

U.S. Trade of Semiconductors: Cross-Country Patterns and Historical Dynamics

Fernando Leibovici, Senior Economist
Jason Dunn, Research Associate

Semiconductors themselves contribute only modestly to aggregate U.S. output. But over the past decade, they have become critical inputs in the production of a wide range of goods, such as computers, toys, appliances, and automobiles. Because of their critical nature in the production process and the difficulty (or impossibility) of finding viable substitutes, semiconductor shortages have had important global effects.

These dynamics have also affected foreign policy. In October 2022, the U.S. Commerce Department’s Bureau of Industry and Security instituted a new round of restrictions on U.S. exports of various semiconductor manufacturing technologies to companies in the People’s Republic of China.¹ This measure, which followed a series of bans and controls throughout 2022,² was put in place to guard against the potential use of these technologies in the advancement of military weapons.

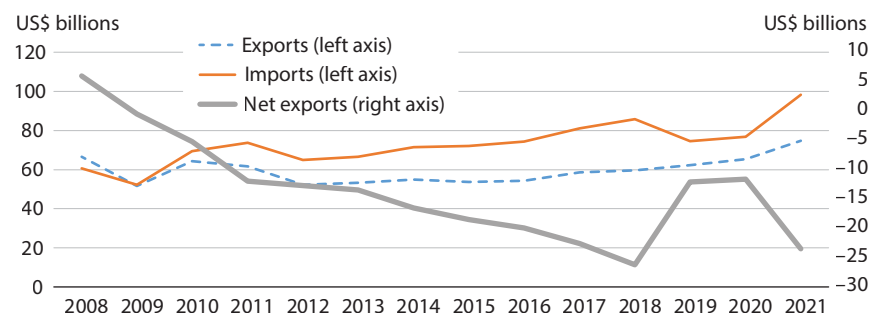
To illuminate the bigger picture, we use data from the U.S. Census to examine the aggregate dynamics of semiconductor trade and the degree of U.S. dependence on foreign inflows of semiconductors.³ We list the key countries from which the U.S. imports semiconductors and the major destinations of U.S. semiconductor exports, with additional focus on China and Taiwan.

We start by examining the aggregate dynamics of U.S. semiconductor trade. Figure 1 shows that U.S. imports of semiconductors increased substantially over this period, particularly over the past few years. In contrast, U.S. exports of semiconductors have been relatively stagnant over most of the period, with a recent increase. The result of these trends has been a systematic decline in U.S. net exports of semiconductors—that is, an increase in the U.S. semiconductor trade deficit. (One exception is the spike in 2018 that resulted from sanctions against China imposed during the Trump administration.⁴) Thus, the U.S. has become increasingly dependent on other countries to access semiconductors.⁵

Now, the specialization of production across countries is a standard feature of a well-functioning trading system, as envisioned by the World Trade Organization. When countries specialize based on comparative advantage, they end up depending on each other for access to the vast range of goods desired, making all countries better off. A concern may arise, however, in the presence of geopolitical or other risks that may disrupt world trade.

Figure 2 shows the breakdown of U.S. exports and imports of semiconductors across destinations and origins for 2021. Malaysia, Taiwan, and China are the largest sources of U.S. imports and important destinations for

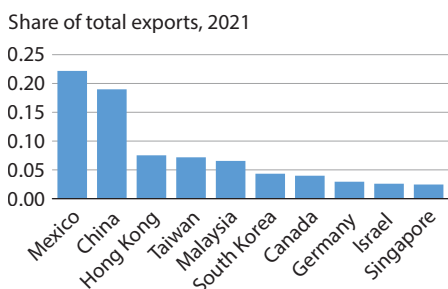
Figure 1
U.S. Semiconductor Trade



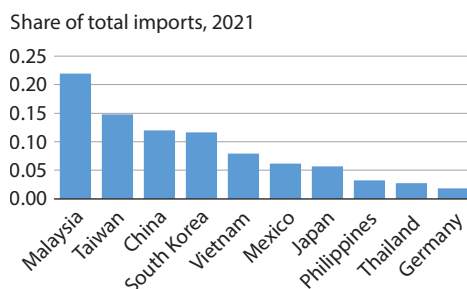
SOURCE: U.S. Trade Census.

Figure 2

A. Top 10 destinations of U.S. semiconductor exports



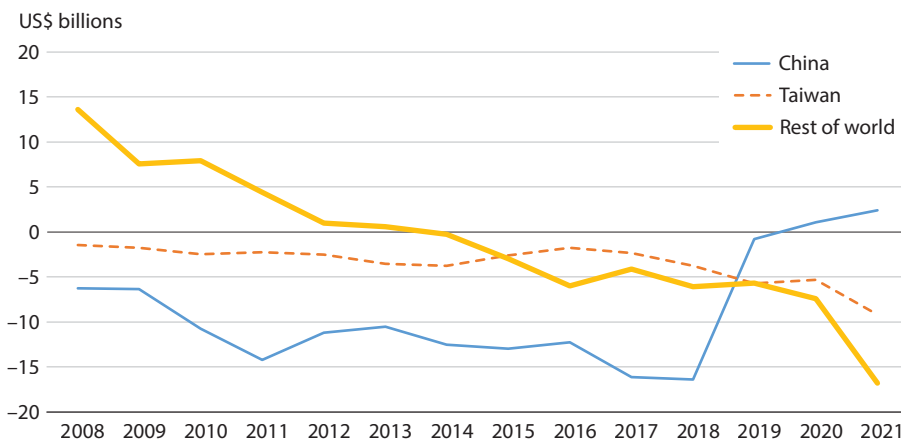
B. Top 10 sources of U.S. semiconductor imports



SOURCE: U.S. Trade Census data for 2021.

Figure 3

U.S. Semiconductor Trade Balances with China, Taiwan, and the Rest of the World



SOURCE: U.S. Trade Census.

U.S. exports of semiconductors. More generally, East and Southeast Asia are critically important partners for U.S. semiconductor trade. Given growing tensions between the U.S. and China,⁶ the mutual dependence between these countries in accessing semiconductors makes it an arena with potential to prevent conflict via cooperation or, alternatively, to serve as a channel for conflict via disruptions in trade flows.

We conclude by investigating the historical dynamics of U.S. net exports vis-à-vis China, Taiwan, and the rest of the world. Figure 3 shows that the U.S. trade deficit of semiconductors with China increased systematically from 2008 to 2018 and changed to a trade surplus in 2020, in the aftermath of the trade war. In contrast, the trade deficit of semiconductors with Taiwan accelerated in recent years, likely as a substitute source to make up for the reduction in semiconductor imports from China. Similarly, net exports with the rest of the world have also declined systematically over this period, and that decline has accelerated in recent years.

The decline in the U.S. semiconductor trade deficit with China suggests the U.S. may now have higher resilience to geopolitical risk in this industry. But much exposure remains. China is still the second-largest recipient of U.S. semiconductor exports and third-largest source of imports to the U.S., despite the reduction in their net exports. Moreover, the critical importance of Taiwan for U.S. access to semiconductors may also prove problematic in a scenario of heightened tensions in that region. In light of these potential vulnerabilities, U.S. Secretary of the Treasury Janet L. Yellen has been increasingly advocating for “friendshoring” as an approach to advancing trade that is free, fair, and secure and “modernizing trade relationships and supply chains to make them more resilient to global shocks.”⁷ ■

Notes

¹ <https://www.bis.doc.gov/index.php/documents/about-bis/newsroom/press-releases/3158-2022-10-07-bis-press-release-advanced-computing-and-semiconductor-manufacturing-controls-final/file>

² <https://www.bis.doc.gov/index.php/documents/about-bis/newsroom/press-releases/3116-2022-08-12-bis-press-release-wa-2021-1758-technologies-controls-rule/file>

³ We focus on exports and imports of semiconductors, omitting goods that are not semiconductors but may have semiconductors embedded (e.g., cell-phones). The annual dataset we use is “Semiconductors and Other Electronic Components” (NAICS code 3344) for 2008-2021.

⁴ For in-depth coverage on the evolution of the semiconductor industry and the current relationship between the U.S. and China in regard to semiconductors, see Bown, Chad P. “How the United States Marched the Semiconductor Industry Into Its Trade War with China.” *East Asian Economic Review*, 2020, 24(4), pp. 349-88 (as well as other work by Bown).

⁵ “Net exports” characterizes a country’s degree of foreign dependence when the goods exported and imported are homogeneous. If exports and imports consist of different types of goods, then countries’ economic activity can be dependent on other countries even if trade is balanced.

⁶ <https://www.nytimes.com/2022/10/07/business/economy/biden-chip-technology.html>

⁷ <https://home.treasury.gov/news/press-releases/jy1014>

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