



SIA

SEMICONDUCTOR
INDUSTRY
ASSOCIATION

2016 Factbook

March 2016

SEMICONDUCTOR INDUSTRY ASSOCIATION

FACTBOOK

Introduction

The data included in the 2016 SIA Factbook helps demonstrate the strength and promise of the U.S. semiconductor industry and why it is critical for policymakers to enact measures that boost growth and promote innovation.

The U.S. semiconductor industry is a key driver of America's economic strength, global competitiveness, and technology leadership.

Semiconductors enable the systems and products that we use to work, communicate, travel, entertain, harness energy, treat illness, and make new scientific discoveries. Semiconductors make possible the global trillion dollar electronics industry. Semiconductors were invented in America, and the U.S. still leads the world in cutting-edge manufacturing and design.

In the semiconductor industry and across the broader tech sector, innovation is made possible through the hard work and ingenuity of the industry's scientists and engineers and is supplemented by smart public policy from the federal government. At SIA, a common theme of the policies we support is that all of them are intended to maintain and accelerate technological advancements. The federal government plays a vital role in furthering these initiatives.

To help promote innovation and ensure America's continued technology leadership, policymakers should do the following:

1. **Facilitate open markets** to fuel semiconductor industry growth.
2. **Increase investments in semiconductor research** to discover the next generation of semiconductor technologies.
3. **Streamline export controls** to allow U.S. semiconductor companies to compete in the global market while protecting national security.
4. **Strengthen America's technology workforce** by retaining the best and brightest scientific minds from around the world and increasing the number of American STEM graduates.
5. **Reform the corporate tax system** to enhance America's competitiveness, boost U.S. design and manufacturing, and promote American innovation.
6. **Reduce the risk of counterfeit semiconductors** through enforcement and government-industry partnerships.
7. **Promote sustainability practices and innovation development** by ensuring that regulations meet the needs of the semiconductor industry.
8. **Advance innovation by protecting valuable intellectual property**, including balanced patent reform and increased protection of trade secrets.

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Section 1

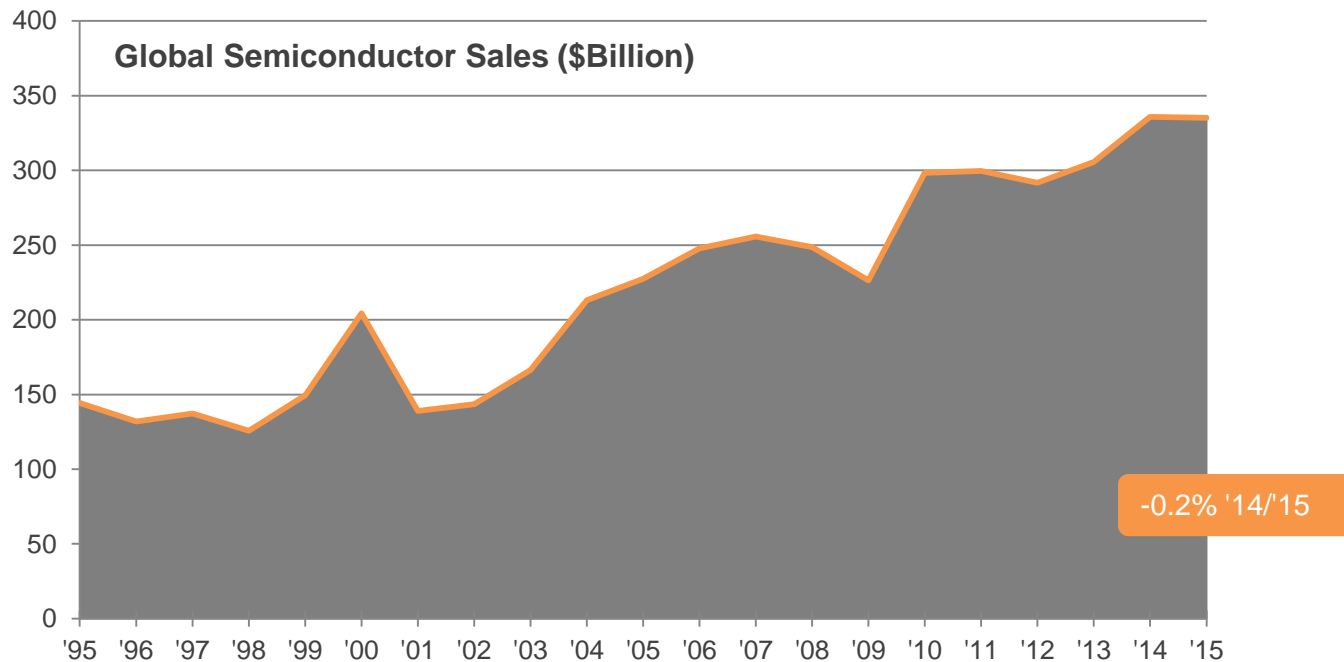
INDUSTRY OVERVIEW

SECTION 1: INDUSTRY OVERVIEW

THE GLOBAL SEMICONDUCTOR INDUSTRY IS A KEY GROWTH SECTOR IN THE GLOBAL ECONOMY

Worldwide semiconductor sales increased from \$144.4 billion in 1995 to \$335.2 billion in 2015, an average annual rate of increase of 9.5 percent per year. According to the WSTS Fall 2015 Semiconductor Industry Forecast, worldwide semiconductor industry sales are forecast to reach \$341 billion in 2016 and \$352 billion in 2017.*

*WSTS, Fall 2015 Semiconductor Industry Forecast.



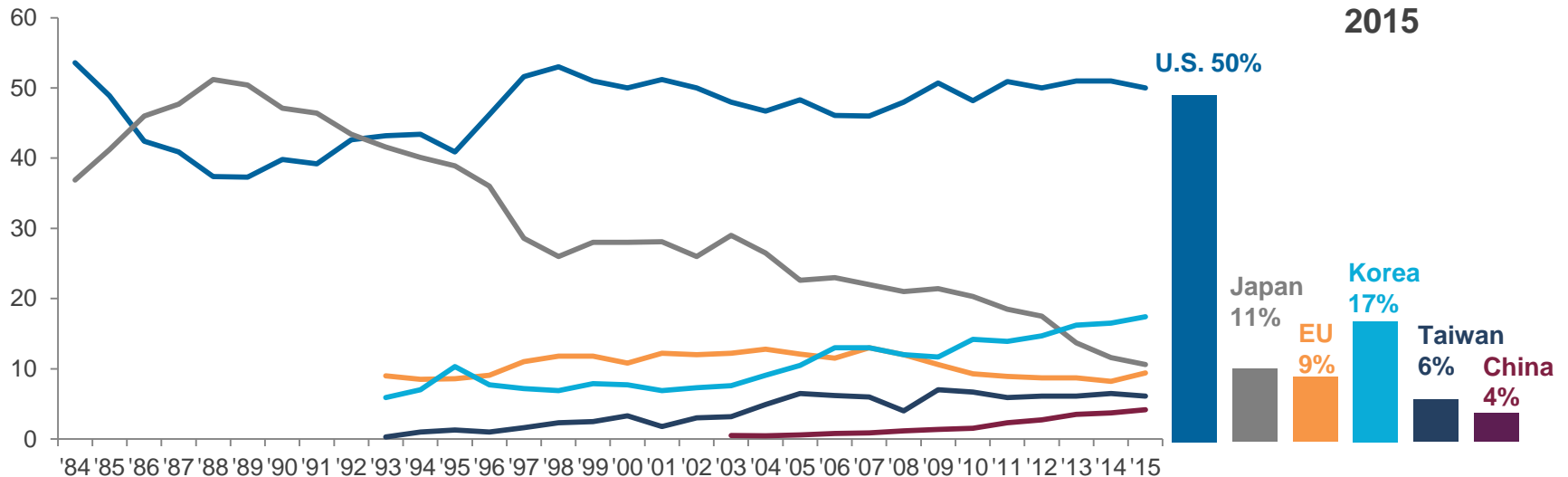
Source: World Semiconductor Trade Statistics (WSTS) and SIA Estimates.

SECTION 1: INDUSTRY OVERVIEW

THE U.S. SEMICONDUCTOR INDUSTRY HAS HALF THE GLOBAL MARKET SHARE

Semiconductor producers based in the Americas experienced a significant loss in market share during the 1982 to 1988 period. In the early 1980s, the Americas-based producers held more than 50 percent of worldwide semiconductor sales. Due to intense competitive pressure from Japan-based firms, the effect of illegal "dumping", and a severe industry recession in 1985 to 1986, the industry lost a total of nineteen worldwide market share points. Today, Americas-based firms have the largest market share with 50 percent.

The industry in the Americas has rebounded strongly since the late 1980s. While largely exiting the DRAM market in the 1980s, its firms have maintained their competitive edge in microprocessors and other leading edge devices, and it has even gained in memory in recent years. Strong growth in these sectors enabled the industry to increase its market share to over half of the world market. Firms in Asia and Europe have grown in terms of their importance as suppliers as well.

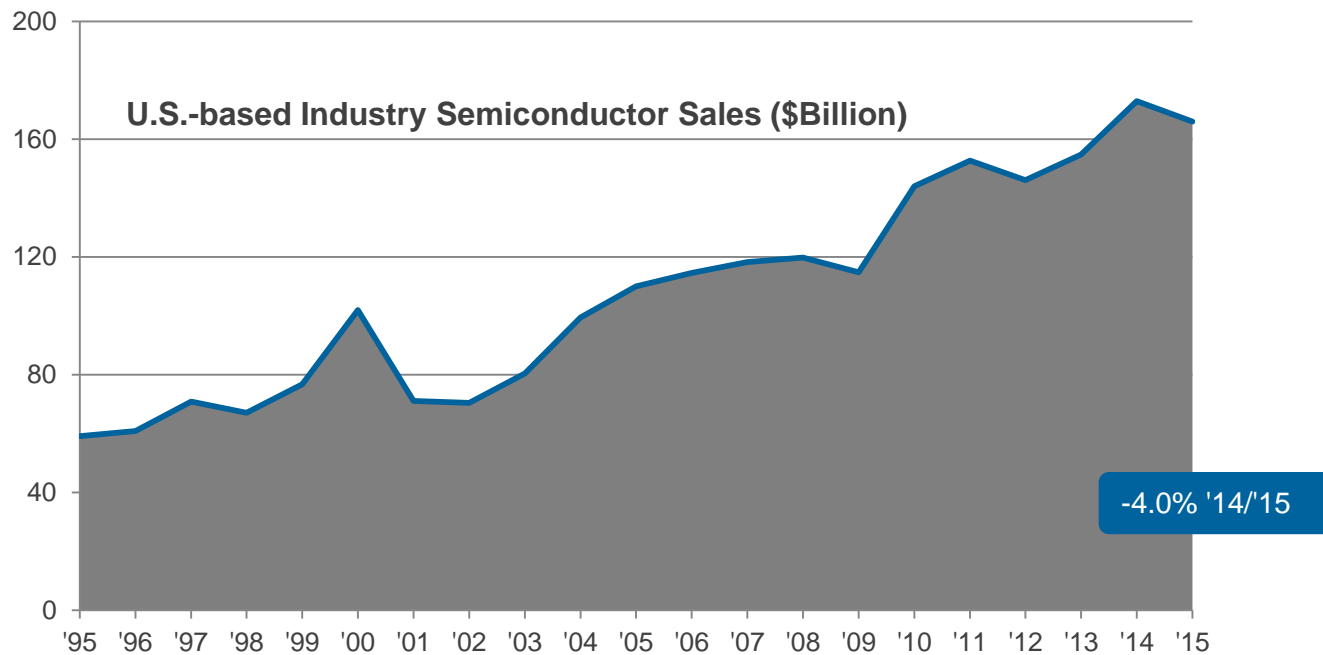


Source: SIA, World Semiconductor Trade Statistics, IHS Global, PwC.

SECTION 1: INDUSTRY OVERVIEW

U.S.-BASED SEMICONDUCTOR COMPANY SALES HAVE DISPLAYED STEADY ANNUAL GROWTH

Sales by semiconductor producers based in the Americas grew from \$59.1 billion in 1995 to over \$165.9 billion in 2015 -- a compound annual growth rate of 5.3 percent. Sales growth for U.S. headquartered companies shows the same cyclical fluctuations characterized by the industry as a whole.

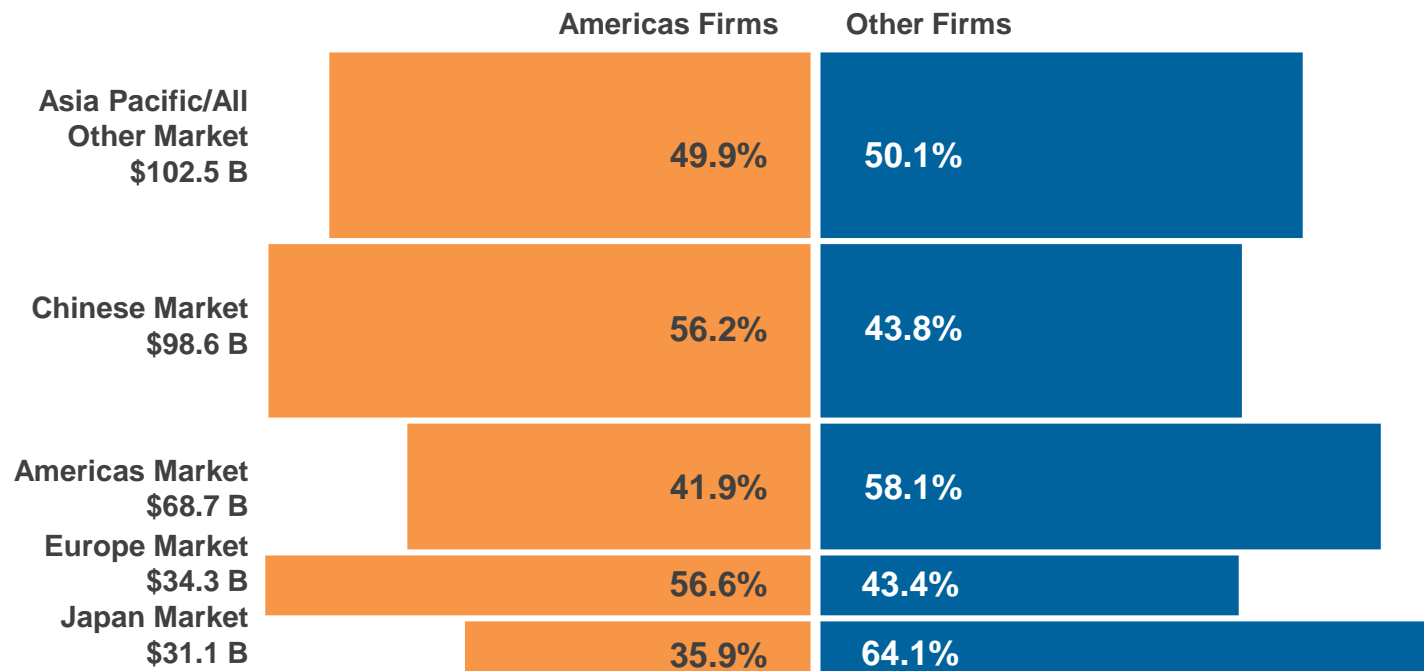


Source: World Semiconductor Trade Statistics (WSTS) and SIA Estimates.

SECTION 1: INDUSTRY OVERVIEW

U.S.-BASED SEMICONDUCTOR COMPANIES MAINTAIN MARKET SHARE LEADERSHIP IN MOST MAJOR REGIONAL SEMICONDUCTOR MARKETS

In 2015, semiconductor firms based in the Americas held 50 percent of the total semiconductor market. In most major country markets, U.S. headquartered companies also held around half the market. In Japan, one of the world's largest single country markets, U.S. firms held only 36 percent share – historically foreign headquartered companies have held a relatively lower share of the Japanese market than in all other markets.



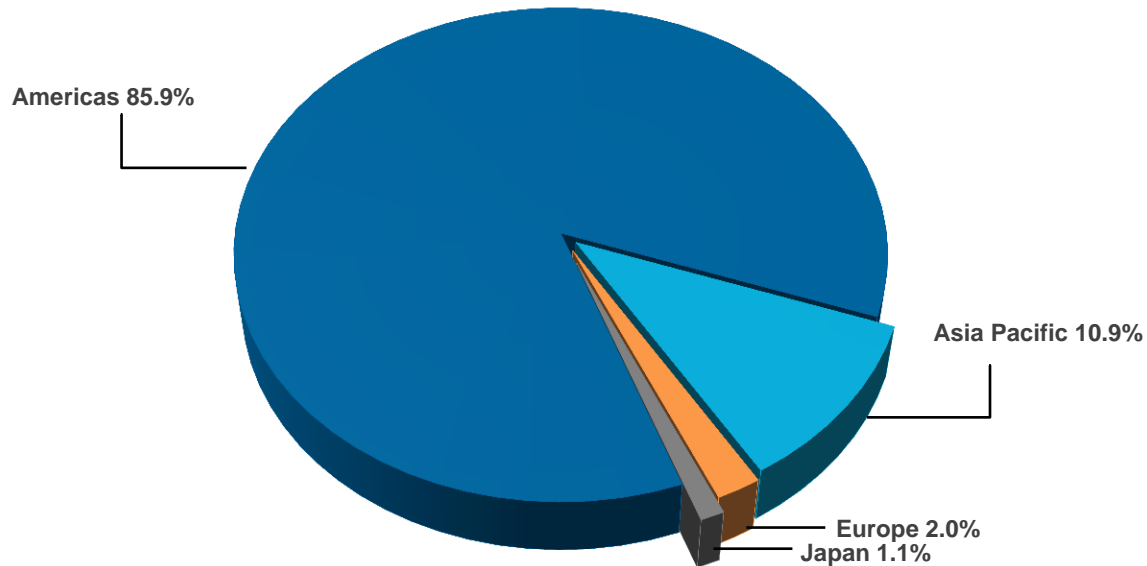
Source: World Semiconductor Trade Statistics (WSTS) and SIA Estimates.

SECTION 1: INDUSTRY OVERVIEW

THE MAJORITY OF SEMICONDUCTOR MANUFACTURING DONE IN THE UNITED STATES IS DONE BY U.S. FIRMS

In 2015, roughly 86 percent of all semiconductor wafer fabrication capacity in the United States was accounted for by U.S. headquartered firms. Semiconductor firms headquartered in the Asia Pacific region accounted for most of the balance of capacity in the United States at around 11 percent.

Percent of Wafer Capacity in the US by Headquarter Location



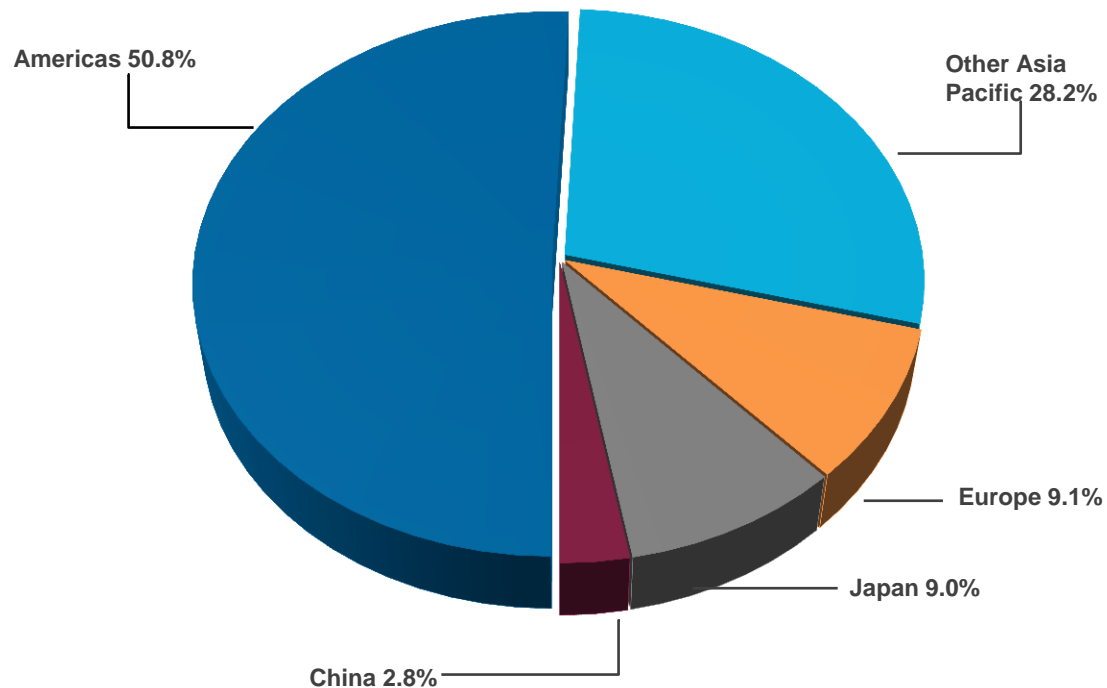
Source: IC Insights Global Fab Database and SIA Estimates.

SECTION 1: INDUSTRY OVERVIEW

U.S. SEMICONDUCTOR INDUSTRY CONDUCTS THE MAJORITY OF ITS MANUFACTURING IN THE UNITED STATES

In 2015, about 51 percent of U.S.-headquartered firm wafer capacity was located in the Americas region. The Asia Pacific region was the second largest area, accounting for 31 percent of the total capacity.

Percent of U.S.-Headquartered Firm Wafer Capacity by Location



Note: Figures are rounded to the nearest 10th.

Source: IC Insights Global Fab Database and SIA Estimates.

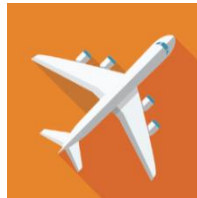
SECTION 1: INDUSTRY OVERVIEW

SEMICONDUCTORS ARE ONE OF AMERICA'S TOP EXPORTS

Electronic products such as computers and telecommunications equipment constitute the second largest U.S. export category by value, with \$207 billion in 2015, and semiconductors are key components of nearly all electronic products. U.S. exports of semiconductor components alone were worth \$42 billion, third highest among U.S. manufactured exports behind only automobiles and aircraft and the highest among electronic product exports.

Top 3 Manufactured U.S. Exports in 2015 (\$ Bn)

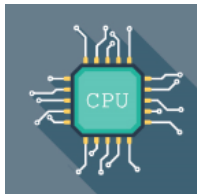
Aircraft \$119 Billion



Automobiles \$55 Billion

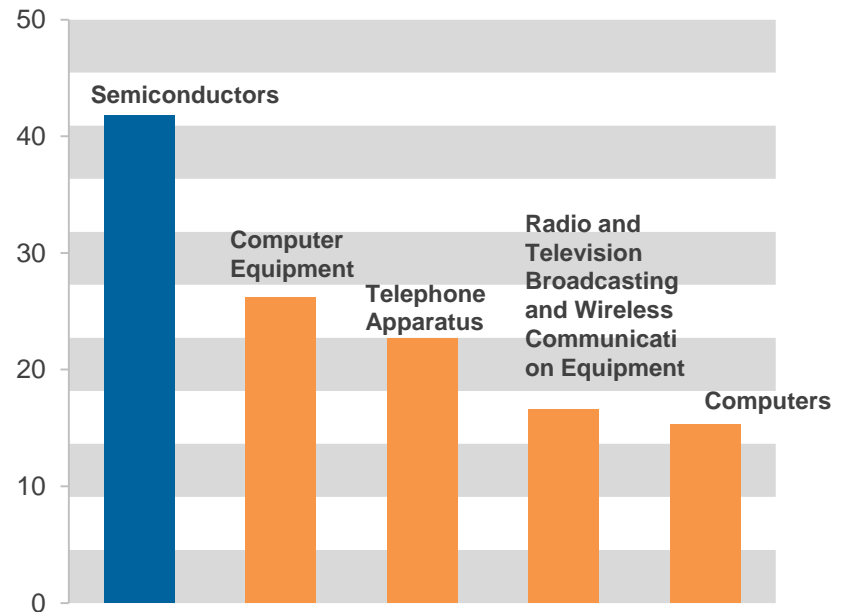


Semiconductors \$42 Billion



Source: U.S. International Trade Commission. Industry defined by NAICS codes: 334413 (Semiconductors); 33641X (Aircraft); 336111 (Automobiles).

#1 U.S. Electronic Product Export in 2015 (\$ Bn)



Source: U.S. International Trade Commission. Industry defined by NAICS codes: 334413 (Semiconductors); 334119 (Computer Equipment); 334210 (Telephone Apparatus); 334111 (Computers); 334220 (Radio and Television Broadcasting and Wireless Communications Equipment).



Section 2

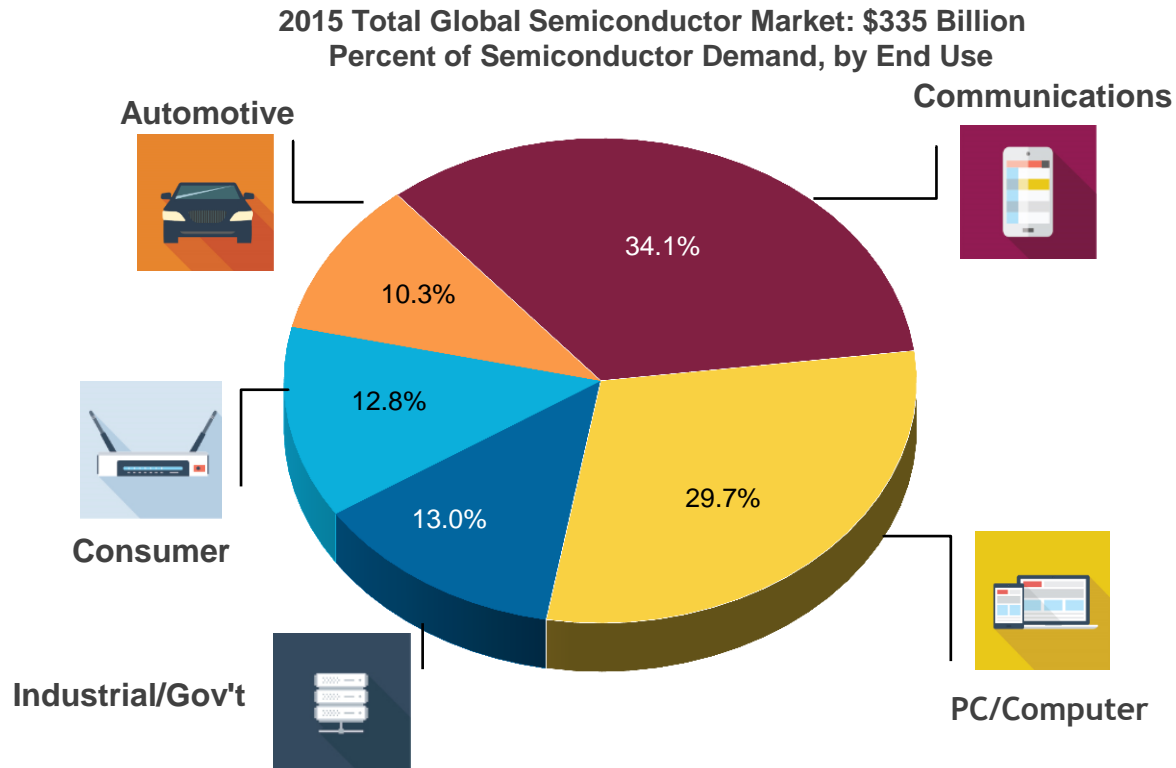
GLOBAL MARKET

Diversified and Consumer-driven

SECTION 2: GLOBAL MARKET

GLOBAL SEMICONDUCTOR SALES ARE DRIVEN BY PRODUCTS ULTIMATELY PURCHASED BY CONSUMERS

The vast majority of semiconductor demand is driven by products ultimately purchased by consumers – be they PC's for home use or communication devices such as smartphones. Increasingly, consumer demand is driven in emerging markets including those in Asia, Latin America, Eastern Europe and Africa.

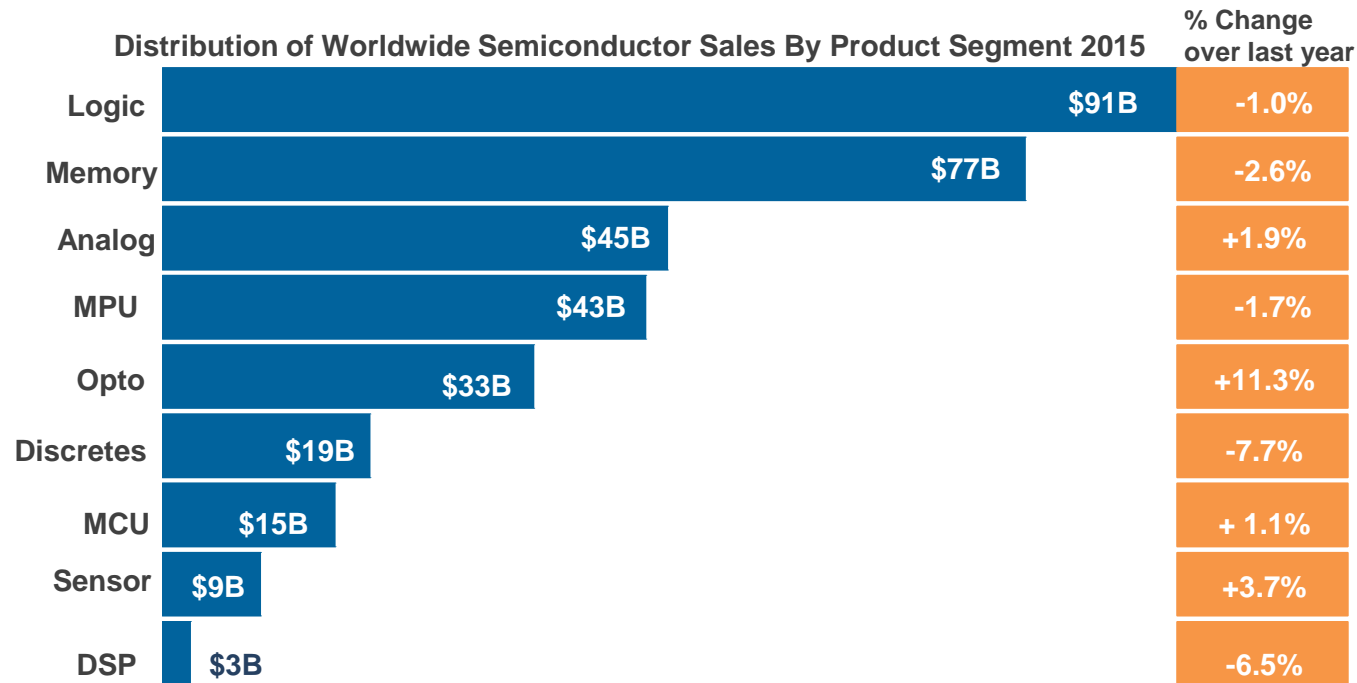


Note: Military is <2% and is included in Industrial/Gov't.
Sources: World Semiconductor Trade Statistics.

SECTION 2: GLOBAL MARKET

GLOBAL SEMICONDUCTOR SALES ARE DIVERSIFIED BY TYPE OF PRODUCT SOLD

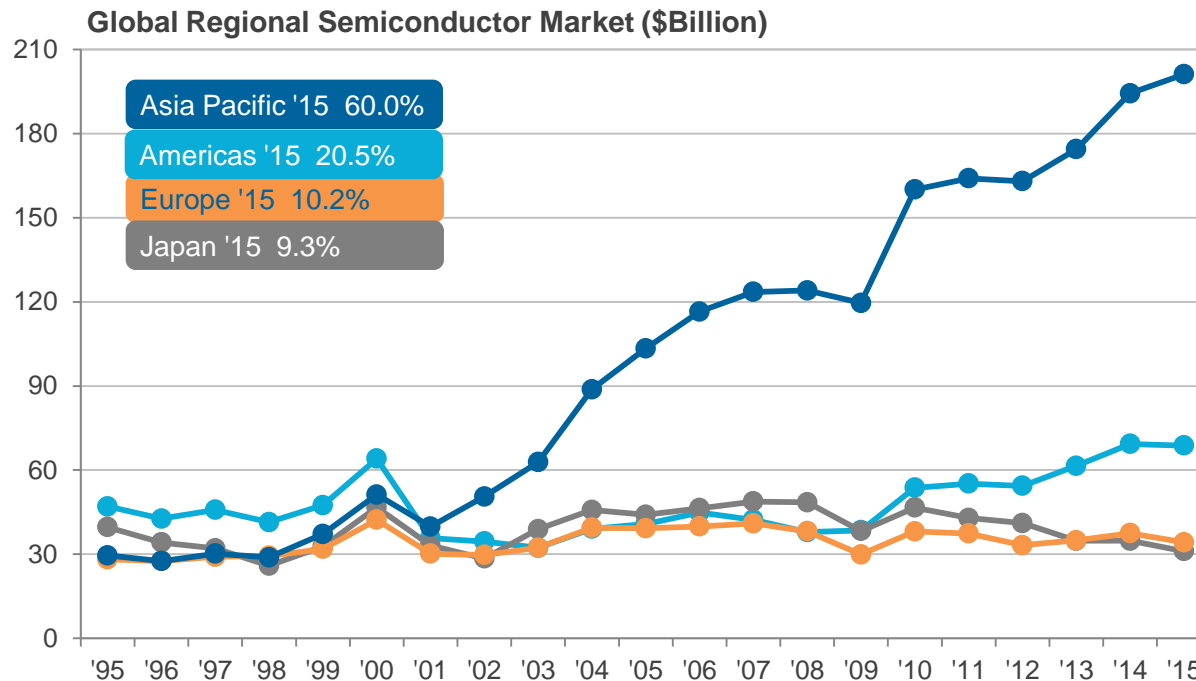
Semiconductor technology has rapidly evolved as the industry develops more advanced product and process technologies for applications in end-use industries. In recent years, the largest segments of the worldwide semiconductor industry have been logic, memory, MPU, and analog. In 2015, these products accounted for 76 percent of semiconductor industry sales.



SECTION 2: GLOBAL MARKET

TODAY, ASIA PACIFIC IS BY FAR THE LARGEST REGIONAL SEMICONDUCTOR MARKET

In 2001, the Asia Pacific market surpassed all other regional markets in sales as electronic equipment production shifted to the region. It has quadrupled in size since then - from \$39.8 billion to over \$201 billion in 2015. This data reflects sales of semiconductors to electronic equipment makers only – final electronic products containing semiconductors are then shipped for consumption around the world.





Section 3

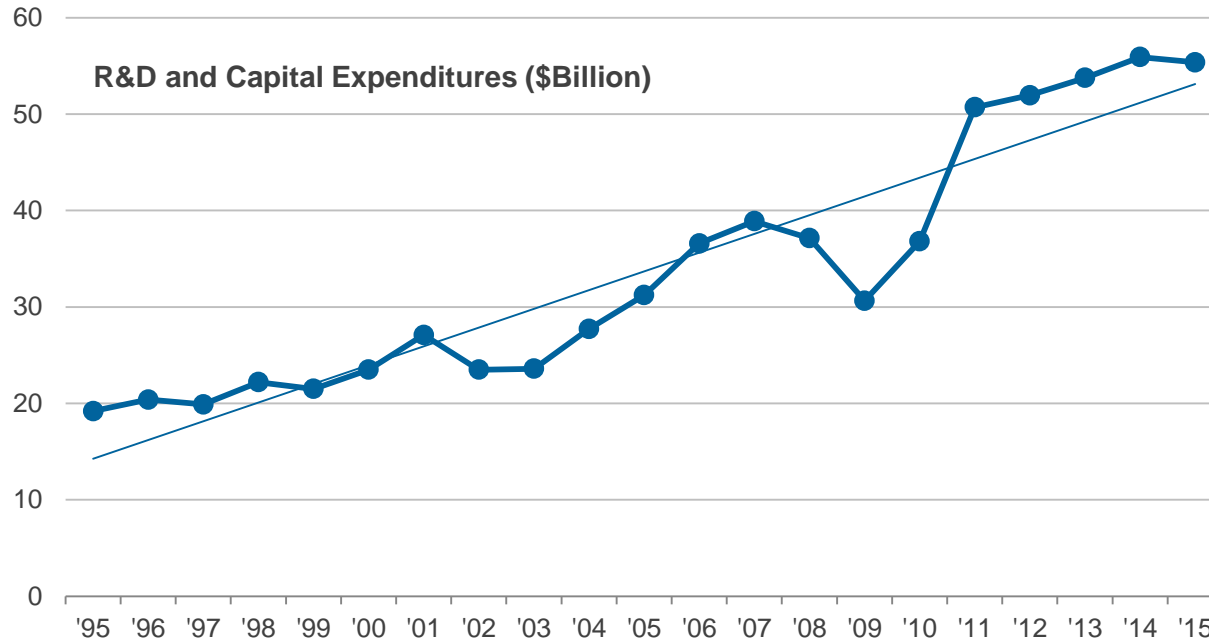
Capital and R&D Investment

A Driving Force in Maintaining a Competitive Semiconductor Industry

SECTION 3: CAPITAL AND R&D INVESTMENT

TOTAL ANNUAL LEVELS OF INVESTMENT IN CAPITAL AND R&D ARE HIGH FOR THE INDUSTRY

Total R&D and capital expenditures by U.S. semiconductor firms including fabless companies was \$55.4 billion in 2015. During the 1995 to 2015 period, the average annual growth rate was approximately 9.5 percent. Investment levels in share of sales terms have not been subject to fluctuations associated with market cyclicalities.

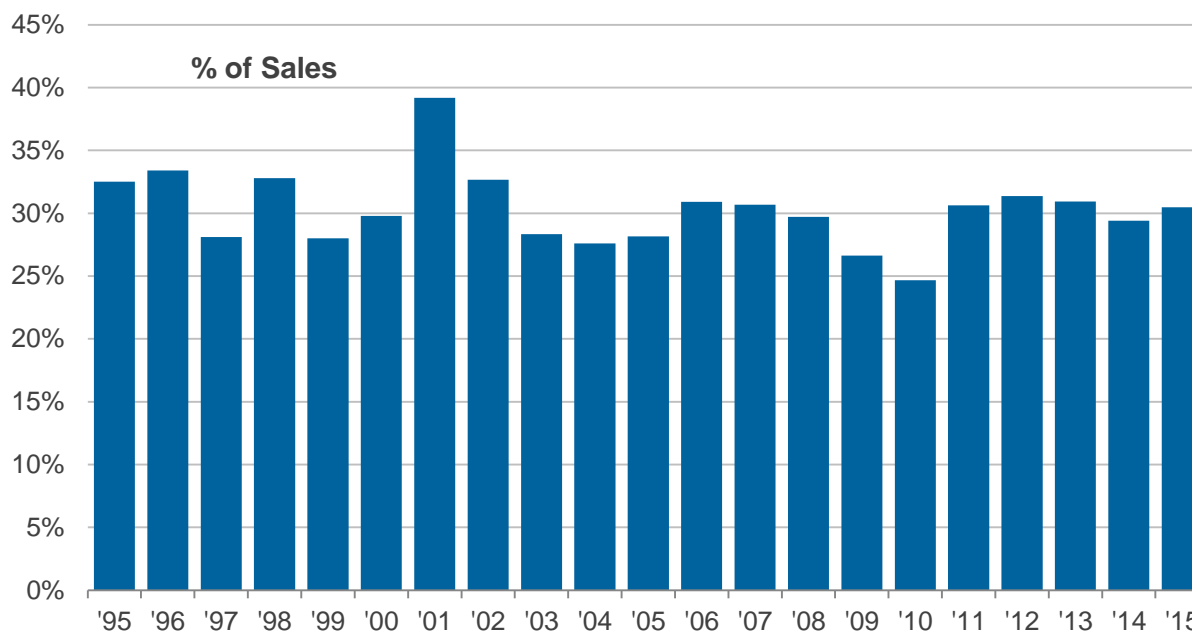


Source: U.S. Semiconductor Companies' Annual 10K Filings* to the USSEC and SIA Estimates.

SECTION 3: CAPITAL AND R&D INVESTMENT

CAPITAL AND R&D INVESTMENT ARE CRITICAL TO MAINTAINING A COMPETITIVE SEMICONDUCTOR INDUSTRY

To remain competitive in the semiconductor industry, firms must continually invest a significant share of revenues in both R&D and new plants and equipment. The pace of technological changes in the industry requires that companies develop more complex process technology and introduce production machinery capable of manufacturing components with smaller feature sizes. The ability to produce state-of-the-art semiconductor components can only be maintained through a continual commitment to keeping pace with industry-wide investment rates of roughly 30% of sales. The need to stay on the leading edge of technology has resulted in some extreme fluctuations in years such as 2001, when sales declined precipitously but expenditures on R&D and capital equipment didn't decline at the same rate.

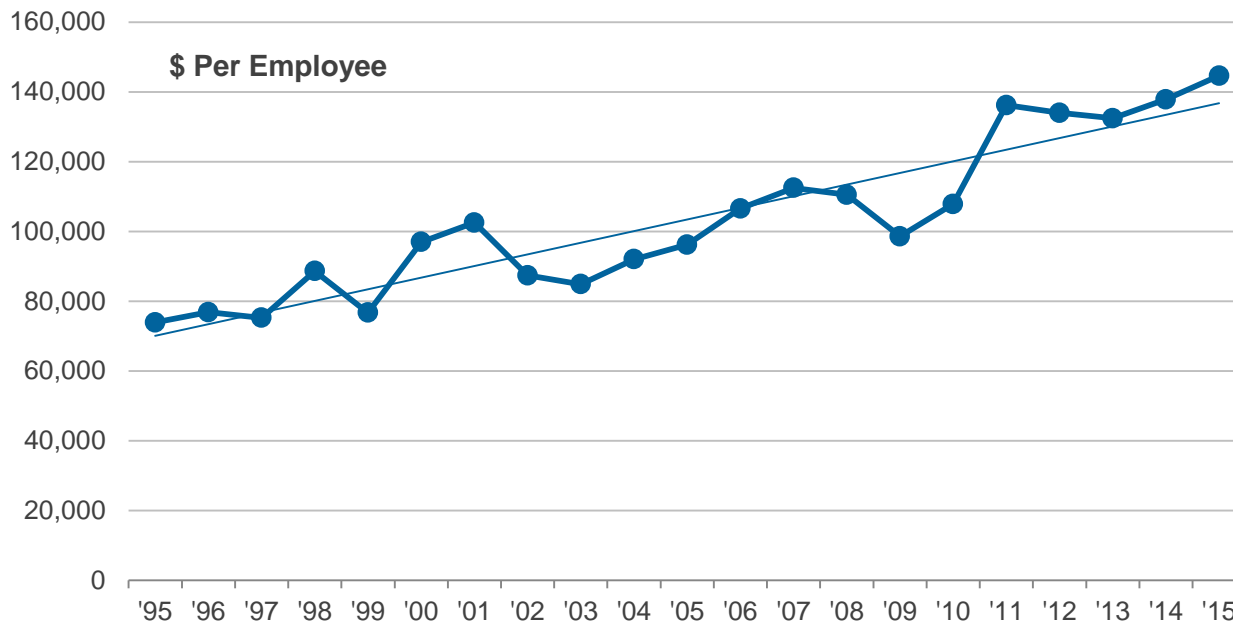


Source: U.S. Semiconductor Companies' Annual 10K Filings* to the USSEC and SIA Estimates.

SECTION 3: CAPITAL AND R&D INVESTMENT

INVESTMENT IN CAPITAL EXPENDITURES AND R&D PER EMPLOYEE IS VERY HIGH, REACHING AN UNPRECEDENTED LEVEL IN 2015

From 1995 to 2015, total investment per employee (measured by combined R&D and new gross plant and equipment) has increased at a rate of about 5 percent per year. These expenditures exceeded \$100K in 2001 but declined to roughly \$85K in 2003 after the 2001 downturn. Investment per employee increased to over \$100K in 2006. The 2008-2009 recession resulted in the decline of investment per employee in 2009 and 2010, but returned in 2012 and grew to an unprecedented level in 2015.



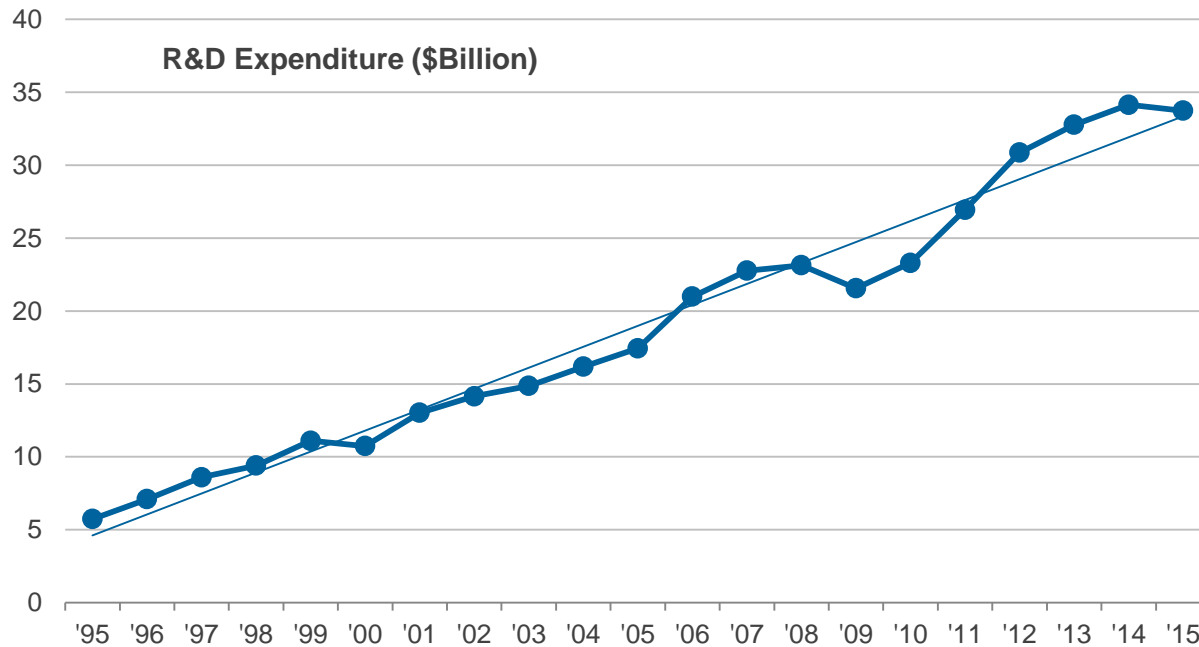
Note: Employees reflect total U.S. industry global employment.

Source: U.S. Semiconductor Companies' Annual 10K Filings* to the USSEC and SIA Estimates.

SECTION 3: CAPITAL AND R&D INVESTMENT

SEMICONDUCTOR INDUSTRY R&D EXPENDITURES ARE CONSISTENTLY HIGH WHICH REFLECTS THE INHERENT IMPORTANCE OF R&D TO SEMICONDUCTOR PRODUCTION

Semiconductor industry R&D expenditures grew at an average annual rate of approximately 25 percent during the 1995 to 2015 period. R&D expenditures by U.S. semiconductor firms tend to be consistently high, regardless of cycles in annual sales, which reflects the importance of investing in R&D to semiconductor production.

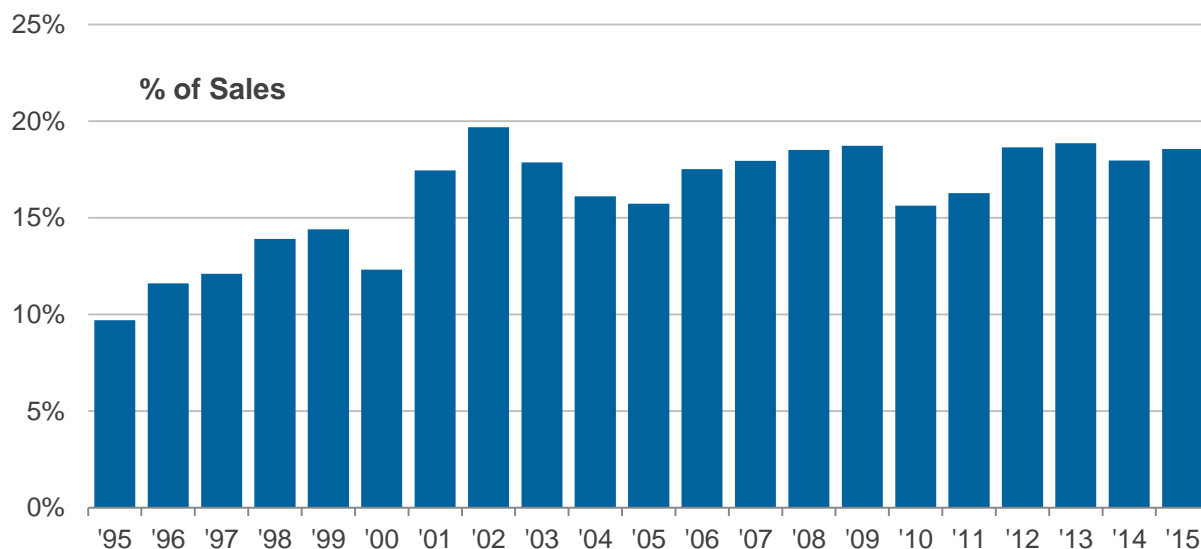


Source: U.S. Semiconductor Companies' Annual 10K Filings* to the USSEC and SIA Estimates.

SECTION 3: CAPITAL AND R&D INVESTMENT

ANNUAL R&D EXPENDITURES AS A PERCENT OF SALES HAVE GENERALLY EXCEEDED 10 PERCENT OVER THE PAST 20 YEARS, AN UNPRECEDENTED RATE AMONG U.S. INDUSTRIES IN THE UNITED STATES

R&D expenditures as a percent of sales have generally exceeded 10 percent over the past 20 years. This rate is unprecedented among major manufacturing sectors of the United States economy. Total expenditures (measured in dollar terms) have risen at an average annual rate of over 25 percent over the period. R&D expenditures are essential to the competitive position of firms within the semiconductor industry. The rapid pace of technological change requires constant advancements in process technology and device capabilities. The increase in R&D in 2001 and 2002 was caused by companies' commitment to the future of technology despite the industry downturn. The 2003-2004 decrease was not due to a cut in R&D budgets but rather to a stronger than expected recovery in the industry which increased revenues faster than expected and R&D fell as a percentage of sales. After the decline during 2008-2010, the rate returned to 19 percent in 2013.

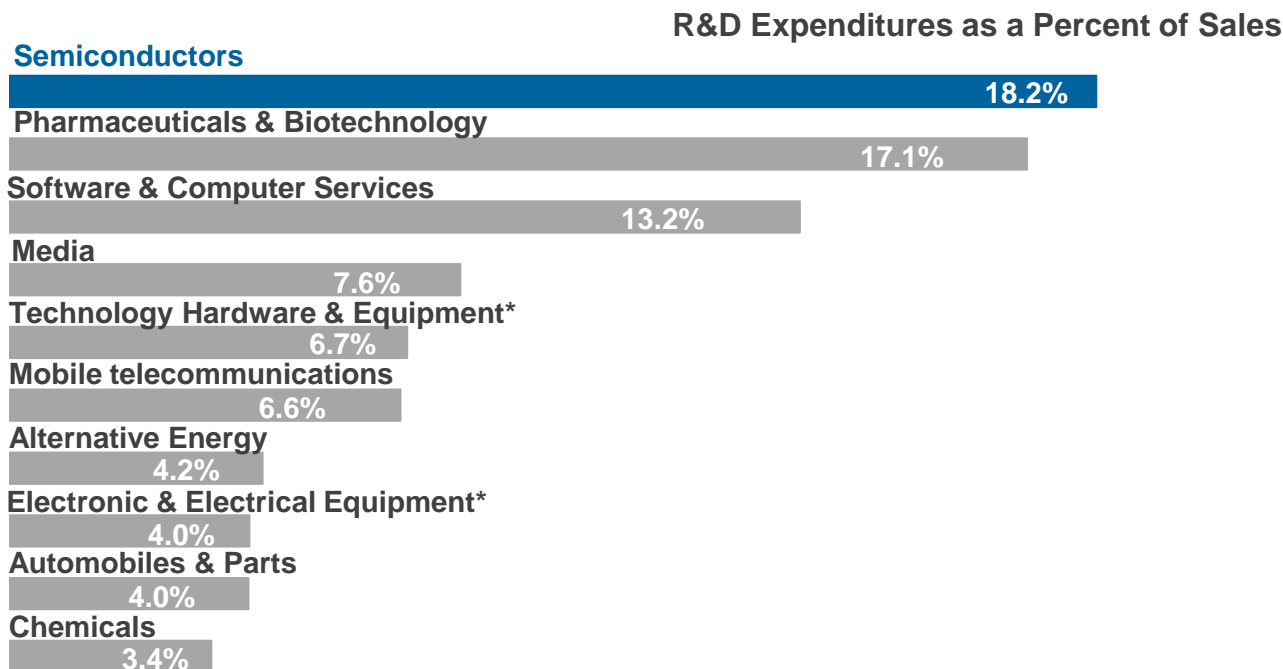


Source: U.S. Semiconductor Companies' Annual 10K Filings* to the USSEC and SIA Estimates.

SECTION 3: CAPITAL AND R&D INVESTMENT

THE U.S. SEMICONDUCTOR INDUSTRY SPENDS MORE ON R&D AS A PERCENT OF SALES THAN ANY OTHER U.S. INDUSTRY

The rate of U.S. semiconductor industry R&D spending is unsurpassed in key high technology industrial sectors. Based on the 2015 EU Industrial R&D Investment Scoreboard, the semiconductor industry led all manufacturing sectors in the rate of R&D spending as a percent of sales.



Note: *Excluding semiconductors.

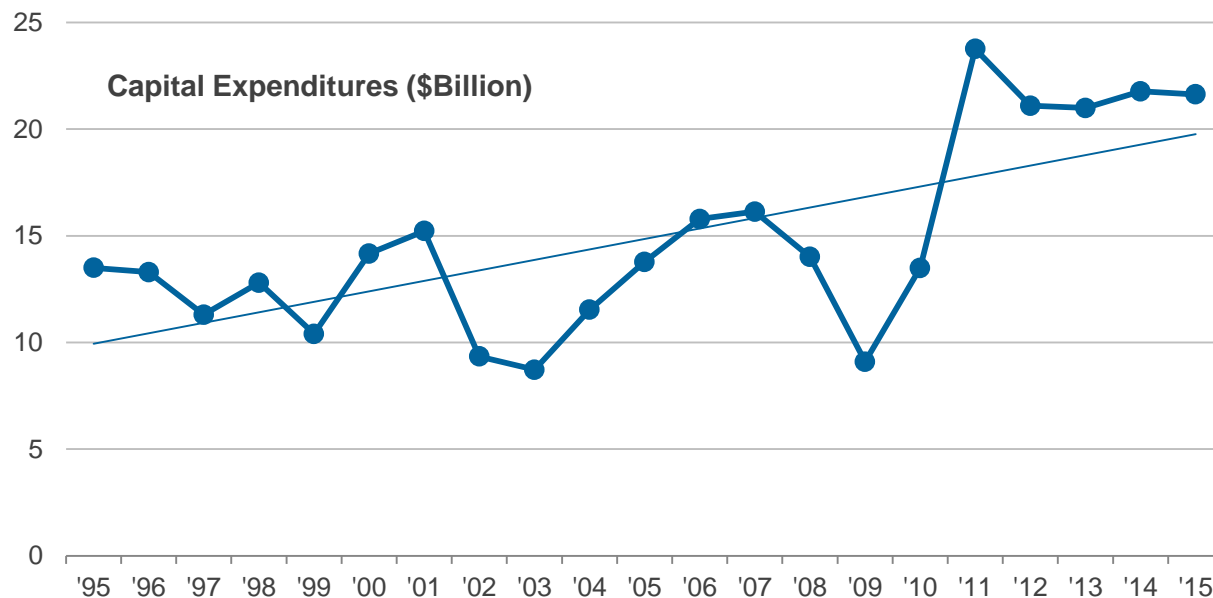
Note: Slight differences in semiconductor industry share from previous slide due to differences in methodology.

Source: The 2015 EU Industrial R&D Investment Scoreboard.

SECTION 3: CAPITAL AND R&D INVESTMENT

U.S. SEMICONDUCTOR INDUSTRY CAPITAL EXPENDITURES REACHED A RECORD HIGH IN 2011 WITH THE INDUSTRY CONTINUING TO INVEST SIGNIFICANTLY IN SUBSEQUENT YEARS

Semiconductor industry gross capital expenditures was \$21.6 billion in 2015. Capital expenditures declined over the 2001-2003 period due both to the completion of major new facilities during the 1999 - 2001 period and outsourcing to foundries. 2004 saw a rebound and in 2005 the industry was in a balanced position in terms of capital expenditures as a percentage of sales. In 2011, after a sharp decline in 2009, capital expenditures reached \$24 billion---an all time high.



Source: U.S. Semiconductor Companies' Annual 10K Filings* to the USSEC and SIA Estimates.



Section 4

JOBS

Section 4: JOBS

THE U.S. SEMICONDUCTOR INDUSTRY ACCOUNTS FOR ROUGHLY A QUARTER OF A MILLION DIRECT JOBS AND OVER A MILLION ADDITIONAL INDIRECT JOBS

242,337

direct jobs in the U.S. semiconductor industry

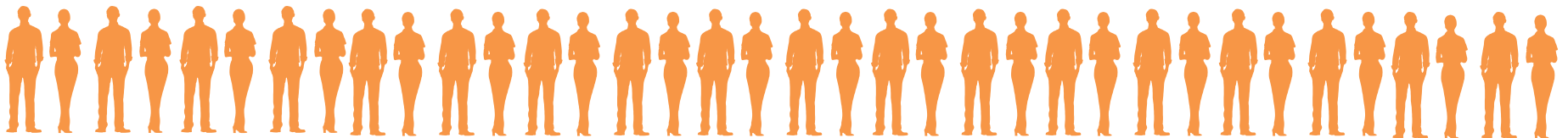
ONE 

U.S. semiconductor job supports

4.89 

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

...that's more than **1 MILLION ADDITIONAL** American Jobs.



Source: U.S. Bureau of Labor Statistics and SIA estimates



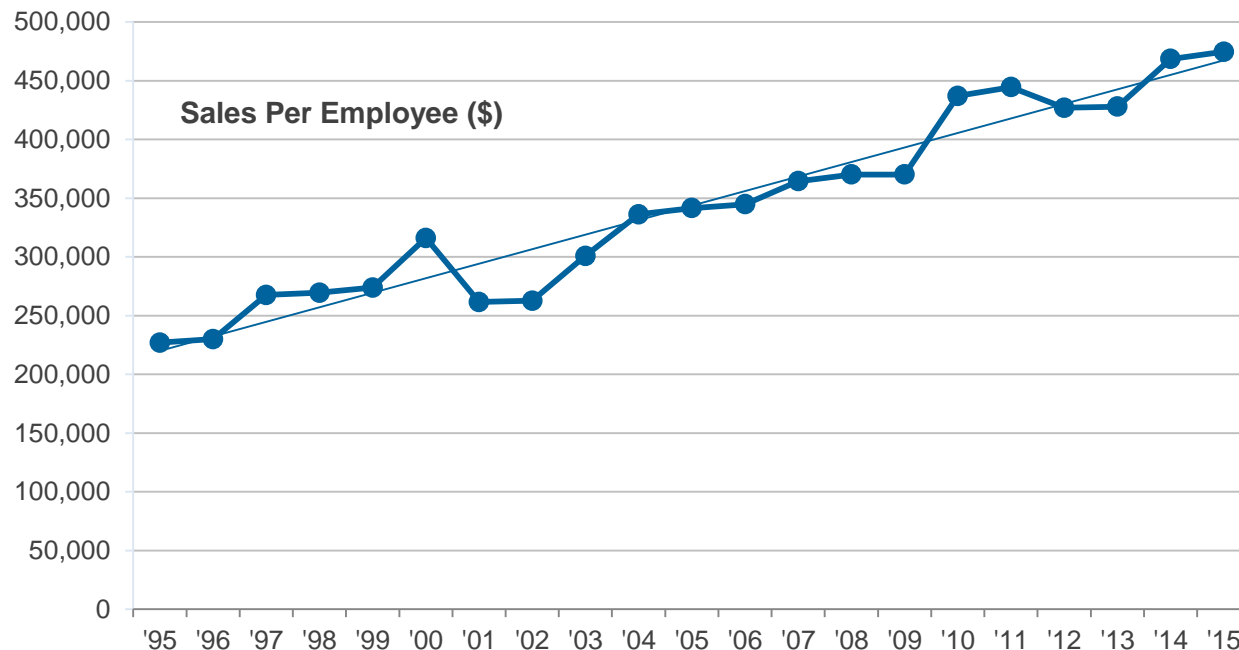
Section 5

PRODUCTIVITY

Section 5: PRODUCTIVITY

U.S.-BASED SEMICONDUCTOR FIRMS HAVE EXPERIENCED RAPID IMPROVEMENTS IN PRODUCTIVITY OVER THE PAST 20 YEARS

Semiconductor industry labor productivity has increased over fourfold since 1995. These productivity gains have been made possible by maintaining high capital investment levels and R&D spending rates. In 2015, the U.S. semiconductor industry recorded an average sales revenue per employee ratio of over \$475,000 – an all time high record.



Note: Employees reflect total U.S. industry global employment.

Source: U.S. Semiconductor Companies' Annual 10K Filings* to the USSEC and SIA Estimates.