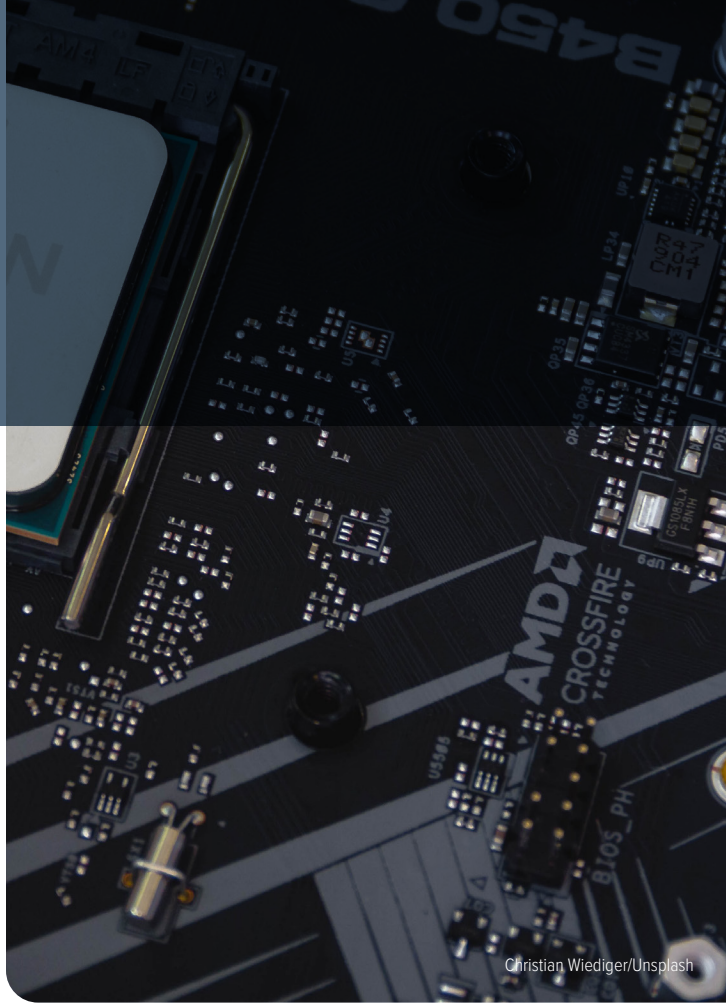
DATA FOR *PROGRESS*

POLICY LEVER

Support Resilient Semiconductor Manufacturing

This policy memo is part of Data for Progress and National Wildlife Federation's Made Clean in America series, which features analysis and polling on federal investments to build American clean industrial capacity, tackle the climate crisis, and create high-quality manufacturing jobs.



Christian Wiediger/Unsplash

BY ASHWIN NARAYAN

Background

Semiconductors are the workhorses of the Information Age, and their supply chain has come under increased scrutiny after its fragility was unearthed by the coronavirus pandemic. Advanced semiconductor manufacturing has become dangerously concentrated, with one company, the Taiwan Semiconductor Manufacturing Company (TSMC), responsible for manufacturing 84% of the most advanced chips for the entire global economy. Moreover, the resilience of supply chains generally, but for high-tech manufacturing specifically, is opaque, with preference in the system for supply to match demand exactly rather than incorporating redundancy in inventories to withstand shocks. Manufacturing capacity in the United States has fallen precipitously, and recent shortages have strangled the auto industry and highlighted the ubiquity of chips and the brittleness of their supply.

Demand will only continue to increase. The promise of 5G networks and increased connectivity of both household and industrial devices require more and more devices with chips. Perhaps most consequentially, fighting climate change will require massive investments in measuring emissions and developing clean technologies, and ensuring climate justice will require high-resolution monitoring and mapping. All of these efforts will increase the need for chips.

The decline in the American manufacturing industry has been extensively reported on, paralleled by the decline in labor unions, increased automation, and the offshoring of jobs. While there is often an air of inevitability in these discussions, a well-designed industrial policy approach can both revive the industry and meet the currently unmet demands of the twenty-first century. By investing in training, research, and development, and by incentivizing onshoring jobs via procurement of chips, the public sector can kickstart American manufacturing. And by directing this policy towards the vital need to fight climate change, these investments will have far-reaching impacts even beyond the manufacturing industry. Developing a robust industrial policy for semiconductors will demonstrate that government can indeed be a powerful force for helping the American people.

Key policy options

PROCUREMENT. Domestic manufacturing of semiconductors can be encouraged by requiring that chips bought by the federal government are domestically produced. Having a guaranteed customer will greatly incentivize chip manufacturers to invest in domestic capacity, as the prohibitively high startup costs of building fabrication factories has encouraged consolidation in the industry. Because the goal of requiring domestic procurement is to make domestic manufacturing more competitive, the stipulation can also be designed to fade out as the American semiconductor industry matures. This will further incentivize manufacturers to build with an eye towards *becoming* globally competitive, rather than relying on the government being a permanent customer.

One potential option for domestic semiconductor procurement is in the fight against climate change. In order to meet Paris goals and to ensure climate burdens are equitably distributed, it will be crucial to expand auditing of emissions; to upgrade aging electric grids; and to expand high-resolution monitoring of air and water quality in underserved areas. Each of these tasks requires massive investment in devices with computing power — not just cutting edge artificial intelligence-driven chips for smart grids, but also simple monitors. Meeting Paris climate goals and supporting American manufacturing can, and should, go hand in hand.

SUPPLY CHAIN RESILIENCE. Shortages in semiconductors have come to the fore because of the coronavirus pandemic, especially in the auto industry. Companies have been forced to reckon with the opacity of their supply chains — the cascading effects of shortages caused massive backlogs. Rep. Jackie Speier (D-CA) recently noted in a recent House Intelligence Committee hearing that a chip "can travel to more than 70 countries during the production process". While the globalization of the manufacturing process will be difficult to undo (even if that was desirable), it is clear that much work needs to be done on improving resilience.

Different strategies exist for improving supply chain robustness. The CHIPS Act proposes $52 billion in subsidies and RD&D initiatives to encourage onshoring of semiconductor manufacturing, premised on the idea that domestic manufacturing is more resilient than far-flung supply chains. The argument for increased government support of the semiconductor industry is that the countries where manufacturing is currently concentrated (namely Taiwan and South Korea) lavish support on

their semiconductor industries. Specifically, targeted subsidies can help onshore production that fills in the gaps in current supply chains. Beyond direct domestic subsidies, the government can support a robust global supply chain by setting technical standards for security, incentivizing redundancy for key components, and mandating supply chain transparency.

SEMICONDUCTOR R&D. A major provision of the CHIPS Act is increased funding for semiconductor research and development, but the focus of the act is near-term and incremental advances. In order to be a world leader in advanced semiconductor manufacturing, funding is needed with an eye towards *long-term*, high-risk, high-reward research. Especially needed is investment into developing more energy efficient semiconductors (since computing is now a major source of electricity consumption) as well as more cryptographically secure computation (to allow more expansion of distributed computing).

The government has a strong track record of supporting this type of long-term investment, especially through programs like the Defense Advanced Research Projects Agency (DARPA), which deputize highly trained program managers to find the most promising research programs for "moonshot" projects. DARPA has sprouted a number of analogous programs, like ARPA-E (for energy) and IARPA (for intelligence agencies), each with a similar mandate: to explicitly tackle high-risk, high-reward projects by seeking out the most promising researchers and giving them all the support they need to succeed. There is certainly potential to amplify semiconductor research within these existing programs, perhaps through research into efficiency at DARPA or through energy and climate applications at ARPA-E; or to consider the development of new, dedicated R&D programs devoted to the advancement of semiconductor technologies.

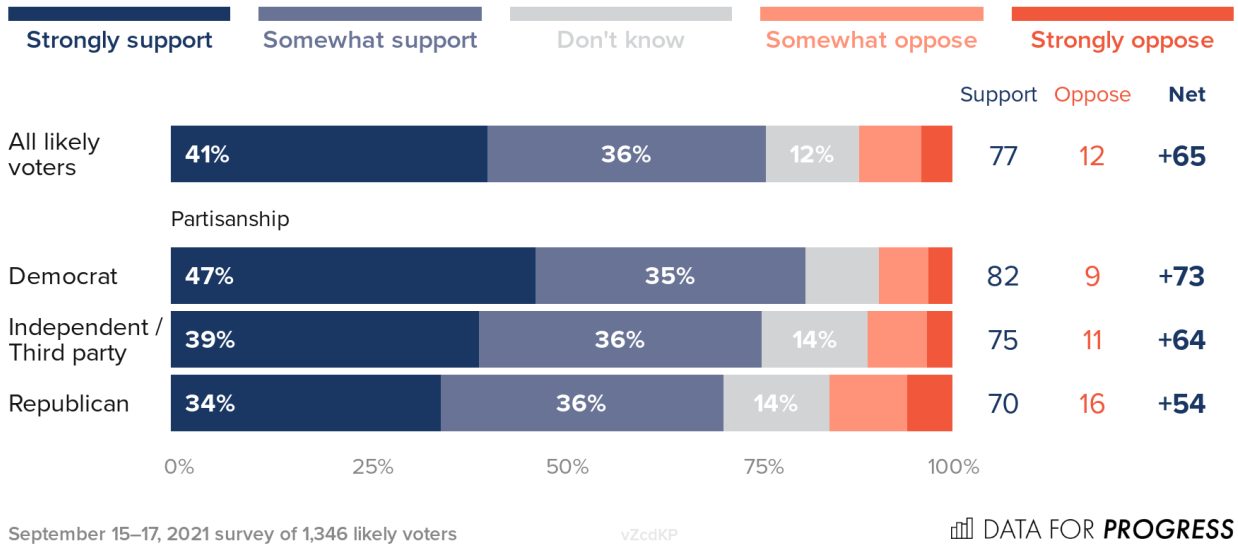
Polling

Given their critical importance to domestic supply chains, voters support federal investments to shore up domestic production of semiconductors by a +65-point margin. A majority of Democrats (82 percent), Independents (75 percent), and Republicans (70 percent) all support a multi-billion dollar investment to strengthen domestic supply chains and increase American competitiveness with leading semiconductor manufacturers around the world, including China.

Voters Overwhelmingly Back Federal Investments to Increase Domestic Semiconductor Production

Some lawmakers have introduced a bill that would fund a multi-billion dollar increase in the manufacturing of semiconductors, a key component of computer chips that form the backbone of most modern technologies. The U.S. significantly lags behind other nations, including China, on semiconductor manufacturing.

Do you support or oppose this federal investment to increase the domestic production of semiconductors?



From September 15 to 17, 2021, Data for Progress conducted a survey of 1,346 likely voters nationally using web panel respondents. The sample was weighted to be representative of likely voters by age, gender, education, race, and voting history. The survey was conducted in English. The margin of error is ±3 percentage points.