



# Worker Adjustment in the Energy Transition: Evidence from the Decline of US Coal

Eleanor Krause — May 2026

## Background

Coal mining employment in the United States declined sharply after 2011, falling by more than 50 percent over the following decade. This shift was driven largely by the rise of low-cost natural gas in electricity generation and marked a rapid contraction in a highly regionally-concentrated industry.

For workers employed in the coal mining industry, this decline was not a temporary disruption. It led to substantial and long-lasting reductions in earnings and employment, along with increased reliance on alternative sources of income.

This issue brief summarizes new research on how workers adjusted to this large-scale industry decline, using administrative data covering the universe of US coal workers from 2005 to 2021. The analysis focuses on workers with sustained employment in coal mining prior to 2011 and compares their outcomes to those of similar workers in other industries.

The evidence shows that the costs of coal's decline were substantial and persistent. Earnings losses reflect both reduced time spent working and lower pay when employed — whether in coal

or in other industries, where earnings are typically even lower — while government transfers and early retirement offset only a limited share of these losses. Switching industries or moving to new labor markets did little to mitigate them.

These patterns reflect the regional concentration of coal mining employment and the limited availability of local alternatives. In many coal-producing areas, job opportunities outside the industry are scarce, and the skills developed in mining may not easily transfer to other sectors. As a result, many workers experienced prolonged periods out of the workforce rather than successfully transitioning to new jobs. More broadly, the findings illustrate how the geographic concentration of fossil fuel industries can shape how workers respond to industry decline in ways that amplify the challenges they face during place-based energy transitions.

## Key Findings

**Coal's decline imposed large and persistent earnings losses on workers with the strongest attachment to the industry.** Workers with several years of full-time employment in coal mining prior to 2011 experienced substantial and long-lasting earnings reductions during the

industry's decline. Between 2012 and 2019, these workers lost nearly two years' worth of pre-decline annual earnings relative to similar workers in other industries. Losses were especially pronounced in the eastern United States (Appalachia and Interior) and among younger and less-educated workers, while workers in western regions experienced smaller declines, reflecting differences in workforce characteristics, local labor market conditions, and the fact that coal's downturn was more concentrated in the east.

**Coal workers earned less while working and left the workforce altogether.** Earnings losses reflect both lower earnings while employed and fewer years with earnings. Following the decline, coal workers were less likely to have earnings in a given year, indicating extended periods without work in addition to transitions into lower-paying jobs.

**Workers' outcomes appear shaped by limited alternatives.** Coal mining employment is highly geographically concentrated — more so than other industries of similar size — and is often located in relatively rural areas with fewer alternative job opportunities. The decline of coal affected entire local economies, and its effects were largest in places with fewer alternatives: workers in less economically diversified areas and in places with higher unemployment experienced larger declines in both earnings and employment. At the same time, the skills developed in coal mining are relatively specialized and may not transfer easily to other sectors. Together, these patterns are consistent with limited alternative job opportunities shaping workers' outcomes.

**Moving to new industries or new regions did little to mitigate losses.** Coal workers spent

relatively little time working in other industries or communities during the industry's decline. When they did work in other industries, earnings remained substantially lower — even in sectors typically associated with relatively high wages, such as utilities, finance, and professional services. Relocation was also limited and did not meaningfully offset overall earnings losses.

**Government benefits and retirement income increased but replaced only a fraction of lost earnings.**

Coal workers were more likely to rely on alternative income sources following the decline, including disability insurance and retirement income. While these sources provided partial support, they offset only a modest share (about 15 percent) of total earnings losses.

## Policy Implications

**Transition policy should address both employment losses and reduced earnings.** A meaningful share of losses reflect fewer years with earnings, not just lower wages among those working. This indicates that workers often face repeated or extended gaps without employment, in addition to moving into lower-paying jobs. Policies aimed at supporting workers through industry decline should therefore consider both the stability of employment and the quality of jobs workers are able to obtain.

**Policies that rely on mobility or retraining alone may overstate workers' ability to adapt.** Movement across industries and regional labor markets was limited, and when it occurred, it did little to offset earnings declines. In geographically concentrated industries such as coal, policies that assume workers can readily move or retrain into similar-paying jobs may fall short if

comparable employment opportunities are not available.

**Improving local labor market opportunities is critical for reducing long-term earnings and employment losses.** Larger losses in less diversified and higher-unemployment areas suggest that limited local job availability makes it harder for workers to find and keep jobs. Training programs are unlikely to succeed on their own if they are not aligned with realistic job opportunities or paired with efforts to expand local labor demand, such as through investments that support job creation or economic diversification in affected communities.

**Income supports play an important role but provide only partial insurance.** Coal workers increasingly relied on disability insurance and retirement income following the decline, but these sources replaced only a modest share of lost

earnings. Policies that directly supplement earnings — such as wage insurance — may provide more immediate and reliable support while reducing reliance on existing safety net programs.

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### About the Resilient Energy Economies Initiative

The REE Initiative develops strategies that support the economies of fossil fuel-dependent communities across the United States as the energy system transforms. In addition to supporting action-oriented research to find what works, REE has built a community of scholars, policymakers, and economic development practitioners from the local, state, tribal, and federal levels to share knowledge and build relationships across the nation's energy communities.

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