Testimony of George Scalise
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Introduction:

Mr. Chairman, members of the Commission, my name is George Scalise, I am president of the Semiconductor Industry Association. SIA represents the largest US headquartered semiconductor companies. I also serve on the President's Council of Advisors on Science and Technology – the PCAST – where I recently chaired a subcommittee on Information Technology and Manufacturing Competitiveness.

I want to start by thanking you for inviting me to testify here today. I think this hearing – with its focus on the opportunities and challenges that face the US high technology industry vis-à-vis our Chinese competitors -- is very timely. As I will explain in my testimony, Chinese government policies, and not lower labor costs, are the major contributor to 10 year, a $1 billion cost differential, between building and operating a semiconductor plant in China compared to the U.S.. This Commission has a responsibility to help build the consensus among U.S. policy makers to develop an effective response to this challenge.

I would like to begin with a brief overview of the US semiconductor industry and the mission of the SIA before going into more detail on the challenges presented by Chinese policies.

First, though, I want note that China can and should pursue its desire for a strong microelectronics industry. China is a very compelling market for US companies, and it is home to some very strong competitors. SIA has since its inception favored free and open trade, and the case of China is no exception – robust competition is what drives the industry to invest ever higher amounts in research and technological advances in order to stay ahead.

U.S. leadership in advanced technology is not guaranteed, and foreign competition is intensifying. Many other countries – including China -- are aggressively pursuing policies to build technical capabilities and to attract semiconductor and other high tech investments. The issue before us today is to understand the competitive factors influencing our industry, ensure that competition is fair and unencumbered by government barriers or market distortions that prevent the best company from winning, and develop policies that will help us retain our leadership position in the years ahead.

Overview: The US Industry

Today, the US semiconductor industry is the most competitive in the world in terms of market share. US chip companies account for almost half of the world market in terms of sales – more than any other country. Over three quarters of US-owned wafer capacity is in this country despite the fact that three quarters of our sales are outside the US; almost 80% of the US industry's total labor compensation is in the US, while only 55% of our labor force is here.

The US also has the lead in terms of technology and manufacturing capacity. US semiconductor firms as a whole still account for the largest percentage of purchases of semiconductor manufacturing equipment, but that lead is diminishing. Purchases by American companies have gone from just over 43% in 2001 to roughly 25% last year. Chinese companies' share of equipment purchases grew from about 2.6% to over 8% over that same period. The second metric we look at is the geography where the equipment will be located. In terms of leading edge capacity, the US has declined from a high of 36% in 1999 to just over 20% in 2004, and that trend is continuing. Two-thirds of the world's new 300mm fabs will be built in Asia.

These numbers represent a geographic shift, and also a structural shift from so-called integrated device manufacturers to foundries. Foundries manufacture product designed by others – Taiwan built its industry on the foundry model, and China appears to be following suit.

A large part of the reason for this dramatic shift, though, is cost based. As I mentioned previously, there is a $1-plus billion 10-year cost difference between building and operating a fab in Asia versus the U.S.. About 70% of the cost difference is due to tax benefits, 20% due to capital grants, and only 10% due to lower labor costs. Operating costs such as lower utility costs or cheaper logistics are also slightly lower overseas.

As taxes represent 70 percent of cost differential, it is instructive to compare tax rates in specific countries. In the U.S., the Federal income tax rate is 35%, and state and local taxes typically equate to an additional 6% rate (after adjusting for the Federal deduction). In contrast, China offers a five-year income tax holiday, and an additional five years at half the tax rate. Singapore and Malaysia offer five- to 10-year tax holidays. Ireland has a 12% tax rate, which is still a third of the U.S. rate. Taiwan's tax holiday and accumulated tax credits have resulted in Taiwan chip companies reporting higher net profitability after rather than before taxes. These tax benefits often also apply for research, development, and design centers.

The mission of the SIA is to ensure that the US retains its lead in terms of both market share and technology. Chip manufacturing, corporate R&D, product design, semiconductor equipment and materials producers, and university research are all key elements of the semiconductor technology ecosystem, and erosions in any one part affects the other parts. The data I've just shared with you makes clear that while we have a solid lead today, we face significant competitive threats that I believe must be dealt with quickly and forcefully if we are to retain our lead in the future.

China's Market

China's semiconductor market was estimated at $25 billion in 2003, with annual growth rates ranging from 15-20%. China today is the third-largest country market worldwide, and is predicted to become the second-largest overall market by 2010. China is already the world's largest mobile phone market, and second largest personal computer market. The demand for chips is driven by China's increasing role as an electronics manufacturing hub, producing everything from PCs and cellular phones to flat panel displays, digital cameras, and DVD players.

Semiconductors exports to China in 2003 were $2.4 billion and $2 billion for the first nine months of 2004 – making them the second largest manufactured export from the US to China. These figures may actually under-report the full value of U.S. semiconductor products exported to China, as the distributed nature of assembly and final testing in third-countries is not captured in U.S. export figures.

Chinese Government Incentives

This very rapid market growth is accompanied by a very ambitious policy agenda to foster the semiconductor industry in China. These policies range from direct incentives to manufacture in China to support for R&D, coupled with a willingness to utilize the standards setting process quite aggressively to favor specific firms. Some of these policies represent an effort to make rapid progress in an important industry. Others, unfortunately, represent violations of World Trade Organization (WTO) rules.

In 2004, the Office of the United States Trade Representative (USTR) brought the first WTO case against China on that country's Value Added Tax (VAT) rebate on semiconductors. In summary, that policy provided for rebates of 14% of the 17% VAT paid to companies who manufactured their semiconductors in China, while imposing the full 17% VAT on imported chips. This created a substantial incentive for Chinese chip purchasers to utilize domestically made product. The WTO case was always about more than fair market access – it was about making sure that investment decisions will be based on sound market factors and not government interference. The policy was very effective in skewing investment decisions and led to substantial increases in manufacturing capacity in China. In July 2004 the case was settled, and on March 31, 2005, all remaining elements of the program were halted. To its credit, the Chinese Government implemented in full and on time all of the commitments made as part of the settlement agreement.

Following resolution of the VAT case, it appears that the focus is shifting to R&D. At the point in time the VAT replacement policy was to be announced, China issued "Temporary Measures of Special Funds in R & D in the Semiconductor Industry"– these measures will reportedly go into effect on April 30, 2005. The policy was jointly announced by the Ministry of Finance (MOF), the Ministry of Information Industries (MII) and the National Development and Reform Commission (NDRC). The notice itself does not indicate funding amounts, although press reports indicate that the fund may pay up to 50% of a firm's R&D costs. Press reports also indicated additional income tax breaks for semiconductor makers, reportedly lengthening tax breaks to five years exemption and five years at half rate, up from the current two-year exemption and three years at half rate that is granted to preferred companies. The SIA is actively seeking additional details regarding this policy, and would be happy to share them with the Commission when they become available.

In addition to these direct subsidies, the Chinese Government has also shown an interest in utilizing the standards setting process to impact the market. I'm not going to spend much time on this issue here today, but would be happy to answer any questions you may have at the conclusion of my testimony.

Chinese Manufacturing Capacity and Technology Trends:

The combined impact of China's compelling market opportunities and Chinese Government subsidies has been noticeable – By 2007, the projection is that almost 10% of global semiconductor capacity will be in China – up from barely 2% only a few years ago.

Much of the investment going into China today is in the foundry area. In the year 2004 alone, foundry capacity in China doubled to approximately 500,000 wafer starts per month – revenues earned by Chinese foundries also doubled from 2003 to 2004 to approximately $1.8 billion. By 2006, Chinese foundry capacity at the 0.18 um node will be approximately 28% of world total.

While much of the capacity in China today is 200mm and in some cases employs used equipment, experts project that there will be up to five 300 mm fabs operational in China by 2007. While the majority of Chinese capacity in 2004 continued to be at 0.5 um, the capability and capacity are rapidly expanding for more advanced nodes upto 0.13um – and one foundry even announced that it will soon have available 90nm (0.09 um) process technology.

Most Chinese foundries have entered into – or are in the process of entering into – process technology licensing agreements with leading semiconductor companies in Taiwan, US, Japan and Europe. Foreign companies also represent the bulk of the customer base for these foundries. Last year, foreigners accounted for approximately 80% of Chinese foundries revenues. However, Chinese fables companies are growing rapidly – their revenues are expected to quadruple between 2003-2008, to $1.2 billion. Although this is still a relatively small number, Chinese foundries expect that local design houses will drive demand for advanced manufacturing capabilities in the future.

Semiconductor technology has been making rapid strides in China by virtually any metric one can imagine. The determined resolve of the local authorities to build a strong local semiconductor industry, coupled with the attractiveness of China as a market, is acting as a powerful accelerator.

The decision to locate new capacity in China is not driven primarily by low labor costs – semiconductor fabs are capital and technology intensive and even an 80% differential in wage rates results in barely a 10% difference in final costs. The difference lies mainly in Government incentives such as favorable taxation and other benefits.

Although China has chosen the low end of the foundry business as their entry vehicle into the global semiconductor industry, Chinese foundries are advancing rapidly to becoming world-class in leading-edge process technology. In addition, the Chinese Government proactively supports an entire local ecosystem including fabless design houses, integrated device manufacturers (IDMs), contract manufacturers (EMS) and designers (ODMs), test and packaging houses, venture capital and start-up firms. The rapid growth of the Chinese electronics ecosystem is likely to make the global environment far more competitive than ever before.

Steps the US Must Take: Technology Policy

Again, I believe that China can and will have a competitive semiconductor industry, and we welcome it as a competitor. That said, my concern is what the United States must do to ensure that we do not lose our position as technology leaders going forward. We must recognize that what is true for us in industry is true for the country as a whole – retaining our lead in this newly more globally competitive era will require a focused effort, and significant investments.

As I mentioned, I serve on the President's Council of Advisors on Science and Technology – the PCAST – and I recently chaired a subcommittee on Information Technology and Manufacturing Competitiveness. We delivered our report to President Bush in January of last year. Among our key findings were:

- Manufacturing share of US GDP and employment fell by half over 50 years, but productivity increases allowed output to remain steady;
- Technology improvements drive approximately half of US GDP, and two-thirds of productivity gains. While IT-producing industries generate less than 5% of GDP, they accounted for nearly half the surge in productivity growth since 1995. Continued advances in information technology are the key to continued economic growth.
- There is growing international competition for leadership in high tech fields – our foreign competitors aren't content to be low cost commodity suppliers anymore
- Many of our competitors have low labor costs, and benefit from significant foreign government incentives; and finally, and I think most importantly,
- US leadership is not guaranteed.

Retaining our technological leadership depends on the existence of a healthy innovation eco-system, and that in turn relies on a number of key components, including among other things:

- Strong investments in basic R&D
- Skilled scientists and engineers
- Laws and regulations that support domestic investment
- A competitive investor and tax environment
- A level playing field with effective IP protection

There are a number of government policies that support and help strengthen this eco-system. A cornerstone is supporting a strong and vibrant university R&D capability. Our university system is the best in the world, and federal investment in university research is critical to retaining current leading edge industries and also creating new ones.

Before addressing what I believe the government should do, let me make clear that the US semiconductor industry invests heavily in this area. In recent years, semiconductor firms have invested between 19-22% of sales in R&D, for a total of $16 billion in 2004 – more as a percentage of sales than virtually any other industry. Although much of this investment is on the product development side, basic university research and consortia activities represent important components, especially as we reach the physical limits of CMOS. Exclusive of consortia such as the SIA affiliated Semiconductor Research Corporation (SRC) and the SIA-founded Focus Center Research Program (FCRP), semiconductor companies contribute $50-60M annually to university research. In addition, industry consortia contributions to universities, SEMATECH and other programs totaled $320 million in 2003, tripled the level from $110M in 2001.

Federal funding for R&D as a percentage of GDP, though, declined from 1.2% in 1985, to only 0.7% in 2003. While the downward trend was slightly reversed from 2000-2003, it is important to return to the levels of the mid-1980s as a percentage of GDP. In addition to overall funding levels, we need to think about balance. Within university R&D, the physical sciences have remained largely flat, and engineering only recently showed modest increases. In 2005, overall Federal R&D investment was $132.2 billion, a 4.8% increase from the previous year. The Department of Defense (DoD) accounted for 80% of the increase.

The National Science Foundation Authorization Act of 2002 called for doubling the NSF budget over 6 years, but appropriations have not followed. In FY 2003, a 10.1% increase was a good start, but a 5% increase in FY2004 fell well short of the goal – I believe this year it is imperative that the NSF receive at least a 7% increase in funding to keep up with technology demands. This would lead to doubling by 2014.

SIA has first hand experience with the federal funding challenge. The Focus Center Research Program (FCRP), jointly funded by SIA companies, equipment suppliers and DoD, sponsors university-based research across the country. Federal funds are leveraged through matching industry contributions. Due to budget constraints, the Administration has not been requesting its share of funding for this program in the last two years. Congress has added money to fund the program. Government funding for FY 2006 should be $20M, to be matched by $20M by industry. It is important to the continuity of research that this program has a predictable funding mechanism from our federal partners.

These investments in R&D are as much economic policy as they are technology policy. It is not in our national interest to try to compete as a low labor cost supplier, and even if we did choose to compete on this level we could not compete against China. Our goal must be to create high wage jobs, which can only be achieved with higher productivity and products that command a premium in the market place.

A perfect emerging example can be found in the area of nanotechnology. The worldwide annual industrial production in the nanotechnology sectors is estimated to exceed $1 trillion in 10 - 15 years from now, which would require about 2 million nanotechnology workers. Recognizing the importance of this new area, the President signed the 21st Century Nanotechnology Research and Development Act in December 2003. Since FY 2001, federal spending on nanotechnology has more than doubled, to a total of $1 billion in the FY 2005 request. In 2004, U.S. nanotechnology investment was estimated at nearly $1B. Yet, the EU, Japan, the combined total of Korea, China, and Taiwan, each invested at nearly the same levels, and their investments are growing.

SIA has proposed the Nanoelectronics Research Initiative to find the next foundation for information technology – the successor to CMOS – by the year 2020. The NRI will be a collaborative effort between the U.S. government, industry, and academia. This year, SIA gained significant understanding of existing government programs in this area, and the NRI will continue to augment, link and accelerate these efforts.

Steps the US Must Take: Tax Policy

In addition to technology policy, America's federal and state governments need a coordinated strategy to reduce the cost differential created by foreign government tax and incentives policies. This strategy should include several elements, including competitive federal tax policies, a permanent R&D tax credit, and other elements.

The Federal government should match the tax holidays offered overseas and it must correct many of its misguided policies that discourage investment in the U.S. and consider other measures to close the tax gap with our trading partners. Specifically Congress should:

- Make the R&D tax credit permanent, enact the Alternative Simplified Credit and other R&D credit enhancements such as those included in the Senate bill last year, and increase the credit rates so that the foreign tax cost differentials are eliminated. The credit is

currently scheduled to expire at the end of 2005. Equally important, many companies invest significant sums on R&D yet cannot use the credit as currently structured.

- Allow companies to expense high technology equipment and thereby improve its cash flow and its ability to invest in new high technology equipment.
- Rethink international taxation rules and consider alternatives to the current rules on taxing foreign source income. Many of the companies that compete against the U.S. operate under territorial tax systems, or otherwise more favorably treat foreign income. The move toward contract manufacturing, a result of the escalating cost of chip factories, puts an additional burden on U.S. companies because their offshore income may be treated under Subpart F rather than as deferred income. Taxes on repatriated funds make it more likely that these funds will be reinvested overseas.
- Consider significant rate reductions to allow manufacturing to remain in the U.S. SIA is encouraged by last year's FSC/ETI resolution that will effectively reduce the rate for domestic production to 31.85 percent over five years. As result of recent reductions in Europe, U.S. corporate tax rates also even now exceed most European nations.

State and local governments also have a role to play. They must ensure that their tax policies must take into account the capital intensity of the semiconductor industry. Sales and property taxes fall disproportionately on businesses that provide their workers with the expensive tools that drive productivity. To counter foreign tax holidays, states that have succeeded in attracting new facilities or retooling of existing fabs have adopted policies such as sales tax exemptions for machinery and equipment, property tax caps, R&D tax credits, business tax apportionment and ad valorem tax abatements. Successful states have also emphasized prompt and flexible environmental permitting to reduce cost and respond to the short product life cycles in the chip industry.

Conclusion:

The question posed to me today by the panel was two-fold: the state of China's manufacturing and technology capabilities, and what the US can do to address these challenges.

As noted, I believe the stated of China's technological and manufacturing capabilities are rapidly increasing. They are able and talented competitors, who will increasingly pose a challenge to the US. I believe it is incumbent upon us not to seek to dampen this competition, but to embrace it fully while at the same time making the investments needed to retain the US competitive lead. It is not in our interest to try to compete as a low labor cost supplier – our goal is to pay high wages which can only be justified with higher productivity and products that command a premium in the market place.

The US competitive lead is ours to keep – or ours to lose. The investments and policy changes needed to achieve this goal are neither easy nor inexpensive, but it is vital that we make them.