Semiconductors: The "New Oil"

Silicon-based semiconductors will be essential going forward for China and emerging markets generally.

FEBRUARY 19, 2021

Shenzhen, China

Key Takeaways

- The global semiconductor industry may experience the development of divergent supply chains—some serving the domestic needs of mainland China and others serving the needs of countries that are less in alignment with China's priorities.
- We think new and enhanced supply chains will provide attractive investment opportunities in mainland China—as well as in other emerging markets.
- With over 1.4 billion people, mainland China is becoming increasingly focused on its own needs for modern living standards—which means existing Chinese companies and startups should have enormous opportunities for growth just within the country's borders.
- For emerging markets generally, the energy and materials sectors rose in importance during the decade ended December 31, 2010 but fell in importance during the most recent decade.
- The information-technology, communication-services and consumer-discretionary sectors have seen their roles in emerging markets expand dramatically over the past 10 years, and we think these trends will continue—along with the growing importance of health care.
- While geopolitical tensions may be unnerving, we don't think they will slow the global economy. In fact, we believe they may actually accelerate the development of companies that might create attractive investment opportunities.

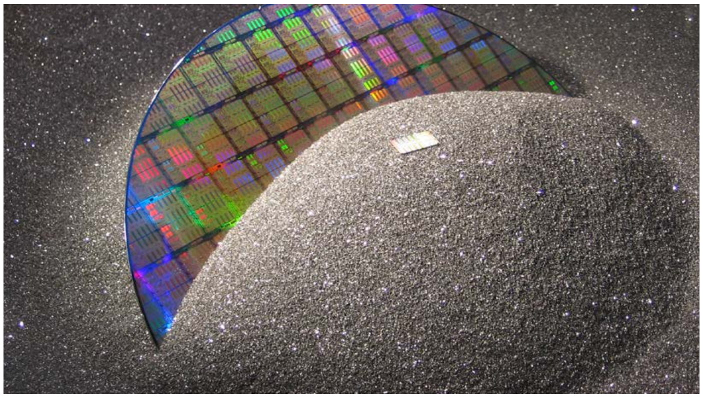
While oil and other natural resources had been the foundation of emerging-market investing, silicon-based semiconductors will be essential going forward for China and emerging markets generally. But success will depend on technological know-how and infrastructure, rather than on the commodity itself.

Semiconductors have been around for decades. But many of today's electronic devices and business processes depend on the most technologically sophisticated chips, which are extremely difficult to fabricate. So while oil and other commodities were the key economic "lubricants" for emerging markets in the past, we think advanced semiconductors and other cutting-edge technologies will dominate the landscape going forward.

Currently, we believe geopolitical tensions are beginning to disrupt the design and fabrication of semiconductors around the world. These disruptions may have specific implications for investments pertaining to China and different implications for investments pertaining to other emerging markets.

OIL PRODUCTION IS BEING OVERSHADOWED BY SILICON-BASED SEMICONDUCTORS

Some observers of emerging markets may take issue with our comparison of oil to semiconductors. After all, oil is a commodity with a finite supply while semiconductors theoretically can be improved ad infinitum. But we think the reality is that some semiconductor companies



are so far ahead of their competitors that supply is in fact a constraint—and therefore a major investment consideration.

The most common material used to manufacture semiconductors is a very different commodity—silicon, which can be altered by a process of introducing impurities into the crystal structure. This process creates the specific conducting properties needed for various applications. Broadly speaking, there are two types of semiconductors: analog chips and digital chips.

SEMICONDUCTORS PROVIDE THE FOUNDATION FOR MODERN LIFE

Many of the semiconductors fabricated in the U.S. are analog chips—which are often used for power supplies, sensors and wideband signals (e.g., speech, music and video). Digital chips are also fabricated in the U.S., largely by Intel Corp. Applications for digital chips include computer processing, data storage, logic functions and information management.

Compared to analog chips, digital chips are generally considered much more technologically advanced. Digital chips are necessary to enable e-commerce, mobile payments, fintech, 5G telecom, health-care advances (e.g., telemedicine and drug discovery), remote learning, online entertainment, artificial intelligence, autonomous machines, self-driving cars, supply-chain management, cloud computing and software-as-a-service (SaaS) applications.

Given the technological rise of mainland China, a logical question might be: How many of the world's top 10 semiconductor companies are Chinese? The answer is zero. In fact, five of the top companies are American, two are Korean, one is Taiwanese, one is Japanese and one is a U.S.-based business that's been acquired by a company in Singapore.

FABRICATION—NOT JUST DESIGN—IS KEY FOR SEMICONDUCTORS

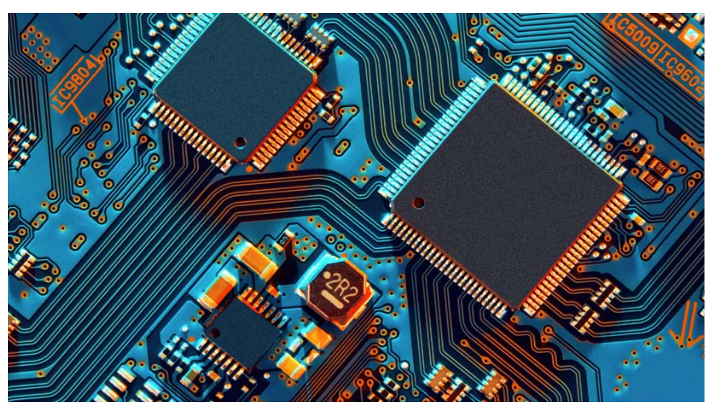
In the U.S. and elsewhere, many semiconductor companies do the design work but outsource at least a portion of the fabrication. Intel is a major designer and fabricator. But Intel has been experiencing production delays and has fallen significantly behind Taiwan Semiconductor Manufacturing Co. (TSMC) in the race to deliver smaller, faster and more energy-efficient chips.

In fact, TSMC is a fabricator for many U.S. companies—including Advanced Micro Devices, Apple, Marvell Technology Group, NVIDIA and Qualcomm. This is where mainland China's lack of leadership in semiconductors becomes an issue to consider. Taiwan is friendly to the U.S., and the U.S. is in a technological trade war with mainland China. Because some mainland Chinese companies are considered threats to American security, exports of critical technologies to China are being blocked by the U.S.

Based on the fact that mainland China is the world's largest importer of semiconductors, which enable the cutting-edge functions described above, it's easy to understand why the trade war will create challenges and opportunities that must factor into our investment decisions. Moreover, even if the trade war is temporarily resolved, we don't think China will ignore its lagging competitive position in semiconductors—which will be a major factor in the country's long-term development.

THE ROAD AHEAD FOR MAINLAND CHINA AND THE REST OF THE WORLD

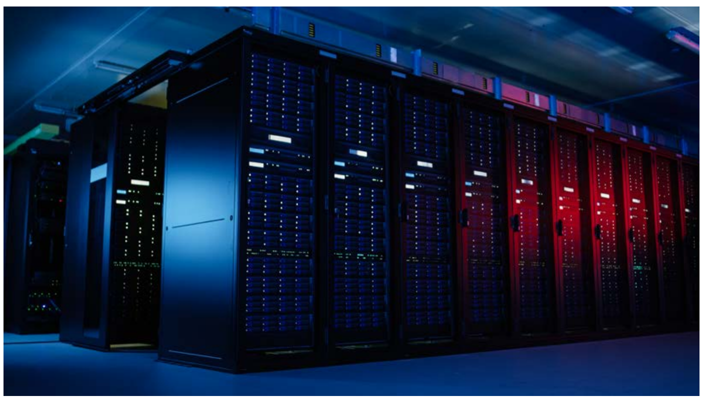
So where do mainland China and the rest of the world go from here? We think there are two main scenarios. The first scenario is that China has the willingness and the ability to largely decouple its semiconductor industry from the rest of the world. This scenario would mean China would rapidly enhance its ability to design and fabricate



advanced-tech semiconductors for domestic use. Under this scenario, hundreds of Chinese companies would probably spring up to be engaged in every phase of the semiconductor industry.

Outside of mainland China, companies would also serve the Chinese market—likely on an exclusive basis. In other words, China would want to be sure it has strong control over its semiconductor supply chain from start to finish.

The second scenario is that mainland China doesn't decouple its semiconductor industry from the rest of the world. Under this scenario, it's possible China would seek to exert greater control over Taiwan generally and TSMC more specifically.



It's important to note here that mainland China attempted to dominate Taiwan during two crises in the 1950s. A modern-day crisis would not only be likely to escalate political and trade-war tensions between mainland China and the U.S., but semiconductor fabrication could also be disrupted around the globe. As a result, we'd expect other investment opportunities to develop—likely in emerging markets outside of China and Taiwan.

Beneficiaries could include Korean semiconductor equipment suppliers and fabricators—and maybe even some Japanese, Malaysian, Singaporean and Thai suppliers and fabricators. In fact, as it attempts to catch up with TSMC in terms of technological advances, Intel may increasingly outsource supply-chain processes to emerging-market players that we'll want to keep on our radar as potential investments.

Which scenario is more likely? We think the first scenario—China largely decoupling its semiconductor industry—has a greater probability of occurring. But the main point is that there's likely to be disruption under either scenario. And disruption usually creates investment opportunities. Our job is to be flexible and prepared to invest where the trends lead us. Just being aware of the issues and what's at stake should help us act more quickly.

MAINLAND CHINA: SIMILARITIES TO THE U.S. IN THE 1960s

Our view of where mainland China is today is analogous to where the U.S. was in the 1960s. After World War II, the U.S. was one of the relatively few countries in a strong economic position. In the late 1940s and throughout the 1950s, the U.S. was a major exporter of high-quality manufactured goods to foreign countries.

As the 1960s progressed, however, the U.S. was primarily interested in serving the domestic needs of a rising middle class. For example, the Big Three automobile companies—General Motors, Ford and Chrysler—during that period were predominantly focused on selling cars to American consumers. This is the type of transition we see mainland China making today.

For decades, mainland China has been an exporting powerhouse as it has ramped up its economy by improving its industrial and technological capabilities. Now, with over 1.4 billion people, mainland China is becoming increasingly focused on its own needs for modern living standards. This means existing Chinese companies and startups should have enormous opportunities for growth just within the country's borders. To understand these opportunities in context, consider that the mainland Chinese population is more than four times the size of the U.S. population.

As shown in ***Figure 1*** on page 4, China has a rapidly growing economy with an annual gross domestic product (GDP) greater than US$14 trillion—which already dwarfs the country's exports at approximately US$2.6 trillion. So it's clear that even now, China is less dependent on exports than many casual observers assume. Moreover, regardless of politics and trade issues, we think China is mostly a well-run economy and is too important to ignore from an investment standpoint.

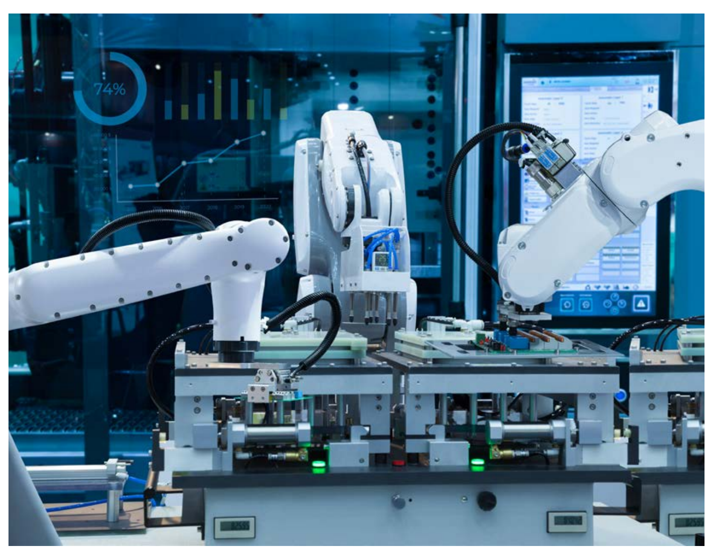
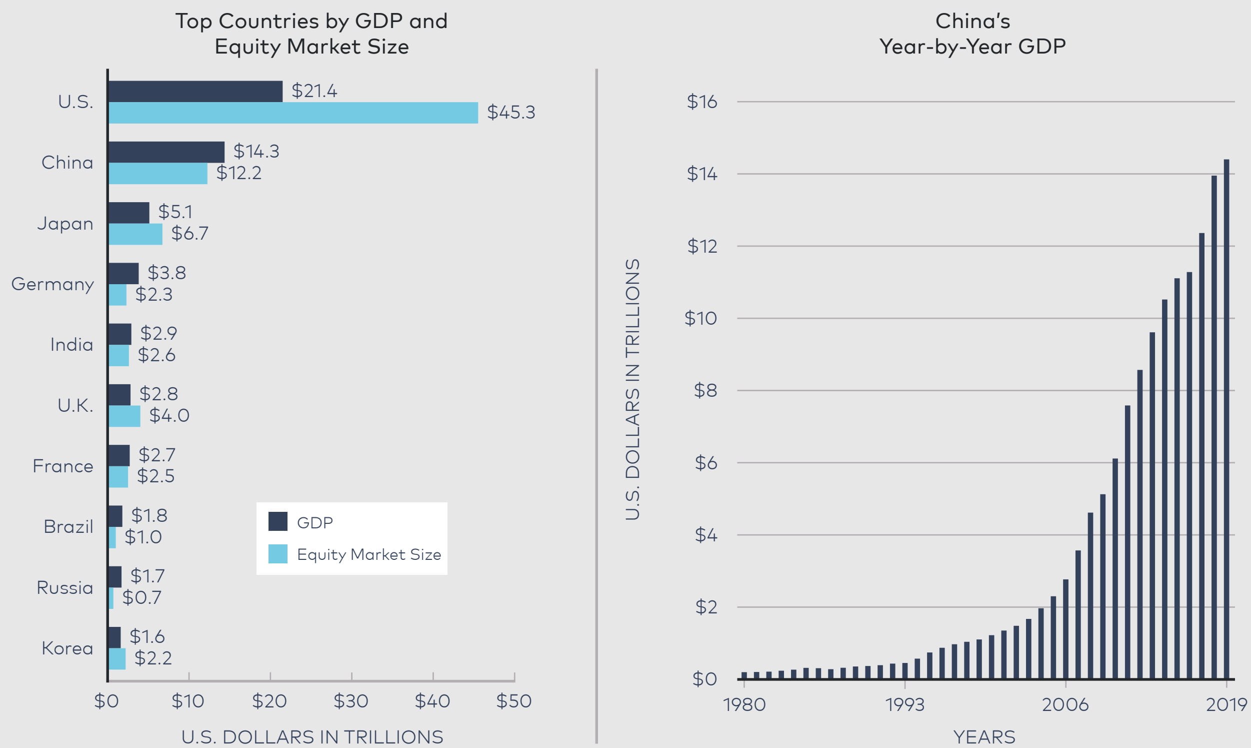


Figure 1: Rapid Growth in GDP

CHINA IS ON PACE TO BECOME THE WORLD'S LARGEST ECONOMY BY 2029



Sources: The World Bank and World Federation of Exchanges databases. In the left-hand chart, GDP data are as of December 31, 2019 and equity market size data are as of December 31, 2020. In the right-hand chart, year-by-year GDP data are from December 31, 1980 through December 31, 2019.

EMERGING MARKETS ARE CHANGING

For a better understanding of how emerging markets have been changing over time, refer to ***Figure 2*** on page 5—which shows the sector weightings of the MSCI Emerging Markets Index in 2000, 2010 and 2020. As you can see, energy and materials rose in importance during the decade ended December 31, 2010 but fell in importance during the most recent decade. Conversely, information technology (IT), communication services and consumer discretionary have seen their roles in emerging markets expand dramatically during the most recent decade. These are the sectors that include, for example, semiconductors, e-commerce and SaaS.

One sector that hasn't shown as much significance in the Index is health care. But we think this will change dramatically during the coming decade due to the growing utilization of health-care services by people in developing nations and the use of technology to make health care more accessible to these people. For example, China's Ping An Healthcare & Technology is an online and mobile provider of medical services through the internet-based platform "Ping An Good Doctor." The platform is used for remote consultations, hospital appointments, health management, wellness services and health-care resource referrals. Ping An's goal is to improve efficiencies in the allocation of primary-care and hospital resources through the use of innovative technologies including artificial intelligence.

Another example is Wuxi Biologics, which is headquartered in China but operates globally. The company develops antibody drugs and biological medicines and provides value-added services to other pharmaceutical firms. Wuxi has an expanding pipeline of business including involvement in vaccine production for Covid-19.

INVESTMENT OPPORTUNITIES IN MAINLAND CHINA

As described above, we think mainland China may start making major strides to decouple its semiconductor industry from the rest of the world. To better understand this issue, we also need to consider what's going on in Taiwan.

According to a recent report from Taiwan's statistics bureau, the island's economy expanded during the third

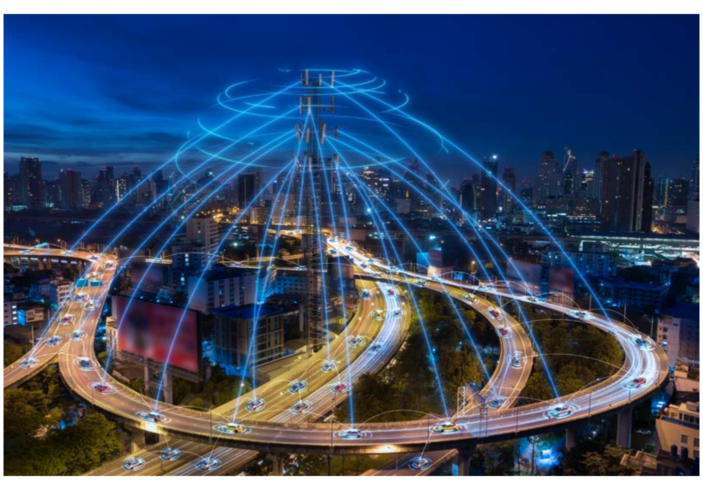
Figure 2: Sector Weightings of the MSCI Emerging Markets Index

	December 31, 2000	December 31, 2010	December 31, 2020
Communication Services	17.9%	7.4%	11.6%
Consumer Discretionary	6.3%	6.9%	18.3%
Consumer Staples	8.9%	6.7%	5.9%
Energy	5.9%	14.3%	5.0%
Financials	19.0%	25.1%	18.0%
Health Care	2.0%	1.0%	4.7%
Industrials	6.8%	7.4%	4.3%
Information Technology	15.4%	12.9%	20.5%
Materials	12.3%	14.9%	7.6%
Real Estate	—	—	2.1%
Utilities	5.5%	3.4%	2.0%
Total	100%	100%	100%

Source: FactSet and MSCI. Past performance is not indicative of future results. You cannot invest directly in an index.

quarter of 2020 at the fastest pace in four years. Much of this growth was driven by exports—with a substantial share coming from Taiwan Semiconductor Manufacturing Co. (TSMC), the country's largest firm. TSMC's revenues surged in 2020 as China's Huawei Technologies stocked up on semiconductors ahead of the U.S.-imposed sales ban, which took effect in September.

Financial markets appear to reflect optimism that the current state of affairs marks a low point in U.S.-China relations. The thinking seems to be, even if relations don't improve much under Joe Biden's presidency, they're unlikely to deteriorate much further. This thesis is reasonable in our view. At the very least, we think the new administration will take a more calibrated approach to China—and place greater emphasis on the interests of American allies such as Taiwan.



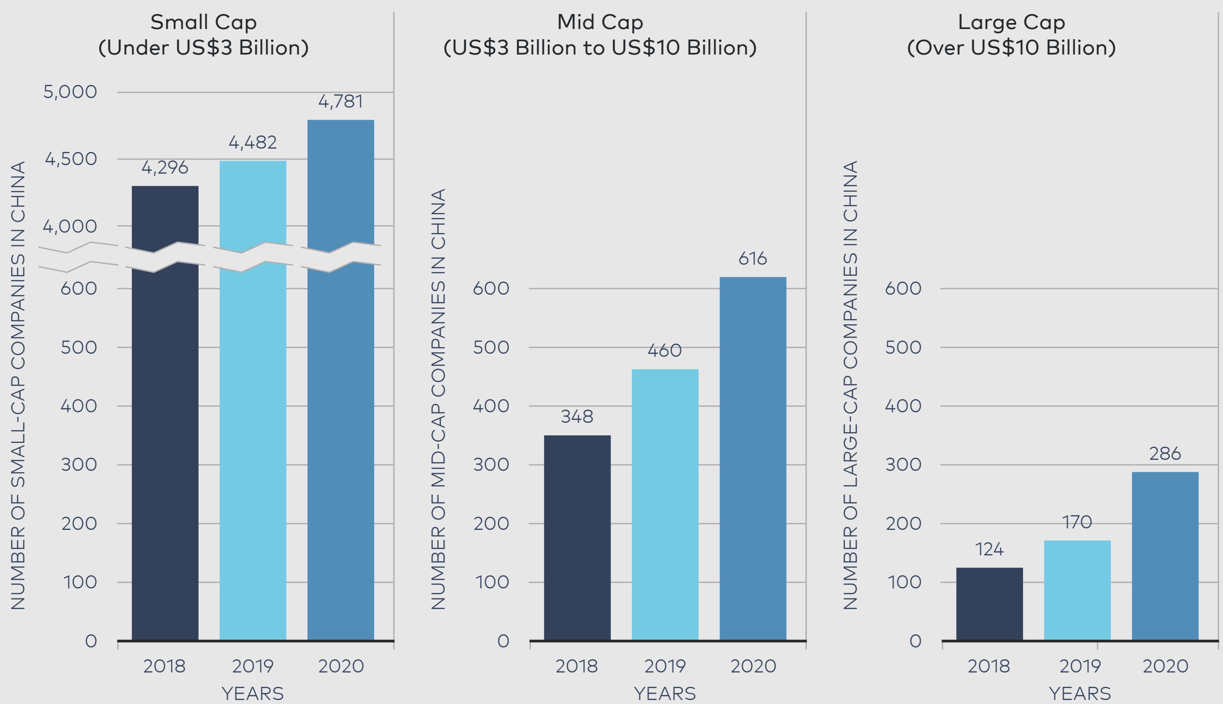
Partially due to Taiwan's strong business ties in the U.S. and Europe, we believe China's long-term strategy is to invest heavily in building a Chinese-centric infrastructure for semiconductor design and fabrication. However, start-to-finish semiconductor production is a complex process that requires considerable time and effort to develop the necessary expertise. Meanwhile, countries such as Taiwan may find themselves caught in the middle between China's desire to expand its global economic influence and the U.S.'s desire to contain this influence.

Having said that, trade tensions and other forms of geopolitics have always been inherent risks in emerging markets. Despite these risks, we think there may be good investment opportunities related to the development of China's semiconductor infrastructure to serve the country's own needs. These opportunities could go beyond design and fabrication—as semiconductor production also requires many different types of machines, tools and other supplies.

Outside of semiconductor production, which is still in a nascent stage, China already has a large and deep range of investable companies across market capitalizations—as presented in ***Figure 3*** on page 6. Moreover, many of these companies cater to domestic Chinese demand—which is an economic segment we find particularly attractive. Please go to ***wasatchglobal.com*** for more information about the new Wasatch Greater China Strategy and Fund.

Figure 3: A Large and Deep Range of Investable Companies

CHINA'S BREADTH OF COMPANIES CONTINUES TO INCREASE ACROSS ALL MARKET CAPITALIZATIONS



Source: Bloomberg. Data represent the total number of companies domiciled in China that have market-capitalization information. Data are for December 31, 2018, December 31, 2019 and December 31, 2020.

OPPORTUNITIES IN OTHER EMERGING MARKETS

As noted above, when emerging markets first became recognized as comprising a separate asset class, investors valued them mainly for their energy reserves, mineral deposits and other natural resources. Extraction of these resources drove many emerging-market economies, which largely depended on exports of commodities to the developed world for growth and hard currency. This mutually beneficial relationship allowed emerging markets to mature well beyond their initial roles as commodity producers.

With technology now accounting for a larger share of emerging-market economies, comments like "tech is 'eating' the world" no longer apply just to developed nations. The MSCI Emerging Markets Index also reflects this shift, as indicated in ***Figure 2*** on page 5. For example, in the semiconductor industry, TSMC's stock has benefited tremendously from the company's technological superiority over Intel. Having said that, TSMC along with Taiwan as a whole are vulnerable to Chinese interference—at least in the near term.

Outside of Taiwan, Korea may be the largest beneficiary of ramped-up semiconductor production to meet demand from around the world. While Korean companies—similar to Intel in the U.S.—have fallen behind TSMC, they may have some of the best prospects to catch up. Again, beyond design and fabrication, semiconductor production requires many other types of regional companies to be involved in the supply chain. Therefore, semiconductors may contribute to the rise of a new group of "Asian Tigers."

Elsewhere, although India isn't yet a powerhouse in semiconductors, technological innovation is nevertheless on full display. For example, India's human capital is an abundant resource that can be leveraged through technology. A recent article in *Bloomberg Businessweek* featured nine-year-old fifth grader Shivank Patel, who has been learning to write software code for a year and has already created several apps. Patel's latest endeavor, which he hopes to publish in the Google Play Store, is designed to help parents and doctors monitor babies born prematurely. Online coding classes for elementary-school children have become popular in India, as concerned parents seek to provide their kids with the tools necessary to land a well-paying job.

For an extensive discussion of India, please visit ***wasatchglobal.com*** to find our white paper entitled *India's Virtuous Circle of Amazing Progress*. The paper covers what we believe are three megatrends in India: digitalization, financialization and formalization—all of which are enabled by technology.

THE WASATCH OUTLOOK

This white paper clearly addresses the tensions between the U.S. and mainland China. But while these tensions may be unnerving, we believe they may actually accelerate the development of technologically advanced supply chains—some serving the domestic needs of China and others serving different channels.

The coronavirus pandemic, which caused dramatic shortages of protective gear and pharmaceutical ingredients, also highlighted that countries and companies need to diversify their supply chains and exert more control over production. Low cost can no longer be the primary consideration. For example, Apple is planning to expand iPhone production in India. In addition, Samsung already has its largest smartphone manufacturing facility located in India and will start making TVs there too.

We think new and enhanced supply chains will provide attractive investment opportunities. If you still doubt that companies and their stocks can perform well amid the U.S.-China geopolitical tensions, consider the headline from the cover of a recent issue of *TIME Magazine*, "2020: The Worst Year Ever." Next consider that most of the Wasatch strategies and funds, which focus on high-quality companies with strong cash flows, were up double-digit percentages in 2020. (See ***wasatchglobal.com***.) Moreover, many of the broad stock indexes around the world did well too.

Over the coming years, we believe thousands of companies will enter—or increase their involvement in—the technologically advanced supply chains running through emerging markets. And with so many companies, especially in China, some will succeed spectacularly while many others will struggle. Therefore, we think active stock picking will be particularly important. In this regard, Wasatch's experience analyzing innovative, technology-driven companies should be well-suited to navigating the rapidly shifting terrain of emerging markets. Moreover, while some of our strategies and funds focus on small caps, our "select" strategies and funds allow us to invest in mid- and large-cap companies that we believe can continue to grow substantially.

To summarize, within emerging markets, we want to own many of the types of tech-related companies that have brought enormous efficiencies and modern conveniences to developed countries for many years—including during the coronavirus pandemic. And we're particularly excited that technology, an area in which we consider ourselves to have particular expertise, may have replaced commodity production as the leading force in emerging markets.

WASATCH HEAD OF EMERGING MARKETS INVESTING

Ajay Krishnan, CFA

Portfolio Manager and Head of Emerging Markets Investing

26 Years of Experience / 26 Years at Wasatch

Mr. Krishnan joined Wasatch Global Investors in 1994 and serves on the Board of Directors. He is also a Portfolio Manager, the head of emerging markets investing and a member of the global research team.

Mr. Krishnan earned a Master of Business Administration from Utah State University, where he also worked as a graduate assistant. He completed his undergraduate degree at Bombay University, earning a Bachelor of Science in Physics with a minor in Mathematics.

Mr. Krishnan is a CFA charterholder and a member of the Salt Lake City Society of Financial Analysts.

Ajay is a native of Mumbai, India and speaks Hindi and Malayalam. He enjoys traveling and cycling.

RISKS AND DISCLOSURES

Mutual-fund investing involves risks, and the loss of principal is possible. Investing in small cap funds will be more volatile and loss of principal could be greater than investing in large cap or more diversified funds. Investing in foreign securities, especially in emerging markets, entails special risks, such as unstable currencies, highly volatile securities markets and political and social instability, which are described in more detail in the prospectus.

The Wasatch Greater China Fund is subject to risks associated with investments in China and countries in the greater China region that could affect the value of your investment in the Fund, including government control over currencies, economic conditions, industries and specific issuers, as well as continued strained international relations, uncertainty regarding taxes, and limits on credible corporate governance and accounting standards. Because of its exposure to greater China, including mainland China and China's special administrative regions, such as Hong Kong, the Fund is subject to greater risk of loss as a result of volatile securities markets, adverse exchange rates and social, political, military, regulatory, economic or environmental developments, or natural disasters that may occur in the China region. The imposition of tariffs or other trade barriers by the U.S. or foreign governments on exports from China may also have an adverse impact on Chinese issuers. The Fund may invest in the securities of Chinese issuers through the China Stock Connect

program. Trading through the Stock Connect Programs is currently subject to a daily quota, which limits the maximum net purchases by all purchasers using the Stock Connect Programs each day. While the daily quotas are relatively large, there is the possibility that the quotas could be reduced or exceeded, meaning buy orders for China A-shares would be rejected, affecting the Fund's ability to efficiently execute on its investment strategy.

An investor should consider investment objectives, risks, charges and expenses carefully before investing. To obtain a prospectus, containing this and other information, visit wasatchglobal.com or call 800.551.1700. Please read the prospectus carefully before investing.

Being non-diversified, the Wasatch Greater China Fund can invest a larger portion of its assets in the stocks of a limited number of companies than a diversified fund. Non-diversification increases the risk of loss to the Fund if the values of these securities decline.

Information in this document regarding market or economic trends, or the factors influencing historical or future performance, reflects the opinions of management as of the date of this document. These statements should not be relied upon for any other purpose. **Past performance is no guarantee of future results, and there is no guarantee that the market forecasts discussed will be realized.**

The Wasatch Greater China Fund's investment objective is long-term growth of capital.

Portfolio holdings are subject to change at any time. References to specific securities should not be construed as recommendations by the Funds or their Advisor. References to individual companies should not be construed as recommendations to buy or sell shares in those companies. Current and future holdings are subject to risk.

As of December 31, 2020, the Wasatch Emerging Markets Select Fund had 0.7% of its net assets invested in Ping An Healthcare & Technology Co. Ltd. and 3.6% of its net assets invested in Wuxi Biologics Cayman, Inc.

As of December 31, 2020, the Wasatch Global Value Fund had 3.2% of its net assets invested in Samsung Electronics Co. Ltd.

As of December 31, 2020, the Wasatch Greater China Fund had 1.7% of its net assets invested in Ping An Healthcare & Technology Co. Ltd. and 4.6% of its net assets invested in Wuxi Biologics Cayman, Inc.

As of December 31, 2020, none of the Wasatch strategies or funds held Intel Corp., Taiwan Semiconductor Manufacturing Co. Ltd., Advanced Micro Devices, Inc., Apple, Inc., Marvell Technology Group Ltd., NVIDIA Corp. or Qualcomm, Inc. Huawei Technologies Co. Ltd. is a privately held company.

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DEFINITIONS

The original **Asian Tigers** *are South Korea, Hong Kong, Taiwan and Singapore.*

*The "***cloud***" is the internet.* **Cloud-computing** *is a model for delivering information-technology services in which resources are retrieved from the internet through web-based tools and applications, rather than from a direct connection to a server.*

Gross domestic product (GDP) *is a basic measure of a country's economic performance and is the market value of all final goods and services made within the borders of a country in a year.*

The **MSCI Emerging Markets Index** *is a free float-adjusted market capitalization index designed to measure the equity market performance of emerging markets. You cannot invest directly in this or any index.*

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Wasatch Global Investors
505 Wakara Way, 3rd Floor
Salt Lake City, UT 84108

Institutional Investors
p: 800.381.1065
institutionalinfo@wasatchglobal.com

Financial Advisors
p: 800.381.1065
advisorservices@wasatchglobal.com

Individual Investors
p: 800.551.1700
shareholderservice@wasatchfunds.com

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