The Geography of the Electronics Supply Chain from Soup to Nuts

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August 18, 2024

Abstract

The geography of the electronics supply chain is a subject of keen interest to policymakers, as evidenced by the recent wave of incentives for domestic construction of semiconductor fabrication plants. Importantly, these plants are only one of many stages in the manufacture of electronics. We sketch the complete supply chain, discuss data sources, provide estimates of the magnitude of production at each stage, by economy, and flows between them, from 1990 to 2023. Some elements of production shift location over time more than others, providing a sense of their relative geographic flexibility. Most notably, chip fabrication and final electronics assembly in the United States has dwindled in recent years while the intangible elements of the supply chain—R&D and management—have remained. We then discuss the prospects for protecting the supply chain from risks (whether geopolitical, climatic, epidemiological, or otherwise). Several factors militate against success in such a project. First, the fixed proportions nature of electronics manufacturing and the concentrated production of specific narrowly-defined electronic components ensures that disruption of a single stage may suffice to cause first-order supply shocks

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in the market for final goods. (Motor vehicle production during the COVID-19 pandemic is one example of many.) Second, the sprawling geography of the supply chain has emerged largely in response to the differing comparative advantages of participant economies, suggesting the opportunity cost of confining the chain to a restricted set of those economies would be prohibitive. Third, individual economies implement policies in the context of a dynamic game; other economies have provided subsidies to chip fab manufacturing similar to those provided by the CHIPS and Science Act and analysis of factory construction plans suggest the U.S. share of semiconductor fabrication will be little changed in coming years.