National Network for Critical Technology Assessment

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We have developed the foundations for a capability to explore matching between local labor markets and skills needed to bring critical technologies to scale.

Research Issue

We seek to understand how critical technologies and the decisions around their implementation affect skill demand and the matching between this demand and both incumbent industry workforces and more broadly available skill supply in different U.S. regions. These capabilities will enable us to anticipate the value of technical and strategic decisions within critical technologies for national objectives such as economic mobility for workers, employment stability and national competitiveness. Such capabilities will also allow us to ask the reverse question, and better understand the value of workforce readiness and development interventions for the feasibility of strategic decisions. At this pilot stage, our toolset should be viewed **not as a final decision support tool** but as one of a suite of methods for orienting deeper analyses into possible matches between skill demand and supply from different occupations.

Methods and Data

To understand the interplay of workforce outcomes and constraints, we develop and apply methods for evaluating (1) the skill demand implications of innovations in critical technology domains (such as battery production), (2) the supply of corresponding skills across regions, occupations, and industries, and (3) the degree of possible labor mobility into high-demand skills from industries and occupations outside of critical technology applications. To achieve (1), we employ operations modeling and data from prior studies (e.g. Cotterman et al 2022) to recover labor and skill demand (characterized using the O*NET survey instrument from BLS) under different operational scenarios using or producing critical technologies. To achieve (2) and (3) we employ the US Current Population Survey, American Community Survey and the Occupational Employment and Wage Survey to characterize occupational employment by County/MSA, the skill and wage distributions for occupations and hence skill supply.

Insights

The NNCTA's March workshop on CHIPS Act Implementation, Measurement, and Technology Needs illustrated the significance of cross-cutting labor shortages in both production and design, and the need for new or alternative sources of skill supply to maintain and grow robust capacity. We illustrate our supply assessment capability with the following side-by-side comparison of skill supply for semiconductor processing technicians in two MSAs that have received significant investments in manufacturing capability. Our work shows how skill supply constraints may be much stronger in some regions than others as well as how these constraints may be alleviated by sourcing talent that is a partial match for skill requirements but may require additional training or other skill development support.

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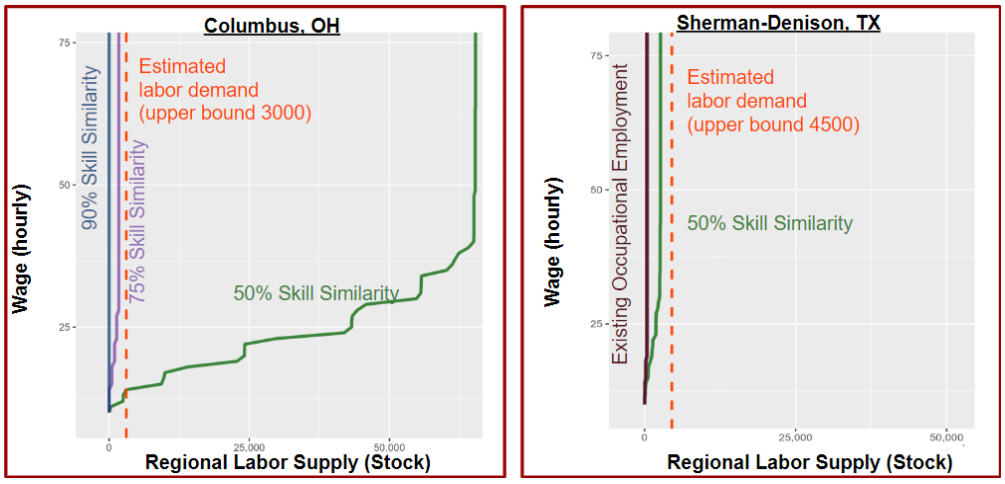
Figure 1: Skill Supply Curves for Semiconductor Processing Technicians by MSA



Our work also suggests that it may be possible to source skilled workers from outside of traditional manufacturing, especially in healthcare, to fill technically sophisticated manufacturing roles with some transferable skills. We consider an illustrative case for skill sourcing in the following table.

Table 1: Summary of Skill Gaps for Radiologic Technologists to Transition into Industrial Technologists[1]

Skills Gap: More → Less

Skill	Lower Bound Industrial Technologist Skill	Upper Bound Radiologic Technologist Skill	Difference
Mathematics	2.93	1.26	-1.67
Systems Analysis	2.88	1.45	-1.43
Technology Design	3	1.7	-1.3
Equipment Selection	0.8	2.14	1.34
Service Orientation	2.43	3.57	1.14

Applications of our methodology to the electric vehicle context also suggest some early stage insights. Our operations modeling work suggests that production scale in battery manufacturing could drive different distributions of skill demand due to different opportunities for allocation of worker capacity.

Options and Trade-offs

We find possible tradeoffs in geographic siting of production facilities, in that many regional targets for economic development (especially in manufacturing) may face an undersupply of skilled labor to meet critical technology demands. Moreover, supply chain risks in critical technology may also pose risks to the stability of employment demand for workers. Where proposed sites can benefit from strong labor markets for manufacturing skills, they may instead place pressure on skill supply to incumbent industries, potentially imposing new labor constraints and corresponding supply chain risks. These challenges also suggest an opportunity for development of multiple industries in regional clusters to enhance opportunities for skill supply and strengthen the robustness of labor markets, to improve the economic security of workers.

[1] Based on work with Krishnan and Telang, with support from the Block Center for Technology and Society.

Early wins

The methodologies developed as part of this project represent the foundation for a future assessment capacity for possible labor supply constraints and occupational opportunity impacts of investments supported by the Inflation Reduction Act, CHIPS Act and future large scale initiatives. For instance, a mature version of this capability could be deployed to evaluate the labor dimension of the Advanced Manufacturing Credit under Section 13502 of the IRA, in terms of the workforce feasibility of different US sourcing strategies. This capability also could be used to support workforce development investment under CHIPS. We have developed a working prototype, server-hosted app that calls stock and flow of occupations for any MSA in the country. Our goal is rapid first-order evaluation of supply constraints on large-scale capacity building, to orientate more detailed analysis at a feasible scale of analysis.

Next Steps: Future work and plans

Our key next steps are to continue developing our estimates of the flow and elasticity of labor supply. This approach will involve building a network model of occupational mobility which can be used to evaluate the supply impact of interventions such as training programs or worker-augmenting technologies such as AR. We also plan to integrate our findings into the BEV team's work on geographic distribution and alternative battery chemistry options to characterize labor market resiliency to disruptions and impacts on workers of industry supply shocks. Finally, we will seek to validate our skill similarity measures against empirical occupational transitions, as well as integrate analysis on the cost of training or other interventions to facilitate transitions across skill gaps between occupations.