

Climate change reduced the labour share in the 21st Century

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September 5, 2025

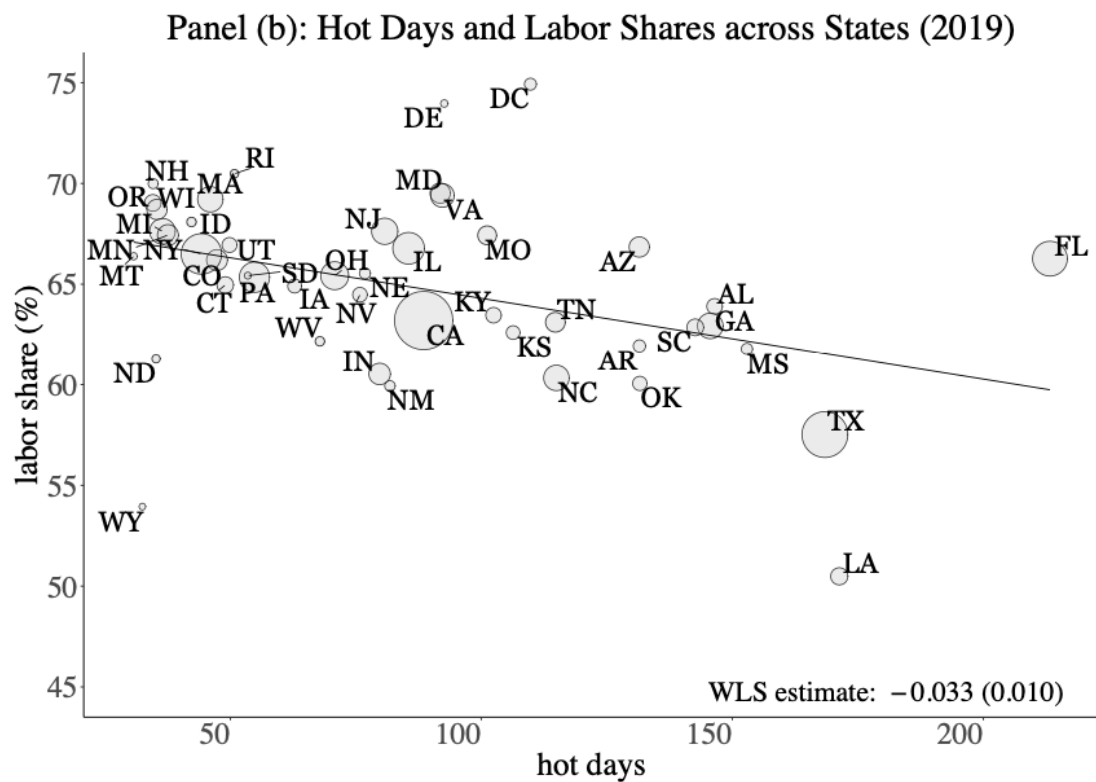
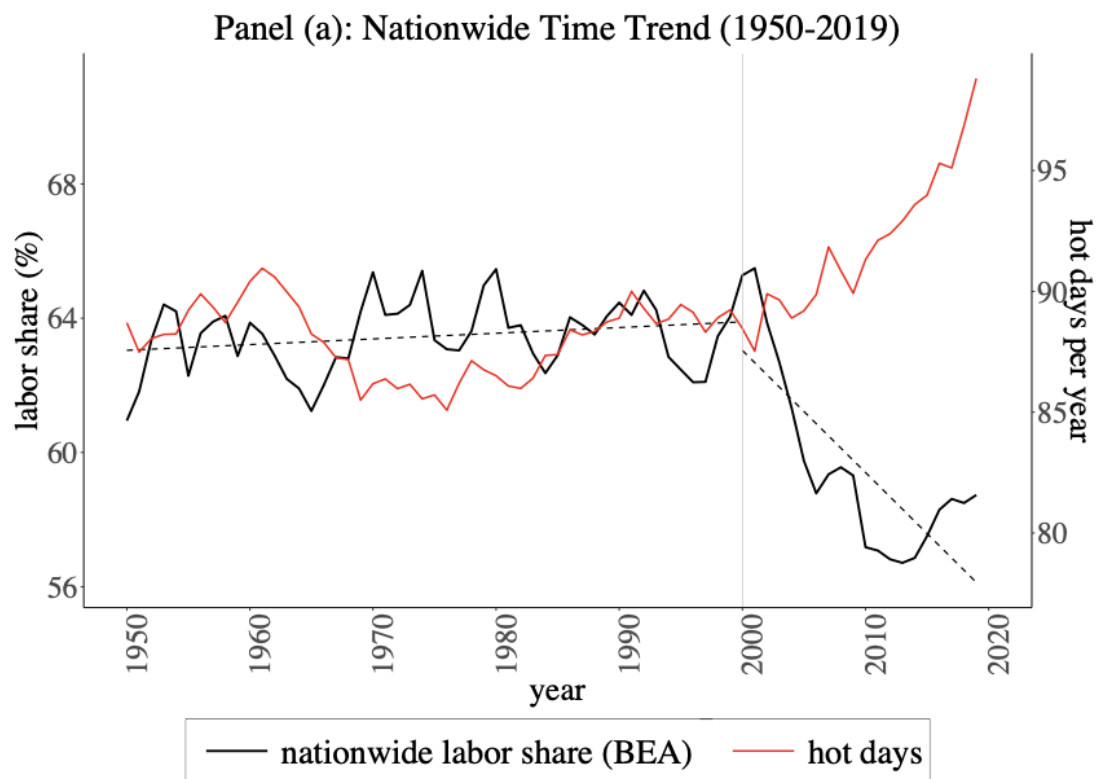


Figure 1: Climate change and the labour share in the U.S. (1950-2019) Note: Hot days are defined as days with an average temperature during working hours exceeding 77°F. Panel (a): County-level exposure to hot days is aggregated at the national level, weighted by county employment in 2000 from the County Business Pattern. The aggregate labour share is taken from the headline figure provided by the Bureau of Economic Analysis. Panel (b): A scatterplot of the statewide labour share against the prior decade average of hot days per year across the U.S. in 2019. Hot days are the 2010 employment-weighted average of hot days during 2010–2019 across counties. The bubble size captures the denominator of labour share (i.e., GDP) in 2019.

Masahiro Yoshida, from Waseda University's Department of Political Science and Economics, presents a new theory and evidence linking climate change to the decline of labour share

The puzzle of declining labour share in the new century

The labour share – the portion of national income accruing to workers as wages and compensation – has fallen sharply in the United States (U.S.) since 2000 (as shown by the black line in Figure 1a). This decline disrupts the historical stability of the labour share established as one of the stylised facts of economic growth (Kaldor, 1961). It has been documented across a wide range of countries worldwide.

Concerns over growing inequality between labourers and capitalists have sparked considerable debate among economists about the causes of this phenomenon, such as technological change, globalisation, shifts in market structure, and various measurement issues (see Grossman and Oberfield (2022) for a survey). This paper introduces a novel perspective by uncovering the role of climate change – another prominent global secular trend – in shaping the observed decline of the labour share.

A global warming hypothesis

The Earth's climate is changing rapidly, and the U.S. is no exception to the trend of intensifying global warming in recent decades, as shown by the red line in Figure 1a. Economists are increasingly concerned with the [economic consequences of climate change](#), as global warming and more frequent extreme heat events not only harm ecosystems but also impair production processes.

Recent labour and health research shows that extreme temperatures harm labour efficiency (Lai, Wangyang, et al., 2023), presumably by accumulating physical fatigue and mental stress, interrupting work, and increasing error rates and workplace injuries. We hypothesise that firms are incentivised to adopt labour-saving technologies in response to climate change, which in turn contributes to the decline in labour share.

Using the U.S. counties as a “laboratory”

To empirically test this hypothesis, we build a new county-level panel dataset that combines climate variables constructed from granular daily weather station records, with local labour share constructed from the [Bureau of Economic Analysis \(BEA\)](#) Regional Economic Accounts. To the best of our knowledge, this is the first paper to measure labour share at the county level in the U.S.

Figure 1b presents a scatterplot of local labour share against the ten-year average of hot days per year across the U.S. The fitted line reveals a clear negative correlation, indicating that hotter states – such as Texas, Florida, and Louisiana – tend to have lower labour shares.

Mechanism: Climate-induced automation?

Although we do not claim that automation is the exclusive explanation for the declining labour share ⁽¹⁾, we demonstrate that climate change nudged firms to adopt labour-saving technologies. First, we observe more severe effects in areas where jobs with outdoor or uncontrolled indoor environments are more prevalent.

Second, the effects are amplified in areas with a high potential for automation – specifically, jobs that involve manual, routine, and hazardous tasks. Moreover, employing two datasets from the BEA and the [International Federation of Robotics \(IFR\)](#), we provide direct evidence that industries more exposed to extreme temperatures adopt more industrial robots.

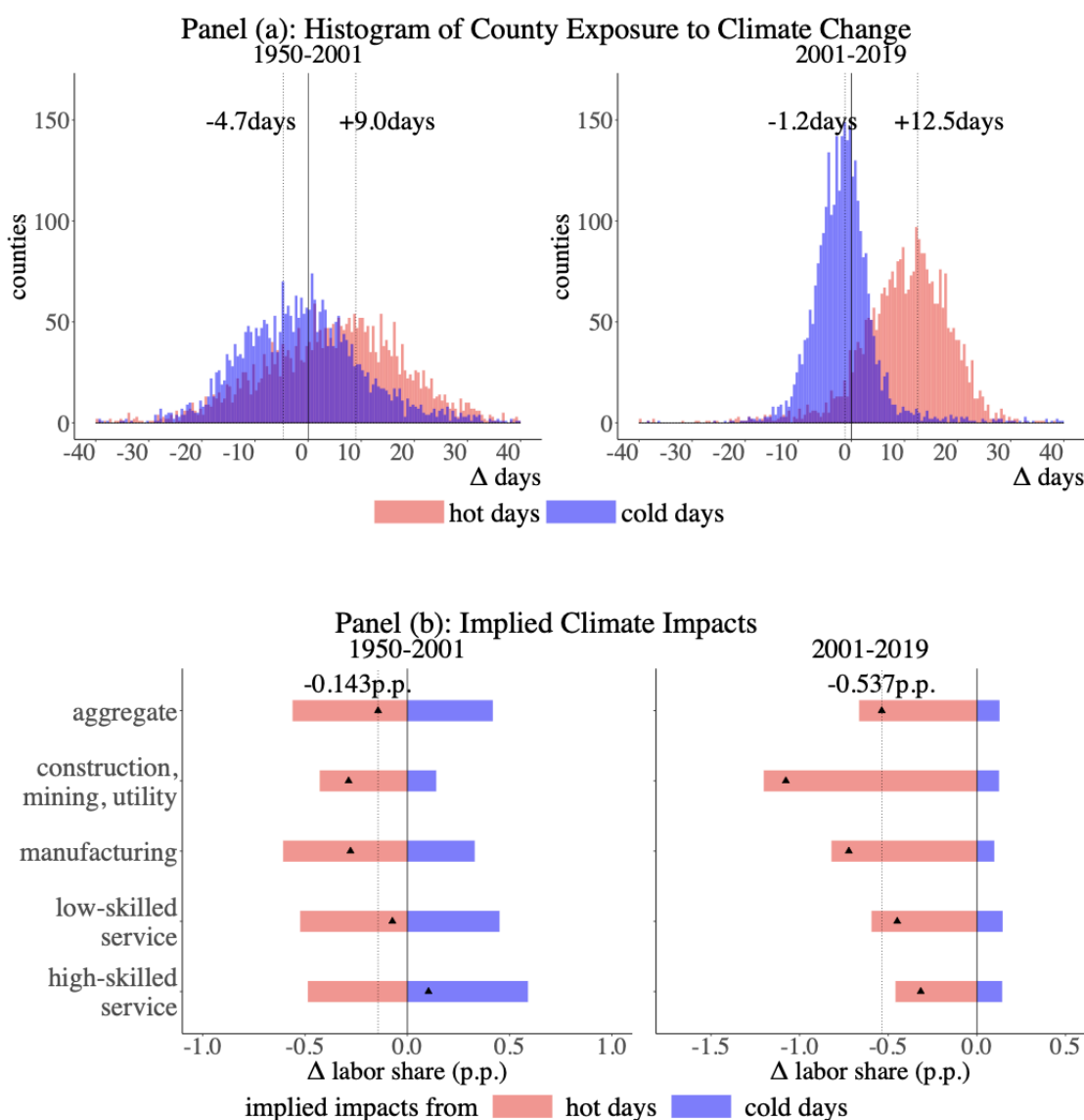


Figure 2: Implied impacts of climate change on labour share (1950-2001 vs. 2001-2019)

Note: Panel (a): Hot days are defined as those with an average temperature during working hours over 77°F, and cold days below 50°F. Changes in the decadal average number of days (1941-1950 for 1950, 1992-2001 for 2001, 2010-2019 for 2019) are allocated into 0.5 days.

Panel (b): Aggregate effects are calculated using the estimation model, formally presented in the original paper. Sector-level impacts are computed from sector-specific estimates. Black triangles mark the net effects of hot and cold days.

Impact: 14% of declining labour share in the 21st century

Finally, we quantify the overall effect of climate change on labour share to derive its macroeconomic implications. We multiply the observed changes in the number of hot and cold days by their respective estimated coefficients and aggregate the effects. Between 2001 and 2019, the increase in the annual number of hot days (+12.5 days) dominated the decrease in cold days (−1.2 days) (Figure 2a).

Our calculation reveals that these changes lead to an aggregate drop in the labour share of 0.54 percentage points, accounting for 14% of the observed declining trend. In contrast, during the period from 1950 to 2001, the competing effects of the increase in hot days (+9.0 days) and the decrease in cold days (−4.7 days) nearly cancel out each other (Figure 2b), consistent with the established stability of labour share in the 20th century.

This article is a non-technical summary of Qiu, Xincheng, and Masahiro Yoshida. “Climate Change and the Decline of Labor Share”. No. 17485. IZA Discussion Papers, 2024.

Citations

Grossman, Gene M and Ezra Oberfield, “The Elusive Explanation for the Declining Labor Share,” *Annual Review of Economics*, 2022, 14 (1), 93–124.

Kaldor, Nicholas, “Capital Accumulation and Economic Growth,” in “The Theory of Capital: Proceedings of a Conference Held by the International Economic Association”, Springer, 1961, pp. 177–222.

Lai, Wangyang, et al. “The Effects of Temperature on Labor Productivity.” *Annual Review of Resource Economics* 15.1 (2023): 213-232.

Footnote

1. Alternatively, our findings may reflect the exits and offshoring of labour-intensive establishments, or the growth of capital-intensive ones.

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