

The Effect of Korea-Japan Relations on Trade and The Global Economic Order

KEI-KITA Joint Seminar

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About ITIF

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- Supports policies driving global, innovation-based economic growth.
- Focuses on a host of issues at the intersection of technology innovation and public policy across several sectors:
 - Innovation and competitiveness
 - IT and data
 - Telecommunications
 - Trade and globalization
 - Clean energy, manufacturing, life sciences, and ag biotech



Semiconductors Are A Uniquely Integrated Global Industry

Beyond Borders: Semiconductors are a Uniquely Global Industry

Typical semiconductor production process spans multiple countries: 4+ Countries, 4+ States, 3+ trips around the world, 25,000 miles travelled, 100 days TPT, 12 days in transit



\$1,340 Billion in Global Trade
Top Participants in Global Trade: Semiconductor Goods

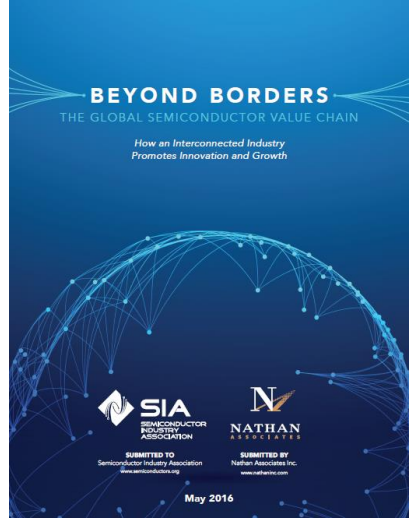
- | | | |
|-----------|-------------|-------------|
| China | USA | Mexico |
| Hong Kong | Malaysia | Thailand |
| Singapore | Japan | France |
| Taiwan | Germany | Viet Nam |
| Korea | Philippines | Netherlands |

\$36.8 Billion in Global Trade
Top Participants in Global Trade: Fabrication Material Goods

- | | | |
|---------|-----------|-------------|
| China | Taiwan | Norway |
| USA | UAE | Mexico |
| Japan | Singapore | Netherlands |
| Germany | UK | France |
| Korea | Italy | Brazil |

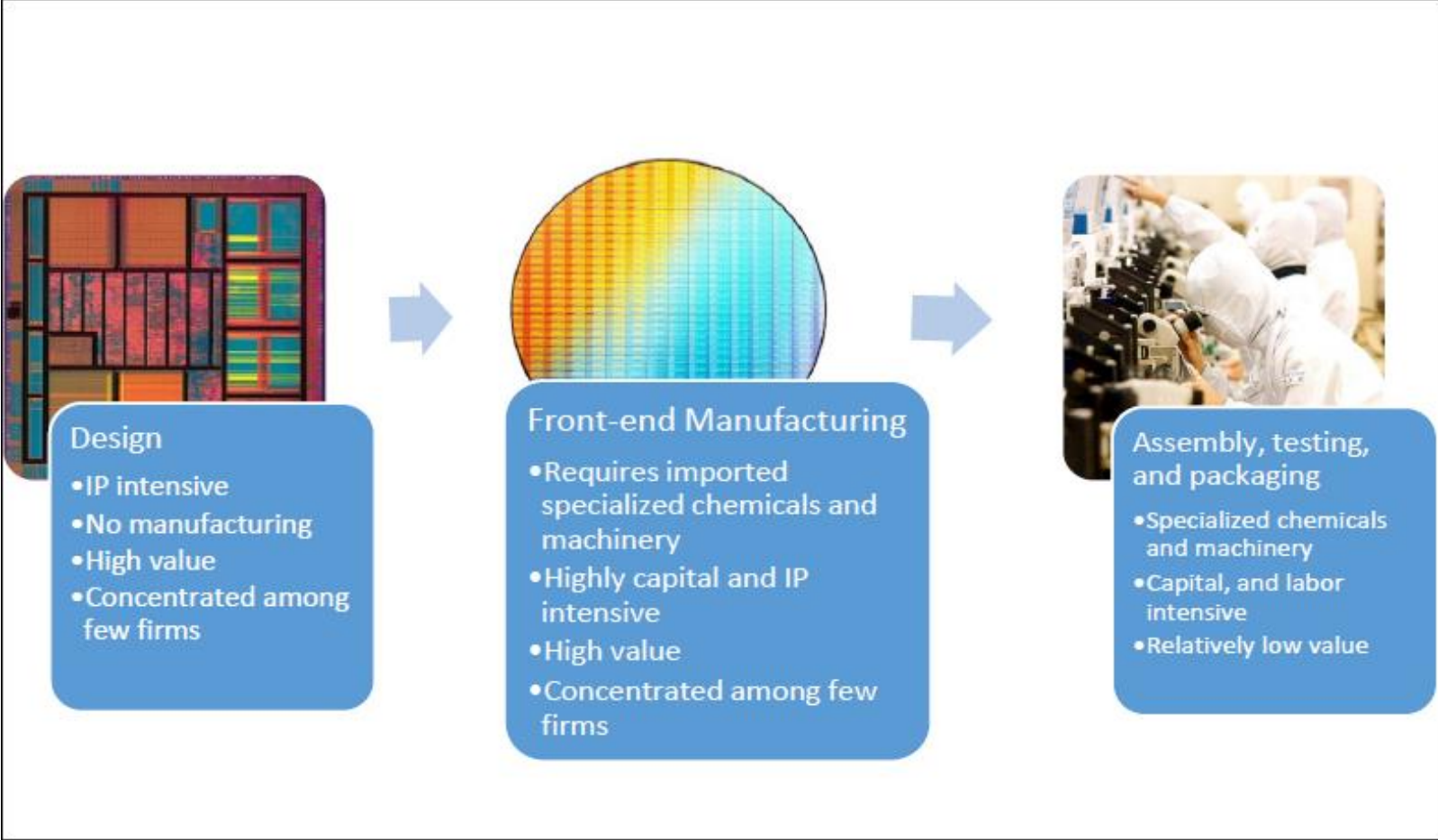
\$23.7 Billion in Global Trade
Top Participants in Global Trade: Assembly, Test, Packaging Goods

- | | | |
|---------|-----------|-------------|
| China | France | Mexico |
| Germany | Korea | Netherlands |
| USA | Hong Kong | Poland |
| Japan | Italy | Canada |
| Taiwan | UK | Belgium |



Source: Nathan Associates, "Beyond Borders: The Global Semiconductor Global Value Chain"

Stylized Semiconductor Production Process



Office of Industries
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The South Korea-Japan Trade Dispute in Context: Semiconductor Manufacturing, Chemicals, and Concentrated Supply Chains

Samuel M. Goodman, Dan Kim and John VerWey

Abstract
 The semiconductor production supply chain is among the most globally integrated. Japan's recently announced export control actions have introduced supply chain risks for semiconductor and electronics manufacturers, particularly in Japan and Korea. This paper provides context and examines the potential implications of such risks. We identify the factors behind Japan's competitiveness in the semiconductor materials and equipment industries, focusing on specialized chemicals, and South Korea's competitiveness in semiconductor manufacturing. We explore the short and long-term implications of sustained supply chain risks for this particular supply chain and find that there are strong supplier-customer relationships between materials and equipment suppliers and semiconductor manufacturers, due to specialization and high fixed costs throughout the supply chain. In the short-term, Japanese chemical providers and Korean semiconductor producers face potential disruptions in their production and exports, though the magnitude of potential losses for Korean chipmakers are likely much larger than Japanese chemicals suppliers. In the long-term, these actions create incentives for Korean chipmakers to significantly lessen their sourcing from Japanese suppliers, not only in specialized chemicals, but throughout the entire semiconductor supply chain.

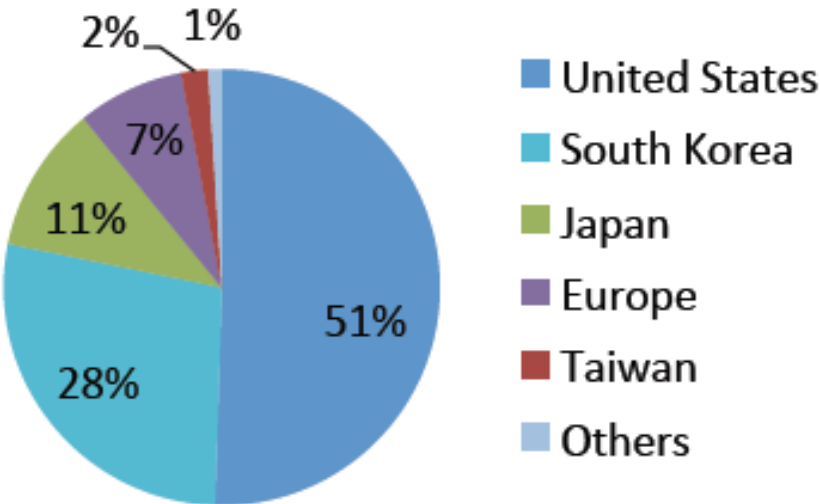
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Source: Samuel M. Goodman, Dan Kim, and John VerWey, U.S. ITC, "The South Korea-Japan Trade Dispute in Context: Semiconductor Manufacturing, Chemicals, and Concentrated Supply Chains"

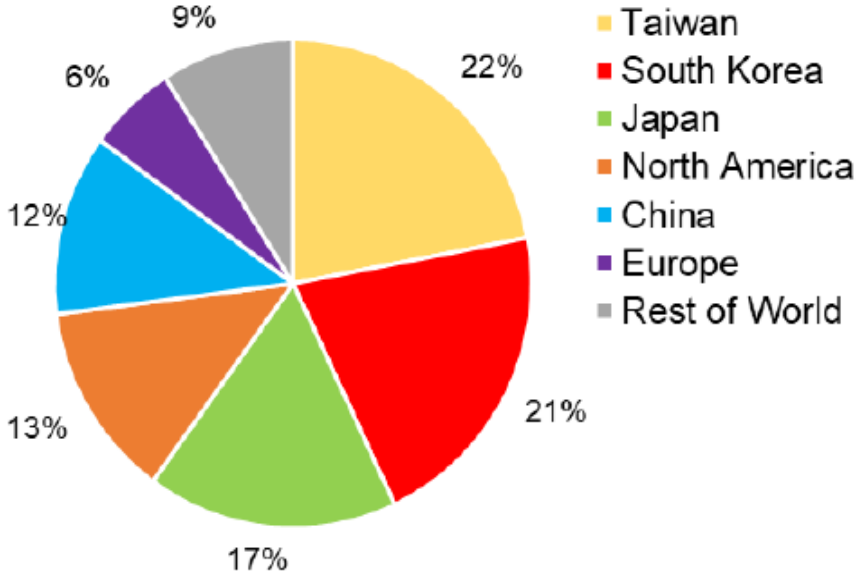
What's At Stake For Korea?

- Korea's semiconductor industry has second-most overall fabrication capacity.
- Samsung and SK Hynix are world's 2nd and 4th largest semiconductor suppliers.

Share of Semiconductor Integrated Design Manufacturers



Total Global Wafer Capacity, December 2018



Source: Samuel M. Goodman, Dan Kim, and John VerWey, U.S. ITC, "The South Korea-Japan Trade Dispute in Context: Semiconductor Manufacturing, Chemicals, and Concentrated Supply Chains"

What's At Stake For Korea?

- Semiconductors and related components account for 30% of Korean exports.
- In 2018, semiconductors accounted for 92% of Korean export growth.
- Semiconductors accounted for 80% of Korea's current account surplus in 2017-2018.
- Downside GDP risk of ongoing stalemate = 2 to 2.6% of Korean GDP.

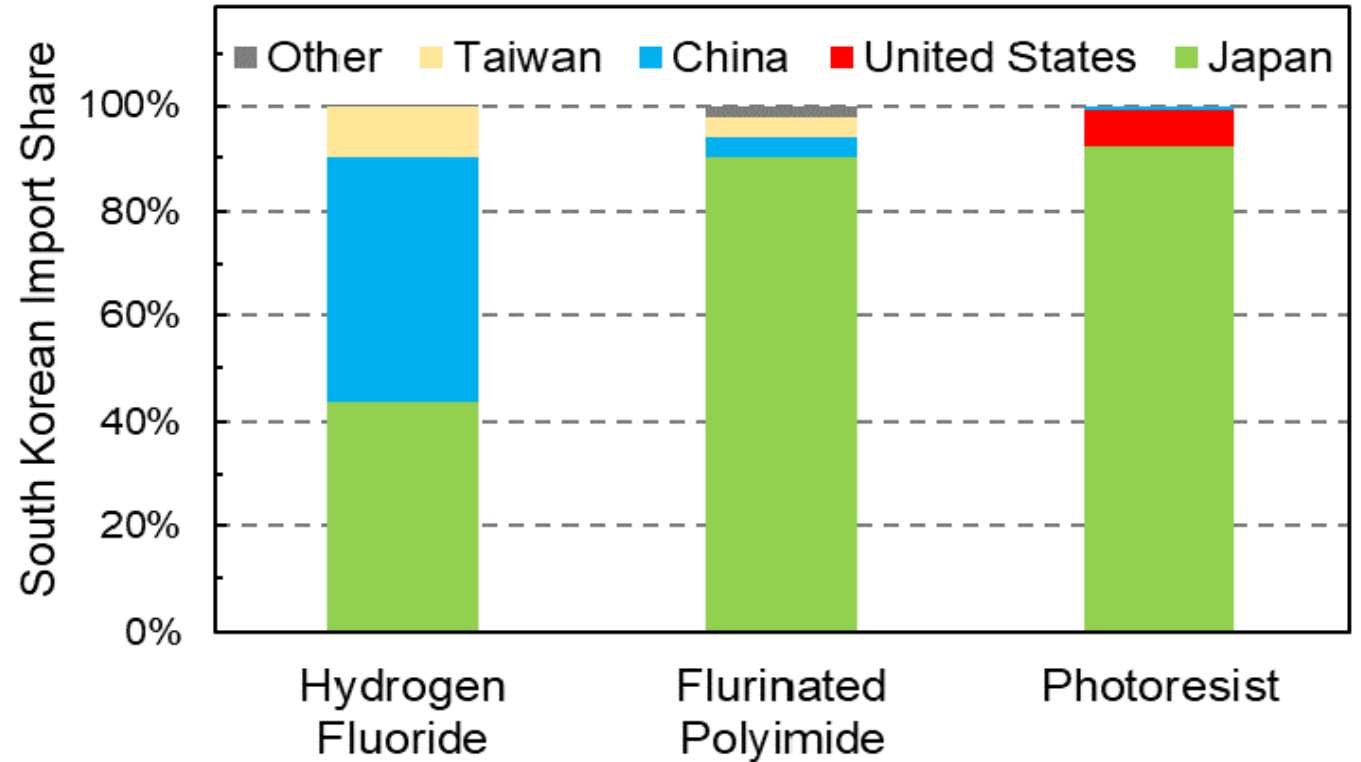


Source: *Financial Times*, "Korea Caught In the Crossfire of Trade and Tech Wars," July 13, 2019; Bloomberg, "Economists Warn of Larger Ripple Effect of Japan-South Korea Trade War"

What's The Issue?

- Japan has imposed export controls on three chemical inputs critical to semiconductor production.
- Japan produces 90% of world's supply of fluorinated polyimide and photoresists.
- Japan accounts for 70% of global production of hydrogen fluoride.

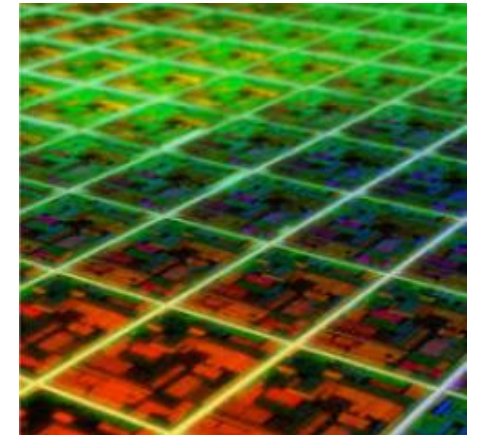
Sources of Semiconductor-related Chemicals Imports for Korea, by source (% Total), January to May 2019



Source: Samuel M. Goodman, Dan Kim, and John VerWey, U.S. ITC, "The South Korea-Japan Trade Dispute in Context: Semiconductor Manufacturing, Chemicals, and Concentrated Supply Chains"

Photoresists

- Establish the pattern upon which semiconductor micro-circuitry is built.
- 90% of Korean photoresist imports in 2018 originated from Japan.
- Few alternative international suppliers, available stockpiles would last only 3-6 months.



Source: Samuel M. Goodman, Dan Kim, and John VerWey, U.S. ITC, "The South Korea-Japan Trade Dispute in Context: Semiconductor Manufacturing, Chemicals, and Concentrated Supply Chains"

Korean Dependence on Japanese Supply

- On average, Korea imports \$33.6 million of restricted chemicals monthly.
- But Korea exports \$8.4 billion of semiconductors and parts depending on those chemicals.
- Meaning Korean export loss exposure is 250 times greater than that of Japan's chemical-makers.

Export Code	Product description	Monthly average	Quarterly average
854231	Processors And Controllers, Electronic Integrated Circuits	\$1,746.7	\$5,240.1
854232	Memories, Electronic Integrated Circuits	\$5,525.0	\$16,575.0
854233	Amplifiers, Electronic Integrated Circuits	\$4.5	\$13.5
854239	Electronic Integrated Circuits, Nesoi	\$381.4	\$1,144.1
854290	Parts For Electronic Integrated Circuits And Microassemblies	\$21.1	\$63.2
(a)	Display parts	\$752.9	\$2,258.6
	Total	\$8,431.5	\$25,294.5

Source: Samuel M. Goodman, Dan Kim, and John VerWey, U.S. ITC, "The South Korea-Japan Trade Dispute in Context: Semiconductor Manufacturing, Chemicals, and Concentrated Supply Chains"

Downstream Supply Chain Impacts

- Export restrictions not only impact Korea's electronics manufacturers, but all downstream industries that depend on integrated circuits, in Korea & abroad.



Source: Stephen J. Ezell, "How The Information Technology Agreement (ITA) Bolsters Economic Growth in Nations"

International Impacts

- Short-term: TSMC (Taiwan) and Intel (U.S.) likely beneficiaries of dispute.
- Long-term: “These actions create incentives for Korean chipmakers to significantly lessen their sourcing from Japanese suppliers, not only in specialized chemicals, but throughout the entire semiconductor supply chain.” – Goodman, Kim, VerWey
- China unlikely to capitalize in short-term, but adds impetus to China’s ambition for autarkic production of semiconductor sector.
- Amicable resolution needed to maintain confidence in globalization of both semiconductor supply chains and liberalized market-based trade.

Sources: Samuel M. Goodman, Dan Kim, and John VerWey, U.S. ITC, “The South Korea-Japan Trade Dispute in Context: Semiconductor Manufacturing, Chemicals, and Concentrated Supply Chains”
ITIF, “Stopping China’s Mercantilism: A Doctrine of Constructive, Alliance-Backed Confrontation”

Thank You!

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