Labor Market Policy and the Energy Transition: A Problem Statement

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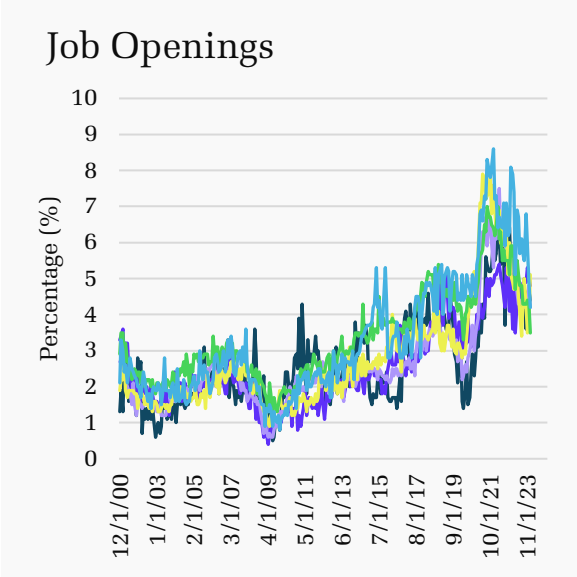
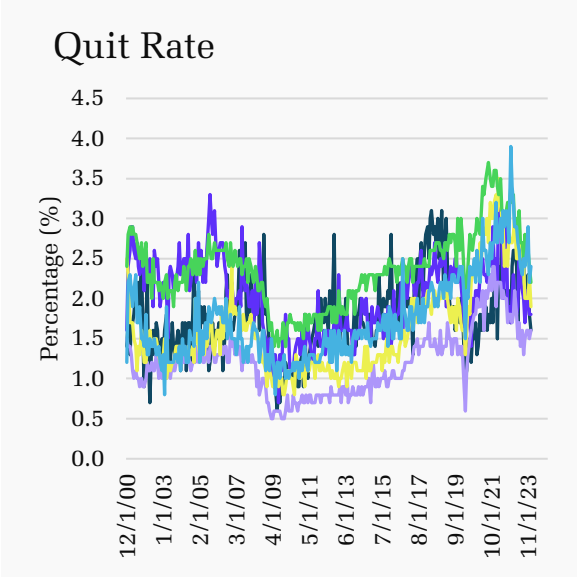
Summary

This piece is the first in a series of research briefs and reports analyzing labor market policy and the energy transition.

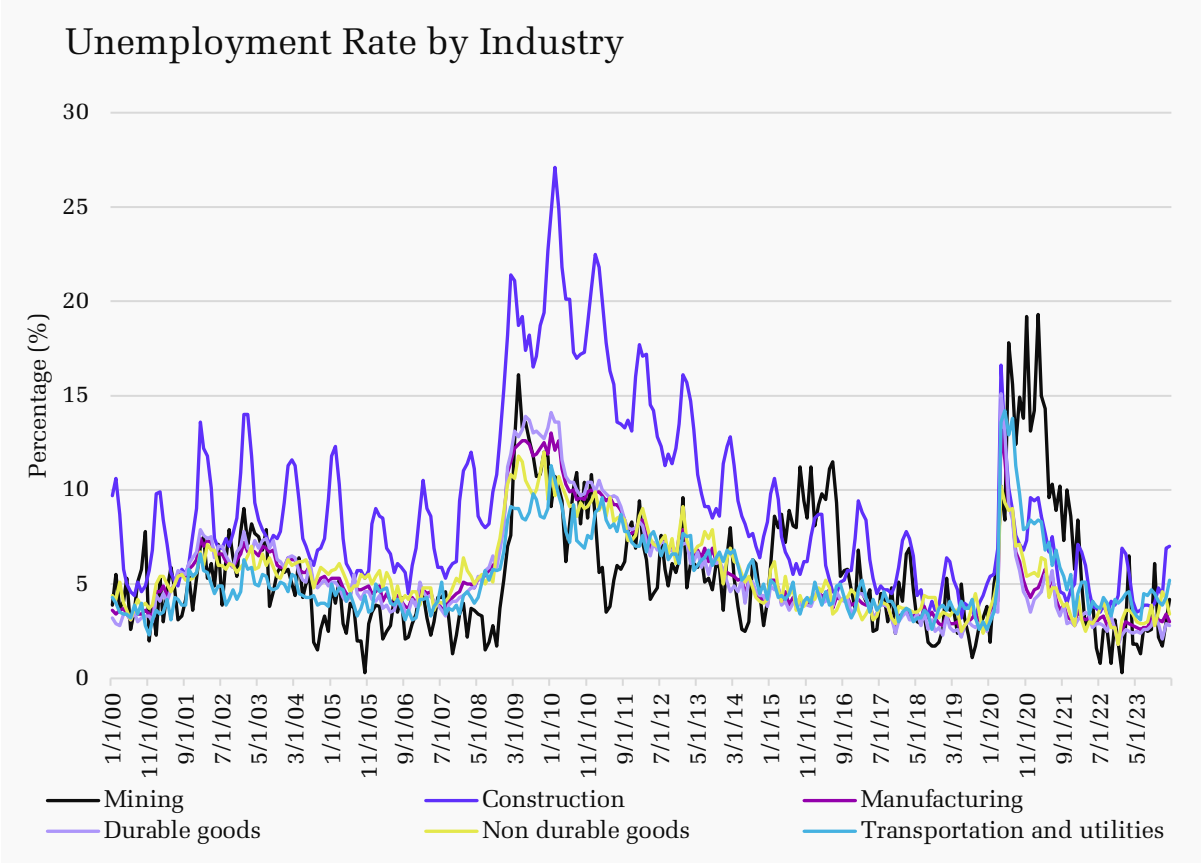
Overview

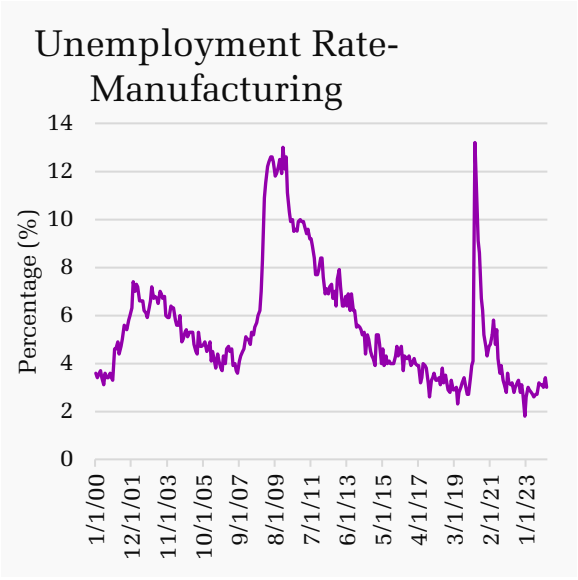
The tides are shifting for work. While the post-covid inflationary period has caused a 5% decline in real wages for U.S. workers in the top 10th percentile of the income distribution, the bottom 10th percentile has seen 5.7% real income growth. Labor markets are tight, with unemployment at just 3.9%. But the aggregate unemployment rate masks the even tighter skilled labor sectors. There are shortages across nearly every skilled occupation. While wage growth cooled somewhat in 2023, construction and mining annual median wage growth is near historic highs.

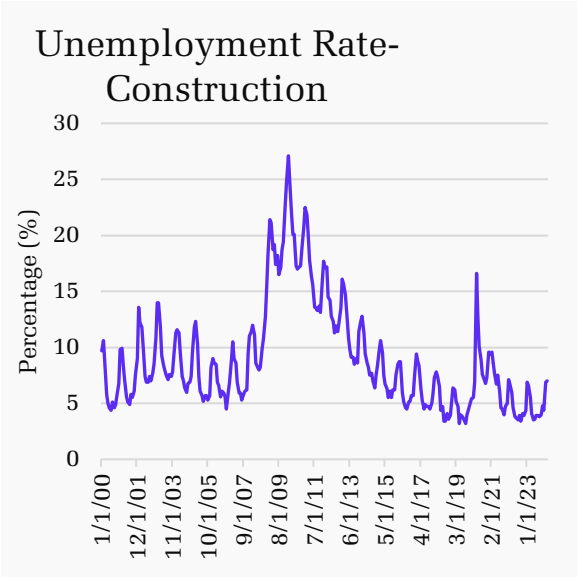




In electrical work, the 7,000 new electricians each year are outnumbered by the estimated 10,000 retirements. The shortfall of construction workers is expected to exceed half a million, according to the Associated Builders and Contractors. The average age of HVAC contractors is between 52 and 57; this cohort's looming retirement exacerbates the current shortfall, estimated at 65,000 technicians. In durable goods manufacturing, there are more unfilled job openings than unemployed workers with experience; if every unemployed person with experience in a related industry were employed by the industry, only 75% of vacant jobs would be filled. Job openings in mining, construction, manufacturing, utilities and transportation remain elevated, far above average levels in the 2000's and 2010's.

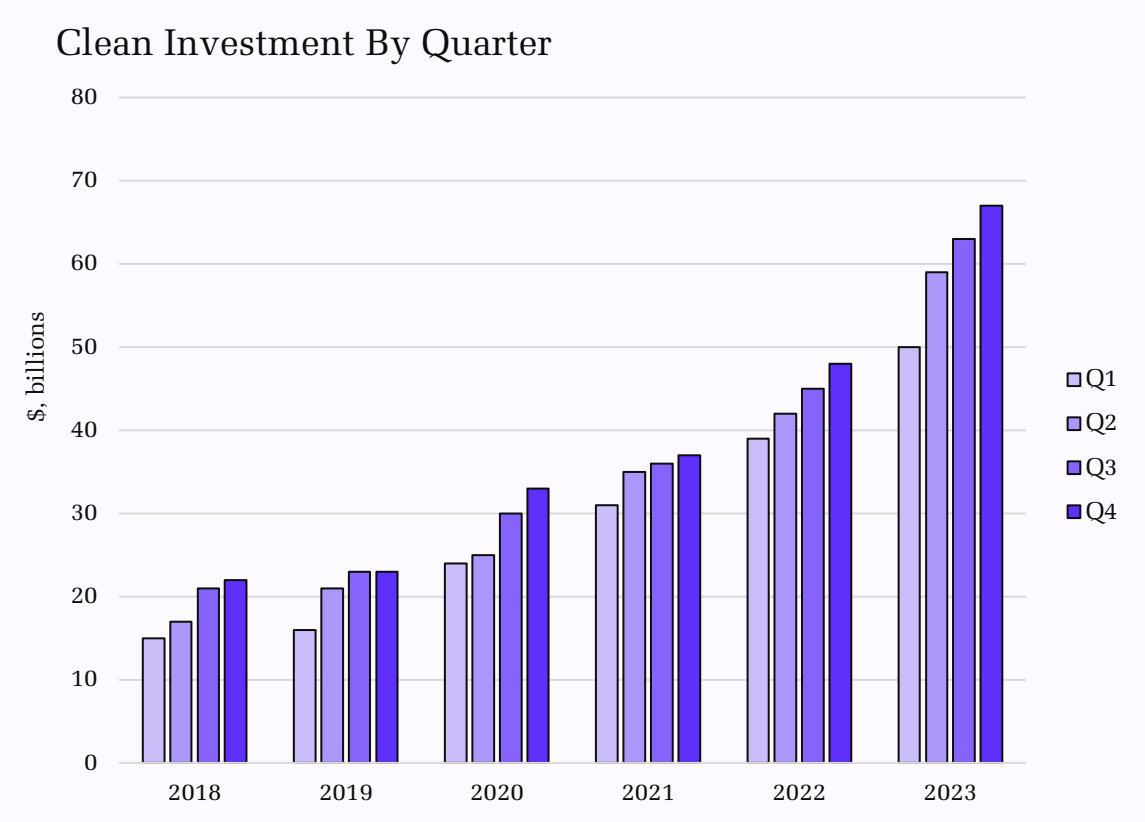






These industries have one additional theme in common: they are critically important to the green transition. The Biden administration formalized its green ambitions in the Infrastructure Investment and Jobs Act (IIJA) and the Inflation Reduction Act (IRA) nearly 3 years ago. Research on the impact of the IRA on employment results in a wide range of

estimates. Princeton's Jesse Jenkins forecasts 900,000 jobs in electrical grid work; UMass Amherst sees 570,000 electrical-related jobs by 2025; Mayfield et. al. expect 3 million "direct energy jobs" by 2030. The green transition—the promise of the IRA—hinges on these job forecasts becoming real. This is practically where the benefits, and the limits, of a derisking state cash out: for the green transition to really transpire, financed projects will need to become operational.



The current labor market tightness represents both an opportunity and a challenge. On the one hand, tight labor markets could slow down projects, delaying capital deployment and pushing out project timelines, and there's some evidence that this effect is already observable. On the other hand, tight labor markets put skilled labor in a strong bargaining position; United Auto Workers has already taken advantage of this position. The question is then: can skilled labor supply expand at the necessary pace to green our energy system, without wasting an opportunity to negotiate high-quality, well-compensated jobs?

Take semiconductors as a case study. Just last month, on March 20, the Department of Commerce announced that they had reached preliminary terms with Intel on a set of factories that would create an estimated 30,000 jobs. McKinsey expects approximately $400 billion in semiconductor construction expenditure in just the next few years, through 2028. This construction boom would require an estimated 200,000–300,000 skilled laborers including electricians, mechanical workers, welders, and pipefitters. And the resultant labor gap might be exacerbated by issues of geography: skilled laborers with

experience in the technically complicated process of semiconductor plant construction are localized in areas with pre-existing fabs, while new fabs are concentrated in Arizona and Texas.

One obvious solution, apprenticeship programs, likely won't cut it. The US would need to add 15 large apprenticeship programs "on the scale of those offered by the state of Illinois" to meet advanced industry labor needs, according to McKinsey. While apprenticeships grew annually by around 12% between 2019 and 2020, growth has flatlined since 2020, and turned negative this year. There are fewer registered apprentices in 2024 than in 2023.

To bridge the labor gap, recent legislation has added incentives to the already existing registered apprenticeship program (RAP). The IRA requires that between 12.5% and 15% of total labor hours for IRA funded projects come from apprenticed labor. The CHIPS act foists the responsibility of workforce development on funded companies, requiring workforce development plans that detail how a project will source skilled labor, train that labor, and partner with community colleges and Career and Technical Education (CTE) programs.

Much has been made of the additional requirement that CHIPS sites include childcare for labor, with some arguing that childcare provisions will unleash talent that has been previously locked out of construction, and others arguing that the requirement will slow down construction by diverting resources toward secondary priorities—making the perfect the enemy of the good. Childcare provisions have become a microcosm for a debate about how to do progressive, green development. Should we sacrifice speed if we can create projects that satisfy not only climate goals but also meet other goals, chiefly those of labor? A project that tries to do everything might never break ground, but there's a long history of business interests side-lining labor in the interest of efficiency or speed.

The IRA and CHIPS Act have made it so the labor policy that necessarily complements a green transition is a responsibility of the companies that receive subsidies. In the case of the CHIPS Act, this means placing the burden of workforce development on companies themselves. In the IRA, subsidies and tax credits are designed to encourage workers to re-tool for emergent green industries. In the first case, workforce development is pushed to companies; in the second, it's pushed to workers. In either case, the assumption seems to be that labor supply will flexibly respond to meet needs in the nascent green sector.

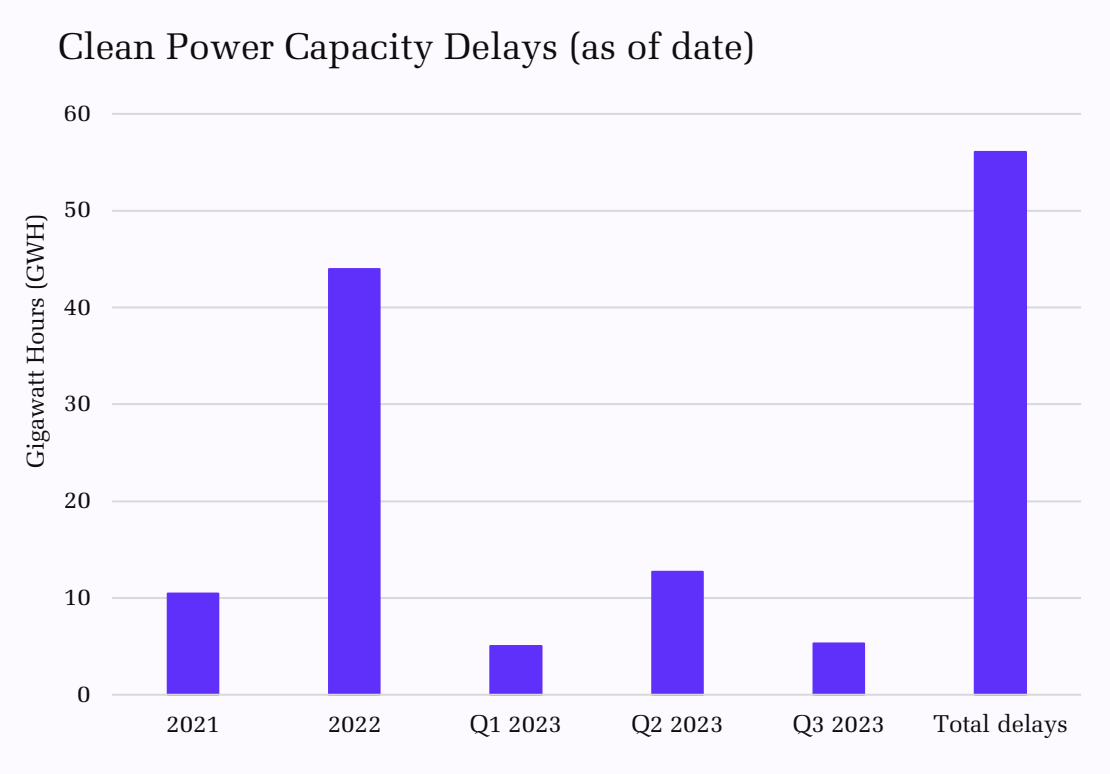
But there is reason to be skeptical that labor supply will naturally shift to these new sectors. First, there are geographical concerns. Skilled labor that may best re-tool to meet the demands of the solar industry, for example, might be geographically distributed in areas of low growth. In fact, pipefitters seem to be concentrated in the rust belt, while new CHIPS projects are concentrated in the Southwest and Southeast. If the IRA, as some have argued, should not only create green jobs but also make those jobs available to workers previously employed in dirty sectors, then geography matters. To date, most of the biggest projects have been unveiled in GOP districts, with concentration in the sunbelt. To make matters worse, there's a healthy literature showing that skilled labor is highly immobile:

skilled workers tend not to move for work, even when there are compelling economic incentives to relocate.

Second, there's a question of policy commitment and credibility. Researchers have found that skilled workers can be wary of committing to new industries—especially if the change involves significant retooling—when they don't trust the credibility of the government's commitment to those new industries. In the solar and wind industries, workers may be distrustful that jobs will actually exist in 10 years. This question of credibility is exacerbated by political polarization. Workers that might be best suited to work in emergent green industries might be least likely to trust the government's commitment to the transition. How can the government credibly commit to the green transition, in a way that workers will believe?

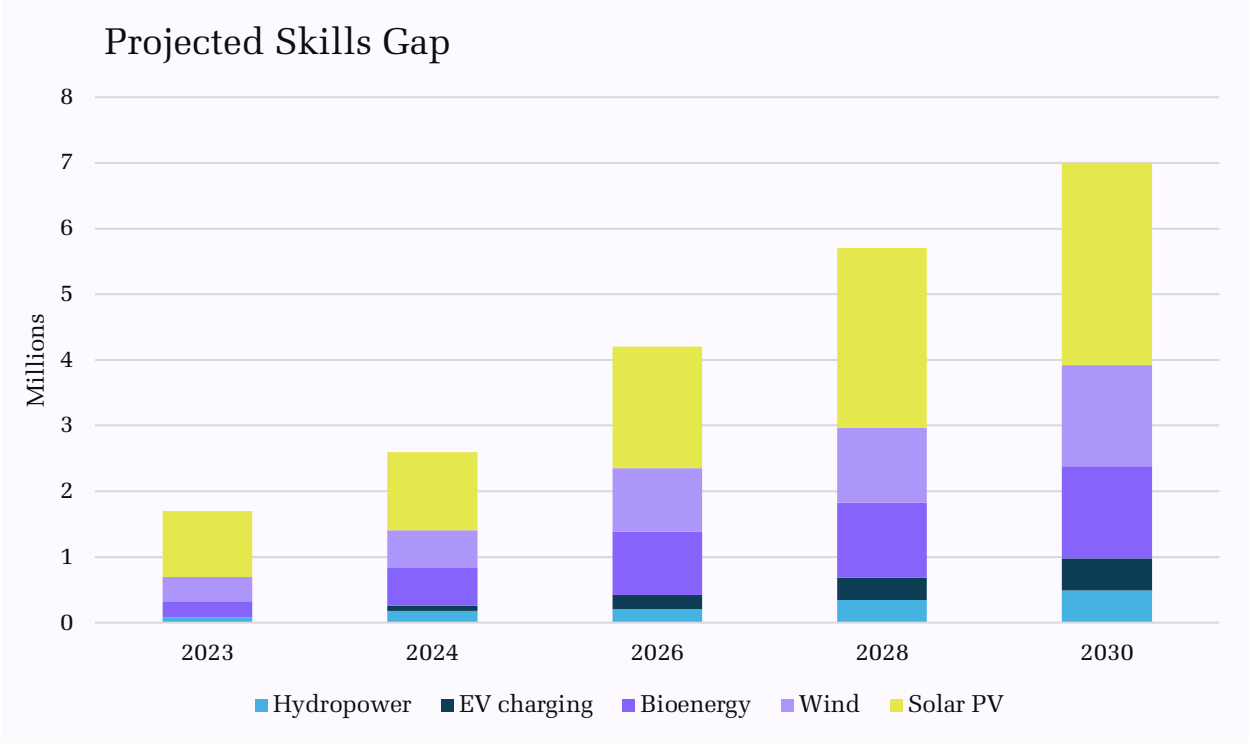
Breaking Ground or Breaking Stride?

In the three years since the IRA passed, we've already seen signs that projects are not quite breaking ground at the pace of many optimistic early forecasts—and that labor shortages might be part of the problem. Since the end of 2021, nearly 56 gigawatts (GW) of clean energy have faced project delays of on average 14 months. Clean power capacity growth peaked in 2021 and came in lower in 2022 and 2023. By the end of 2023, only 10% of IIJA and 2% of IRA authorized spending had been awarded.



So far, delays have primarily been attributed to permitting, supply chain issues, and high interest rates. But labor has also been cited as a problem: TSMC announced further delays on its Arizona plant owing to skilled labor shortages. In 2021, 89% of surveyed solar energy employers said it was difficult to find qualified applicants; this share likely increased in 2022.

While forecasting the green transition is a near impossible task, a recent BCG attempt predicted a 7 million person skilled labor shortage by 2030. Practically, this labor shortage would result in construction delays accounting for a 0.1° celsius increase in global temperatures. Again, while the precision of these estimates is unclear, the practical outcome of labor shortages in the energy sector perpetuates the status quo: increasing global temperatures and potentially irreparable climate change.



From High School to Limbo

Despite labor shortages—and exacerbating these shortages—high school graduates who do not attend college are thrown into a world without clear options and defined paths. We have publicly-funded, internationally recognized systems dedicated to the problem of

upskilling the highest income earners; for lower income earners, these systems are wholly absent.

At present, a spectrum of options is available to students who don't immediately pursue higher education after high school. First, there are Career and Technical Education programs embedded within high schools. These programs offer vocational programs with the goal of training students in occupations and preparing students either for community colleges or apprenticeships after graduation. CTE programs were first established in 1917 in a bid to catch up with Germany's superior vocational education program; between 1917 and 1967 the number of enrolled students increased from 200,000 to 3 million. However, in the decades that followed, interest in CTE programs flagged as the manufacturing share of the labor force declined. A 1990 report found that 30% of high school CTE graduates not in post-secondary education had dropped out of the labor force six months after graduation; 9.7% were unemployed.

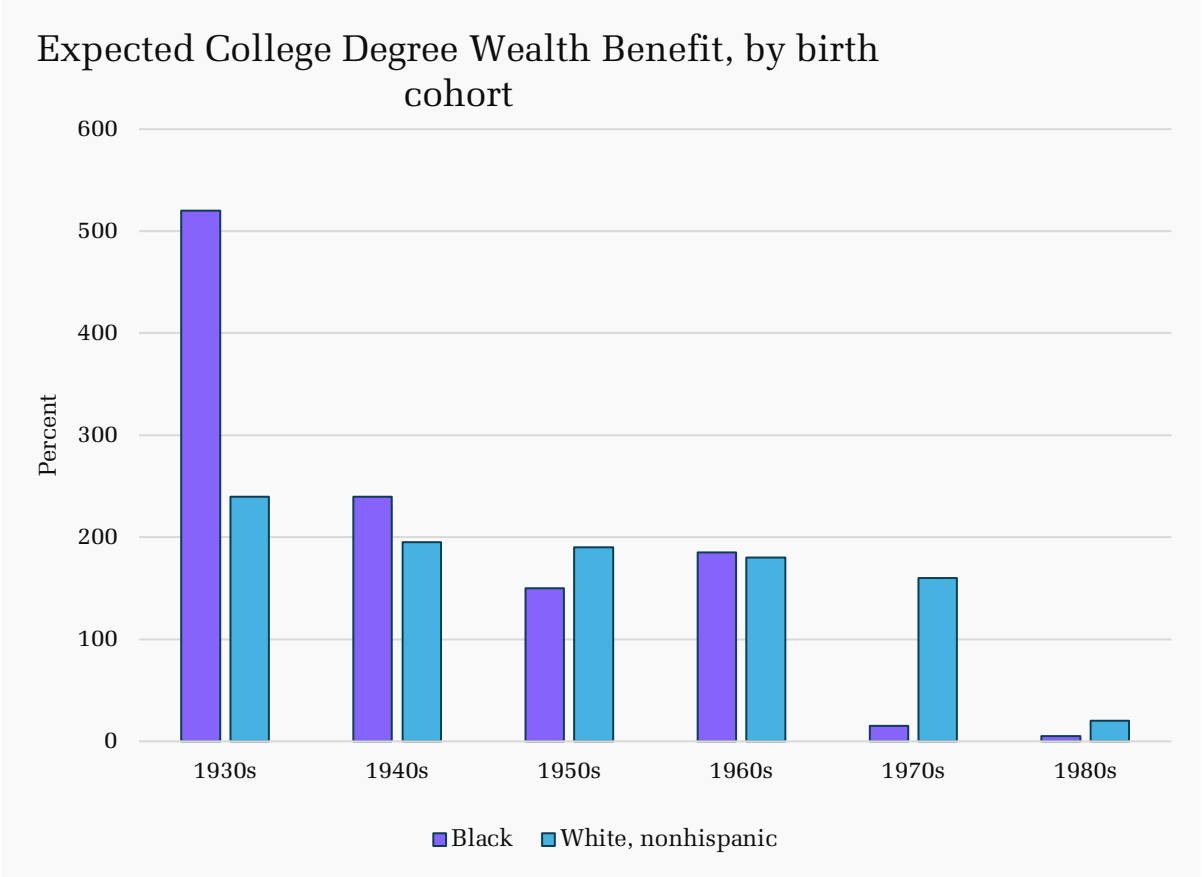
Second, there are community colleges, offering a range of both preparatory classes for a full bachelor's degree and classes designed for immediate entry into the workforce or apprenticeship programs. Job market outcomes for community college attendees are mixed. The Aspen Institute, for example, gives a prize for excellence in community college education every 2 years; of the top 150 programs, nearly 40% had a three-year graduation rate of under 50%. Around 25% of community college attendees enroll in four-year universities.

Third, there are registered apprenticeship programs (RAPs) under the Department of Labor. RAP programs were first established in 1937 to provide federal funding and tax credits for employers to train employees. As of 2019, 633,000 apprentices were in programs. This number currently stands at 641,000.

Intersecting with this system are city and state climate action plans, many of which emphasize the need for green jobs (and some of which talk about workforce development with specificity). Of 50 city climate action plans, 47 mention the need to generate good, green jobs (though only 19 include detailed plans and 10 mention funding or "programmatic support"). In some cases, city or state plans involve grants or subsidies for workers to switch to green industries. But there's reason to wonder if these plans and their attendant programs offices are reaching workers. While battery or semiconductor manufacturers might be able to navigate the IRA's system of investment tax credits, workers are not as responsive to these "nudges."

What stands out about the current system is that it's disorganized and unstructured. There are a wide variety of programs, each with their own federal funding structures and job outcomes. Some are run through colleges, some through employers. The CHIPS office within the Department of Commerce has doubled down on this (lack of a) plan by announcing the National Semiconductor Technology Center (NSTC), which will try to "standardize" workforce training for the semiconductor industry. However, critically, it will take years to become operational.

This lack of structure has a tangible effect on high school graduates' conception of their options: when polled, 50% of high school parents say they wish there were more post-secondary options available to their children. Higher education still pays dividends for some or even most. While around 75% of college degree holders participate in the labor force, only 57% of high school diploma holders do. However, at the same time, the benefits of a college education have been declining, dropping by nearly 100% over the last few decades.



So, we face a situation wherein: 1) the green transition requires an expansion of skilled labor, 2) the programs that could enable that training are small, nebulous, and too underfunded to bridge this growing gap, and yet 3) there's a significant pool of the labor force that is underserved and feels underserved by the current constellation of institutions. The capital side of the climate problem has been the focus of recent legislation, and rightly—greening the system is first a problem of capital deployment. But the next problem is one of labor. How do we find workers for these ambitious projects? What role can the state play?

Alternative Models

A better model than our current disorganized CTE/vocational system wouldn't leave labor policy in the hands of workers or outsource it to their employers, but would rather take up labor policy as a necessary part of the state's industrial policy. A serious policy would introduce real change to bridge the education gap instead of merely tacking new incentives on to the pre-existing regime. And, of course, this model would generate the labor force necessary for confronting the climate challenge.

What would an alternative model ideally deliver? First, it would provide a culturally recognized alternative to college; parents and high school students could trust, just as they currently do with public universities, that the education students received would be worthy of the time investment—an improvement on the current system of for-profit degree programs and haphazardly accredited community colleges. Second, this system would work hand-in-hand with industrial policy. Partnerships between accredited vocational schools and subsidized industry would enable students to secure jobs and employers to secure high quality workers. Third, a single system would allow workers to more flexibly re-tool as needed, without having to navigate the complex and overlapping system that currently exists.

Fourth, it would serve, in a few ways, as a bulwark against the currently hyper-cyclical nature of life and work for those without college degrees. For the last few decades, unemployment rates for high school diploma holders have been at least double those of bachelor's degree holders. This effect stands out sharply during periods of economic recession. Throughout the global financial crisis, the unemployment rate for non-college graduates was over 10%.

A clearer, federal funded system would offset this cyclicality. Programs could serve as a release valve for workers in industries experiencing either temporary or structural slowdowns; workers could more easily switch to new industries. Just as college and master's programs allow highly educated workers relief when unemployment is high, building out resumes and allowing older students to shift career tracks later in life, a parallel system for skilled workers could grant the same flexibility and relief.

Fifth and finally, an alternative model would serve to link workers across the country and across employers, and thereby would make sectoral bargaining a possibility. The system would not only support unions. Unions would also be actively involved in crafting curricula. A nationalized, publicly funded system would serve to augment unions by coordinating workers within the same sectors across the country. It could serve as a locus for standardizing industry practices.

Case Study: IT and the University System

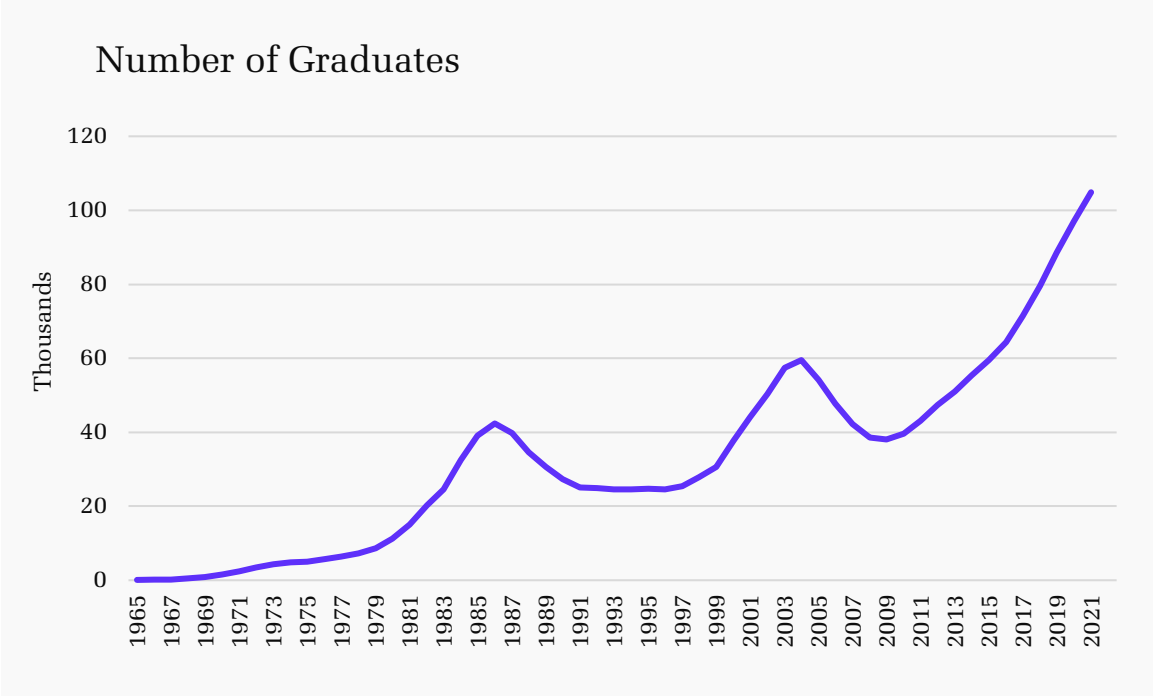
The Biden administration conceives of the energy transition as a fundamental shift in the economy towards building "from the middle out and the bottom up," the sort of transition that dramatically alters the labor market, creating a whole sector of new, high-paying jobs. The American economy went through a similar transformation over the last several decades, with the deployment of information technology across the economy initiating a digital revolution. While the digital revolution differs importantly from the green transition—critically, it is much less capital intensive—it did necessitate a transformation of the labor market.

Between 1970 and 2010, the number of people working in information technology increased tenfold from 450,000 to around 5 million. But beyond direct employment in the IT sector, information and communication technology became a "general purpose technology," technology that was deployed in firms across the economy. This new technology necessitated a major upskilling of the workforce.

The federal government had already been critical to the development of computational technology in the US, funding research programs and labs through the National Science Foundation, the Department of Defense, and, of course, the military technologies development agency, DARPA. After this period of early research investment (and then a considerable lag period wherein newly developed ICT was deployed across industries), the same labor question hit policymakers and companies: how do we upskill the workforce and train millions of workers for this new industry?

In 1999, the Department of Education commissioned a report titled "The Supply of Information Technology Workers in the United States," which sought to address the perceived growing shortage of skilled tech workers, and the programs that would help alleviate that shortage. Measures of labor market tightness showed that there was a deficit of skilled workers in the burgeoning new industry. Unemployment rates in the sector were significantly lower than the national average rate, and median earnings were increasing quickly.

In the case of the tech boom, the university system was the obvious partner. Indeed, almost all of the report focuses on the ways in which the federal government can help colleges train new tech workers. In fact, in the following two decades, colleges scaled up degree and nondegree programs. The number of graduates majoring in computer science rose dramatically, increasing 137% from 2000 to 2020. Colleges partnered with employers who launched their own training programs, often modeled off of college classes or housed within colleges.



The contrast case for this episode is the United Kingdom. While the US experienced an increase in productivity that many attributed to the deployment of ICT, UK productivity decreased between 1990 and 2000. While the divergence could be attributable to a number of critical differences, Basu et. al. argues that there might be two factors: 1) the number of high skilled, college-educated managers and 2) "complementary capital" investments in learning and reorganization. In either case, while the US federal government funded and encouraged universities and schools to teach ICT, the UK education system lagged in shifting its focus towards the new industry. It would take over a decade for the UK, and the EU broadly, to catch up to the US.

This past episode shows the central importance of institutions during a technological transition, not just for research or capital deployment but for labor. Reskilling takes time and investment; without the necessary complementary investments, a new technology can fail to take hold, and productivity can lag. In the last major transition, upskilling conveniently aligned with the emerging "human capital" discourse. It made sense to make major investments in teaching ICT, so long as that investment was in the service of progress, pushing out the technological frontier. New cutting-edge skills were viewed as worth the federal dollars. Every worker, in time, would ideally learn to code.

But what of the considerable human capital investments of skilled workers? If the green transition is going to amount to a true transformation of our energy systems, we need to dramatically upskill our labor force. So far, policymakers have only paid lip service to this needed upskilling, implicitly assuming that some combination of market forces—rational companies and workers facing government-tweaked incentives—will do the trick. Implicitly, while the digital revolution involved a collaboration, from beginning to end,

between the state, institutions of higher education, and companies, this time solar technicians, linemen, and wind engineers will just come along.

Conclusion: Research Agenda

The re-entry of industrial policy—the "vibe shift to stuff"—comes at an interesting cultural moment. While "stuff" is arguably becoming more important and a broad consensus emerges that for both climate and security reasons the U.S. must start 'building,' public distrust in higher education is growing. In 2012, a Gallup poll found 90% of parents expected their kids to attend college, compared to around 50% in 2021. Confidence in higher education has declined sharply. And research from Raj Chetty complicates the social mobility effect of higher education: "highly selective private colleges currently amplify the persistence of privilege across generations." These results, magnified and warped by political polarization, amount to a slow-brewing crisis: are universities the engines of equity and economic growth that earlier generations hoped they would be? Can our collective economic and social goals depend solely on a set of necessarily limited or, worse, compromised institutions?

The controversy around higher education is perhaps most interesting in its implied negative space; while many debate norms in higher education, these elite institutions reach but a small (though highly vocal) sliver of American life. Those without college degrees or even those attending community colleges and state schools remain outside the cultural spotlight. One might not know, given the outsized coverage, that college attendance is in a state of continuous decline, falling 5% between 2019 and 2021 alone. While the crisis of higher education seems to be an elite crisis, the hidden crisis is one for everyone else.

This presents an opportunity. We can see the world beyond higher education that has been ignored through an extended policy of disinvestment. We can also fill that policy gap, and imagine a labor policy that goes hand-in-hand with America's new industrial policy.

Over the next year, JFI will be working on policy related to this twin crisis—or, flipped, the twin opportunity—of the climate labor gap and the skilled labor institutional gap. A few topics that we'll investigate:

1. Which models in other countries have been effective in upskilling workers, expanding the worker pool, and ultimately producing good jobs? Which models have failed?
2. How have alternative models of vocational education and CTE in other countries served or, alternatively, undermined unionization and/or sectoral bargaining?

3. How can we measure and visualize the geographic distribution of skilled labor market tightness?
4. Which of the IRA and CHIPS Act workforce development initiatives, either housed within companies or partnerships with external community colleges, have been effective? What has made those partnerships effective?

The current landscape of the climate transition reveals a paradoxical juxtaposition: paired forward-thinking policies around capital deployment stand in contrast to retrograde skilled labor policy. This combination will only serve to undermine and delay the energy transition while also wasting an opportunity to construct truly ambitious, sorely-needed new institutions. In the coming series, we'll investigate what it would take to build these new institutions.