trillion in revenue by 2030: Global semiconductor market value by vertical, US$ Billion



Source: McKinsey & Company "The Semiconductor decade: a trillion-dollar industry" as of April 1, 2022.. CAGR refers to the compound annual growth rate (%). For illustrative purposes only. Forward-looking estimates may not come to pass.

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Artificial Intelligence (AI)

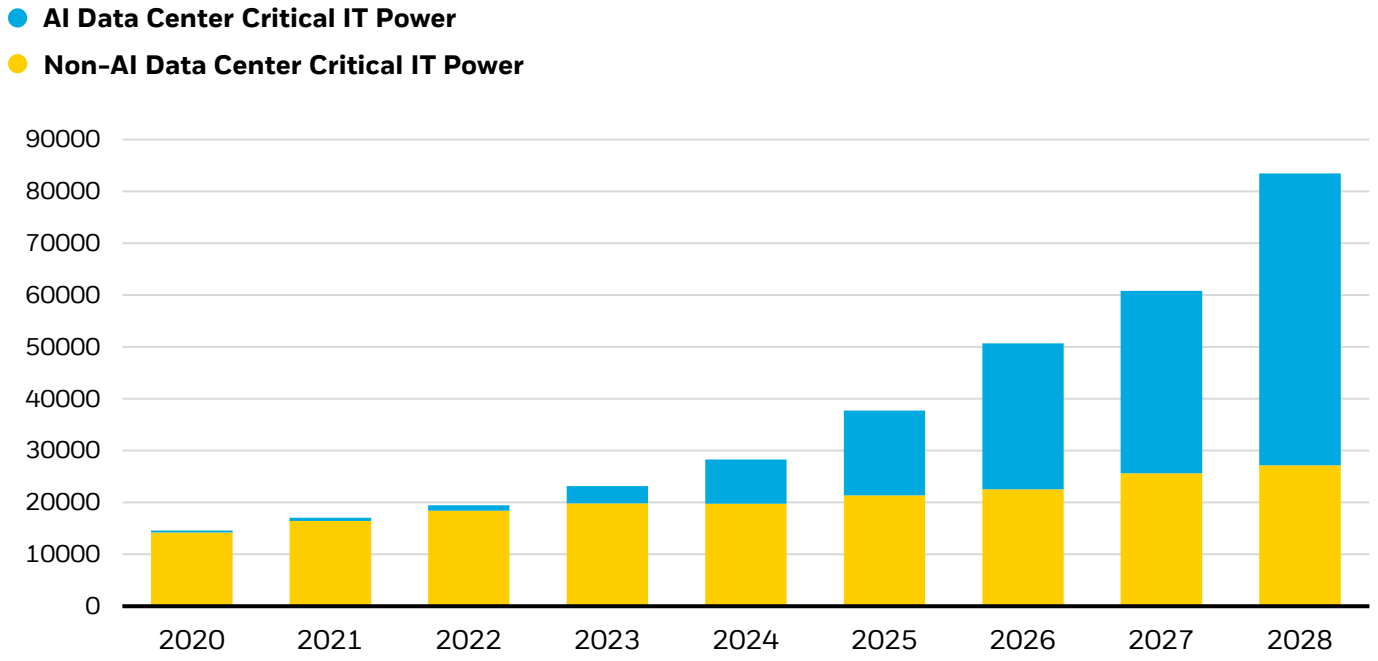
Power infrastructure may need an overhaul to keep up with AI energy demand

AI data centers cannot support the growth of the technology without another crucial input, power. Data centers need an abundance of inexpensive electricity to run powerful servers and keep them cool.

Critical IT power is defined as the usable electrical capacity at the data center floor which is available to computer servers and networking equipment that is housed within the server racks. The chart below shows a measure of the power capacity available to U.S. data centers (in megawatts). Critical IT capacity in the U.S. will need to triple from 2023 to 2027, and surge well beyond, to keep pace with rising demand – with the vast majority driven by AI's expansion[8].

The use of power toward AI data centers is expected to grow rapidly:

Global data center critical IT power (Megawatts-MW)



Source: Semianalysis.com, ""AI Datacenter Energy Dilemma- Race for AI Datacenter Space." As of March 13, 2024. For illustrative purposes only. Forward-looking estimates may not come to pass

Recent estimates by Goldman Sachs expect data centers to represent 8% of overall U.S. power demand by 2030. All of this means we may see a demand for power not experienced since the dotcom boom, that's because along with AI's rise, other power-hungry themes are emerging like electrification, Electric Vehicles (EVs), and a potential resurgence in U.S. manufacturing (driven by reshoring). Adding energy production capacity, improving power transmission, and scaling energy storage solutions will be key to meeting this explosion in energy demand[9].

Investors interested in the AI theme may consider the iShares Semiconductor Index ETF (**XCHP**), and the iShares Exponential Technologies Index ETF (**XEXP**).

Copper could be the chokepoint for meeting demand for energy infrastructure and digital infrastructure

Copper is an essential input to many aspects of energy infrastructure as well as digital infrastructure. Copper demand is growing rapidly; it's projected to rise nearly 20% by 2030 from 2023 under the IEA's Stated Policies scenario[10], which is based on the current policy landscape. While clean energy applications may be the biggest drivers of growth in copper demand, data centers will also play an important role. JP Morgan forecasts that the additional power consumption required by data centers could add another 2.6 million tons, to an already 4 million metric tons deficit by 2030.[11]

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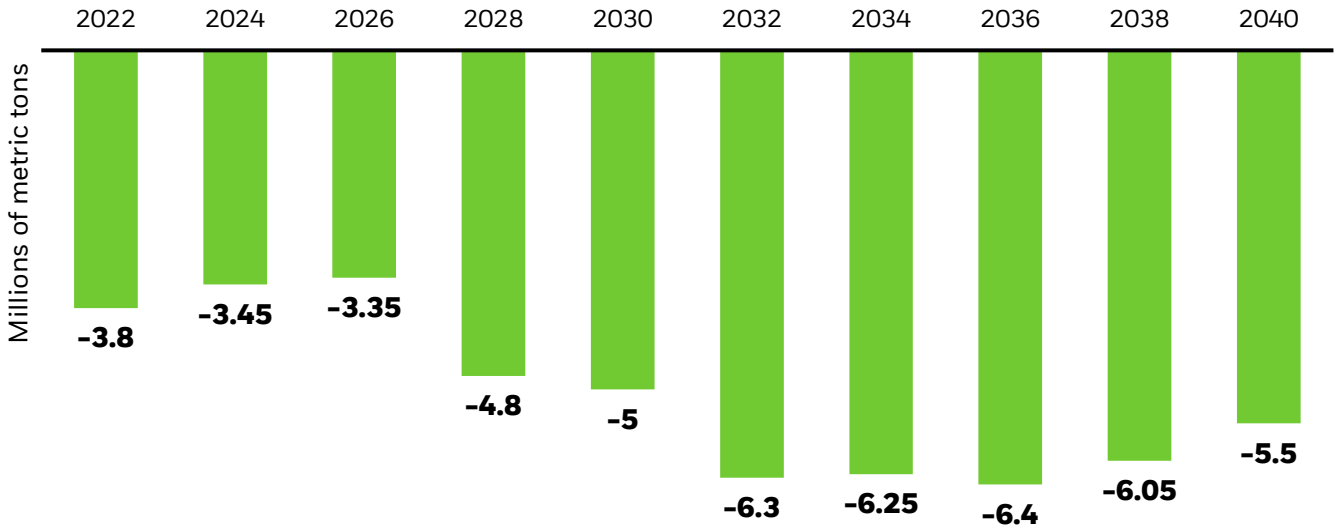
Although demand is rising, supply growth is not. World copper mine production is growing slower than expected, as it takes on average 10-20 years to permit and build a new copper mine[12]. Persistent copper supply deficits could become a chokepoint for AI's growth if energy infrastructure is unable to keep up with soaring power demand due to a lack of copper. This supply-demand imbalance could keep copper prices elevated, potentially benefitting copper miners around the globe.

Investors interested in copper may consider the iShares S&P/TSX Energy Transition Materials Index ETF (**XETM**)

The surging demand for copper has created a supply deficit:

Forecast supply deficit, refined copper



Source: BloombergNEF': "Surging copper demand will complicate the clean energy boom", 9/1/2022. Base case supply scenario, excluding recycled supply. For illustrative purposes only. Froward-looking estimates may not come to pass.

Geopolitics: Tech and supply chains at the center of a global election year

Geopolitics is increasingly important to the global economy, especially in a year where countries representing half the world's population are holding elections. Domestic and foreign policies have rapidly reshaped supply chains, with technology and manufacturing drawing the lion's share of attention amid intensifying global economic competition.

"Dispersion is accelerating for U.S. technology stocks at the intersection of innovation and geopolitics. Evolving dynamics in globalization and industrial policy have the potential to disrupt years of established hiring practices and growth strategies." – Linus Franngard, BlackRock Systematic Equities Portfolio Manager

The U.S. technology sector is highly globally-dependent, deriving large parts of its supply chains and nearly 60% of its revenue overseas[13]. Given its exposure to economic and national security, the technology sector is increasingly caught in the crosshairs of rising geopolitical tensions. Tariffs, export bans, and corporate fines are becoming commonplace between economic blocs as AI, data privacy, and semiconductor supply chains become increasingly important to economic policy and politicians' platforms. As such, we are seeing a clear dispersion forming between tech firms that are more exposed to geopolitical risks and those who aren't.

One way to measure exposure to geopolitical risk is to look at company hiring practices. In the chart below, we highlight global job postings by American tech companies. The yellow bars represent the firms with the most U.S.-centric job listings, and the purple bars represent the firms with the most international hiring practices. Over time, we see a clear and growing divide between tech firms that hired abroad and those who invested in maintaining a U.S.-focused workforce. In our view, this gap reveals a potential investment opportunity focused on identifying companies driving domestic self-sufficiency and mitigating geopolitical risks. In addition, we believe that firms with more U.S. centric hiring are potentially poised to benefit more from government support, such as tax credits or government contracts vs their more globally exposed peers.

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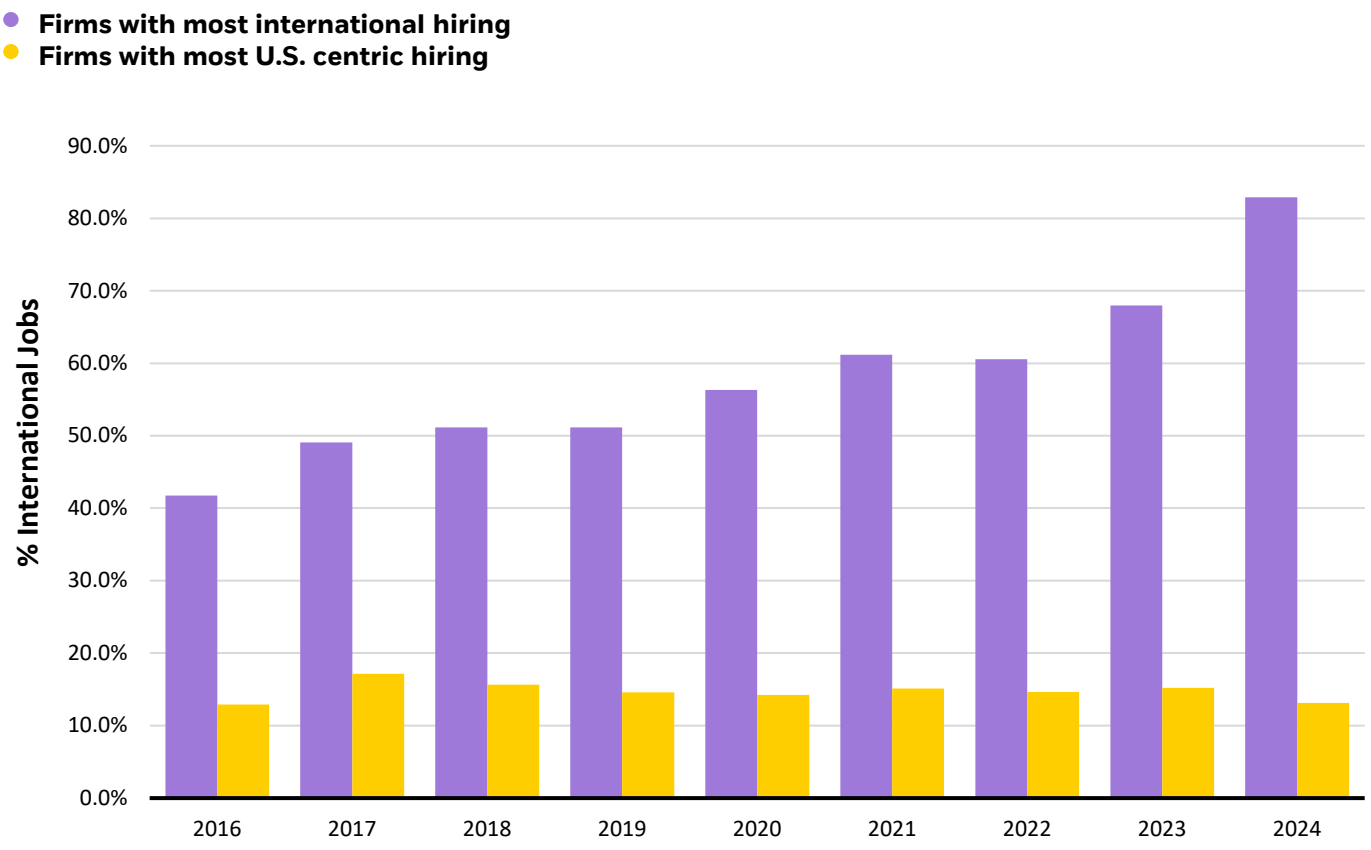
Geopolitics

Widening gap in international hiring trends of U.S. firms (2016–2024):
Historical percentage of jobs posted abroad



Source: BlackRock Systematic, Burning Glass Technologies, as of June 2024 using data as of May 2024. For illustrative purposes only

Looking beyond tech, manufacturing is enjoying a renaissance in the U.S. as policy efforts to "reshore" production are yielding powerful results.

"Reshoring is the process of bringing production or manufacturing back to the country of origin, previously outsourced to other countries. By bringing manufacturing back to the U.S., the risks of unstable supply chains, shipping delays, poor product quality, and trade tensions could dramatically decrease." – Tony DeSpirito, BlackRock Global Fundamental Equities CIO

Since the pandemic, the U.S. has implemented several policies to increase domestic production and reduce reliance on global supply chains. These policies, which include the Infrastructure Investment and Jobs Act, the Inflation Reduction Act, and the Chips and Science Act, are expected to lead to well over US$1 trillion in spending[14] to rebuild traditional infrastructure, support high-growth industries like EVs, and secure supply chains for key technologies like semiconductors.

While government stimulus often aims to drive domestic economic growth, reshoring policies may also increase the resiliency of the U.S. economy, via the reskilling of the manufacturing workforce, enhancing the quality and safety of products, and reducing the potential impact of geopolitical tensions on our ability to procure vital goods.

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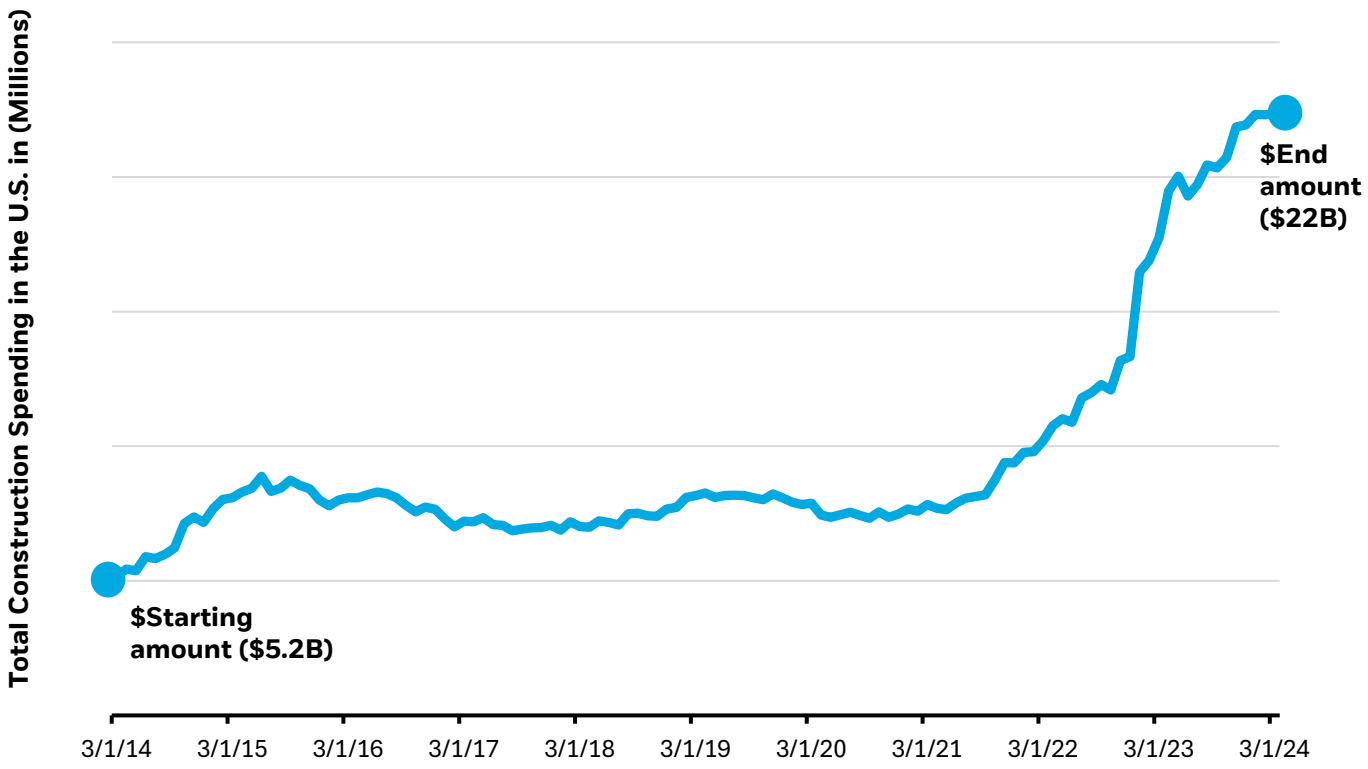
Geopolitics

Total construction spending in manufacturing in the U.S. has increased nearly 4X since 2014 (US$)



Source: Federal Reserve Economic Data, "Total Construction Spending: Manufacturing in the United State, Millions of Dollars, Monthly, Seasonally Adjust Annual Rate as of May 2024

Regardless of the outcome in this year's presidential election, the reshoring trend could accelerate through increased tariffs, government spending, or both. "On trade, presumptive Republican nominee, former President Trump has suggested a more protectionist stance that would levy a 10% across-the-board tariff and a 60% tariff on Chinese goods," according to the BlackRock Investment Institute. Presumptive Democratic nominee, President Biden is expected to keep his current protectionist policies, like higher tariffs for some sectors, industrial policies favoring domestic production and the use of export controls[15].

We're already seeing the impact of these policies in the U.S. economy, with manufacturing capex accelerating and manufacturing jobs rising, underpinning the impact of favorable policies and reshoring on domestic manufacturing.

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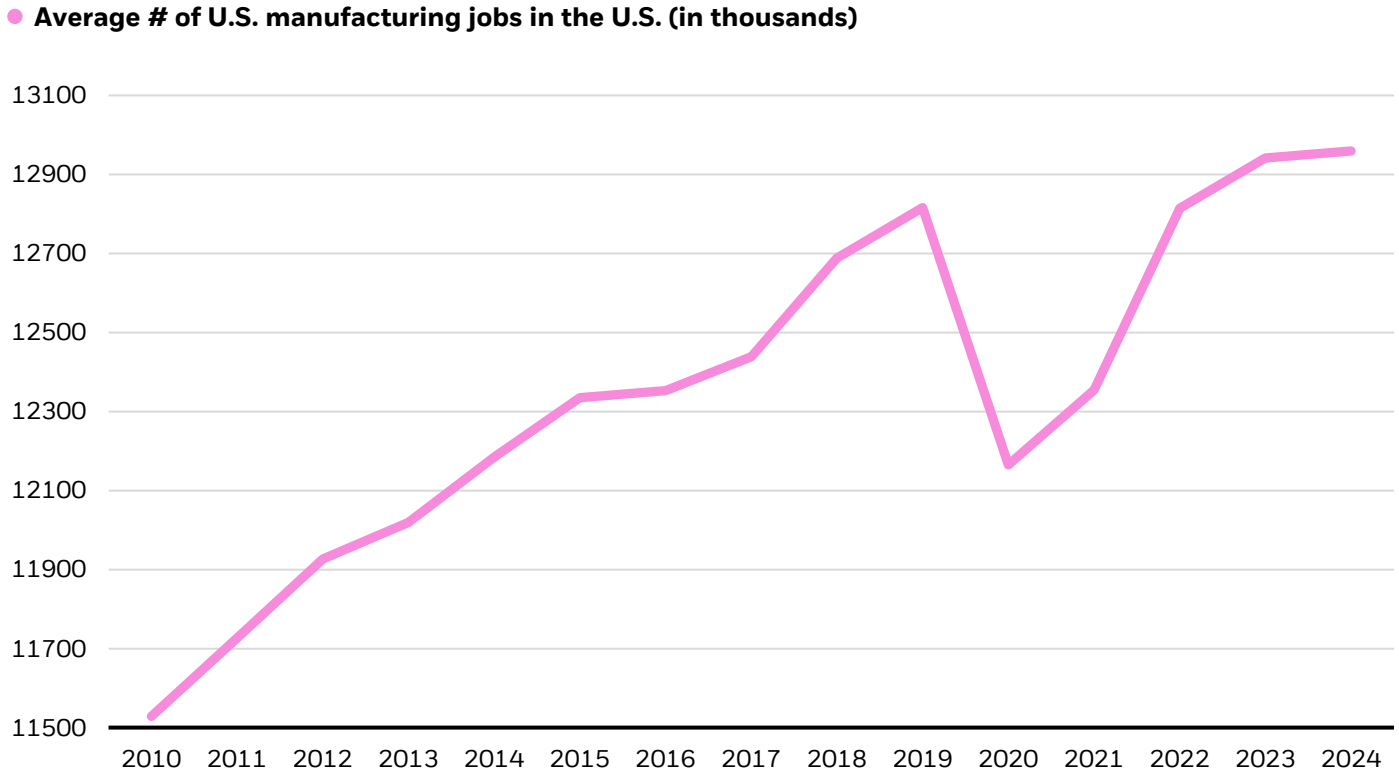
Geopolitics

U.S. Manufacturing jobs have been steadily growing:
Increasing 13% since 2010



Source: U.S. Bureau of Labor Statistics, "Manufacturing, all employees, thousand, seasonally adjusted." As of May 2024

The intersection of trade policy and youthful demographics could spur emerging market (EM) opportunities

Outside the U.S., trade policy and rewiring supply chains are creating new opportunities in select emerging markets, particularly those with close proximity to the U.S., friendly trade relations, and / or youthful demographics. Among those countries positioned to potentially benefit are Mexico and India.

In 2023, Mexico replaced China as the U.S.'s top trading partner, benefiting from its geographic proximity, youthful population, strong manufacturing-based economy, and competitive labor costs. Mexico also ranked fourth in global destinations for industrial operations for U.S. companies[16]. This has boosted Mexico's economy, which had an average growth rate in GDP per capita of 6.8% from 2021-2023, compared to 2.3% from 2010-2022[17]. Deepening supply chain integration with the US, catalyzed by policies like the **USMCA** and **Inflation Reduction Act** could further spur Mexico's economic growth. The June election of Claudia Sheinbaum as Mexico's president could signal a continuation of recent deepening trade ties to the U.S. given that she comes from the same political party as Mexico's outgoing incumbent.

A similar phenomenon is occurring in India, where a large, youthful labor pool is deepening its ties with the U.S. As U.S. corporates look to diversify supply chains, several companies from Apple to FedEx have shifted supply chains to India. As a result, the value of its exports to the U.S. grew 67% from January 2020 to March 2023[18]. Like Mexico, India's economy has benefitted from growing trade, helping to drive high growth in GDP per capita, rising 11% from 2021-2023 vs. 5.3% from 2010-2022[19].

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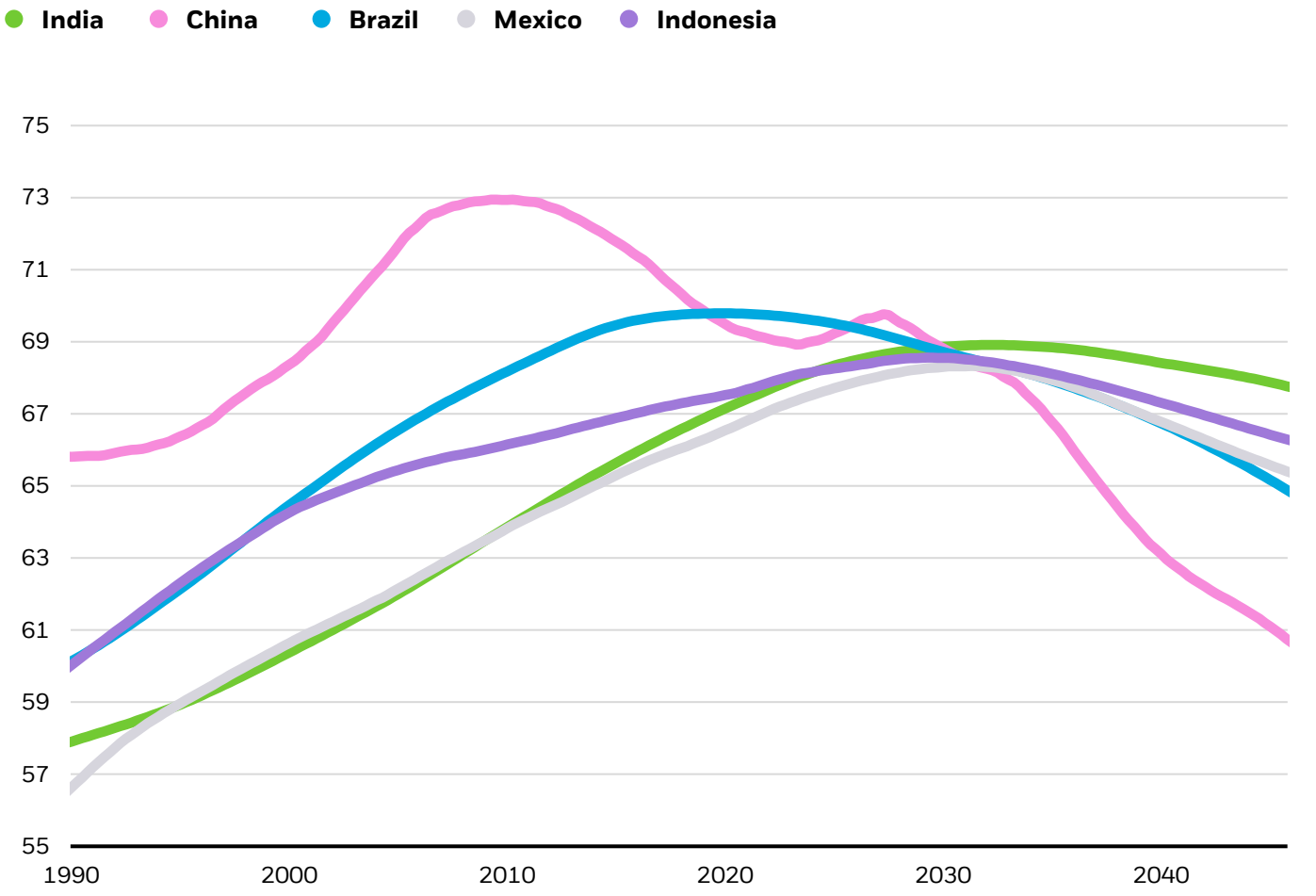
Geopolitics

While near-term growth may be driven more by policies surrounding rewiring supply chains, over the long-term, demographics could become a primary driving force of economic growth in these countries. By 2050, China's share of working-age population could see a significant decline to below 60% from 73% in the early 2010s, as evidenced in the chart below[20]. We believe other EM countries like India, Indonesia, and Mexico may see both population growth and a more stable composition of working-age population over the next few decades. Those countries could greatly benefit from a youthful population with lower healthcare costs and higher workforce productivity, leading to higher economic growth potential.

This divergence of demographics is highlighted in the below chart, showing the working-age population as a percentage of total population over three decades. Demographics may play an increasingly important role in supply chains and trade relationships, as developed markets like the United States, Europe and Japan continue to age and see slowing workforce growth.

Investors interested in exposure to the theme of Emerging Market supply chains and demographics may be interested in the iShares MSCI Emerging Markets ex China Index ETF (**XEMC**).

Shifting population landscapes in emerging economies:
Working-age population as % of total population



Source: Reuters Refinitiv, data based on 2023 OECD Labour Force Statistics. Forward-looking estimates may not come to pass.

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Conclusion

The vast acceleration we're seeing in AI along with the impact of elections around the world, are real catalysts presenting potential investment opportunities, ranging from the picks and shovels being used in the AI buildout, to the reshaping of global supply chains. Thematic strategies, using a tailored construction process in each theme's value chain, may allow investors to capture the tailwinds of mega forces that are reshaping our global economy.

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Related funds

Artificial intelligence

XCHP iShares Semiconductor Index ETF

XQQU iShares NASDAQ 100 Index ETF

XEXP iShares Exponential Technologies Index ETF

XETM iShares S&P/TSX Energy Transition Materials Index ETF

Geopolitics

XID iShares India Index ETF

XAD iShares U.S. Aerospace & Defense Index ETF

XEMC iShares MSCI Emerging Markets ex China Index ETF

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[3] BlackRock Global Infrastructure Team, As of May 2024
[4] Forbes, Don Lofstrom, "IDP and Beyond: The Impact of AI Hyperscalers on Business Innovation." As of March 26, 2024
[5] Reuters, "Microsoft, OpenAI plan $100 billion data-center project, media report says," As of March 29, 2024. Forward-looking estimates may not come to pass.
[6] Gartner, "Gartner Forecasts Worldwide AI Chips Revenue to Grow 33% in 2024." As of May 29. 2024. Forward-looking estimates may not come to pass.
[7]Source: McKinsey & Company "The Semiconductor decade: a trillion-dollar industry" as of April 1, 2022. Net growth calculated based on total revenue of $590B in 2021, with a $125b growth in revenue of computing and data storage from 2021 to 2030, accounting for 25% total net growth of the global semi market at $475B. Forward-looking estimates may not come to pass.
[8] Semianlysis, "AI Datacenter Energy Dilemma- Race for AI Data Center Space. "As of March 13, 2024.
[9]Goldman Sachs, "Generational Growth- AI data centers and the coming US power demand surge." As of April 28, 2024. Forward-looking estimates may not come to pass.
[10]IEA, "Global Critical Minerals Outlook 2024." Page263. As of May 2024. Forward-looking estimates may not come to pass.
[11] WSJ Pro, Joseph Hoppe & Chrisan Moess Laursen, "AI Siphons Copper Supplies Needed for Green Transition." As of June 6, 2024. Forward-looking estimates may not come to pass.
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[13] BlackRock, Aladdin Explore, using revenue breakdowns from the S&P 500 index as of 4/30/2024.
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[15] BlackRock Investment Institute, "What we're watching in 2024 elections." As of June 10,2024
[16] Source: MSCI, as of Feb 2024. Forward-looking estimates may not come to pass.
[17] International Monetary Fund, "GDP per capita, current prices." As of May 2024.
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[19]International Monetary Fund "GDP per capita" As of May 2024
[20] Reuters. Refinitiv, data based on 2023 OECD Labour Force Statistics, Forward-looking estimates may not come to pass.

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