

Reversing the Global Migration of the U.S. Semiconductor Industry

Sen. Joseph Lieberman

The United States is facing a serious threat to its economy and national security as a result of government actions in other countries that have capitalized on the changing composition of the semiconductor industry. My concern is the loss to the United States of the high-end semiconductor manufacturing sector, the potential subsequent loss of the semiconductor research and design sectors, and the grave economic and national security implications that these would entail. East Asian countries are leveraging market forces through their national trade and industrial policies to drive a migration of semiconductor manufacturing to that region, particularly China. Historically, shifts in manufacturing result over time in the migration of research and design capabilities. This is especially true of leading-edge industries such as advanced semiconductor manufacturing, which requires a tight linkage of and geographic proximity for research, development, engineering, and manufacturing activities. This loss also has equally serious national security implications. If the ongoing migration of the chip manufacturing sector to East Asia continues, the U.S. defense and intelligence communities will lose both first access and assured access to secure advanced chip-making capability at the same time that these components are becoming a crucial defense technology advantage.

The influence of the semiconductor industry on the U.S. economy in the last decade is difficult to overstate. The U.S. semiconductor sector currently employs 235,000 people (July 2003) in high-wage manufacturing jobs and had sales totaling \$102 billion in the global market in 2000 (50% of total worldwide sales). The productivity growth in the United States in the 1990s was due in significant part to

computer production and advances in information technology that depended on the semiconductor industry.

The U.S. high-tech industry has been in a recession for the last two years, with sharply reduced sales and severe losses. The number of state-of-the-art U.S. chip manufacturing facilities is expected to sharply decrease in the next 3–5 years to as few as three firms that now have the revenue base to own a 300 mm wafer production fabrication facility (“fab”). The remaining state-of-the-art U.S. chip-making firms face great difficulty in obtaining the huge amounts of capital required to construct next-generation fabs. This situation stands in contrast, for example, to that in China. To ensure that China develops the ability to build the next-generation fabs, the central government of China, in cooperation with regional and local authorities, has undertaken a large array of direct and indirect subsidies to support its domestic semiconductor industry. China has provided an effective combination of government trade and industrial policies that has taken advantage of opportunities resulting from market forces and changes in the semiconductor industry. In a sector characterized by rapidly increasing capital costs and the need to have access to large, rapidly growing markets, such as China’s, Chinese government policies and subsidies can decisively change the terms of international competition. Manufacturing is not the only sector that is threatened. According to Intel Corp. co-founder and chair Andrew S. Grove, “the software and technology service businesses are under

siege by countries taking advantage of cheap labor costs and strong incentives for new financial investment.”

One of the many factors contributing to the migration of this high-tech manufacturing sector is the ability of China to draw on substantially larger pools of technically trained labor as compared with the United States, from its large cohort of domestic engineering graduates. The output of Chinese universities is supplemented by large numbers of engineers trained at U.S. universities and mid-career professionals who are offered substantial incentives to return to work in China. But the immediate and most powerful incentives for a highly leveraged industry are the direct and indirect subsidies, including infrastructure needed for state-of-the-art fabs, offered by the government. For example, the central government of China has undertaken indirect subsidies in the form of a substantial rebate on the value-added tax (VAT) charged on Chinese-made chips. While many believe this is an illegal subsidy under GATT trade rules, the impact of the subsidy on the growth of the industry may well be irreparable before—and if—any trade action is taken. Another factor that further promotes China’s competitive advantage is its manipulation of currency markets to hold the value of its currency (and therefore the prices of its manufactured goods) by as much as 40% below the actual value.

It is therefore important to understand that the current shift in manufacturing capacity to China is not entirely the result of market forces. In a recent study by the President’s Council of Advisors on Science and Technology (PCAST) Subcommittee on Information Technology Manufacturing and Competitiveness, chair George Scalise warned the administration, “We are not just competing against foreign companies but foreign countries.” It is equally important to recognize that even if some residual U.S. manufacturing capacity remains after this large-scale migration takes place, the shift of the bulk of semiconductor manufacturing will severely constrain the ability of the United States to maintain high-end research and development (R&D) capabilities.

There are things that can be done to maintain U.S. high-end semiconductor chip design and manufacturing capacities. These steps include active enforcement of GATT trade rules, encouraging joint production agreements, encouraging tax incentives for U.S. investment, increasing the number of science and engineering graduates, increasing federal funds for R&D, funding cooperative research programs, surveying non-U.S. trade practices, and

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supporting the semiconductor equipment and materials industry mask consortium.

I believe that a prompt, concerted effort can reverse this trend in the migration of manufacturing, research, and design that is now underway and that will become essentially irreversible if no action is taken in the next few months. The loss goes beyond economics and security. What is at stake here for the United States is its ability to be preeminent in the world of ideas on which the

semiconductor industry is based. Much of applied physical science—optics, materials science, computer science, to name a few—will be practiced at non-U.S. centers of excellence. This stunning loss of intellectual capability will impede U.S. efforts in all areas of society.

A full white paper on this subject, including details of proposed steps for action, can be found at Web site <http://lieberman.senate.gov/newsroom/reports/SemiconductorWhitePaper.pdf>.

Joseph Lieberman (D-Conn.), U.S. senator and 2004 presidential candidate, currently serves on the Senate's Committee on Armed Services, where he is Ranking Member on the Subcommittee on Airland and sits on the subcommittees on Emerging Threats and Capabilities and on Seapower. He is also a Ranking Member of the Senate's Governmental Affairs Committee and sits on the Environment and Public Works and the Small Business and Entrepreneurship committees.

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