



Highlights of [GAO-06-423](#), a report to congressional committees

## Why GAO Did This Study

Much attention has focused on offshoring of information technology (IT) services overseas. “Offshoring” of services generally refers to an organization’s purchase from other countries of services such as software programming that it previously produced or purchased domestically. IT manufacturing, notably semiconductor manufacturing, has a longer history of offshoring of manufacturing operations. Under the Comptroller General’s authority to conduct evaluations on his own initiative, GAO addressed the following questions: (1) How has offshoring in semiconductor manufacturing and software services developed over time? (2) What factors enabled the expansion of offshoring in these industries? (3) As these industries have become more global, what have been the trends in their U.S.-based activities?

## What GAO Recommends

GAO makes no recommendations in this report.

GAO provided copies of our draft report to the Departments of State and Commerce. The Department of State did not provide comments; the Department of Commerce agreed with our findings.

[www.gao.gov/cgi-bin/getrpt?GAO-06-423](http://www.gao.gov/cgi-bin/getrpt?GAO-06-423).

To view the full product, including the scope and methodology, click on the link above. For more information, contact Loren Yager at (202) 512-4128 or [yagerl@gao.gov](mailto:yagerl@gao.gov).

# OFFSHORING

## U.S. Semiconductor and Software Industries Increasingly Produce in China and India

### What GAO Found

The U.S. semiconductor industry began offshoring labor-intensive manufacturing operations in the 1960s, followed in the 1970s and 1980s by increasingly complex operations, including wafer fabrication and some research and development (R&D) and design work. Semiconductor assembly and testing was the first to move to Asia, followed by fabrication and, more recently, by some design operations. Software services offshoring began in the 1990s after Internet communications made it possible to trade services such as software programming and software design. The year 2000 changeover hastened this offshoring trend related to software services because programmers knowledgeable in the appropriate programming languages were available, primarily in India. In the 2000s, firms further expanded their offshoring operations, based on the low-cost and high-quality work from the offshored services undertaken in the late 1990s.

Although a lower labor cost was initially a key factor that attracted firms to offshore locations, other factors such as technological advances, available skilled workers, and foreign government policy, also played roles. Technological advances helped firms in the semiconductor industry improve their management of global supply chains and logistics. Regarding software services, technological advances opened the way to trade in programming and other software services. Foreign government policies in Taiwan and China created favorable investment conditions for U.S. semiconductor firms. India changed its emphasis from state-owned enterprises in the 1970s to an environment more amenable to private enterprise by the mid-1980s. Although its restrictions on foreign investment constrained the software services industry’s overall development, India established software technology parks in 1990 to give domestic firms preferential access to the infrastructure essential for offshored operations.

Although offshoring continues to grow in both the semiconductor manufacturing and software services industries, the United States remains one of the largest and most advanced producers of semiconductors and software services. U.S. production data show that both industries have largely rebounded from the 2001 recession. Employment data show a mixed picture, with semiconductor employment remaining flat and software employment mostly recovering. The United States has global trade surpluses in the semiconductors and software services sectors, although production is increasingly shifting to Asia. Both U.S. industries have become global, sourcing components from many locations overseas. U.S. firms have offshored increasingly complex products, essentially moving up the value chain. The ability of the United States to compete depends on research and development investment, innovative academic environments attracting top-quality students, and a competitive business environment. It will be important for U.S. businesses and policymakers to keep alert to technological changes and competitor countries’ strategies while enhancing the elements of the innovation environment in the United States.