ECONOMIC INNOVATION GROUP

EIG POLICY BRIEF

The Chipmaker's Visa: A Key Ingredient for *CHIPS Act* Success

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Introduction: Congress' Historic Semiconductor Push

The resurgence of industrial policy in the U.S. is perhaps the most consequential—and also most daunting—when it comes to semiconductor manufacturing. The focus of policy on this sector is understandable: the overwhelming concentration of leading-edge chip production in the geopolitical hotspot of Taiwan, along with China's aggressive push to strong-arm Western chipmakers into ceding frontier chipmaking technologies, has raised significant national and economic security concerns. The economy relies on advanced semiconductors for a wide variety of products and services and though the global pandemic did not notably decrease the production of most types of chips, it did illustrate how costly supply chain disruptions can be. Chips play a key role in defense and national security from mature node chips in missiles to leading-edge semiconductors in autonomous vehicles. The extent to which both our consumer economy and national security apparatus rely on semiconductors makes the concentration of the chip supply chain in a potential war zone a top-tier policy concern.

To address these risks, Congress and the administration are making an historic, bipartisan push to reshore some semiconductor manufacturing with the CHIPS and Science Act, which will spend over $50 billion in federal grants for private industry and research groups in the coming years. Using these funds, the U.S. Department of Commerce will make a series of high-stakes bets on new facilities and manufacturing clusters throughout the country. The primary goal of the CHIPS and Science Act's semiconductor provisions is to reshore some production of leading logic and memory chip manufacturing, rebuilding localized communities of practice and highly specialized knowledge and experience. The implementation of these provisions and corresponding policies to support them should remain tightly focused on achieving this reshoring outcome.

While this commitment is an important step towards advancing greater global diversification and U.S. control of a critical industry, success is far from assured. Even if Commerce can successfully incentivize new facilities and new suppliers, it is far from guaranteed that recipients will continue to invest in the United States after funding for subsidies is exhausted. Longstanding criticisms of industrial policy are relevant and cannot be dismissed out of hand simply because of the national security imperative. The history of industrial policy is littered with examples of incomplete efforts that include spending public money without addressing the other necessary barriers to building-out an industry that can ultimately stand on its own without ongoing government support. The risks of industrial policy failure are even more clear in the case of semiconductors; after all, the United States has already proven that it can attain, and subsequently lose, global preeminence in chip manufacturing.

With this history and a realism about the challenges of bringing back a globally competitive industry in mind, policymakers must ask what steps can be taken next to increase the odds of success for this important industrial policy. While the CHIPS Act represents a considerable capital investment, that is only part of the recipe for success for an industry that relies on some of the world's most sophisticated machinery and supply chains. The big push of physical and financial capital must be matched by a big push of human capital. In this brief, we propose a targeted visa reform to assist chipmakers in attracting necessary talent and making the most of this historic bipartisan investment.

Targeted Immigration is an Exception to the Rule

The ideal approach to U.S. skilled immigration policy would be to prioritize immigrants who have the highest earning potential rather than attempt to admit people based on a bureaucratic assessment of which specific skills or occupations are facing "shortages." This hands-off approach is in-line with the broadly decentralized way that U.S. policy traditionally deals with similar issues like degree choice, occupation choice, and industry growth. Policymakers are, in general, ill-prepared to predict long-term changes in the sectoral composition of the economy and to promptly adapt policy accordingly, so an industry-agnostic perspective tends to be most effective in stoking innovation. However, there are a handful of rare, notable exceptions where policy can be targeted at specific industries for geopolitical and national security reasons. Few industries meet this high bar, but Congress has, with justification, decided that the security of semiconductor supply chains is too important to be allowed to be concentrated in the hands of adversaries or geopolitically vulnerable regions. Given this policy stance, the industry-agnostic approach to immigration should be reconsidered in this context as well; CHIPS subsidies are headed out the door regardless, so it is imperative we do what we can to make them work.

Talent is a Barrier to Scaling Up Chipmaking

Indeed, a close examination of the economics of the semiconductor supply chain suggests that talent will be at least as crucial an input to the industry's domestic revival as the additional capital to be supplied by the CHIPS and Science Act. While increasing the supply of engineers and other skilled workers from U.S. universities will be critical in the long-run, sole reliance on this limited and difficult-to-scale talent stream would seriously jeopardize the success of the CHIPS Act in the near-term. In this section, we discuss why high-skilled immigration policy will be a key ingredient to the success—or failure—of CHIPS. The case for a big push of human capital as a crucial component to semiconductor industrial policy is evident in the following four facts about the semiconductor industry with implications for workforce needs.

1. Semiconductor manufacturing requires highly-specialized and experienced technical talent, particularly at the technological frontier.

Semiconductor production is incredibly complex, and at all stages requires a workforce that is not just highly skilled but also possesses hands-on experience. Consequently, international engineers at TSMC, Samsung, and other manufacturers represent a "critical competitive

advantage in the chipmaking industry,"[1] and requiring the U.S. industry to grow solely using the domestic workforce would deprive manufacturers of critically important workers who possess the on-the-ground knowledge necessary for success immediately.

Historically, attracting thousands of high-skilled and experienced workers has proven central for successful industrial policy around the globe. During its infancy, Taiwan's now-dominant semiconductor industry drew from the diaspora of thousands of Taiwanese living in the U.S. who possessed hands-on experience in the U.S. industry, which at the time was the global hub for advanced chip manufacturing. At the company's beginning, the majority of TSMC's executive team had experience in the U.S. working for Motorola, Intel, or Texas Instruments.[2] When China sought to replicate Taiwan's successful policy push, they realized foreign talent was central and hired thousands of experienced engineers from Taiwan.[3] Again and again, countries tailoring industrial policy to boost semiconductor manufacturing have recognized the centrality of experienced, high-skilled immigrants to get off the ground.

None of this is to argue that existing native-born workers are somehow less capable of operating leading-edge chip factories, but rather that drawing on the kinds of tacit process knowledge that can only be acquired first-hand will be key to catching back up to the manufacturing frontier. Ultimately, American engineers will acquire this kind of deep expertise themselves from experience as we build out the next wave of fabs, but we can dramatically speed up this diffusion of know-how by maximizing American factory managers' freedom to hire top talent with the requisite experience.

2. Growing the skilled domestic workforce takes time but increases in chipmaking talent are needed immediately.

If CHIPS is successful, American colleges, universities, and companies will ultimately scale up workforce development efforts to meet the challenge of rebuilding leading-edge semiconductor production in the U.S., but it will take time. However, Congress' $52 billion down payment on reshoring chipmaking is already starting to go out the door. The timelines for building and operating new fabs simply do not match the longer timelines for fixing domestic workforce pipeline problems.

The possibility that U.S. colleges might eventually produce a sufficient domestic labor force to fill the chip industry's engineer and technician roles is not helpful in ensuring the near-term success of the CHIPS Act. Attempting to catalyze the industry and expand the pipeline of requisite workers represents a chicken-and-egg dilemma that will necessitate a big push of skilled immigration to help jump-start the industry. If the U.S. fails to advance its semiconductor industry due to a lack of skilled workers today, we will not be able to convince students to apply to these programs and pursue a career in an industry that is failing to grow tomorrow.

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[1] Hunt, Will, "Reshoring Chipmaking Capacity Requires High-Skilled Foreign Talent," Center for Security and Emerging Technology, 2022.
[2] Miller, Chris. *Chip War: The Fight for the World's Most Critical Technology*, 2022.
[3] Mak, Robyn, "Taiwan digs trenches in battle for chip talent," Reuters, 2022.

Workforce needs are not just about highly educated workers, but also the highly specialized construction workers with experience building complex elements of fab facilities like clean rooms and installing some of the most complicated machines ever built: extreme ultraviolet lithography machines. Since advanced fab construction is so rare in the United States, there are few (if any) ways for native-born workers to gain first-hand experience building these systems, which require absolute precision. Furthermore, given that the long-run demand for these skills is far from guaranteed due to its dependence on the success of the risky industrial policy itself, it is unlikely such workers would invest sufficient time and energy to get the skills needed. What does it benefit a U.S. construction worker to become an expert in building semiconductor clean rooms if the U.S. semiconductor industry is likely to fail due to lack of workers? In the meantime, the industry will face higher costs that will reduce future willingness to invest and expand due to the lack of these skilled workers.

3. The existing workforce pipeline depends on immigrants as well.

Even utilizing the existing pipeline of skilled workers being produced by U.S. universities is dependent on high-skilled immigration, as roughly two-thirds of U.S. graduate students in fields relevant to chipmaking are foreign-born. The status quo for these students already hampers U.S. competitiveness as major flaws in the current immigration system are allowing these students to be successfully recruited by other countries with better functioning high-skilled immigration systems. For example, over 45,000 foreign-born graduates of U.S. colleges have been recruited to Canada's high-skilled immigration programs in recent years.[4] This exodus is no surprise given that the insufficient supply of employment-based green cards that often leaves skilled workers stuck on temporary visas for a decade or more.

The argument that U.S. colleges produce enough skilled workers to fill the needed roles in the industry belies the fact that a significant portion of those skilled workers are themselves immigrants who will need a pathway to staying in this country.

4. An industry-specific pathway is merited.

One potential counterargument for a semiconductor industry-specific visa is that we should simply expand the supply of high-skilled immigration in general. It is important to acknowledge that the U.S. should absolutely expand the overall supply of high-skilled immigrants, and it is true that a sufficient expansion in these workers could potentially meet the needs of the industry and allow it to be globally competitive. However, there remains a strong case for an industry-specific approach.

Chipmakers in the U.S. have to compete with high-paying firms in software and other sectors for talent. An industry-neutral perspective might conclude this is not a problem justifying government involvement; however, Congress has already privileged and subsidized chipmaking,

[4] Esterline, Cecilia, "Previously unreported data: the U.S. lost 45,000 college grads to Canada's high-skill visa from 2017 to 2021," Niskanen Center, 2023.

deeming it a key national and economic security priority. We are now faced with the choice of doing whatever it takes to make these investments pay off or allowing them to flounder.

Second, a more targeted approach like picking which specific roles are facing "shortages" is less likely to succeed. Government generally has a difficult time identifying occupation or industry-specific labor shortages. Importantly, the case for an industry-specific visa does not rest on a precise estimate of the shortfall of workers the industry will need. Whether or not you believe industry estimates of engineering or technical talent shortages, granting chipmakers and their suppliers wider access to the global talent pool will inevitably give them a leg up. This will increase the odds of success of an industry in which policymakers have already agreed we have acute economic and national security interests.

Proposal: Boost CHIPS Investments with Targeted Immigration Reform

Coinciding with historic investments in new semiconductor fab construction and production, Congress should open new visa pathways for this industry to recruit talent globally. A targeted 10-year push specific to the chipmaking industry and its key upstream suppliers will substantially raise the odds that the United States succeeds in its goal of becoming a leading producer of the world's most advanced chips.

Semiconductor production is arguably the most sophisticated manufacturing process in the world and requires deep pools of highly specialized workers with rare skills. Only a handful of sites in the world have combined the necessary capital, supply chain networks, machinery, and talent into successful hubs of leading-edge chip production. The United States, having fallen behind, is now in short supply of technicians and engineers with direct experience manufacturing the latest generation of semiconductors. Given the indispensable role of talent in the global race for semiconductor dominance, Congress should supplement its historic financial investments in new plants, R&D, and domestic upskilling with a new visa pathway that will enable the industry to fully tap into the global pool of experienced talent.

In this paper, we propose a new Chipmaker's Visa that is tailored to the challenge of scaling up leading-edge domestic chip production over the next decade. By cutting through red tape in the immigration system and allowing chipmakers to hunt for the scientific and technical talent they need in the global labor market, the Chipmaker's Visa would treat the semiconductor challenge like the truly urgent national imperative Congress deems it to be.

10-year program

The Chipmaker's Visa program would be authorized to issue 10,000 new visas per year for 10 years with an expedited path to a Green Card not subject to complicated bureaucratic hurdles or per-country caps. This represents a concerted, one-time push to infuse the U.S. workforce with the specialized skills needed to dramatically ramp-up the kind of semiconductor industrial capacity that only exists in a few pockets of the world. It is also designed to pair human capital with the substantial investment incentives that Congress has already provided to enable one to reinforce the other. While Congress may disagree on many elements of immigration policy,

there is a broad bipartisan consensus that reshoring advanced chipmaking is a critical national priority and that the available workforce is not sufficient to build and scale-up these complex facilities quickly. Thus, a time-limited visa specific to the industry should be a highly effective point of bipartisan agreement.

2,500 available each quarter, allocated by quarterly auction

Rather than attempt to identify the occupations chipmaking firms need most, this visa will take a more market-oriented approach, allocating visas by auction so firms can tailor use to their specific, unique needs. Every quarter, 2,500 visas will be auctioned off to qualifying firms. Those firms can then utilize those visas to hire skilled immigrants, subject to an overall minimum salary level that ensures the jobs are genuinely skilled. To ensure the visas are contributing to the industry, they must be utilized by firms within a year of being won at auction. Once a visa is used by a particular firm, its ownership immediately transfers to the sponsored worker.

Unlike annual visa allocations that give businesses one chance to sponsor and hire foreign talent, the Chipmaker's Visa's more regular allocations will allow manufacturers to more quickly scale up production or add workers or managers with highly specific skills and experience they cannot find on the domestic market.

Firms that have Chipmaker's Visas can compete with each other to hire the best talent from abroad or from U.S. universities, incentivizing higher pay and more efficient allocation of the limited supply of skilled, specialized workers to where they are truly needed.

5-year visa, once renewable

The Chipmaker's Visa's longer-than-usual term will give firms certainty that they will have sufficient time to scale-up their investments in the U.S. and train domestic workers. Given the importance of tacit knowledge and first-hand production experience in leading-edge chipmaking, giving firms time to integrate experienced foreign-born workers into their production processes is essential to building the capabilities in the domestic labor force that are necessary to making chips in the U.S. long-term.

A focus on skills and wages, not degrees

Rather than prescribe education requirements or arbitrarily limit the use of the Chipmaker's Visa to those with a particular college degree, the visa will be available to whomever can prove their skills are in demand with a job offer from a relevant chipmaking firm or supplier. Granting visas to firms using an auction ensures that they are only issued to the workers with the most in-demand skills and experience, rather than to replace native workers when they are widely available.

Limited by NAICS codes

To ensure this pathway is narrowly targeted to the chipmaking industry and closely associated suppliers, use of the visa (and the employment authorization it provides) will be restricted by North American Industry Classification System (NAICS) industry code. Commerce will publish an annual list of eligible NAICS codes derived from a regularly occurring supply chain analysis. Such analysis will identify relevant NAICS codes of semiconductor producers and those of mutually dependent industries and report its findings to Congress.

Broad work authorization

While large existing firms clearly have an important role to play in this industry, the success of a leading-edge, globally competitive industry in the U.S. will ultimately depend in part on its dynamism and competitive dynamics. The ability of young firms with fresh ideas and talent to challenge incumbent leaders—long a critical feature of the American economy that drives productivity growth—will be essential to stoking innovation in chipmakers new and old. Therefore, the Chipmaker's Visa should be easy for early-stage startups to access.

While industrial policy in other countries often takes the form of structuring policy around large incumbent firms and so-called "national champions," America's global advantage is our culture and history of dynamism and entrepreneurship. This is why half of the world's unicorns—private startups valued at $1 billion or more—are in the U.S.[5] It is also at the center of the origin of the semiconductor industry in the U.S., when employees of the once-dominant Fairchild Semiconductor left to create dozens of important startups like Intel, National Semiconductor, and AMD.

Leaning into the strengths of the U.S. economy means crafting industrial policy that facilitates the rise of challengers and gives startups easy access not only to the same levers of support as larger peers, but also to the global talent pool. Chipmaker's Visa holders would be free to work for any other qualifying semiconductor firm up and down the greater supply chain as defined by the U.S. Department of Commerce. While a more limited work authorization may seem to benefit an individual large firm, it is ultimately harmful to the industry's long-term ability to learn and adapt in a hyper-competitive globalized market.

For this reason, big firms should be limited in the number of Chipmaker's Visas they can utilize. No firm should be able to purchase more than one-quarter of available visas in a given year, giving a chance for smaller suppliers and their potential challengers to compete in the labor market for critical talent.

[5] "The Complete List of Unicorn Companies," CB Insights.

Salary floor to ensure high labor standards

While employers should have the flexibility to recruit the workers most valuable to the task of quickly building fabs and scaling up production, this visa program should come with a reasonable salary floor safeguard pegged at the national median earnings for full-time workers to ensure the visa is not used for low-skilled, low-wage labor. While we anticipate the vast majority of Chipmaker's Visa users will be highly paid engineers or managers, some may be tradesmen. This benchmark is approximately in line with the median annual pay of pipefitters, plumbers, and steamfitters, for example.[6]

Path to a green card after five years of sufficient earnings

Retaining the talent brought into the Chipmaker's Visa is firmly in the country's and industry's best interest.

Under the status quo policy, discriminatory per-country caps detract from semiconductor firms' ability to recruit and retain talent from across the world. At the same time, burdensome labor market tests and prevailing wage determinations that take many months add costs to firms and existing employees being sponsored for permanent residency without yielding any obvious public benefit. The Chipmaker's Visa would cut through these broken processes, making an exception for a pressing national priority: attracting and retaining the world's top semiconductor talent for our own firms and facilities. Therefore, the Chipmaker's Visa will have a smooth, seamless path to permanent residency for anyone who earns at the 75th percentile of personal income (about $80,000 in 2021) for five consecutive years, exempting them from per-country caps, prevailing wage determinations, and the Permanent Labor Certification process. Upon meeting these conditions, workers will be able to self-sponsor and receive a quick decision from U.S. Citizenship and Immigration Services

This system that replaces opaque bureaucracy with clear and transparent requirements would increase certainty for both high-skilled immigrants and the firms that employ them—if someone is contributing significantly to the U.S. economy in a crucial industry and is following the rules, there should be no doubt from them or their employer that they are welcome to stay.

Dedicate visa auction fees to training American workers

Any chip industry-specific visa reform should be laser-focused on expanding the relevant skilled workforce overall. Allowing practicing companies greater access to the global chipmaking talent pool will facilitate learning among American workers, universities, and workforce training programs over time. However, we can also speed up this process by earmarking all visa auction revenue in excess of that needed to cover operating costs towards workforce development and domestic scholarships for students and workers up and down the semiconductor supply chain. Creating this new dedicated funding stream will accelerate the upskilling of American workers and make the United States a more attractive place for the world's top firms to invest in the

[6] "Plumbers, Pipefitters, and Steamfitters," Bureau of Labor Statistics.

long-run. Revenue could, for example, be split between the National Semiconductor Technology Center—tasked in part with identifying and scaling relevant workforce training programs—and the National Science Foundation's CHIPS for America Workforce and Education Fund, which issues workforce development grants.

One conservative estimate suggests that switching to an auction system for H-1B visas would yield a price of about $5,000 per visa.[7] This estimate is a plausible price for our proposed Chipmaker's Visa, suggesting the program could raise approximately $50 million annually or $500 million over the life of the program. This revenue could fund thousands of scholarships for upskilling or reskilling American workers or help scale-up ongoing training programs in communities building out their semiconductor industries.

Conclusion: A Narrow, Targeted Solution for a Bipartisan Priority

The Chipmaker's Visa represents a bipartisan pathway to addressing bottlenecks to scaling up semiconductor production without reopening more fundamental questions about national immigration policy. It is narrowly tailored to the problem at hand, focused exclusively on what is a pressing bipartisan national priority. As an act of Congress, it would also be resilient to Executive Branch changes to immigration policy from one administration to the next. The ultimate success of the CHIPS and Science Act is by no means assured, but it is critical that we follow through and equip the funding that was appropriated with the other tools the sector and the country needs to finish the job. Well-designed immigration reform is the first such critical next step.

[7] Orrenius, Pia M., Giovanni Peri, and Madeline Zavodny, "Proposal 12: Overhauling the Temporary Work Visa System," The Hamilton Project, 2013.