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EDITORIAL

High Technology and Trade

The United States has been incurring an unsustainable annual trade deficit that in 1995 will approach $200 billion. It has become the world's largest debtor nation. The current effort to achieve a balanced federal budget by 2002 might somewhat ameliorate the annual trade deficit. However, if proposals to slash federal support of research and development are implemented, high-technology trade balances and the national defense will be at risk.

Recently, at an international conference in Washington, D.C., at the National Academy of Sciences, some of the circumstances leading toward a weaker United States were discussed. Most of the topics related to international competition and cooperation in high technology. Some of the most significant included the efforts by which Japan has achieved a huge favorable balance of trade, the emergence of East Asia as the region with the fastest growing economies, and the rapid evolution and globalization of advanced microelectronic technologies.

At the end of World War II, the Japanese economy was devastated. By the 1970s, industry was booming, aided in part by government direction and financing. National autonomy was the goal. Quality control and teamwork were emphasized in production, and imports of consumer goods were practically forbidden. Japanese companies obtained high profits from domestic sales; with those funds, they could sell selected items at or below cost in world markets to gain market share. One target was consumer electronics. Although the United States originated most of these products, Japan has improved them and is now the major supplier to U.S. consumers. In Japan, extensive networks of companies enable competitors to cooperate against outsiders. The United States restricts interactions among companies by enforcing antitrust laws against cooperation.

As Japan became more proficient and competitive in high technology and the value of the yen increased relative to that of the dollar, large sums of money were invested in other East Asian countries. Japanese investments were devoted mainly to facilities for cheaply producing consumer goods for export by using low-paid labor. Gradually, East Asian countries—including Korea, Taiwan, Hong Kong, and Singapore—established high-technology capabilities. Korea is now the world's leading producer of memory chips. Taiwan has amassed a large horde of gold and dollars, and some of its funds have been invested in Southern China. The big question in East Asia is the future role of the People's Republic of China. At present, most of its products are low-tech. However, one measure of what has been happening in China is its net trade balance with the United States. In 1988, the balance was $3.5 billion; in 1994, it was $30 billion. China is on the way toward having the world's largest economy.

The frontiers of silicon-based technology are moving swiftly. Cost per function has been dropping 30% per year. But the cost of machinery required for making chips competitively has skyrocketed. Chips are being incorporated in numerous subsystems and applications, so that companies are finding it impossible to be highly proficient in all possible applications and are becoming each others' customers. Partnerships are forming. But each partner must have unique strengths if a good arrangement is to be made. Some of the partnerships have been transnational, such as Motorola's successful venture with Toshiba, which was described at the Washington conference.

In the torrid climate of enhanced global competition, market share is very important. To minimize the effects of tariffs and other barriers, many companies invest in manufacturing plants in other countries, then import components from the home country. However, some nations forbid foreign investments or require technology sharing, or both.

Politicians in the United States act as if they are unaware of the norms of global competition and persist in antitrust policies that were rational 100 years ago. Congress rails against support of industrial technology at a time when many nations eagerly enhance it. Moreover, in a world in which U.S. industry and the defense establishment will be dependent on well-trained scientists and engineers, current proposals to decrease support for both basic and applied research are a recipe for future national mediocrity.

Philip H. Abelson