



**The Coalition
of Finance Ministers
for Climate Action**

Identifying labor market frictions in the green transition: implications for Ministries of Finance

World Bank

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A contribution to the 'Compendium of Practice from a Global Community of Ministries of Finance and Leading Organizations: Economic analysis and modeling tools to assist Ministries of Finance in driving green and resilient transitions'

Topic: Addressing the climate policy questions facing Ministries of Finance: the economic and fiscal impacts the green transition

June 2025

Access the full Compendium at www.greenandresilienteconomics.org

This contribution was prepared at the request of, and with guidance from, the Ministry of Finance of Denmark as Lead of the Coalition's Helsinki Principle 4 initiative 'Economic Analysis for Green and Resilient Transitions' and its Steering Group, with input from its Technical Advisory Group. The views, findings, interpretations, and conclusions expressed are those of the authors. While many Coalition members and partners may support the general thrust of the arguments, findings, and recommendations made in this contribution, it does not necessarily reflect the views of the Coalition, its members, or the affiliations of the authors, nor does it represent an endorsement of any of the views expressed herein by any individual member of the Coalition.

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This contribution summarizes ongoing work to incorporate labor market dynamics into the World Bank’s analytical and modeling approaches.

The transition to a low-carbon economy has important implications for many people’s jobs and livelihoods, but labor market dynamics are often missing from existing macroeconomic models, including those used by Ministries of Finance. Although studies tend to find that green transition scenarios result in greater job creation overall (Godinho, 2022; ILO, 2018; Stavropoulos and Burger, 2020), these analyses generally assume labor markets are flexible, and workers can transition easily from one job to another. In practice, frictions in the labor market can make it challenging for workers to transition out of areas where labor demand is declining, or into areas where labor demand is increasing. Such dynamics have the potential to drive long-term unemployment, where displaced workers are unable to find alternative opportunities, or labor supply shortages, where unmet demand for workers with specific skills could potentially slow down the pace of the green transition.

Several of the World Bank Group’s Country Climate and Development Reports (CCDRs) empirically analyze a number of labor market frictions that can constrain the ability of workers to move from one job to another (Knudsen et al. forthcoming). These analyses have consistently revealed challenges in worker mobility across five key dimensions: what workers do, where workers are, when workers are available, who workers are, and why people work (Table 1). Frictions or mismatches in each dimension arise when there is a disparity between labor demand and labor supply.

Table 1. Identifying labor market frictions in the green transition

	Labor demand	Labor supply	Potential frictions
WHAT	<ul style="list-style-type: none"> • What skills are needed to deliver the green transition? • What skills are likely to be displaced? 	<ul style="list-style-type: none"> • What are the skills available in the workforce? 	Skill mismatches
WHERE	<ul style="list-style-type: none"> • Where are jobs created and what is the spatial distribution of the skill requirements? • Where are jobs lost and what is the spatial distribution of displaced skills? 	<ul style="list-style-type: none"> • What is the spatial distribution of the skills in the workforce? 	Spatial mismatches
WHEN	<ul style="list-style-type: none"> • When and for how long are the skills needed? • When and how fast are skills being displaced? 	<ul style="list-style-type: none"> • How quickly could skills in the workforce be mobilized? 	Temporal mismatches
WHO	<ul style="list-style-type: none"> • Are employers biased towards certain demographic groups? • Are certain demographic groups more exposed to job displacement? 	<ul style="list-style-type: none"> • What is the demographic profile of the workforce? 	Demographic mismatches
WHY	<ul style="list-style-type: none"> • What incentives are employers able and willing to offer to attract workers? • What types of displacement compensation are available? 	<ul style="list-style-type: none"> • What motivates people to work? 	Motivational mismatches

Source: Knudsen et al. (forthcoming)

Skill mismatches. Skill mismatches occur when the skills available in the workforce are different from those required by employers. Recent studies have tried to quantify skill mismatches during the green transition using methods that rely on empirically observed mobility between occupations or industries

(see, for example, Berryman et al., 2025; Del Rio-Chanona et al., 2021; Lankhuizen et al., 2023) or a measure of relatedness based on tasks or skills (Bowen et al., 2018; Bücken et al., 2023; Mealy et al., 2018). While past job switching patterns are informative, a purely backward-looking approach risk can miss important future possibilities. Many CCDRs therefore adopt the latter, more forward-looking approach based on network analysis (Figure 1). Specifically, they use measures of occupational task or skill similarity to better understand what workers in different occupations do and, importantly, the occupations they *could* do with little to no training. CCDRs thus offer valuable insights that not only highlight critical bottlenecks but also provide actionable information for designing solutions. These include identifying occupations with high task similarity for roles anticipated to undergo significant changes in demand.

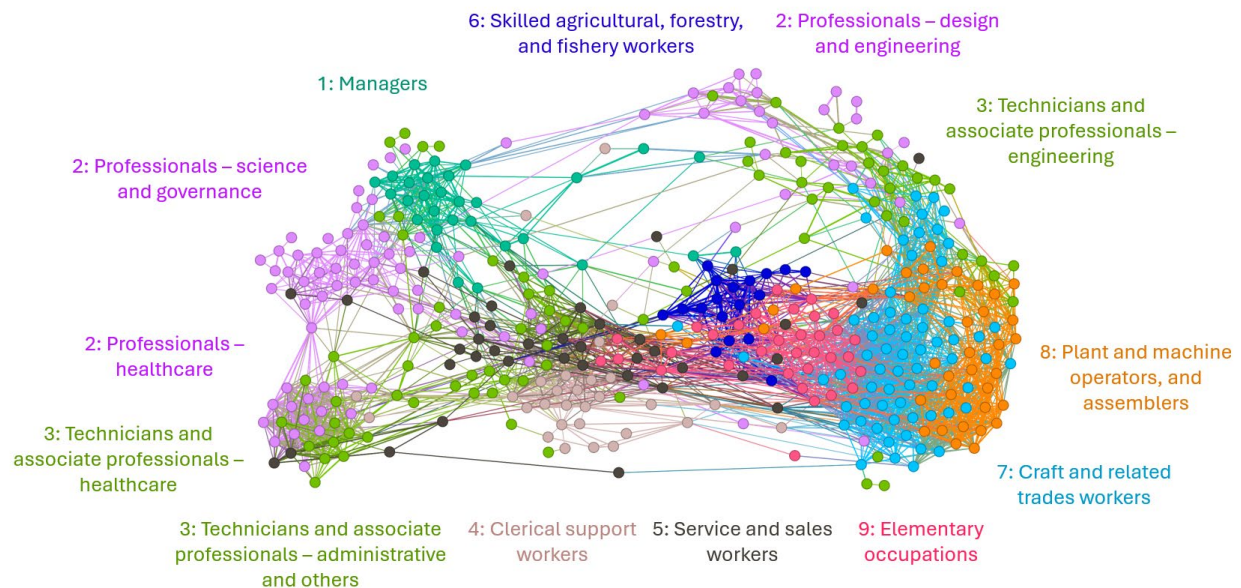
Spatial mismatches. Spatial mismatches occur when there is a geographical distance between the jobs available and the workers who could take on those jobs. As an example, analysis for the Brazil CCDR found that some green jobs (e.g., in green mineral extraction) require similar skills as fossil fuel-related jobs (e.g., coal mining), but while displaced coal workers will likely have the requisite skills to transfer into green mineral extraction, differences in the location of the mineral deposits could act as a barrier (World Bank Group, 2023). Indeed, a stated preference survey among coal miners in Poland illustrates that affected workers and communities could be quite reluctant to commute or relocate (Christiaensen et al., 2022).

Temporal mismatches. Temporal mismatches occur when there is a discrepancy between the timing of job availability and the availability of workers to fill those jobs. Such temporal effects could be a significant barrier to achieving global climate objectives, which requires rapid transformations across all major systems, leading to a spike in demand for workers with certain skills. However, some roles may be needed only for a short duration. A rapid escalation in the demand for construction and manufacturing workers, for example, is expected to support the shift in power generation capacity to renewables, but this scale-up phase will likely be followed by a scale-down phase and eventually a long-term steady state, during which the demand for these workers may decline (Bücken et al., 2025).

Demographic mismatches. Various factors contributing to social exclusion, such as gender and age, can impede the effective reallocation of workers. Demographic mismatches occur when employment opportunities and job mobility are limited due to discrimination against certain worker characteristics, including race, ethnicity, socioeconomic status, education level, disability status, and other demographic factors. For example, many CCDRs have identified that emerging occupations within the green transition are predominantly male-dominated, potentially restricting female workers' ability to benefit from the increasing demand in these sectors. This pattern persists due to job-switching trends that often reflect entrenched gender biases and stereotypes, maintaining the status quo in male-dominated fields. In Georgia, for example, 94% of workers transitioning into male-dominated occupations (defined as those with over 80% male concentration) are men.

Motivational mismatches. People engage in economic activities for various reasons, most notably to generate income, but also for social and psychological fulfillment. Salary mismatches occur, for example, when jobs being created to support the green transition pay lower wages than existing jobs, thereby disincentivizing workers to transition to the new jobs, or when workers in emissions-intensive industries are paid more than those in comparable green industries. In the Brazil CCDR, for example, petroleum and natural gas workers were found to have several transition opportunities that involve a high degree of similar tasks (i.e., jobs likely to require minimal retraining) (World Bank Group 2022). However, several of these jobs offer lower wages, making them less attractive to these workers (Figure 2).

Figure 1. Occupational network based on task similarity



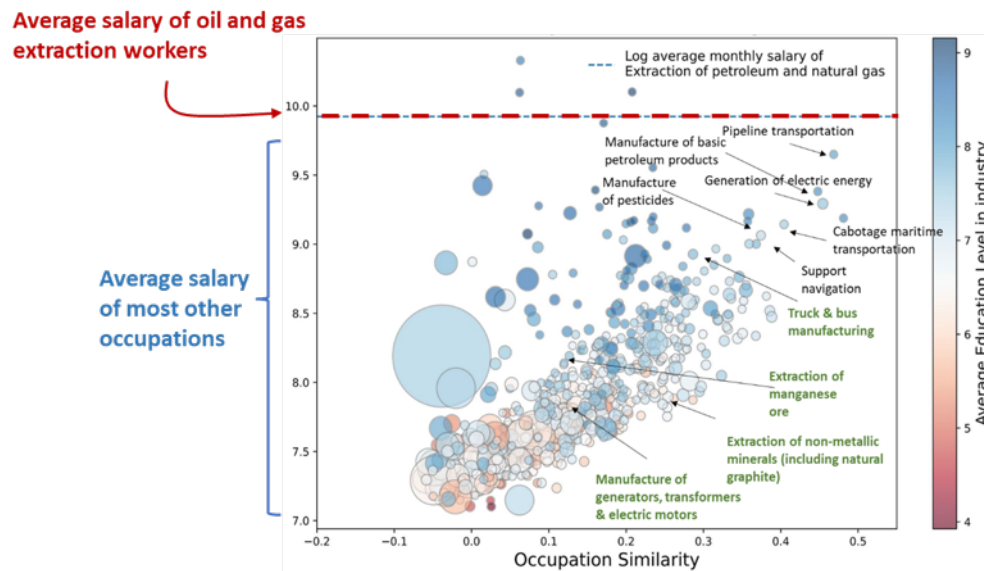
*Note: Each node represents an occupation, with colors indicating the corresponding 1-digit occupation family.
Source: World Bank analysis*

The failure of most macroeconomic models to consider these potential barriers can have substantial implications for policymakers, as the macroeconomic effects predicted by these models may be contingent upon the implementation of various complementary labor market policies. The good news is that existing approaches based on network analysis can help shed light on some of these frictions, as demonstrated in several CCDRs, and efforts are underway to integrate these insights into macroeconomic models. For example, a recent study in Brazil incorporated skill and spatial-related frictions into an agent-based model that simulates how workers move from one job to another (Berryman et al., 2025). This model was then linked to a CGE model to provide insights into regional and occupational unemployment outcomes associated with different development scenarios.

Incorporating labor market dynamics into decision-making tools is crucial, as MoFs play a key role in managing the potential negative labor market impacts of the transition. Examples of proactive policy measures that MoFs can consider include the following:

- Budget allocation may be needed to provide unemployment benefits (to support displaced workers who face job transition challenges), to support education and training programs (to address skill mismatches), or to facilitate wage subsidy programs (to address salary mismatches).
- Financial planning and policy may be needed to account for fluctuations in income tax revenues, e.g., as displaced workers are unable to find alternative opportunities.

Figure 2. Job transition possibilities for petroleum and natural gas workers in Brazil



Note: Each bubble in the figure represents an industry, with the size of the bubble reflecting the level of formal employment in 2018. The color of the bubbles indicates the average education level of the industry's formal workforce.
 Source: World Bank analysis

However, in addition to merely focusing on impacts, MoFs can also adopt strategies such as taxation policies or public expenditure to identify opportunities for stimulating economic growth and boosting job creation through investments in green sectors. For example, to boost job creation in disproportionately impacted regions, MoFs can implement tax breaks for companies that establish renewable energy projects in these areas. Additionally, public expenditure on green infrastructure, such as solar farms or wind energy installations, can create local jobs and stimulate economic activity. By strategically directing resources toward these green initiatives, MoFs can foster sustainable economic growth while addressing regional disparities in employment.

Studying labor market dynamics presents significant challenges (Mealy et al., forthcoming). This type of analysis requires detailed employment data, which is not always available for every country. Additionally, the classification of occupations often varies across countries, complicating cross-country comparisons and the application of a consistent methodology. Ongoing efforts at the World Bank explore how to address these data challenges (e.g., by investigating the relevance of labor market frictions identified in one country to other countries). Furthermore, work is underway to integrate labor market frictions into the World Bank's macroeconomic models. Upon request, the World Bank can collaborate with MoFs to adjust their own models or to utilize World Bank models.

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