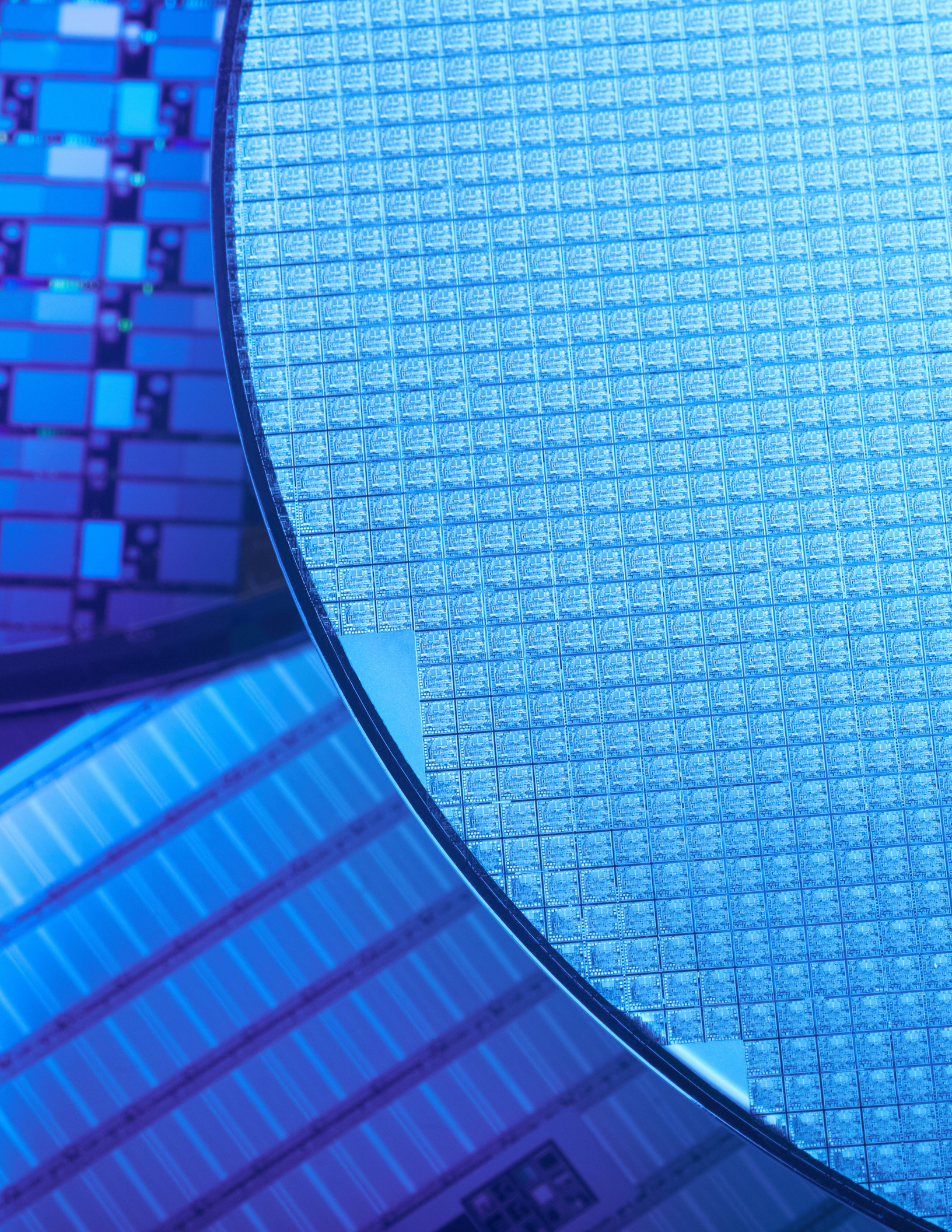
SEMICONDUCTOR INDUSTRY ASSOCIATION

STATE OF THE U.S. SEMICONDUCTOR INDUSTRY

2024



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SEMICONDUCTORS — THE CHIPS THAT ENABLE VIRTUALLY ALL MODERN TECHNOLOGIES — are one of the most transformative inventions in all of human history. Thanks to groundbreaking advancements in semiconductor research, design, and manufacturing over the last 65 years, modern chips can have up to tens of billions of transistors on a small slice of silicon.

The rapid pace of semiconductor innovation has made the world smarter, healthier, greener, and better connected. And chips are powering the transformative technologies of tomorrow, including artificial intelligence, autonomous driving and electric vehicles, and advanced wireless networks.

In 2023, despite a cyclical market downturn that lingered early in the year, global sales rebounded the second half of the year to reach $527 billion. Nearly 1 trillion semiconductors were sold globally, more than 100 chips for every person on earth. With the downturn now over and demand for semiconductors high, industry analysts project double-digit annual growth in 2024.

Rising demand has also prompted new industry investments to increase chip production. Thanks in part to the landmark CHIPS and Science Act, the United States is forecast to secure a larger share of new private investment in semiconductor manufacturing. In fact, as of August 2024, companies in the semiconductor ecosystem had announced more than 90 new manufacturing projects in the U.S. since CHIPS was first introduced in Congress, totaling nearly $450 billion in announced investments across 28 states. These investments are projected to create tens of thousands of direct jobs and support hundreds of thousands of additional jobs throughout the U.S. economy. The industry is also making investments in countries around the world, creating a resilient supply chain.

In the decade following CHIPS enactment (2022 to 2032), the United States is projected to more than triple its semiconductor manufacturing capacity — the highest rate of growth in the world during that period — according to a May 2024 SIA-Boston Consulting Group report. The report also forecasts the U.S. will grow its share of advanced (less than 10nm) chip manufacturing to 28% of global capacity by 2032 and capture 28% of total global capital expenditures (capex) from 2024 to 2032. By comparison, in the absence of the CHIPS Act, the report estimates the U.S. would have captured only 9% of global capex by 2032.

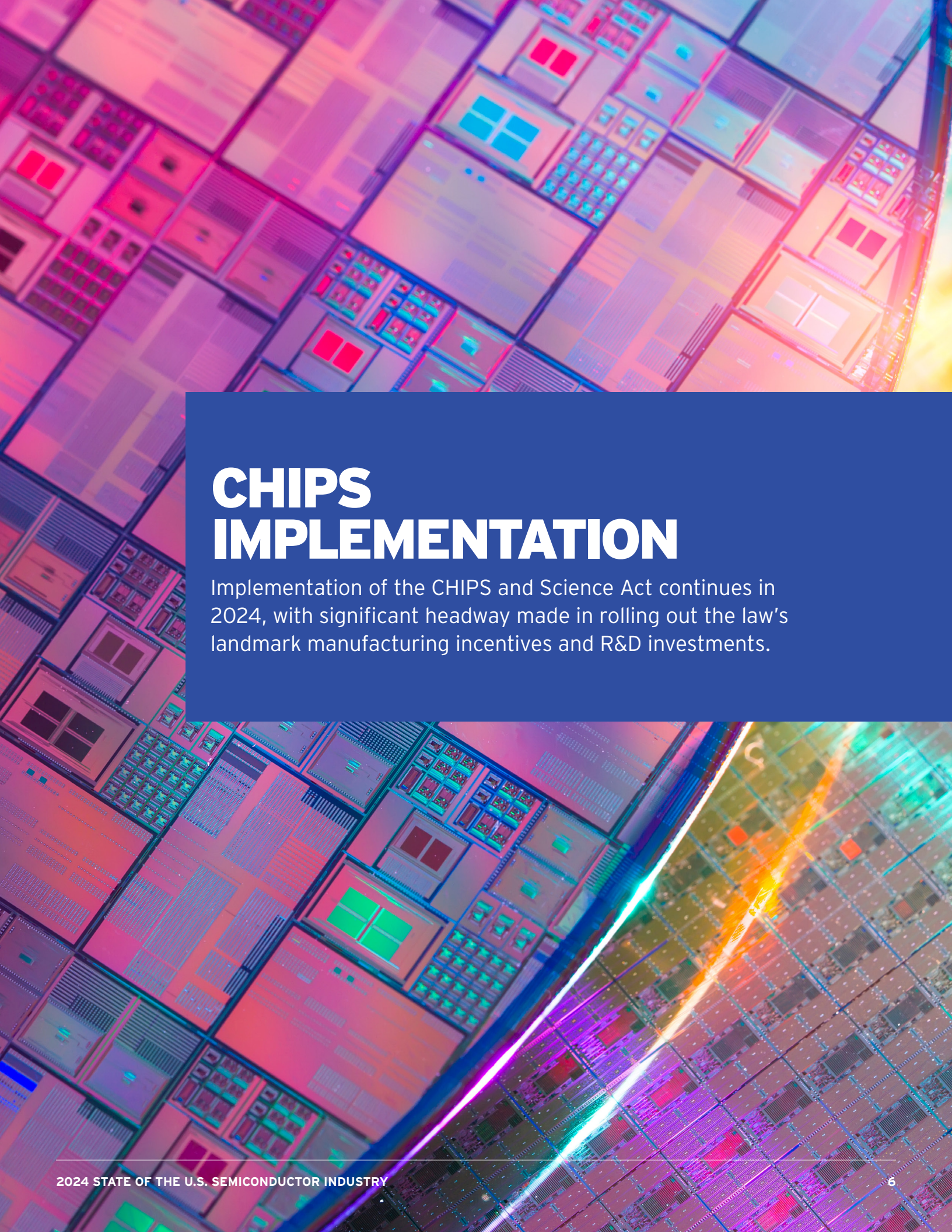
Reinforcing chip supply chains on U.S. shores offers tremendous opportunities, but it also presents significant challenges. For example, as U.S. chip operations expand in the years

ahead, so too will demand for skilled talent. A 2023 SIA-Oxford Economics study projected a shortfall of 67,000 technicians, computer scientists, and engineers in the semiconductor industry by 2030 and a gap of 1.4 million such workers throughout the broader U.S. economy. For the semiconductor industry to grow and innovate at its full potential, and for domestic investment projections to be fully realized, government leaders must advance policies that build on our industry's longstanding workforce development efforts, expand the pipeline of STEM graduates in America, and retain and attract more of the top engineers and scientists from around the world.

Policy action is needed in other areas as well if we are to build on our current momentum. The U.S. should adopt measures to further strengthen the semiconductor supply chain by extending the duration of the incentives under the CHIPS and Science Act, including the advanced manufacturing investment credit, which is scheduled to expire in 2026.

Further, the existing CHIPS tax credit should be expanded to include chip design to ensure more of this critical process is conducted in the U.S. In addition, the U.S. should continue to fund the federal research programs authorized in the CHIPS and Science Act to maintain and grow U.S. technology leadership. And to ensure the U.S. semiconductor industry remains globally competitive and able to continuously invest in research and innovation, the U.S. should pursue agreements and initiatives that open access to overseas markets where companies can sell the chips manufactured here at home.

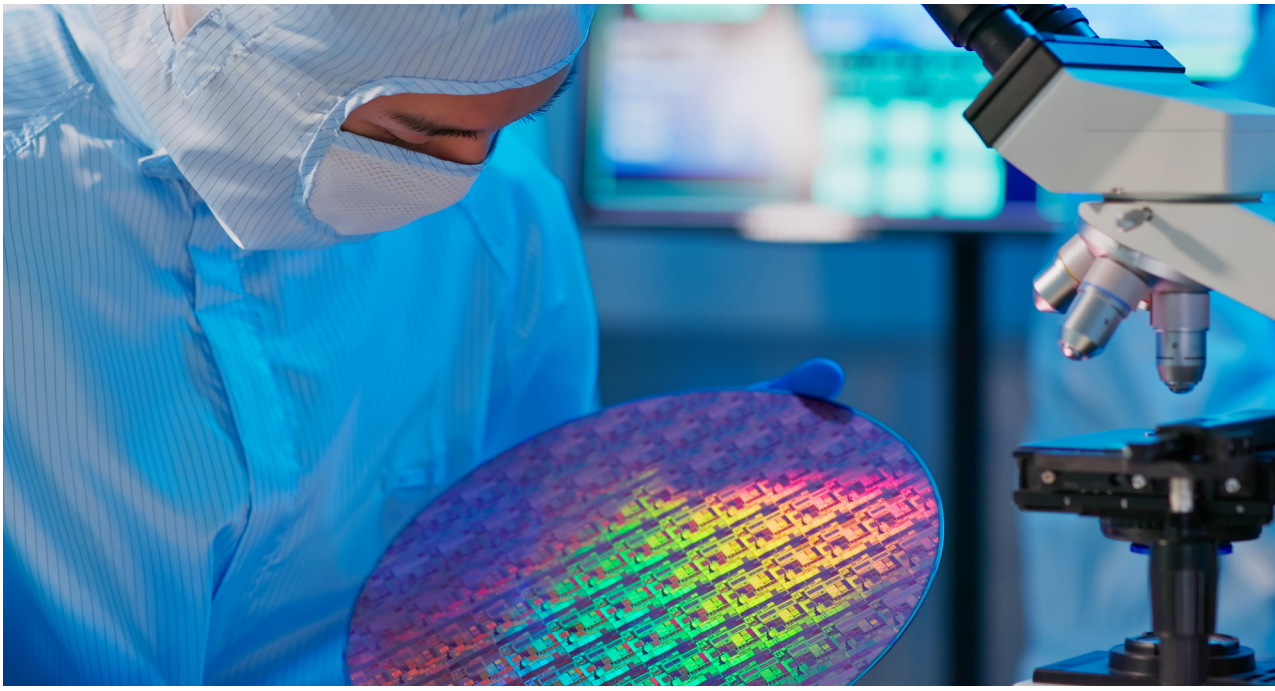
Semiconductors have never played a more important role in society than they do today, and the future of our industry has never been brighter. SIA looks forward to continuing to work with government leaders to strengthen this foundational industry for many years to come.



CHIPS IMPLEMENTATION

Implementation of the CHIPS and Science Act continues in 2024, with significant headway made in rolling out the law's landmark manufacturing incentives and R&D investments.

MANUFACTURING INCENTIVES



The CHIPS Program Office (CPO) continues to make progress in its deployment of the $39 billion CHIPS manufacturing incentives program. Consistent with the goals of the law, the CHIPS and Science Act incentives announced thus far will enhance national security, create jobs, boost U.S. and local economies, and make America stronger and more technologically advanced.

Applications for commercial fabrication facilities and equipment and materials manufacturing facilities are no longer being accepted. As of August 2024, the CPO has announced 17 preliminary agreements representing over $32 billion in grants and $28 billion in loans across 26 projects in 16 states. These projects include projected total investment of more than $350 billion and are expected to create over 118,000 new jobs -- over 38,000 manufacturing jobs and over 78,000 construction jobs. After striking a preliminary agreement, companies engage in further due diligence and negotiation with the Commerce Department before reaching a final deal. The CPO plans to commit all funds by the end of 2024.

Due to strong demand for funding throughout the supply chain and limited available funding, CPO unfortunately announced the suspension of a funding opportunity for commercial research and development facilities.

Furthermore, the CHIPS advanced manufacturing investment credit (AMIC) also provides a powerful incentive for investments in fabrication and equipment manufacturing facilities. As of the date of publication, the industry is awaiting final regulations from the Department of the Treasury.

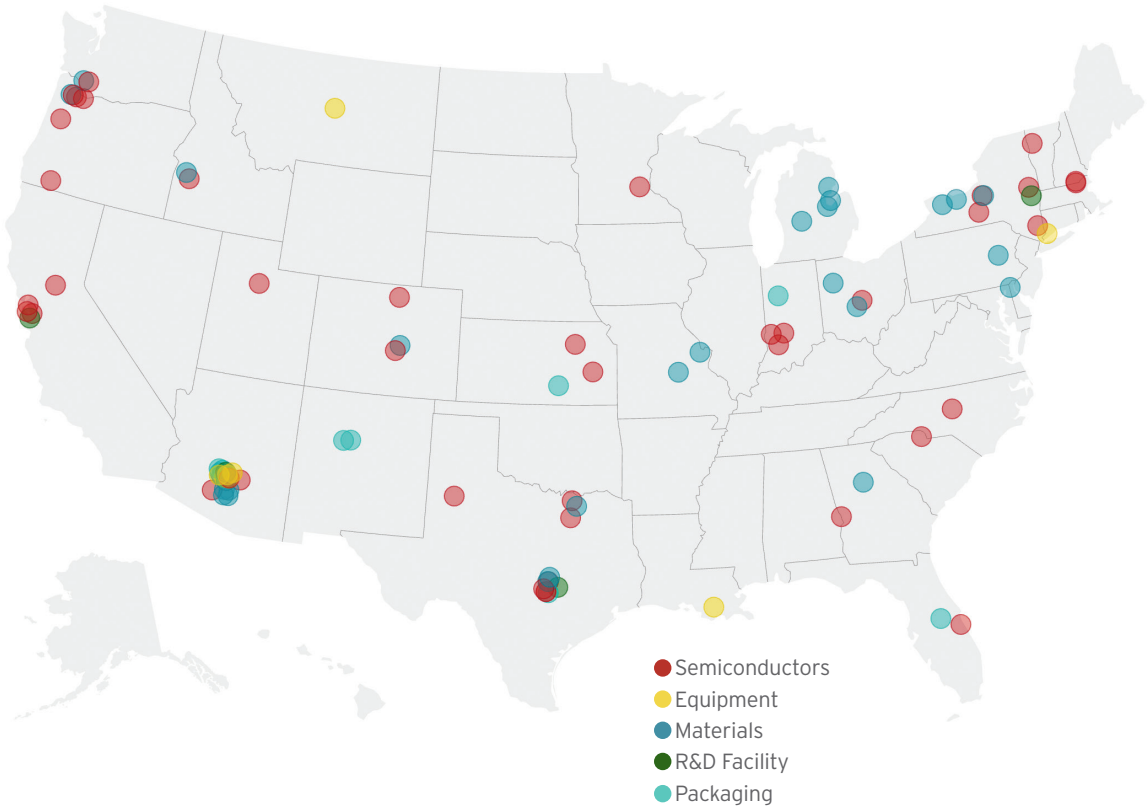
CHIPS SPARKING COMPANY INVESTMENTS

Since the introduction of the CHIPS Act in 2020, companies in the semiconductor ecosystem have announced more than 90 projects across 28 states, totaling nearly $450 billion in private investments. These projects will create over 58,000 of new, high-quality jobs in the U.S. semiconductor ecosystem alone, as well as hundreds of thousands of supported jobs throughout the broader U.S. economy.

The figure below shows projects in the domestic semiconductor supply chain announced between May 2020 and August 2024, representing industry investment in semiconductor fabrication and packaging, equipment and materials manufacturing, and R&D facilities.

THE CHIPS ACT IN ACTION

SEMICONDUCTOR SUPPLY CHAIN MANUFACTURING INVESTMENTS ANNOUNCED MAY 2020-AUGUST 2024



R&D INVESTMENTS

Across the Departments of Commerce and Defense, as well as at the National Science Foundation, activities are ramping up for the $13 billion in R&D funding appropriated through the CHIPS and Science Act.

The Department of Commerce is proceeding with the National Semiconductor Technology Center (NSTC), awarding it $5 billion. The NSTC is expected to be the centerpiece of the Commerce Department's semiconductor R&D activities and will most likely consist of a national network of research facilities, including a NSTC Administrative and Design Facility, a NSTC EUV Center, and a NSTC Prototyping and NAPMP Advanced Packaging Piloting Facility.

Commerce also initiated activities for its National Advanced Packaging Manufacturing Program (NAPMP). This $3 billion program will consist of a series of internal National Institute of Standards and Technology (NIST) research programs to distribute grant funding, as well as the brick-and-mortar piloting facility which will be co-located with the NSTC prototyping facility.

Progress is also underway for the CHIPS Metrology Program, the CHIPS Digital Twins Manufacturing USA Institute, and the DOD Microelectronics Commons.

Taken as a whole, these programs will help advance semiconductor innovation and build on U.S. technology leadership. For updated information on the rollout of the research programs under the CHIPS Act, visit semiconductors.org/chips-rd-programs.

STRENGTHENING THE U.S. SUPPLY CHAIN

A new report by SIA and the Boston Consulting Group on the semiconductor supply chain forecasts significant improvements in the resilience of the supply chain in the U.S. and globally in coming years. In particular, the study shows investments from the industry, facilitated by incentives under the CHIPS Act, are making progress in growing domestic semiconductor manufacturing and strengthening the U.S. economy. Among other things, the report projects the following:

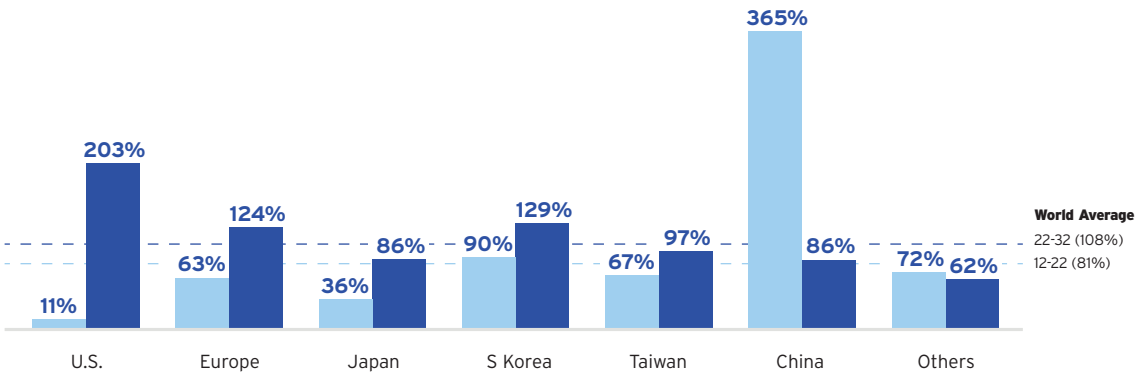
- U.S. fab capacity will increase by 203% from 2022-2032, a tripling of U.S. capacity. The projected 203% growth is the largest projected percent increase in the world over that time.
- The U.S. will secure more than one-quarter (28%) of global capital expenditures between 2024-2032 – an estimated $646 billion – an amount second only to Taiwan. In the absence of the CHIPS Act, the U.S. would have captured only 9% of global capex by 2032, according to the report.
- The U.S. will increase its share of global fab capacity for the first time in decades, growing from 10% today to 14% by 2032. In the absence of CHIPS enactment, the U.S. share would have slipped further to 8% by 2032, according to the report.
- The U.S. will grow its capabilities in critical technology segments, such as leading-edge fabrication, DRAM memory, analog, and advanced packaging. For example, U.S. capacity for advanced logic (less than 10nm) will grow to 28% by 2032, including new capabilities at the leading edge.

Despite this substantial progress, areas of vulnerability in the ecosystem remain, and additional work is needed to maintain this momentum and secure key areas of the chip supply chain.

GLOBAL SEMICONDUCTOR CAPACITY INCREASE BY LOCATION

(% CHANGE IN WSPM CAPACITY)

2012-2022 VS. 2022-2032



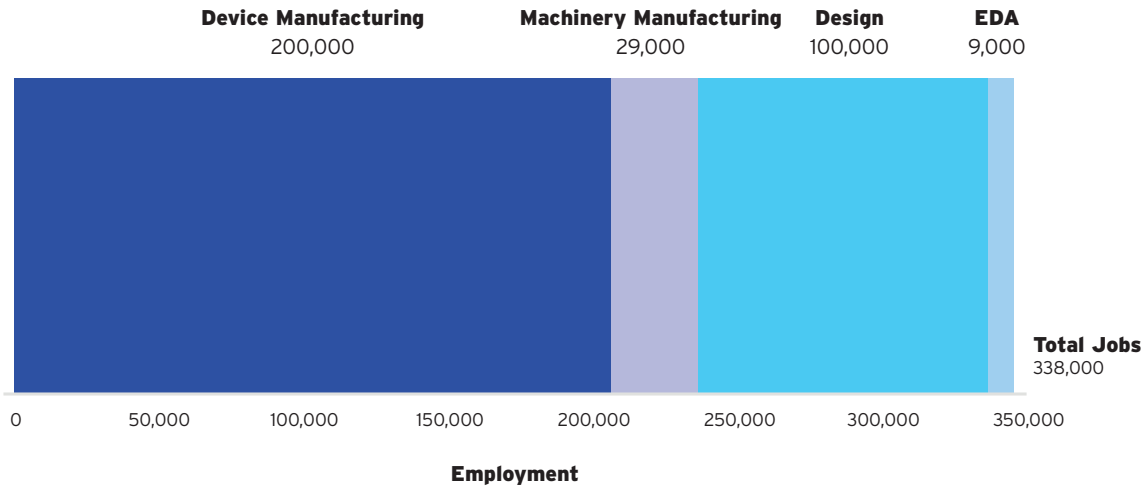
Source: SEMI, BCG Analysis

THE SEMICONDUCTOR WORKFORCE

Having a competitive domestic workforce and resilient manufacturing capabilities are critical to America's lead in semiconductors. In addition, a strong domestic semiconductor industry is essential to the U.S. economy.

The semiconductor industry has a considerable economic footprint in the United States, with roughly 338,000 people working in the industry, including roles in chip design, electronic design automation (EDA), semiconductor manufacturing, and equipment manufacturing. Additionally, semiconductors enable over 300 downstream economic sectors accounting for over 26 million U.S. workers.

SEMICONDUCTOR WORKFORCE BY FIELD, 2023



Source: CES, QCEW, Oxford Economics

The U.S. semiconductor industry accounts for more than 300,000 direct U.S. jobs and nearly 2 million additional indirect and induced U.S. jobs.

ONE
U.S. semiconductor job supports

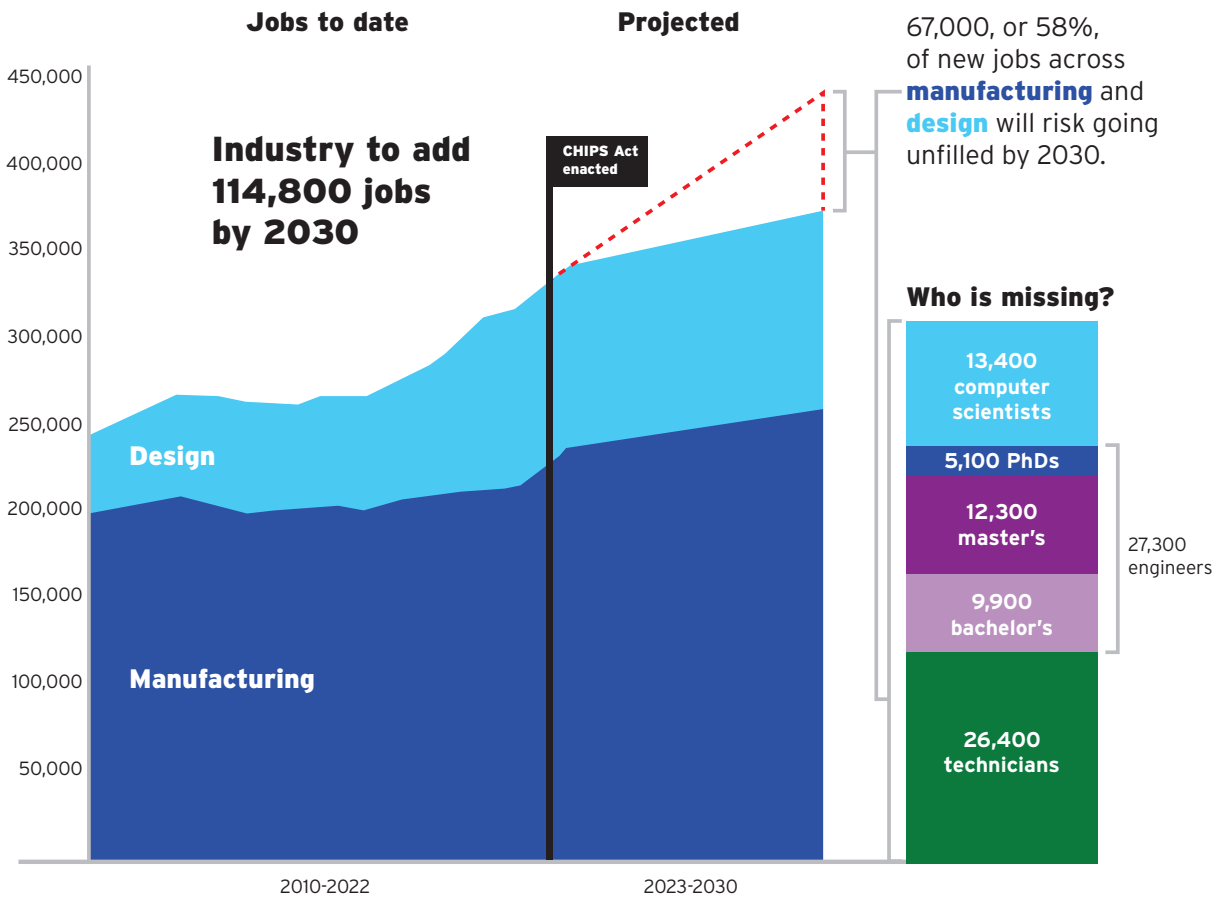
5.7
jobs in other parts in the U.S. economy...

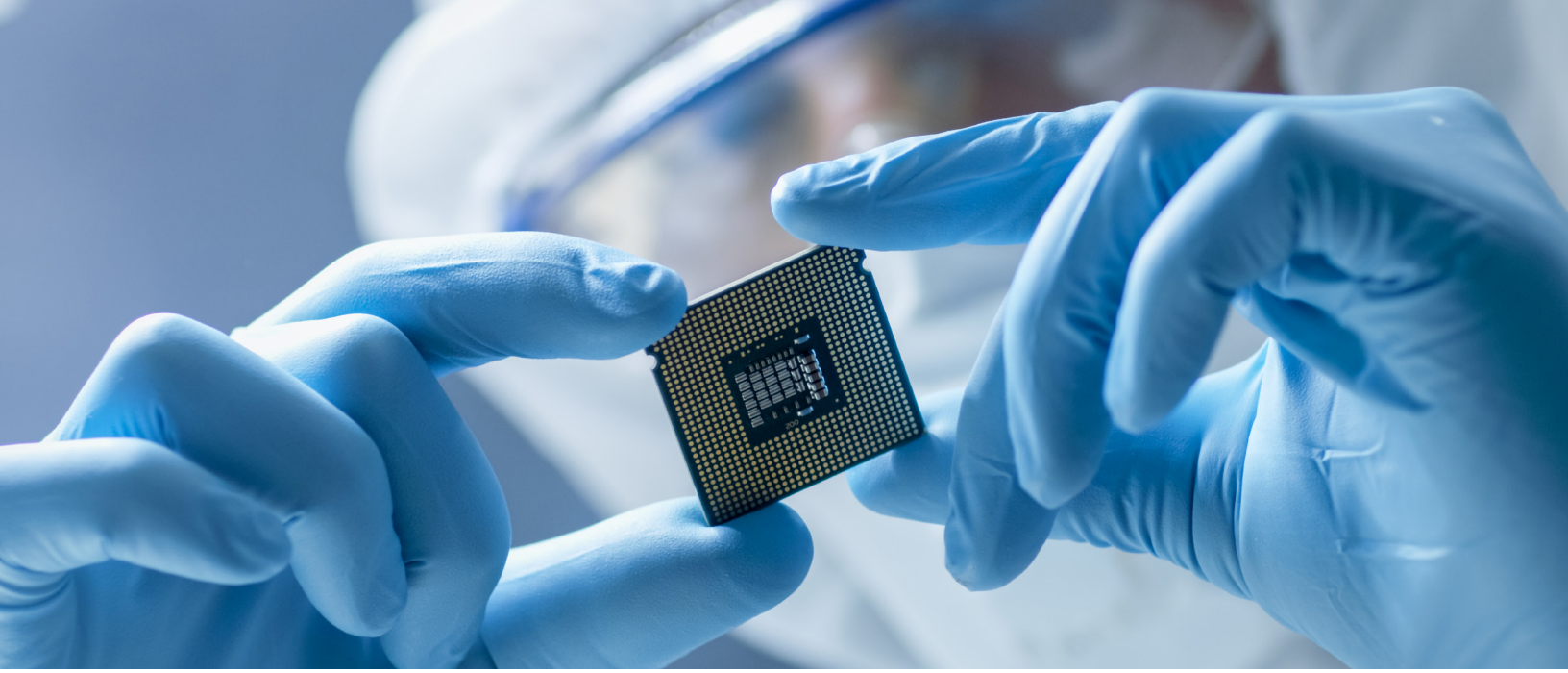
...that's nearly
2,000,000 ADDITIONAL
American jobs

EXPANDING THE TALENT PIPELINE

With demand for chips on the rise and new capacity coming online in the years ahead, demand for industry-ready talent will also increase. According to a 2023 study by SIA and the Boston Consulting Group, the United States faces a significant shortage of technicians, computer scientists, and engineers, with a projected shortfall of 67,000 workers in the semiconductor industry by 2030 and a gap of 1.4 million such workers throughout the broader U.S. economy.

SEMICONDUCTOR WORKFORCE GAP





To meet this challenge and address the growing talent gap, SIA recommends a holistic public policy approach with the following pillars:

1. BUILD THE SUPPLY OF ENGINEERS AND SCIENTISTS

- **Invest in the Innovation Workforce:** Increase and sustain funding for federal research and development (R&D) programs to build America's innovation workforce.
- **High-skilled Global Talent:** Adopt critical and targeted STEM immigration reforms to ensure America attracts and retains the world's top talent.

2. IMPROVE AND SIMPLIFY TRAINING OF SKILLED TECHNICIANS

- **High-quality Workforce Training:** Expand workforce training programs that meet industry needs, including apprenticeships and career and technical training programs, with common and transparent metrics of performance.
- **Standardization and Portability of Skills:** Ease the transition across educational institutions and workforce development programs.

3. CROSS-CUTTING WORKFORCE CHALLENGES: EXPANDING THE PIPELINE AND ADDRESSING AFFORDABILITY

- **Expand and Advance the STEM Talent Pipeline:** Prioritize STEM education for individuals entering or already in the pipeline and expand the pool of potential workers, including veterans, women, and underrepresented minorities.
- **Affordability:** Remove barriers to entry into semiconductor education and workforce training programs through Pell grants, favorable loans, and other financial incentives.

SUSTAINING U.S. LEADERSHIP IN SEMICONDUCTOR DESIGN

Advances in chip design have led to breakthroughs in semiconductor-enabled technologies that are a driving force behind 21st century U.S. technology leadership. This leadership provides the U.S. with the technological edge to be the "first mover" in countless industries and secure the economic and security benefits resulting from this advantage.

Currently, U.S. companies account for half of global chip design revenue, but global competitors are challenging this leadership. Some countries provide tax credits of up to 50% for design efforts, while the U.S. fails to offer a targeted incentive for chip design.

To maintain U.S. leadership in chip design – and continue to derive the enormous economic benefits and strategic advantage of this leadership – the U.S. must ensure it has a favorable climate for more chip design to be conducted in the U.S.

Bipartisan legislation was recently introduced the House of Representatives to expand the CHIPS Act's 25% investment tax credit to include investments in semiconductor design. Passing the "Semiconductor Technology Advancement and Research (STAR) Act" will establish an important incentive to maintain and enhance critical U.S. semiconductor technology leadership.

PROMOTING SUSTAINABILITY

The semiconductor industry has a long history of leadership on environmental sustainability, ranging from actions to reduce greenhouse gas emissions associated with semiconductor fabrication processes to replacing chemicals of concern within semiconductor manufacturing processes.

TACKLING THE PFAS CHALLENGE HEAD-ON

One important sustainability priority for the semiconductor industry is to address the environmental and health concerns associated with per- and polyfluorinated substances (PFAS), a broad category of chemicals identified as potentially posing environmental and health risks. SIA established the Semiconductor PFAS Consortium in January 2022 to better understand the uses of PFAS in the semiconductor supply chain, PFAS treatment and detection methods, abatement and process technologies, and the potential availability (or absence) of alternatives.

To date, the Consortium has identified over 1,000 uses of PFAS in the semiconductor manufacturing process and associated supply chain, including numerous essential applications. The Consortium has published technical white papers, available at www.semiconductors.org/PFAS, documenting these uses, the unique performance and functional attributes of PFAS in each application, and the challenges associated with identifying and qualifying substitutes. While research continues on identifying potential alternatives to PFAS in the semiconductor fabrication process, additional work is needed on process optimization to reduce the use of PFAS and detection and treatment technologies to minimize or eliminate releases to the environment.

As regulators around the world take action to address the challenge certain PFAS pose to human health and the environment, SIA encourages policymakers to leverage the findings of the PFAS Consortium and account for the essentiality of PFAS to semiconductor manufacturing.

SUPPLY CHAIN REBALANCING

Strengthening American and global semiconductor supply chains remains a top priority for the U.S. semiconductor industry, with companies across the sector working to diversify risk by broadening their operational footprint. Governments have also taken a particular interest in advancing supply chain resilience when it comes to the production of chips and upstream materials capacity, with a goal to reduce strategic dependencies.

ITSI Fund: The CHIPS and Science Act allocated $500 million to the International Technology Security and Innovation (ITSI) Fund, which will help expand and diversify segments of the semiconductor supply chains such as critical materials and assembly, testing, and packaging. The State Department has established partnerships with Costa Rica, Panama, Vietnam, Indonesia, the Philippines, and Mexico under the ITSI Fund.

U.S.-Japan: The U.S. and Japan are pursuing a range of cooperative efforts to enhance semiconductor supply chain resilience, including through the U.S.-Japan Commercial and Industrial Partnership (JUCIP), cooperation between the National Semiconductor Technology Center (NSTC) and Japan's Leading-Edge Semiconductor Technology Center (LSTC), and the U.S.-Japan University Partnership for Workforce Advancement and Research & Development in Semiconductors (UPWARDS) initiative.

U.S.-Korea: The U.S. and Korea are also deepening collaboration on technology and economic security policies in support of the semiconductor industry. For example, the U.S.-Korea Supply Chain and Commercial Dialogue (SCCD) established a semiconductor-specific working group to enhance industry supply chains and promote joint R&D efforts.

U.S.-EU: Through the Trade and Technology Council (TTC), the U.S. and European Union (EU) are cooperating to improve the resilience of transatlantic semiconductor supply chains and facilitate information exchange on government incentives provided to the semiconductor sector. The U.S. and EU may also develop joint or cooperative measures to address distortionary effects on the global supply chain for legacy semiconductors.

North American Leaders Summit: In May 2023, the U.S., Canada, and Mexico established the first North America Semiconductor Conference to collectively strengthen the North American semiconductor supply chain, including critical minerals and workforce. In subsequent dialogues, the governments committed to work with academia and the private sector to develop policies that will advance regional competitiveness in semiconductors.

U.S.-India: The U.S. and India are collaborating to create stronger and more secure semiconductor supply chains through multiple bilateral dialogues. A February 2024 Information Technology and Innovation Foundation (ITIF) report found India could expand its role in semiconductor supply chains, particularly if the government pursues and implements systemic policy reforms to better attract and support semiconductor company operations in the country.

GOVERNMENTS RACE TO DEVELOP CHIP STRATEGIES AND INCENTIVES

Governments around the globe are developing comprehensive strategies and offering targeted incentive packages to attract semiconductor investment.

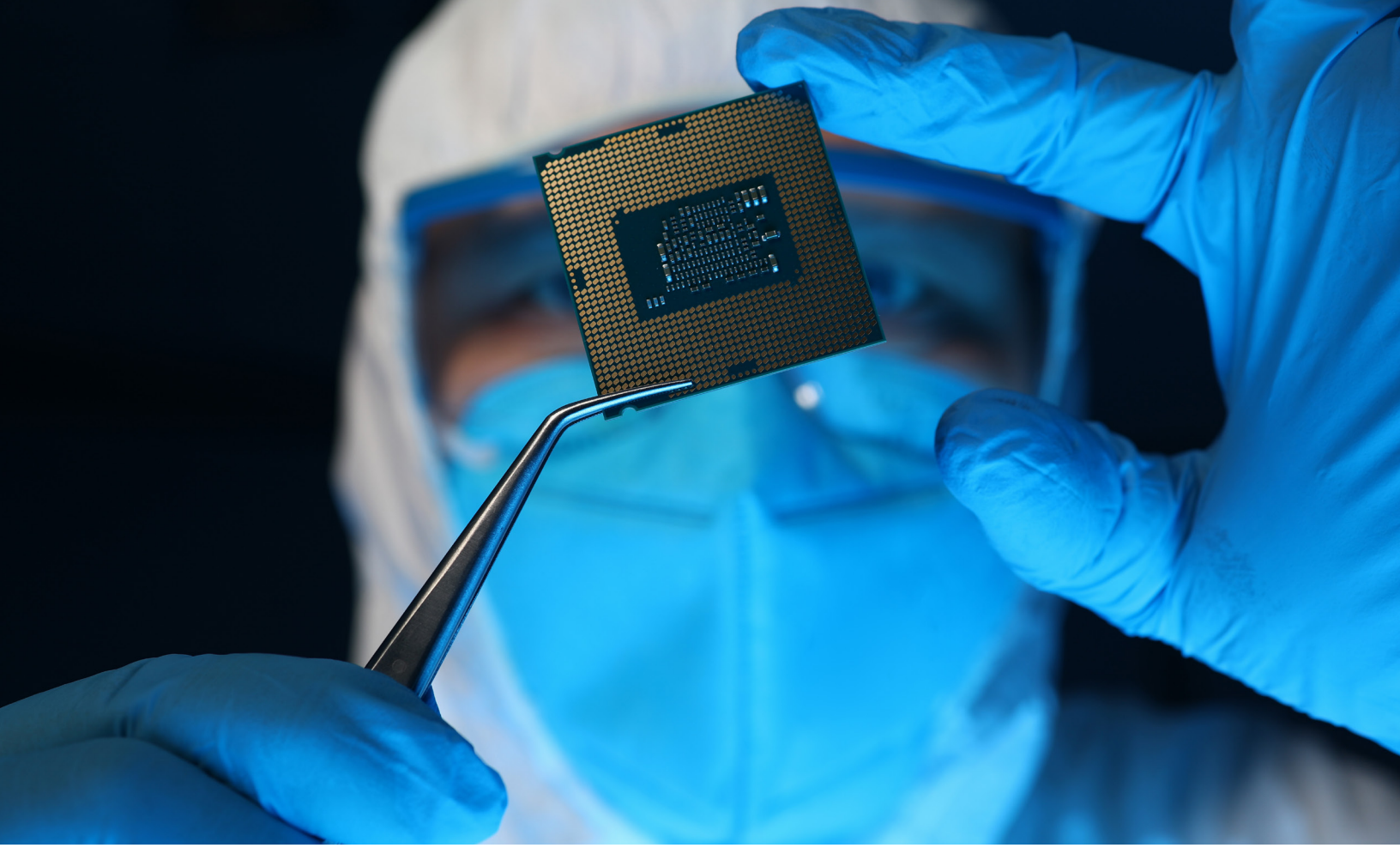
Companies have responded by announcing large-scale investments in new front-end and back-end manufacturing capacity, R&D and design centers, and workforce development. When offering incentives, governments should require a minimum level of private sector investment in projects to ensure government support is market based. SIA and BCG published a report in August 2024 outlining key factors semiconductor companies evaluate when selecting sites for semiconductor ecosystem investments.

China: China continues to invest heavily in its domestic semiconductor production capacity, recently announcing another $47 billion in funding from 19 government and state-owned investors in the third phase of its National IC Fund. China is also using a range of levers, including local content preferences, domestic standards, and informal government directives to create demand for domestically produced semiconductors.

EU: The EU Chips Act, enacted in September 2023, seeks to mobilize $47 billion in public and private funding for Europe's semiconductor ecosystem, with subsidy packages disabused by EU member states. The goal of the EU Chips Act is to double Europe's global market in semiconductor production to 20% by 2030.

Japan: Japan is investing roughly $25 billion to develop its domestic semiconductor production capabilities. Japan has directed this funding to subsidize fab construction as well as to support leading-edge chip innovation through Rapidus, a domestic semiconductor manufacturer that aims to produce 2nm chips by 2027.

Korea: In May 2024, Korea announced a support package totaling approximately $19 billion to bolster domestic chip design and manufacturing capacity. This follows a January 2024 announcement to build the world's largest semiconductor mega cluster in the country, with an investment of $472 billion over the next 20 years.



Taiwan: Taiwan passed its largest-ever incentives for the semiconductor industry under the "Taiwan Chips Act" in 2023, offering investment tax credits of 25% for R&D expenses and 5% for equipment.

India: India's central government launched its $10 billion "Semicon India Programme" in late 2022, coupled with incentives from Indian states for manufacturing and design. The Indian Semiconductor Mission (ISM) — a new government agency dedicated to facilitating growth of India's chips industry — recently approved proposals for three semiconductor plants.

Southeast Asia: In October 2023, Vietnam announced goals to train 50,000 chip engineers by 2030 to bolster the semiconductor sector and plans to unveil a national semiconductor strategy in late 2024. In Malaysia, the New Industrial Master Plan (NIMP) 2030 aims to enhance the manufacturing sector's value by diversifying exported products, focusing on encouraging front-end activities like semiconductor equipment manufacturing, wafer fabrication, and integrated circuit design.

Latin America: Costa Rica announced a national semiconductor strategy in March 2024, with an eye to building out its back-end assembly, test, and packaging manufacturing footprint. In May 2024, Panama's President signed a decree launching a national semiconductor strategy, along with the creation of an Advanced Semiconductor Technology Center. In Mexico, a government decree issued in October 2023 announced new federal tax incentives allowing accelerated depreciation of investments in semiconductors and nine other sectors. And in February 2024, Brazil launched the "More Innovation Semiconductors" scheme, offering $20 million in subsidies to stimulate investments in semiconductor design, manufacturing, and testing.

TRADE AND SEMICONDUCTORS

The semiconductor industry is one of the most globally integrated industries, spanning dozens of nations and thousands of suppliers.

SIA and its members are committed to ensuring global semiconductor supply chains are resilient, further promoting access to global markets and facilitating increased global trade through deeper international collaboration with government and industry. U.S.-headquartered semiconductor companies generate roughly three-quarters of their revenue from sales to foreign markets. To maintain U.S. semiconductor leadership, the U.S. needs a robust trade policy to complement efforts to build domestic capacity through the CHIPS and Science Act. SIA is currently leading efforts to promote global industry cooperation and expand global markets in multiple fora.

World Semiconductor Council (WSC): In October 2023, SIA and the U.S government hosted the 24th Governments/Authorities Meeting on Semiconductors (GAMS), bringing together government delegations from China, the European Union, Japan, Korea, and Chinese Taipei with their respective industry associations that comprise the WSC. Established in 1996, the WSC and GAMS are important examples of public-private partnership and the power of international cooperation to advance policies that foster fairness and openness in the semiconductor industry. The WSC meets annually at a CEO level and issues a set of recommendations to respective governments on issues relating to trade, government support, intellectual property protection, environmental standards, and other pressing issues. During the GAMS, representatives from the six governments discuss, reach agreement, and take action on the WSC's recommendations.

World Trade Organization (WTO): Alongside more than 40 other global associations from around the world, SIA continued to call for WTO members to expand both the geographic coverage and product coverage of the 1996 Information Technology Agreement (ITA) and its 2015 Expansion (ITA2). These agreements eliminated tariffs on hundreds of tech products, including chips, and the materials and manufacturing equipment to produce chips. SIA strongly encourages additional countries to join the ITA1 and ITA2, especially those governments seeking to attract semiconductor investment to their countries. SIA also supports a permanent extension of the longstanding WTO agreement in which governments committed to refrain from imposing import tariffs on data cross-border data flow, known as the Moratorium on Customs Duties on Electronic Transmissions. The Moratorium ensures cross-border flows of semiconductor design and manufacturing data are not subject to time-consuming customs procedures and duties, which would impose additional costs and delays on semiconductor supply chains.

GEOPOLITICS AND THE SEMICONDUCTOR INDUSTRY

The global structure of the semiconductor supply chain has enabled SIA member companies to deliver continual leaps in cost savings and performance enhancements, but chip supply chains also face unprecedented risks.

Geopolitical unrest, conflicts, and escalating restrictions on semiconductor technologies and raw materials have disrupted semiconductor supply chains, exacerbated labor shortages, and created new trading networks that facilitate illicit diversion of semiconductors to conflict areas. Global cooperation between governments and industry is crucial to ensure supply chains are resilient and operational, with appropriate safeguards to prevent access and misuse of sensitive technologies by malign actors.

Economic Security Cooperation: In May 2023, the G7 launched an initiative to counter economic coercion, pledging collective action to ensure attempts to weaponize economic dependence would "face consequences." In May 2024, G7 leaders agreed to act together to "promote economic resilience" and "confront non-market policies and practices that undermine the level playing field and our economic security," including with respect to semiconductors. The alliance also established a semiconductors "Point of Contact" group.

Combating Illicit Diversion of Chips: In response to Russia's invasion of Ukraine, 39 countries imposed coordinated export controls and sanctions aimed to restrict Russia's access to items it needs to sustain its war effort. More than two years into the conflict, however, some western semiconductors have still been found in battlefield weapons systems used by Russia. Semiconductor companies continue to innovate their approaches to due diligence, customer and distributor screening, supply chain tracing, and information sharing with relevant authorities to adapt to Russia's constantly evolving evasion tactics. The U.S. semiconductor industry will continue to support government efforts to root out malign actors from the supply chain.

Technology Restrictions: Trade restrictions are reshaping semiconductor supply chains and the global competitive landscape for the industry. As the U.S., Japan, the Netherlands, and other countries impose more restrictive controls that prevent the sale of semiconductor technologies to China, China has taken steps to strengthen its own export control regime, imposing new licensing requirements on gallium, germanium, graphite, and rare earth elements and technologies, which are critical inputs for both semiconductor production and important chip-consuming sectors, such as automotives.

THE GLOBAL SEMICONDUCTOR MARKET

Over the past three decades, the semiconductor industry has experienced rapid growth and delivered enormous economic impact.

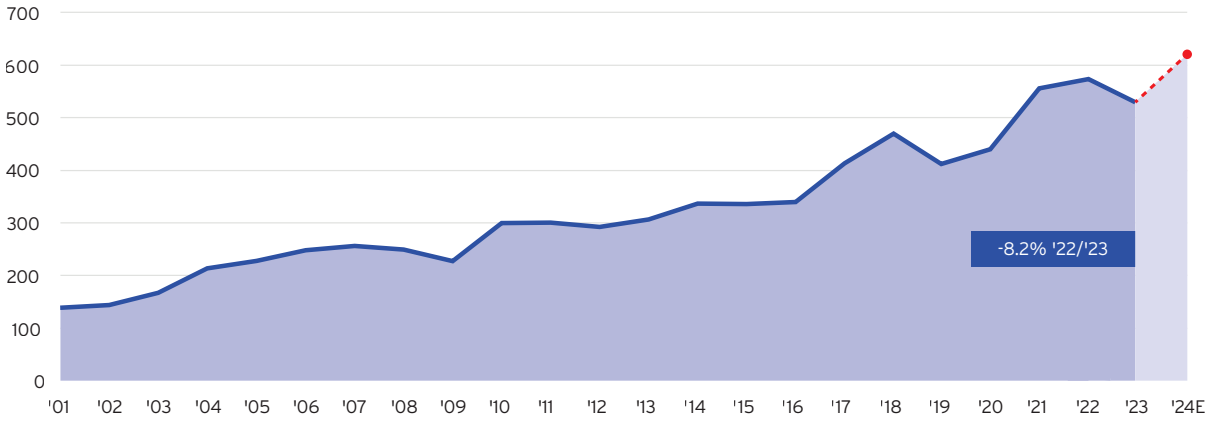
Chip performance and cost improvements made possible the evolution from mainframes to PCs in the 1990s, the Web and online services in the 2000s, and the smartphone revolution in the 2010s. Innovation in AI, electric vehicles, and industrial manufacturing will drive continued growth in the chip market through the next decade. By 2030, AI alone is projected to contribute more than $15 trillion to the global economy. Semiconductors have become essential to our modern world, which is why long-term market demand for semiconductors remains strong.

The 2023 market was down through the first half of the year but strong sales to auto, industrial, and AI propelled a rebound in the second half of the year.

Following a sales record year of $574.1 billion in 2022, global semiconductor sales in 2023 decreased by 8.2% to $526.9 billion. Sales were slow in the first half of 2023 but grew consistently in the second half of the year, largely due to increased demand for chips in AI, autos, and industrial applications. Sales during the first half of 2024 increased by 19.2% compared to sales during the first half of 2023.

Estimates from the World Semiconductor Trade Statistics (WSTS) project worldwide semiconductor industry sales will increase to $611 billion in 2024, a 16% increase compared to 2023. Notwithstanding the short-term cyclical downturn the market faced in 2023, long-term growth prospects for this foundational technology remain promising.

GLOBAL SEMICONDUCTOR SALES ($B)



SEMICONDUCTOR DEMAND DRIVERS

Over the next decade, further innovation in semiconductor technology will enable a host of transformative technologies, including artificial intelligence (AI), autonomous electric vehicles, and the internet of things (IoT). Indeed, long-term growth drivers for semiconductor demand are firmly in place.

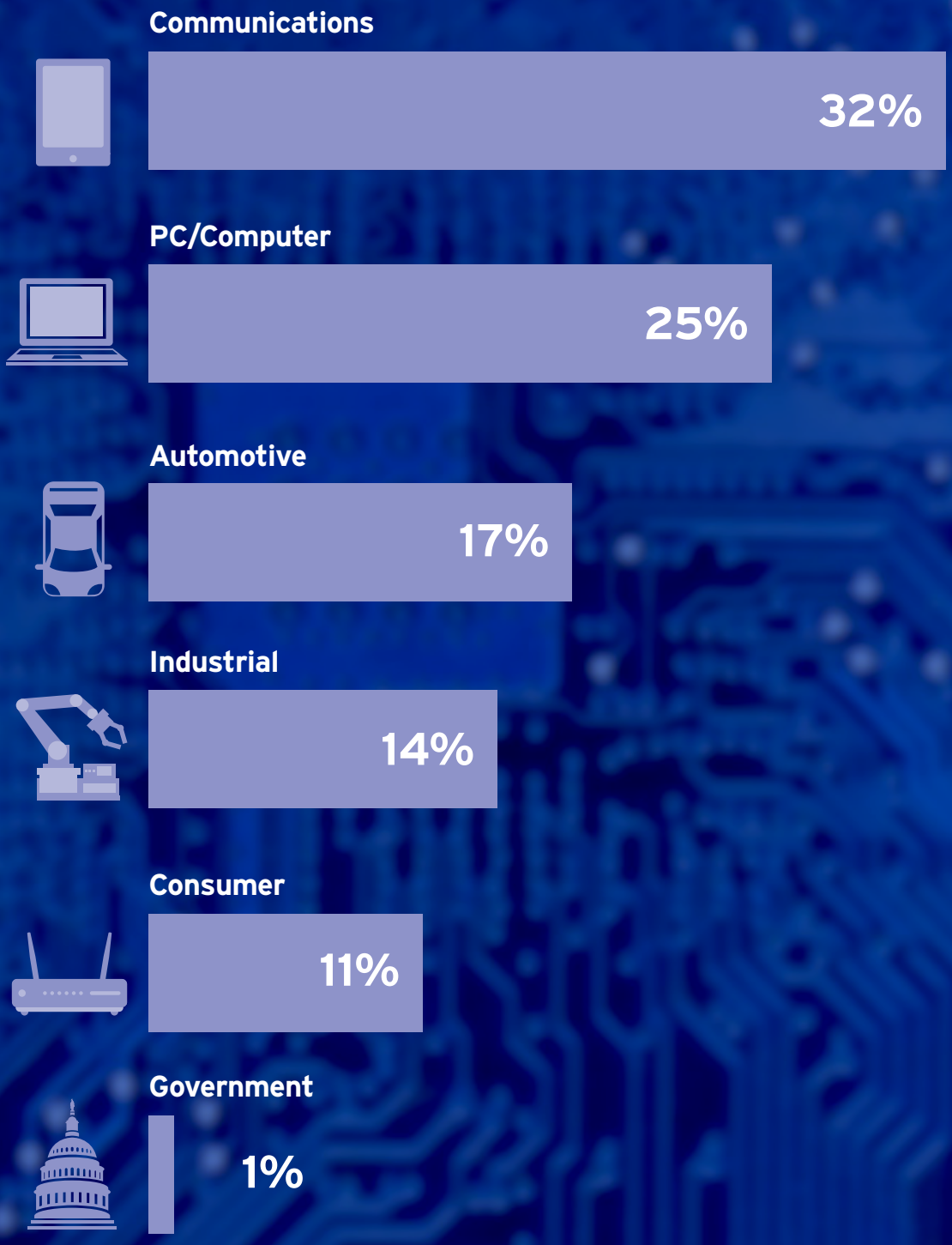
Shifts in end-use market share reflect growing innovation and demand for semiconductors in the automotive, industrial, and consumer markets.

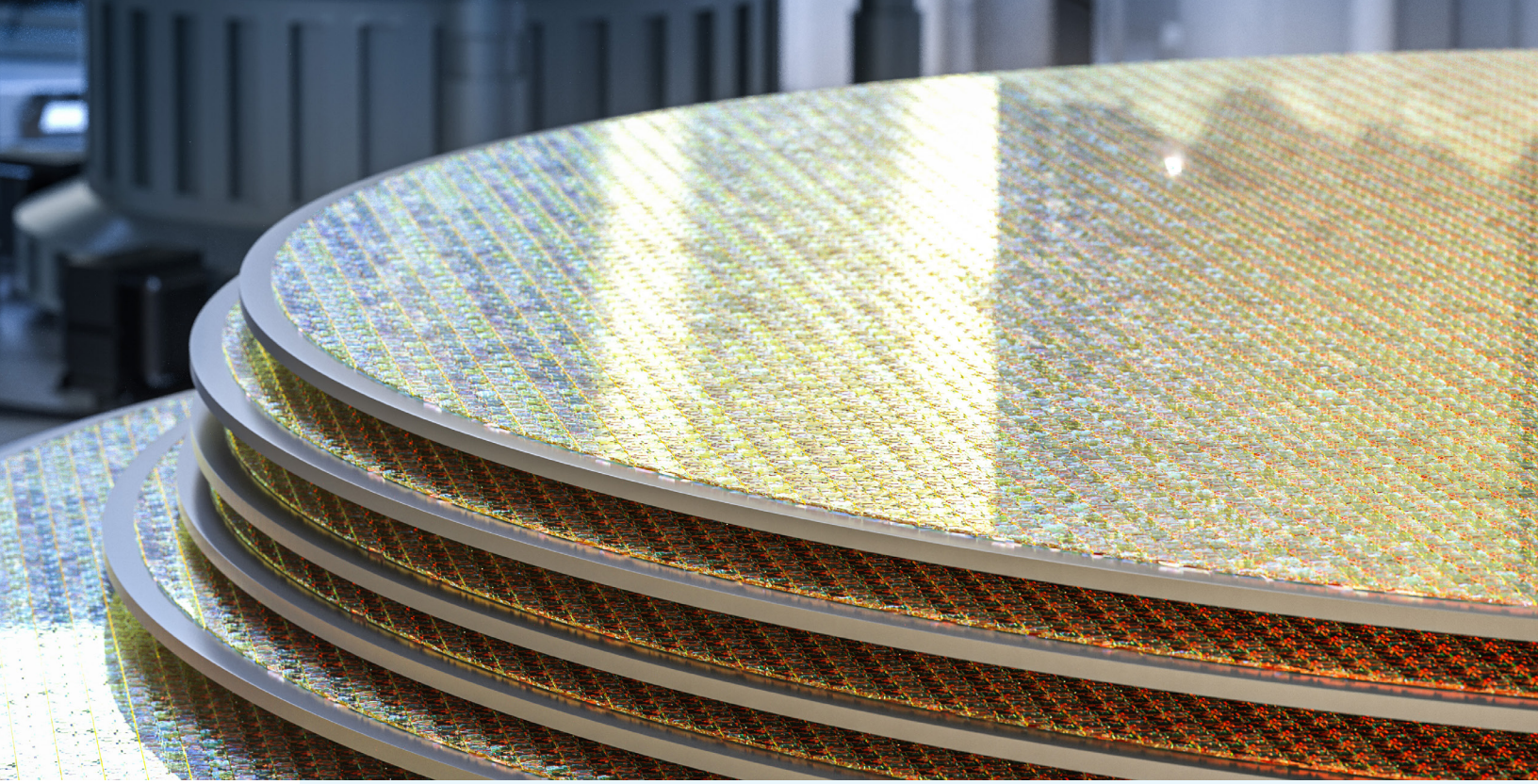
The rebound in sales in the second half of 2023 was fueled by increased sales to the automotive and industrial sectors and the growing demand for a range of chips that are critical to AI systems. The changes among these demand drivers resulted in shifts to the amount of global sales revenue attributed to each market sector. Most prominently, the automotive sector experienced the largest growth in share of chip sales to become the third-largest end market in 2023. Innovation in these industries ensures demand continues to grow and global sales remain on course to potentially reach $1 trillion by 2030. To meet the increasing demand for chips through the decade, semiconductor companies have committed billions in new investments.

2023 DEMAND BY END USE

End-Use Category	Communication	Computer	Automotive	Consumer	Industrial	Government
Annual Growth	-1.8	-7.1	15.0	-31.9	-13.3	-45.0
Total Value ($B)	**169.2**	**140.0**	**90.1**	**54.8**	**72.1**	**5.0**

2023 TOTAL GLOBAL SEMICONDUCTOR DEMAND SHARE BY END USE





DRIVING AI INNOVATION

Artificial intelligence (AI) is one of the highest profile technology development frontiers today. It spans from fundamental science and academic research programs to currently viable and profitable commercial applications. Further, AI is of enormous geopolitical interest, driving fierce global competition for this key enabling technology. The semiconductor industry is simultaneously a driver and a consumer of AI systems. In no uncertain terms, AI will be a prominent feature of the semiconductor industry for decades to come.

AI systems are hungry for chips. The processing capacity required for data-intensive AI workloads is ever increasing, and as AI capabilities make giant leaps and available data streams continue to grow, businesses are eager to leverage AI computing power and memory to convert and store actionable insights. Consequently, the demand for AI products is growing. And, as we identify further applications for AI systems — from accelerated scientific discovery and product innovation to higher resolution climate modeling to supply chain, electric grid, and critical infrastructure resilience planning — the semiconductor industry continues to push the frontiers of innovation for newer, more capable AI accelerators.

At the same time, the semiconductor industry stands to benefit enormously from AI for its own operations. AI is dramatically enhancing electronic design automation (EDA) software. And for fabs, which produce extraordinary volumes of data continuously, AI drives faster determination of root cause for failure modes, streamlines quality assurance measures and efficiency for wafer processing, and optimizes factory operations.

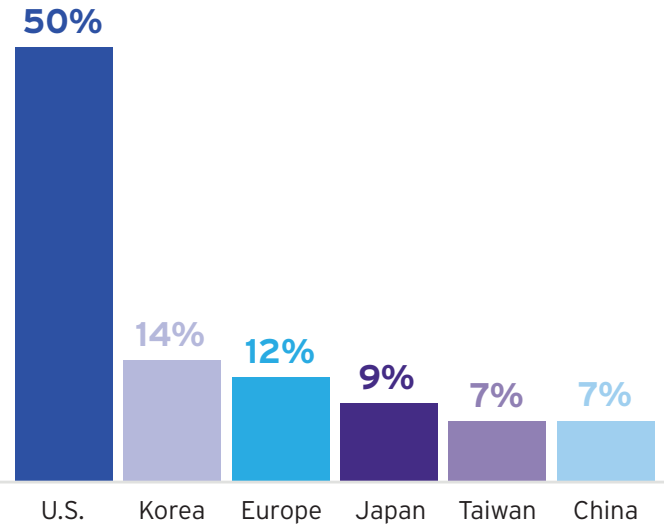
Artificial intelligence is one of the primary demand drivers that will usher the semiconductor industry toward the trillion-dollar annual revenue threshold and beyond.

GLOBAL MARKET SHARE

The U.S. semiconductor industry accounts for half of the global market and on average has displayed steady annual growth.

Since the late 1990s, the U.S. has been the global sales market share leader for chips, and in 2023, the U.S. semiconductor industry continued that trend, accounting for 50.2% of global sales revenue. In addition, U.S. semiconductor firms maintain a leading or highly competitive position in R&D, design, and manufacturing process technology. Global sales market share leadership also allows the U.S. semiconductor industry to benefit from a virtuous cycle of innovation. That sales leadership enables the U.S. industry to invest heavily in R&D, which helps ensure continued U.S. sales leadership. As long as the U.S. semiconductor industry maintains global market share leadership, it will continue to benefit from this virtuous cycle of innovation.

2023 GLOBAL MARKET SHARE



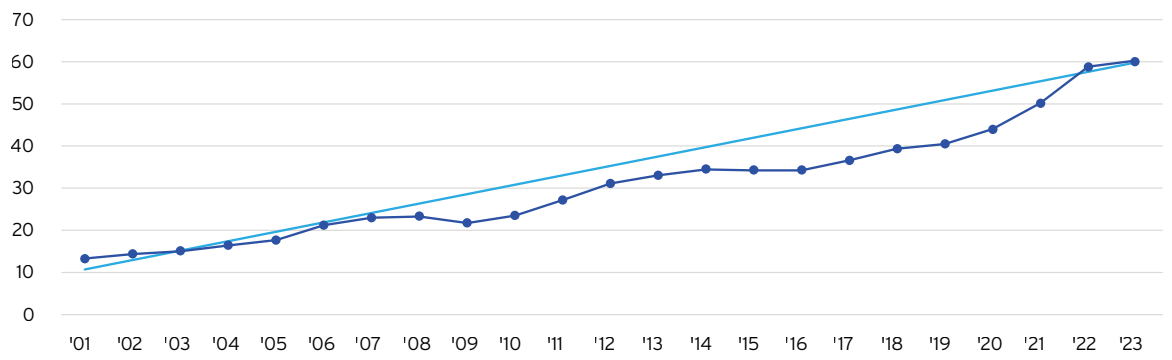
A VIRTUOUS CYCLE OF INNOVATION

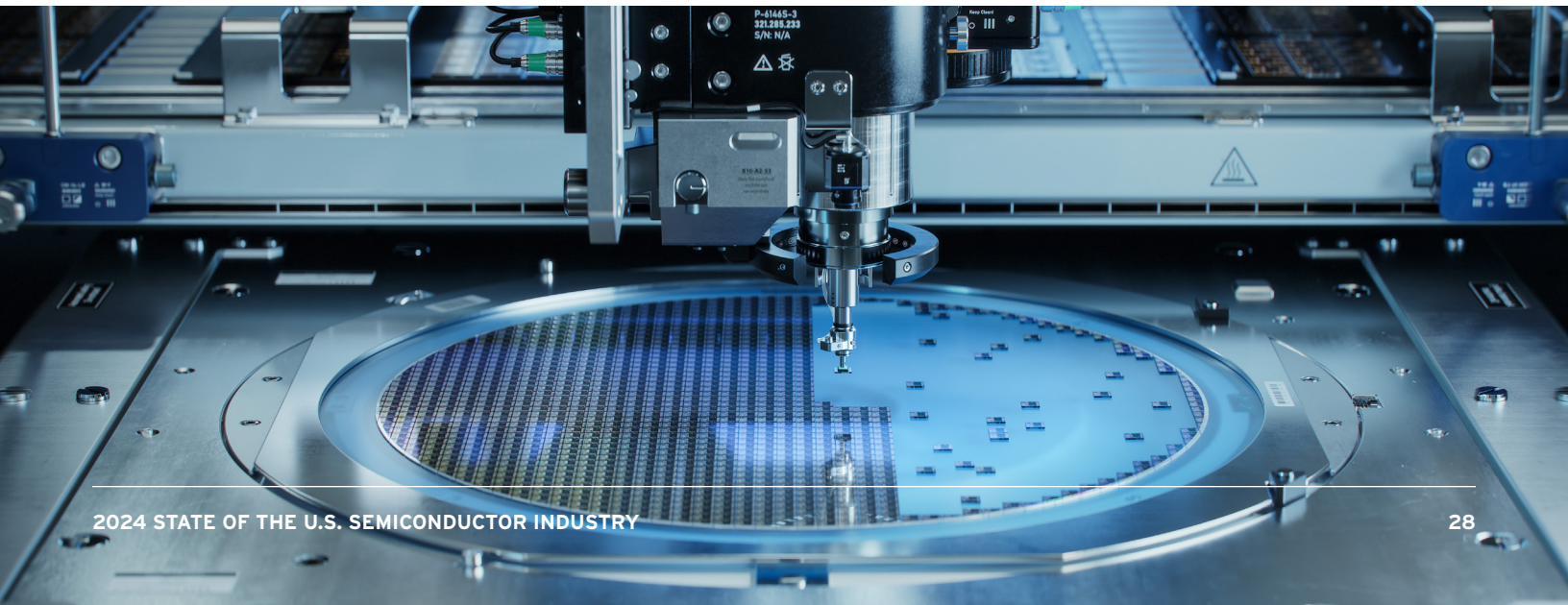
U.S. TECHNOLOGY COMPETITIVENESS

U.S. semiconductor R&D expenditures are consistently high, reflecting the inherent link between U.S. market-share leadership, research investments, and continued innovation.

In 2023, overall U.S. semiconductor industry investment in R&D totaled $59.3 billion. The growth in R&D spending in 2023 represented an increase of 0.9% over 2022. R&D expenditures by U.S. semiconductor firms tend to be consistently high, regardless of cycles in annual sales, which reflects the importance to our industry of investing in innovation.

R&D EXPENDITURE ($B)



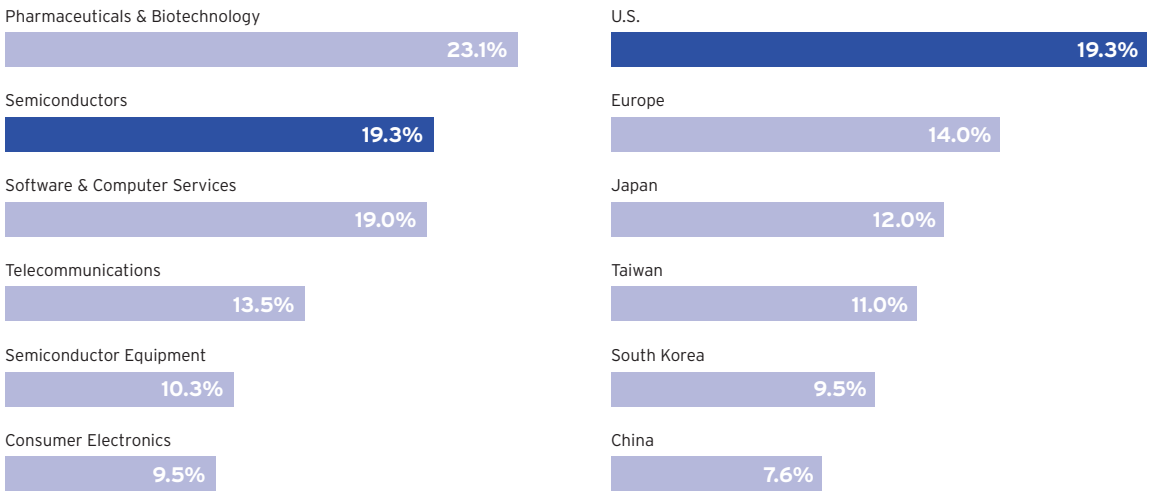


U.S. TECHNOLOGY COMPETITIVENESS

The U.S. semiconductor industry maintains one of the highest levels of R&D as a percent of sales of any U.S. industry.

The U.S. semiconductor industry invested 19.5% of revenue into R&D in 2023, ranking second to the U.S. pharmaceuticals and biotechnology industry in terms of the rate of R&D spending as a percent of sales. While global competitors are increasing their R&D investments to compete with the U.S. industry, American firms spend more on R&D than any other country's semiconductor industry. These high levels of reinvestment into R&D drive innovation in the U.S. semiconductor industry and, in turn, help maintain global sales market leadership and jobs throughout the United States.

R&D EXPENDITURES AS A PERCENTAGE OF SALES



U.S. SEMICONDUCTOR INDUSTRY DOMESTIC ECONOMIC CONTRIBUTION

Semiconductors continue to be one of America's top exports.

U.S. exports of semiconductors totaled $52.7 billion in 2023, sixth-highest behind exports of refined oil, crude oil, aircraft, natural gases, and autos. Consistent with the overall performance of the chip industry, U.S. exports of chips decreased by 14%, causing the industry to drop out of the top five. Meanwhile, U.S. exports of cars increased by 8%, becoming the fifth-largest U.S. export. In 2023, sales outside the U.S. comprised about three-quarters of total U.S. semiconductor industry sales. Despite the downturn in sales and export value in 2023, growth in the U.S. chip industry continues to be promising with projections of double-digit growth in 2024.

U.S. EXPORTS IN 2023

Crude Oil

$117.2B

Aircraft

$113.3B

Refined Oil

$112.9B

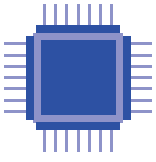
Natural Gas

$67.6B

Automotive

$63.6B

Semiconductors



$52.7B

U.S. SEMICONDUCTOR INNOVATION POLICY LANDSCAPE

To ensure continued U.S. leadership in the global semiconductor industry, the U.S. must carry forward an ambitious competitiveness and innovation agenda.

1. Invest in U.S. Semiconductor Leadership:

- Extend the duration of the incentives under the CHIPS Act, including an extension of the advanced manufacturing investment credit.
- Expand the existing CHIPS tax credit to cover chip design so more of this critical stage of production occurs in the U.S.
- Continue to fully fund the research programs authorized in the CHIPS and Science Act to maintain and grow U.S. technology leadership.

2. Strengthen America's Technology Workforce:

- Implement a comprehensive workforce development strategy — backed by appropriate investments and in consultation with education leaders and the private sector — to improve our education system, increase the number of Americans graduating in STEM fields, support those pursuing careers in microelectronics, and ensure training and education opportunities to fill open positions.
- Reform America's high-skilled immigration system to enable access to the best and brightest in the world, including foreign students with graduate degrees in STEM fields from U.S. universities.
- Secure funding to strengthen the semiconductor workforce for all roles and ensure a robust pipeline at all education levels and skills needs.

3. Open New Global Markets for Semiconductors and Protect IP:

- Leverage trade policy and pursue market-opening initiatives to boost global demand for U.S.-made semiconductors.
- Expand the geographic and product coverage of the WTO Information Technology Agreement.
- Make permanent the WTO Moratorium on Customs Duties and Electronic Transmissions.

4. Cooperate Closely with Like-Minded Economies:

- Align policies and regulations with like-minded allies to strengthen national security and promote growth, innovation, and supply chain resilience.

The right policies can help the U.S. build its semiconductor ecosystem and grow its economy, strengthen national security, and advance technology leadership.

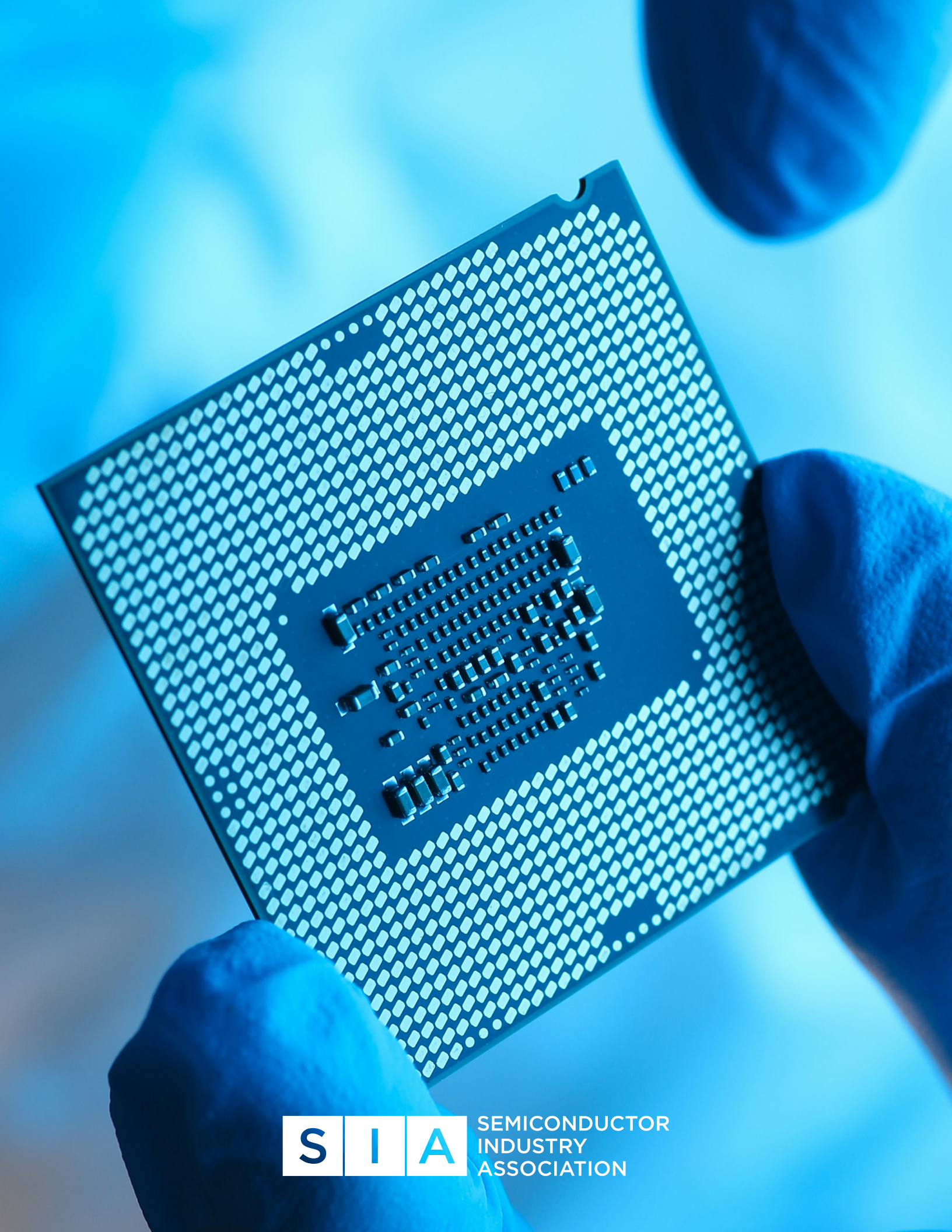
METHODOLOGY

This report is based on data developed independently by the Semiconductor Industry Association and in conjunction with the Boston Consulting Group and Oxford Economics. Figures pertaining to the industry's employment are based on data from the U.S. Census Bureau and the U.S. Department of Labor. Figures regarding the industry's international trade activity are based on an analysis of official U.S. government trade data from the U.S. international Trade Commission. Figures regarding industry manufacturing, capacity, and capital spending were based on data from TechInsights, New York University, McKinsey, The Economist, Tokyo Electron, J.P. Morgan, and IC Insights. Market data was based on World Semiconductor Trade Statistics data. Industry R&D data was based on company financial reports, as well as data from New York University. Lastly, data for the industry job multiplier, GDP contribution, and labor income are based on an Input- Output model developed by IMPLAN.

ABOUT SIA

The Semiconductor Industry Association (SIA) is the voice of the semiconductor industry, one of America's top export industries and a key driver of America's economic strength, national security, and global competitiveness. Semiconductors – the tiny chips that enable modern technologies – power incredible products and services that have transformed our lives and our economy. The semiconductor industry directly employs over a quarter of a million workers in the United States, and U.S. semiconductor sales totaled $264 billion in 2023.

SIA members account for 99 percent of all U.S. semiconductor industry sales. Through this coalition, SIA seeks to strengthen leadership of semiconductor manufacturing, design, and research by working with Congress, the Administration, and key industry stakeholders around the world to encourage policies that fuel innovation, propel business, and drive international competition. Learn more at www.semiconductors.org.



SEMICONDUCTOR INDUSTRY ASSOCIATION