Regional employment vulnerability to rapid coal transition in China and India,
an integrated and downscaled assessment

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Coal under Paris compliant pathways

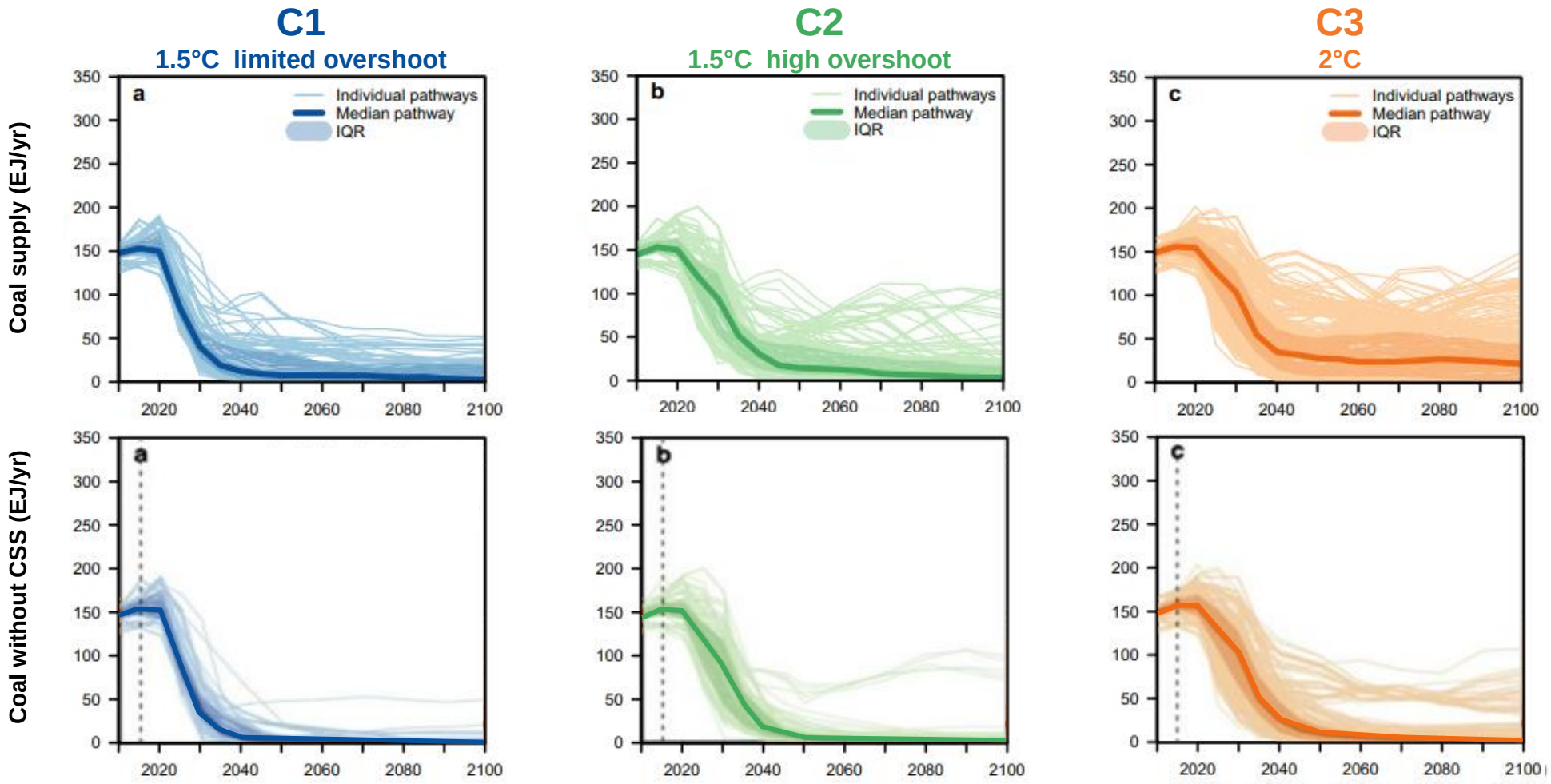


Figure 1: Coal pathways consistent with different climate mitigation objectives (from Achakulwisut et al, 2023)

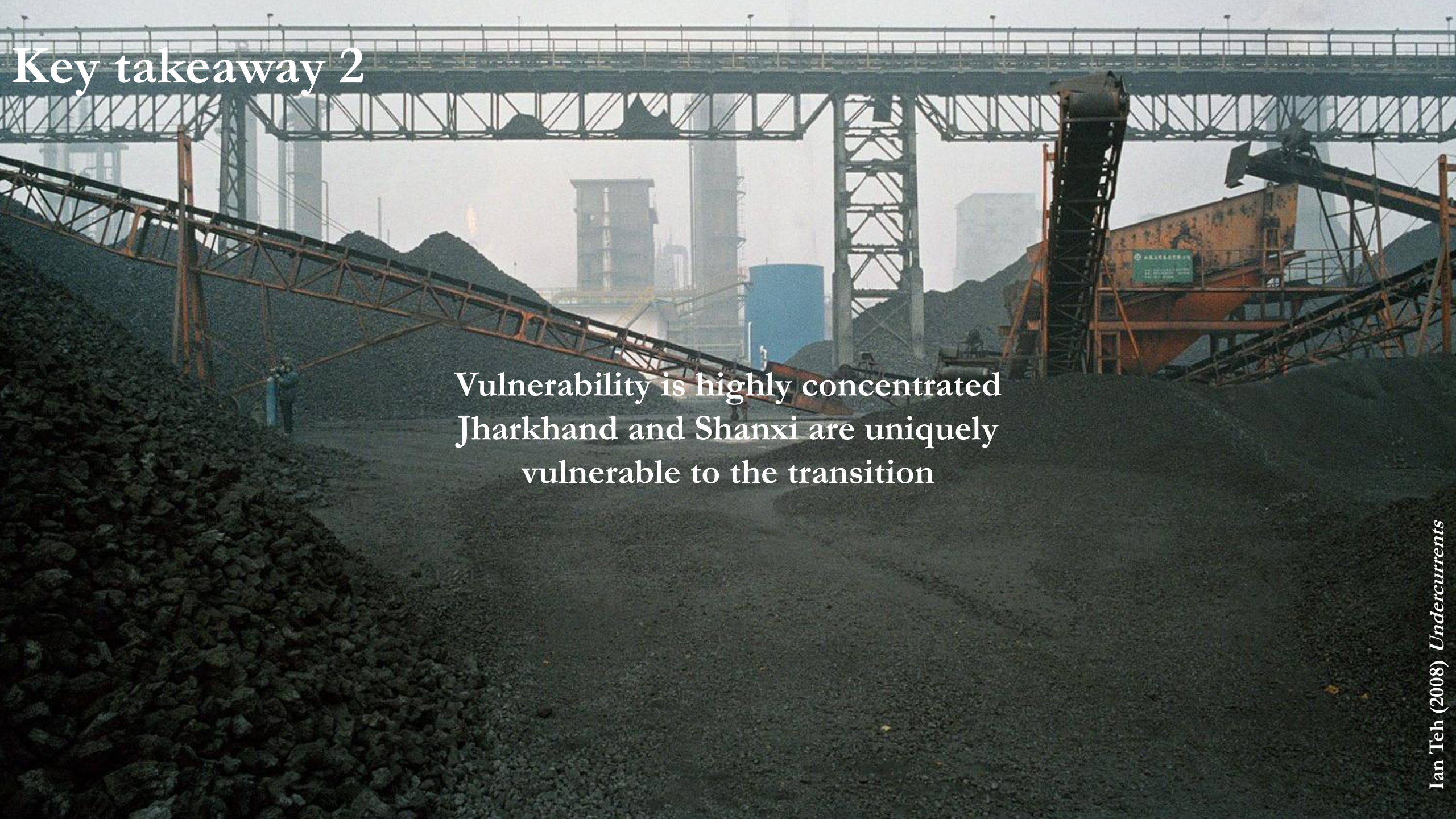
Key takeaway 1

Chinese coal labour will phase down even under current policies

India is at a crossroad

Ian Teh (2008) *Undercurrents*

Key takeaway 2



Vulnerability is highly concentrated
Jharkhand and Shanxi are uniquely vulnerable to the transition

Ian Teh (2008) *Undercurrents*

Key takeaway 3

Despite an aging workforce, large shares of coal workers may not find new employment

Ian Teh (2008) *Undercurrents*

Key takeaway 4

Effective Just Transition policies need to be designed now

Ian Teh (2008) *Undercurrents*

Lessons from historical transitions

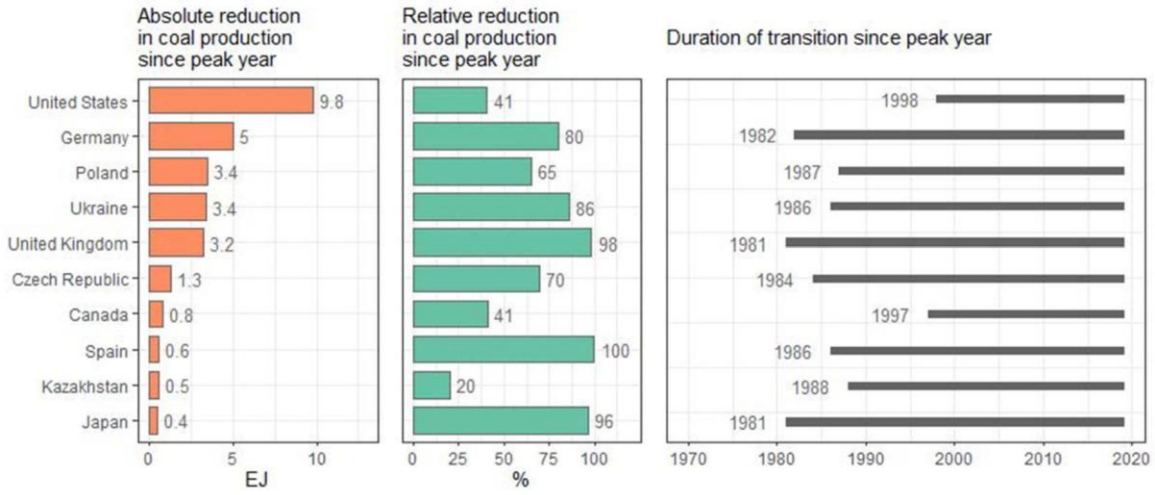
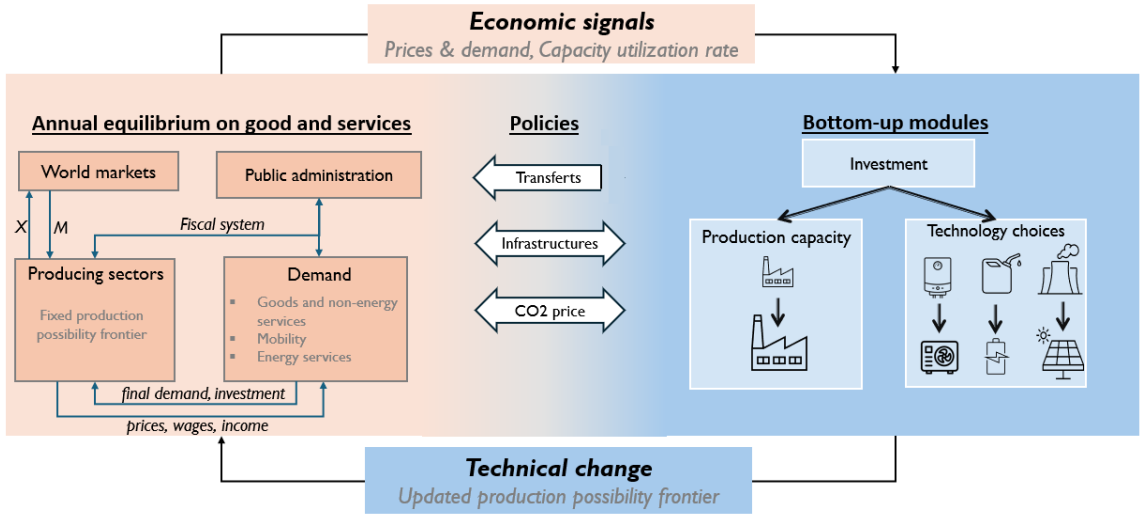


Figure 2: Coal transition indicators in the ten countries that have seen the largest absolute decline in coal production. (from Diluiso et al, 2021)

- Multiple example of coal production and consumption phase-outs
- Inconsistent with the speed required for 1.5°C (Vinichenko et al, 2021)
- Local economic reliance hinders transition (Diluiso et al, 2021)
- Localised regional impacts (Caldecott et al, 2017)
- Generate unemployment (Caldecott et al, 2017)
- Affect workers' and regions' identity (Oei et al, 2020)

The IMACLIM-R model



Model strength

- Hybrid architecture
- Coal sector representation
- Unemployment representation

Necessary improvements

- Spatial disaggregation
- Coal productivity increase
- Labour employability representation

Figure 3: IMACLIM-R modular architecture (from Briera, 2024)

Downscaling and endogenous productivity growth

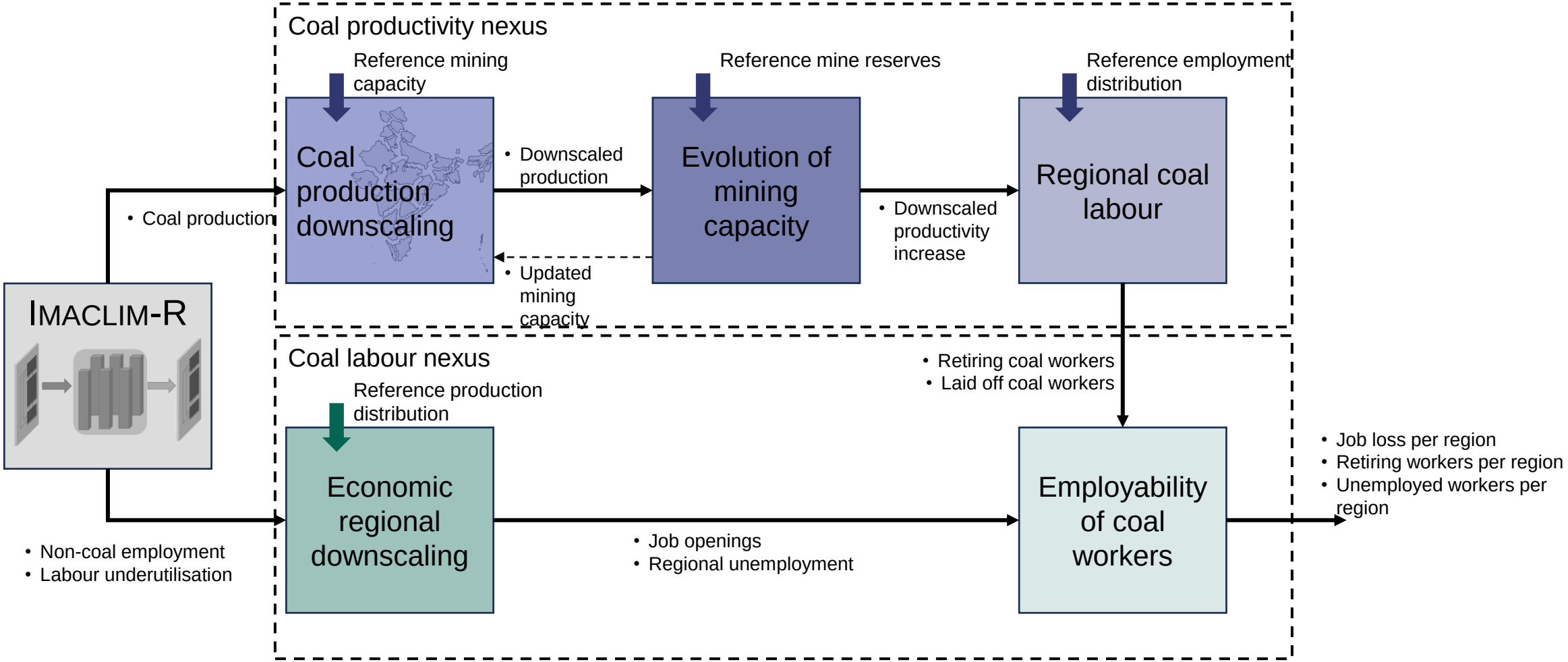


Figure 4: Modelling approach of the coal productivity labour nexus

Coal pathways

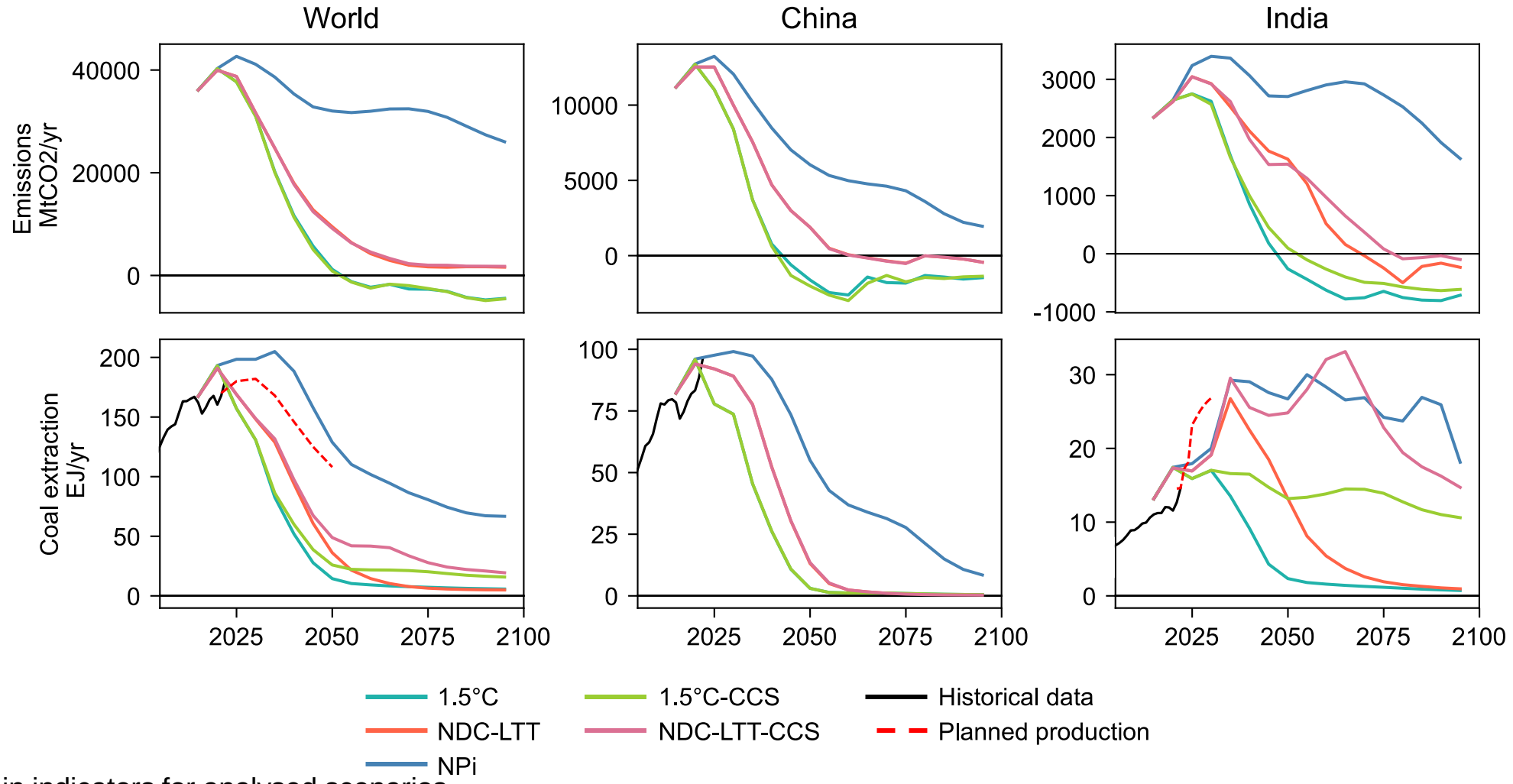


Figure 7: Main indicators for analysed scenarios.

Coal employment pathways

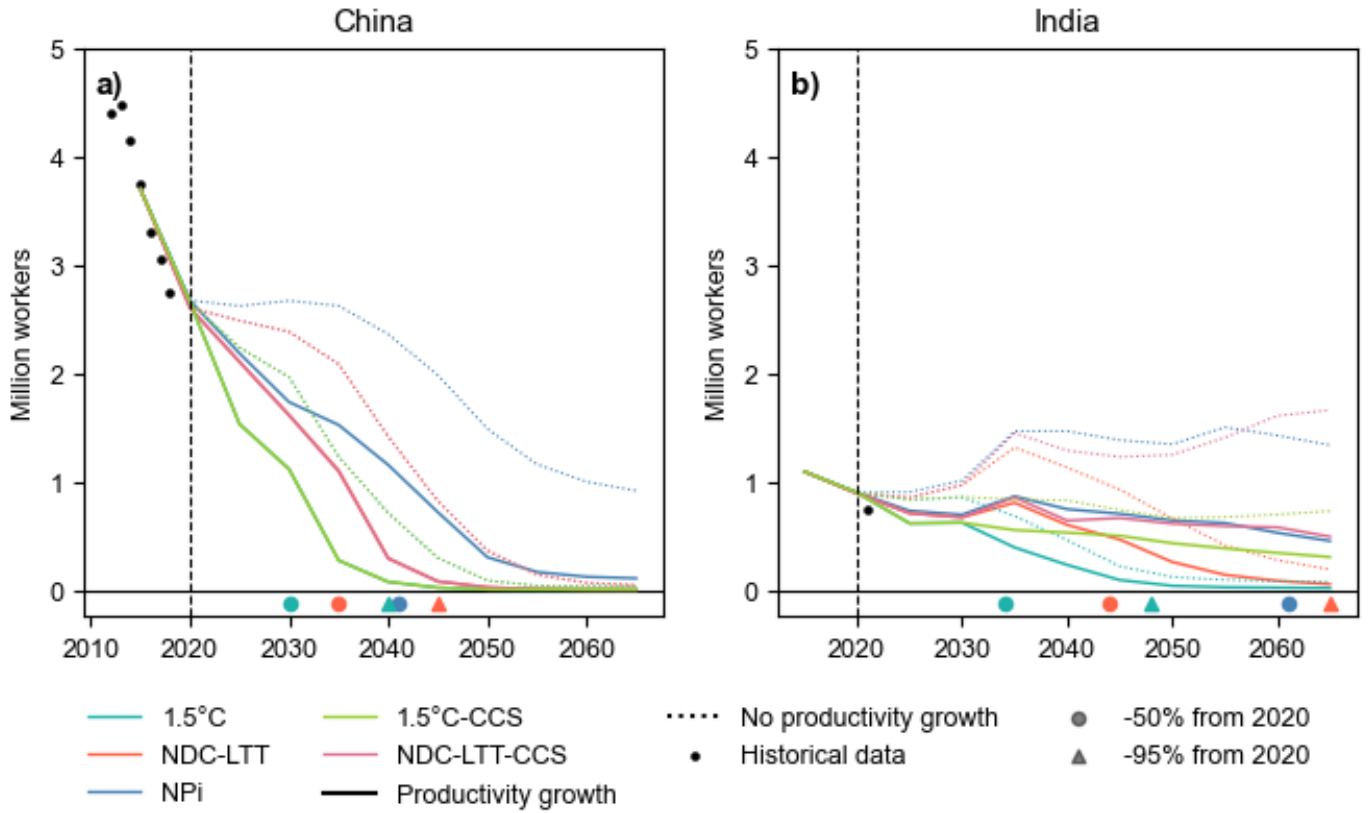


Figure 8: **Employment trajectories** in China (**a**) and India (**b**)
for the five central scenario. Scenarios in dashed lines assume no labour productivity growth after 2020 and are hence aligned with the evolution of coal production. Markers below the x-axis indicate when employment has decreased below a threshold relative to the modelled 2020 value. No historical time series data was available for India.

Chinese coal employment pathways

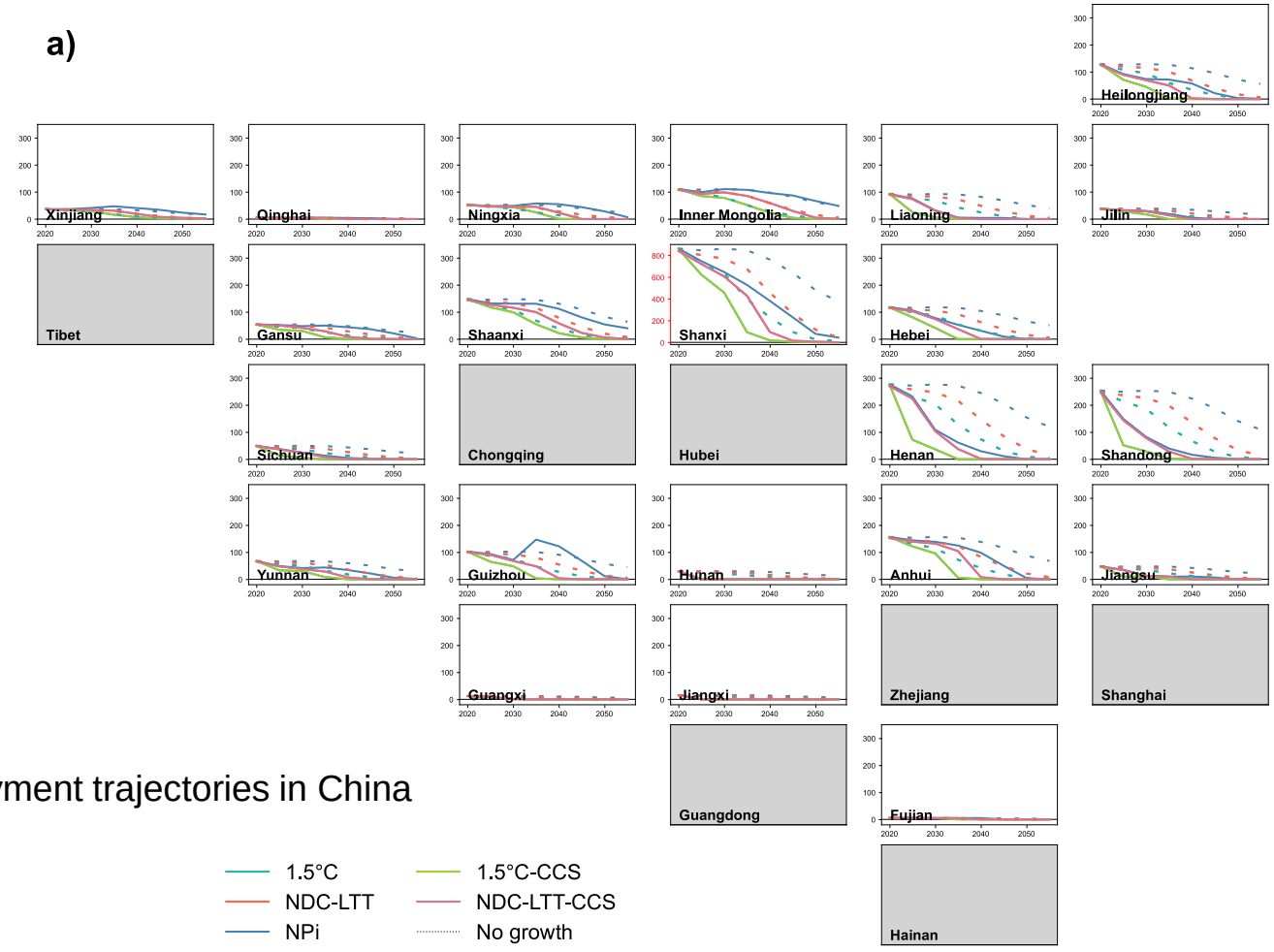


Figure 9.a.: Regional employment trajectories in China

Indian coal employment pathways

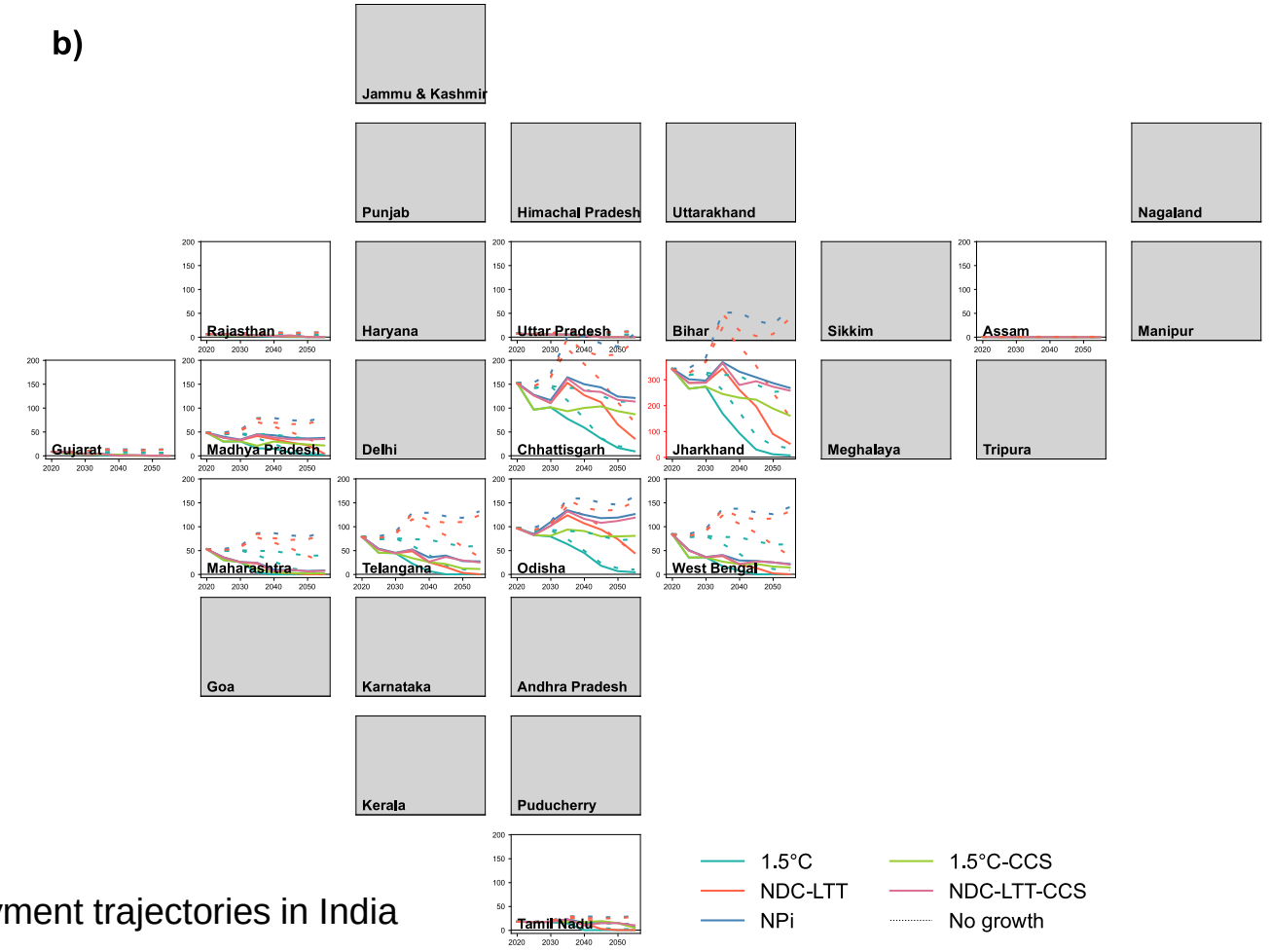


Figure 9.b.: Regional employment trajectories in India

Regional exposure

Figure 10: **Job destructions as a share of the labour force** between 2020 and 2035. Panel a) represents the size of the coal workforce in 2015 as a share of each region's labour force. All other panel represent the number of job destructions in the coal sector as a share of the labour force. Regions in green undergo an increase in the coal workforce between 2020 and 2035. Note the nonlinearity in the colour scale.

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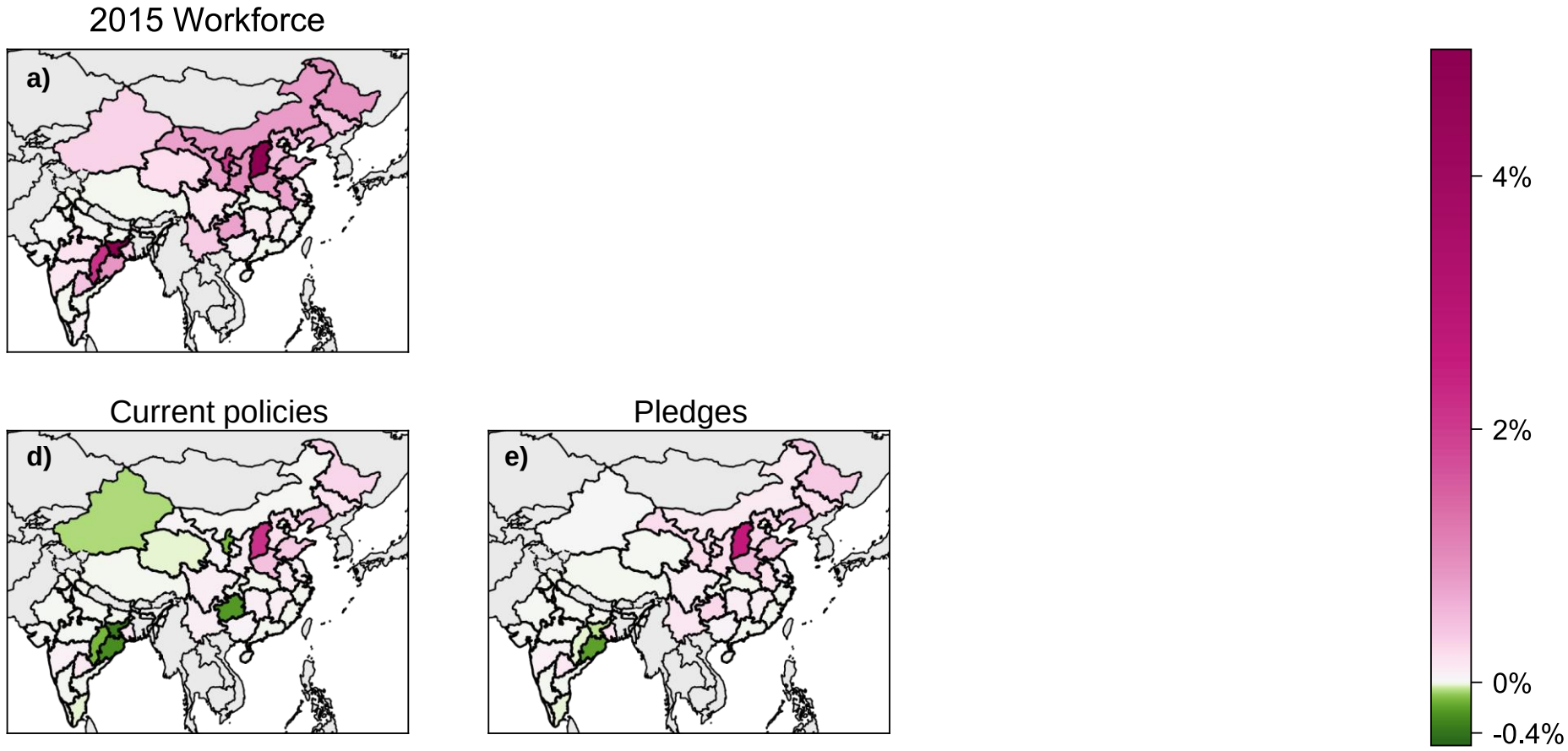

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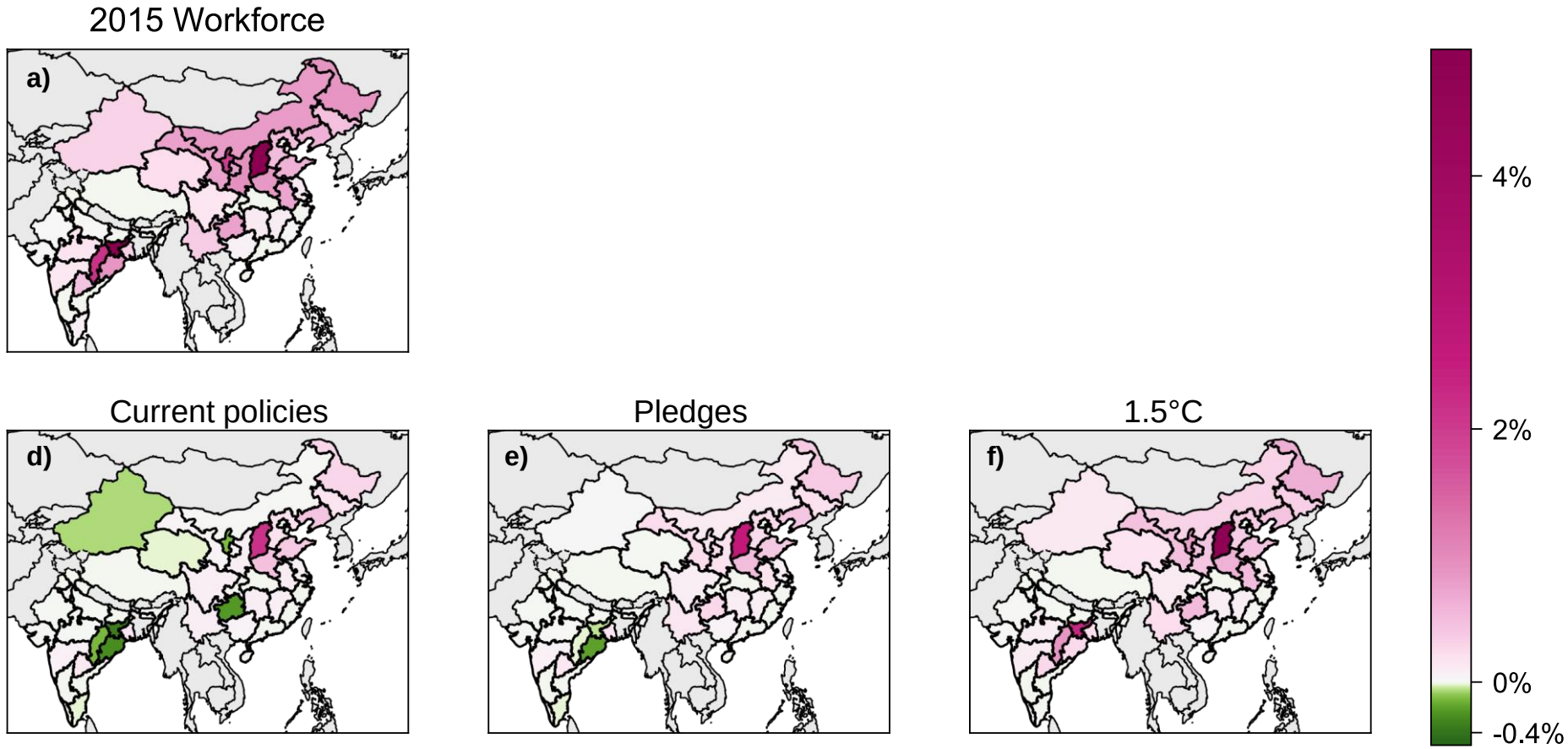

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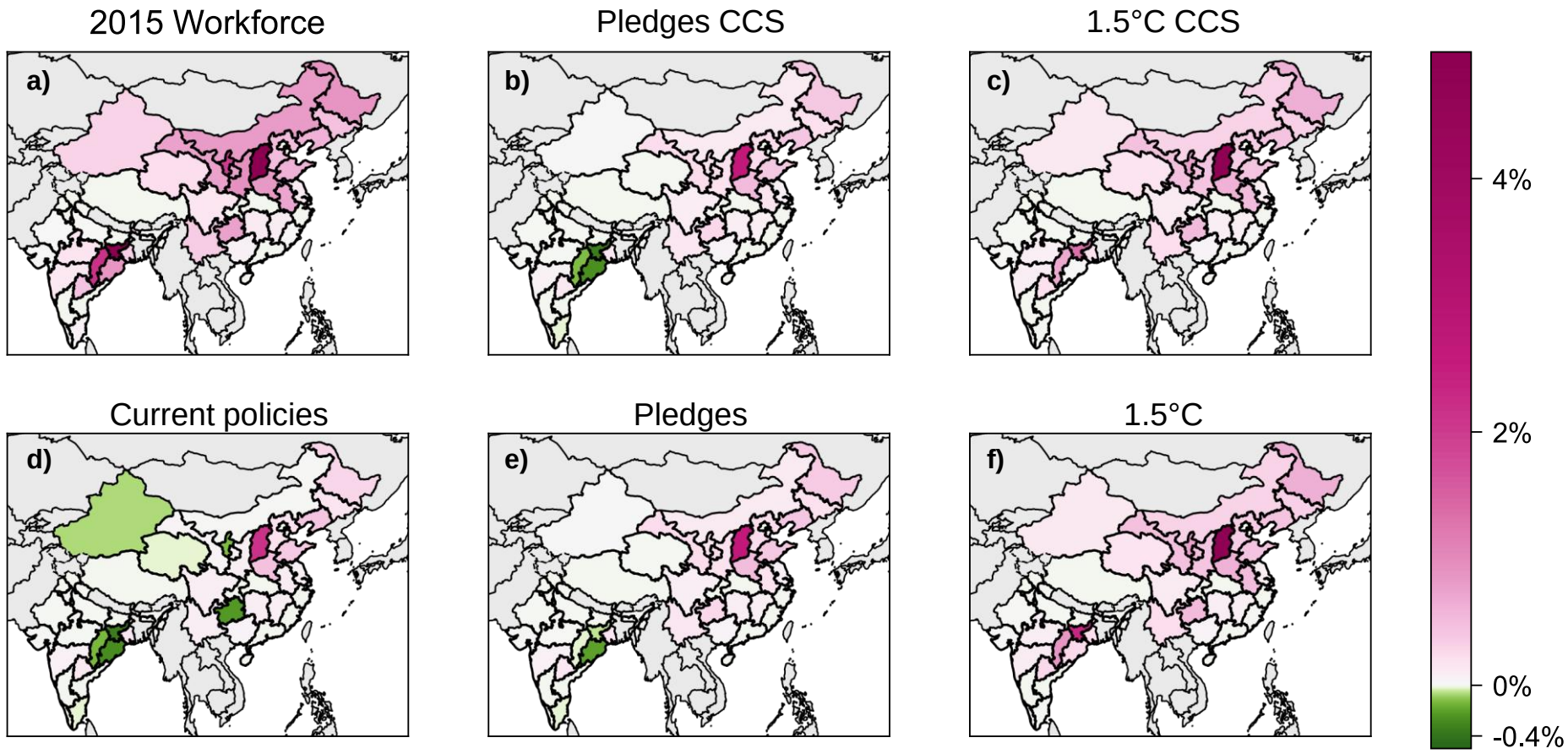

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Regional vulnerability

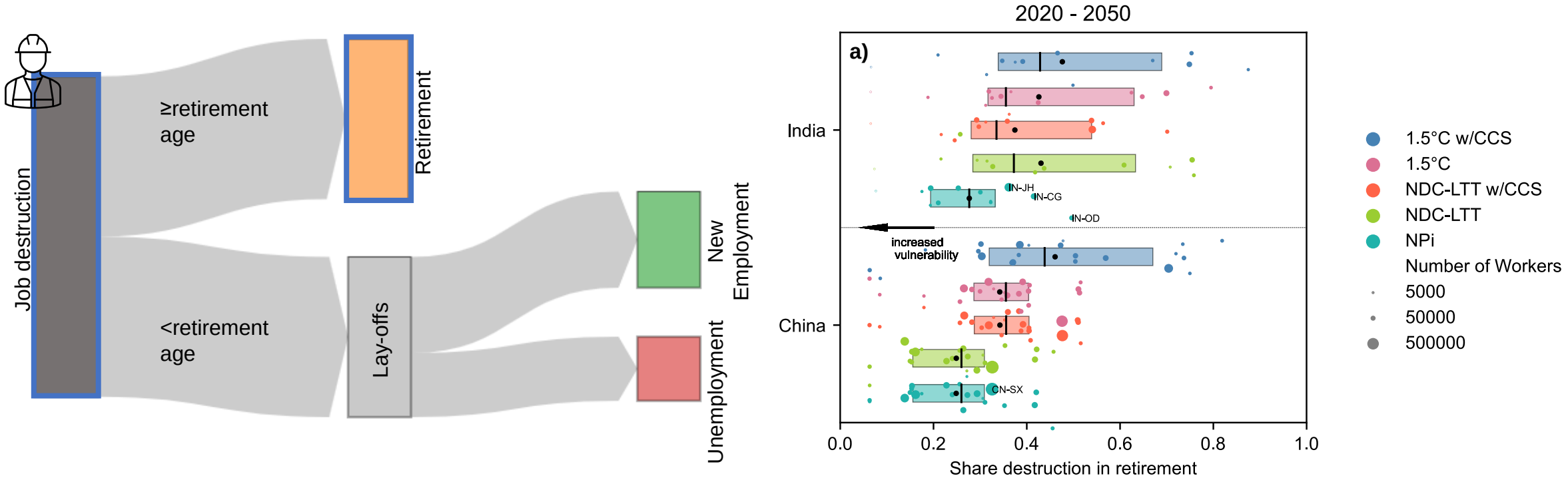

Figure 11a: Transitional labour vulnerability: share of workers leaving into retirement across coal producing regions between 2020-2050. Results are shown for all five central scenarios. Marker size is proportional to number of workers leaving into unemployment or retirement respectively. Black dot is the unweighted national average regional vulnerability.

Regional vulnerability

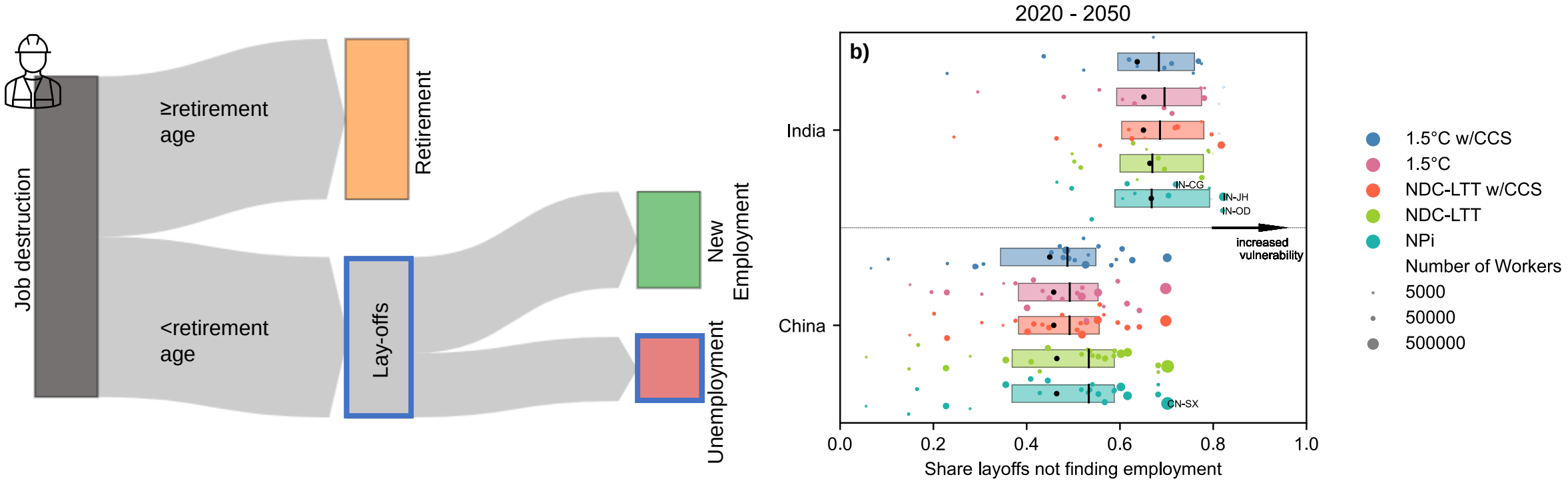

Figure 11b: Transitional labour vulnerability: share of workers leaving into unemployment across coal producing regions between 2020-2050. Results are shown for all five central scenarios. Marker size is proportional to number of workers leaving into unemployment or retirement respectively. Black dot is the unweighted national average regional vulnerability.

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