

**The U.S. Semiconductor Industry**  
20<sup>th</sup> and 21<sup>st</sup> Century Employer Policies and Practices

**Research Report Executive Summary**

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**Brian Dan-Ding**

# Executive Summary

## Introduction

The U.S. has fallen behind in semiconductor manufacturing. To bolster U.S. leadership in this sector, the Biden administration passed the CHIPS and Science Act which provided grants to Intel, Micron Technology, Samsung, and TSMC to manufacture semiconductors in the U.S.

However, a key question remains: how did the United States fall behind in the semiconductor sector in the first place?

## Data and Methods

This report incorporates data from the government and chip companies, with insights gathered from eight American semiconductor engineers and two Rochester Institute of Technology (RIT) professors. The report answers three questions, focusing on CHIPS Act-funded U.S. semiconductor companies Intel and Micron Technology. I) How did the United States fall behind in semiconductors? II) What were the policy actions of U.S. semiconductor firms and the U.S. government? III) In consequence of these questions, how can U.S. semiconductor companies achieve their domestic workforce needs? These points are developed in further detail below.

## Question I: How did the United States fall behind in semiconductors?

### Part I: Financialization

U.S. semiconductor companies conducted stock buybacks, with Intel committing \$152 billion in buybacks since 1990 (Leopold, 2024). Policymakers have prohibited the use of CHIPS Act funding for stock buybacks.

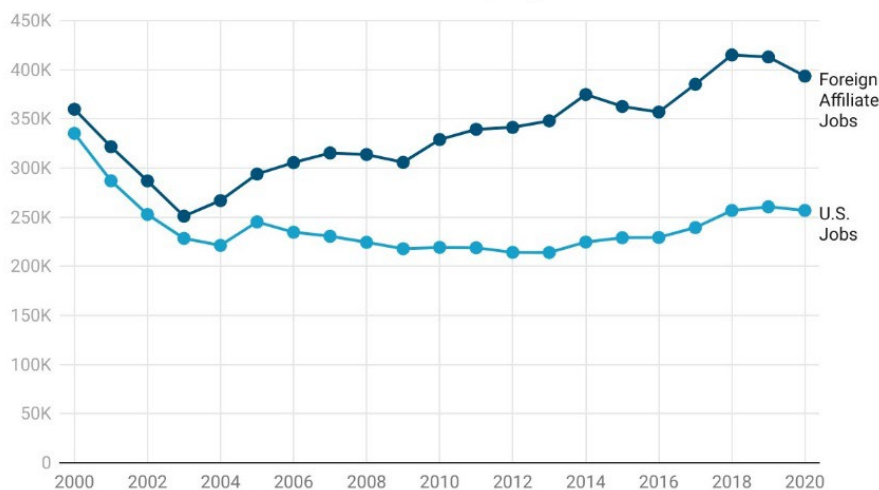
### Part II: American Workforce Disinvestment

U.S. workforce disinvestment occurred through a) outsourcing and offshoring, b) layoffs of American workers, c) hiring of guest workers, along with d) disinvesting in existing and future American worker education and engineers. Asian semiconductor companies took workforce investment and retention seriously. The U.S. struggled to advance and innovate on semiconductors without experienced and skilled American workers.

## A.) Offshoring and Outsourcing

- U.S. semiconductor companies outsourced and offshored jobs. Intel grew only 1,000 of 35,000 net new jobs in the United States between 2001 and 2021. Micron Technology grew jobs overseas while shrinking jobs at home.
- U.S. semiconductor companies staunchly defended outsourcing and offshoring jobs while ignoring long-term consequences.
- Manufacturing outsourcing led to job losses for Americans and a reduction in semiconductor manufacturing capacity, impacting national security and innovation.

### Semiconductor Multinational Employment 2000-2020



Source: Bureau of Economic Analysis (BEA), Annual Survey of U.S. Direct Investment Abroad: Selected Financial and Operating Data of Nonbank U.S. Parents, by Industry of U.S. Parent and Selected Data for Foreign Affiliates and U.S. Parents in All Industries, 2000-2020 • Created with Datawrapper

## B.) Layoffs of American Workers

- To cut labor costs, U.S. firms that avoided layoffs in the 20<sup>th</sup> century embraced layoffs in the 21<sup>st</sup> century. Of the five top U.S. semiconductor companies, all five disproportionately cut U.S. workers. Micron Technology conducted 81% of its workforce reduction in the United States. Intel laid off older, more experienced, and more expensive American workers (Rogoway, 2016).
- Layoffs had detrimental impacts on American workers, U.S. firms and the United States.
- Meanwhile, TSMC replaced its CEO after receiving backlash from workers and TSMC founder Morris Chang for committing layoffs in 2009 (Miller, 2022, p. 220).

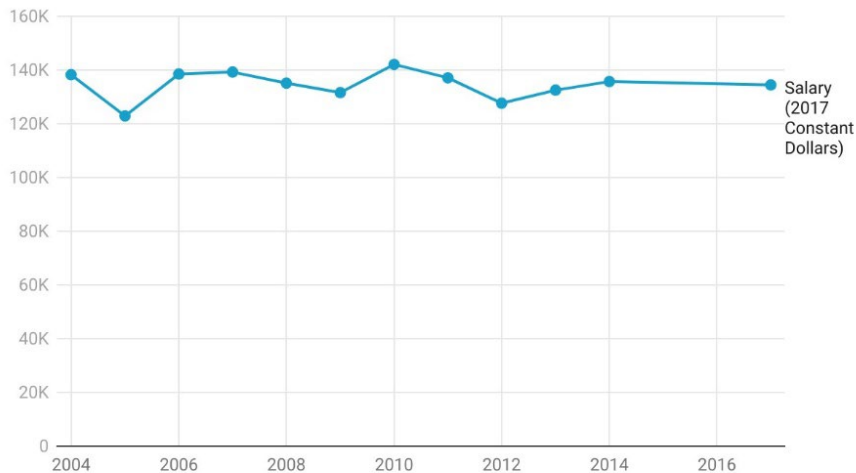
### C.) Hiring Guest Workers

- After laying off Americans, U.S. semiconductor firms brought in guest workers via the H-1B and Optional Practical Training guest worker programs. A third of recent U.S. professionals hired at Intel were on an H-1B visa. In the 2000s and 2010s, the company was the second largest user of the OPT.
- The influx of guest workers depressed wages and job opportunities for American workers.

### D.) Disinvesting in existing future U.S. Worker Education and Engineers

- The federal government's G.I. Bill and tuition reimbursement from semiconductor firms funded American semiconductor engineers in the 1980s.
- Going forward, companies disinvested in advanced semiconductor education, for example, Rochester Institute of Technology (RIT) in the 2000s.
- As can be seen in the chart, salaries for American engineers at U.S. firms that had trained and retained them in the 1980s and 1990s stagnated. By the 2000s and 2010s their experience and expertise had been devalued.

**Average Salaries of Electronic Engineers in the U.S. Semiconductor Industry 2004-2014, 2017**



Source: Electronic Design Annual Salary Survey for Electronic Engineers in the IC & Semiconductor Industry • Created with Datawrapper

## **Question II: What were the policy actions of U.S. semiconductor firms and the U.S. government?**

Employers focused on guest workers and advocacy programs to change government policies to accommodate more guest workers leading government to shift control to various private and government sector research and development groups.

### **Employer Policy Advocacy**

After 1990, semiconductor companies focused their policy attention on advocating for more guest workers. This led to the creation of programs such as STEM OPT and the American Competitiveness Act in the 21<sup>st</sup> Century Act.

### **Past Government Policy**

In the same time period, the U.S. government modified its approach, switching from industrial policy to science policy (Khan, 2017; Khan et al., 2018). Science policy focused on fostering research and development through universities, private sector entities, and multiple government agencies, including the Defense Department, the National Science Foundation, Energy, and Commerce. However, problems with coordination, poor funding, and corporate control of the research agenda meant science policy initiatives yielded little in semiconductor technological breakthroughs.

## **Question III: How can U.S. semiconductor companies achieve their domestic workforce needs?**

### **Part I: Workforce Supply Claims**

- The Semiconductor Industry Association claims there will be a workforce gap of 67,100, of which 27,400 are engineers by 2030, necessitating policy solutions to expand guest workers. However, the chip industry claimed a labor shortage in the 2000s, but researchers found that “the labor market for high-tech engineers does not seem to be out of balance in either supply or demand” (Brown & Linden, 2009, p. 114).
- There is not a STEM labor shortage (Salzman, 2013; Hira, 2022) given the many American engineering graduates being produced and available for employment. The problem lies in the scarcity of relevant STEM jobs available for graduates and attracting graduates to the U.S. semiconductor industry. Electrical and electronic engineering salaries are stagnant, meaning American semiconductor companies are not doing enough to financially entice workers.

## **Part II: Workforce Solution**

U.S. semiconductor companies should develop a “multigenerational plan for recruitment and retention of Americans in labor sourcing” (Long, 2022, p. 6), focused on recruitment, training, reimbursing tuition, and increasing salaries for new and existing employees. Training and retaining Americans, rather than focusing on more temporary guest workers, should be the approach to workforce development going forward.

## **Policy Implications and Recommendations**

The policy implications of this report are that U.S. semiconductor companies implemented workforce policies that aided and abetted the U.S. falling behind in semiconductors.

Accountability for past actions, creating workforce policy guardrails, and prioritizing American workers should be the focus of policymakers. Additionally, a new “plan for sourcing labor of American citizens at competitive wages... for multiple generations” (Long, 2022, p. 6) and an American talent management strategy (Long, 2023) should be implemented. Policy analysis will need to focus on accountability and a more in-depth inquiry into corporate business practices. The resulting policy should include guardrails that will limit workforce practices such as offshoring, layoffs, and guest worker onshoring. Workforce policy should prioritize veterans, educational incentives, hiring, and retention.

## **Conclusion**

U.S. semiconductor companies adopted detrimental business practices: stock buybacks, outsourcing manufacturing and offshoring white-collar jobs, firing Americans, hiring guest workers, and disinvesting in a current and future American workforce. These practices, while cutting down on labor costs, also diminished United States capacity to lead in semiconductors. Meanwhile, the U.S. semiconductor industry turned its attention to obtaining more guest workers and lobbied for policies that would divert government science and research funding to short-term easy to commercialize projects. The U.S. semiconductor industry’s appeals for more government labor subsidies after receiving CHIPS Act subsidies are a wrong policy approach. A commitment to prioritize American workers in recruitment, hiring, training, and retention is urgently needed, not only to protect American jobs but to restore American leadership in this industry and protect U.S. security interests.

Holding semiconductor businesses to account for their past failures and mistakes, mandating guardrails so the mistakes are not repeated, and creating policies that prioritize Americans and American interests for these high-paying jobs is an issue that policymakers need to address on an urgent basis.

## **About the Author**

*Brian Dan-Ding is a research analyst at the Institute for Sound Public Policy whose research focuses on the U.S. STEM workforce, high-skilled employment, and guest workers. He earned his bachelor's degree in public policy and history from Rutgers University-New Brunswick in 2023. He continues to collaborate on these issues with Rutgers University Public Policy Professor and mentor Hal Salzman. This policy report is adapted on behalf of the Institute for Sound Public Policy from the honors thesis research Brian conducted while at Rutgers.*

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