

Research Statement

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1. Research Agenda

I specialize in applied econometrics. **I study how three long-term secular structural changes—climate change, technological change, and demographic change—reshape employment opportunities and income inequality through workers' employment decisions and firms' technology choices.** Within a common theoretical framework, I view these changes as forces that shift comparative advantage across tasks and reorganize who does which work. I examine their labor market effects and policy implications. Alongside two published papers on theory and laboratory experiments, my research centers on **“Climate Change and the Reallocation of Work”** and **“Automation, Immigration, and Population Aging.”**

2. Climate Change and the Reallocation of Work

I examine climate change's effects on local labor markets through labor force participation, labor shares, unemployment, disability insurance receipt, and marriage. As a shared empirical foundation, I independently constructed over fifty years of daily weather data at population centroids of commuting zones and counties in the contiguous United States. The dataset draws on thousands of National Oceanic and Atmospheric Administration stations and covers temperature, precipitation, snowfall, and humidity. My analysis of outdoor work across roughly 900 occupations in O*NET shows that 30% of prime-age men and 10% of prime-age women work outdoors. **These studies trace how outdoor work contributes to socioeconomic disparities within and across regions through labor force withdrawal, unemployment, automation, and occupational injuries. Together, these studies highlight climate change not only as an environmental and public health challenge but also as a force reshaping local labor markets.** This growing research agenda is supported by new KAKENHI and Zengin foundation grants for 2026–2028.

Paper 1: Yoshida (2026a), “Too Hot to Work? The Erosion of Male Comparative Advantage in Outdoor Jobs”

Revision requested at Journal of Labor Economics; Job Market Paper; SSRN Working Paper

Since the 1980s, the decline in U.S. prime-age male labor force participation has been particularly pronounced among advanced economies. I investigate deteriorating outdoor working conditions as one explanation. Robotization, computerization, and trade liberalization have reduced demand for low-skilled indoor labor in manufacturing and services, **steadily increasing outdoor work's share of employment among men without college degrees. Warming reduces outdoor labor demand while raising the relative value of indoor leisure, given the spread of residential air conditioning in the 1970s.** Both forces lower the payoff to outdoor employment. I build a task-based model that formalizes how they encourage labor force withdrawal when indoor job opportunities are scarce.

I test the model by linking Census and American Community Survey microdata, aggregated to approximately 700 commuting zones, with climate data for 1980–2019. Fixed-effects estimates exploit differences in long-term temperature changes across commuting zones within states. Ten additional hot days, with daytime mean temperatures of at least 75°F (24°C), reduce participation among men aged 25–54 by approximately 0.3 percentage points. **Effects are larger where outdoor work is more prevalent, smaller where air-conditioned indoor employment is more prevalent, and statistically insignificant for women,** who work outdoors less often. **Participation declines are larger in areas where residential air conditioning was historically more prevalent. This pattern is consistent with the idea that warming makes leisure at home more attractive relative to outdoor work.** My estimates suggest that climate change accounts for approximately 10% of the participation decline among men without college degrees in the twenty-first century. Effects are particularly large among wage and

salary workers and nonseasonal workers, and robust to regional trends and other confounding labor demand shocks. The findings suggest that warming reduces productivity in outdoor manual work, eroding men's traditional comparative advantage and encouraging labor force withdrawal.

Paper 2: Qiu and Yoshida (2026), “Climate Change and the Decline of Labor Share”

Conditionally accepted at American Economic Journal: Macroeconomics; IZA Working Paper

The substantial decline in labor shares in Europe and the United States this century challenges Kaldor's (1961) stylized fact that labor's share remains stable as economies grow. We propose a new explanation: **warming changes the relative costs of labor and capital, inducing labor-saving technology adoption and reducing labor's share.**

We construct a panel combining daily weather for approximately 3,000 U.S. counties with county–industry–year labor shares for 2001–2019. Fixed-effects estimates show that ten additional hot or cold days reduce labor's share by 0.6–0.9 percentage points. Effects are larger in regions and industries with greater outdoor work and occupational injury risks, together with greater technological scope for automation. Combining industry-level climate measures with robot investment data, we also show that increases in hot and cold days accelerate industrial robot adoption. At the aggregate level, climate change accounts for approximately 14% of the U.S. labor share decline this century. In this collaboration with Xincheng Qiu at Peking University's business school, I led the empirical analysis, manuscript preparation, and responses to referees.

Paper 3: Rujiwattanapong and Yoshida (2026), “Climate Change and Unemployment Dynamics: Evidence from US Counties”

Under review at American Economic Journal: Macroeconomics; WINPEC Working Paper

Unemployment is a key indicator for central banks and legislatures. Seasonality accounts for 80% of monthly unemployment fluctuations, but published figures generally remove this component. **We show how climate shocks shape unemployment and how conventional seasonal adjustment can mask their effects.**

Using monthly weather and unemployment data for approximately 3,000 U.S. counties, we find that additional hot and cold days raise unemployment through fewer vacancies and hires and seasonal job losses. Warmer winters have reduced winter unemployment, while hotter summers have increased summer unemployment. Extreme temperatures account for approximately 11% of monthly unemployment levels in unadjusted data; this contribution nearly disappears after seasonal adjustment.

Our central contribution is an econometric framework identifying conditions under which seasonal adjustment attenuates estimated economic effects of climate change. Modeling adjustment as a linear filter on the outcome, we show how it mechanically absorbs variation driven by climate shocks systematically correlated with the calendar. Within this framework, unadjusted data recover the structural parameter, whereas adjusted data can yield attenuation. The framework extends beyond unemployment to other monthly economic outcomes. In this collaboration with Similan Rujiwattanapong at Waseda University's Faculty of Political Science and Economics, I developed the hypothesis, analyzed the data, and wrote the manuscript.

3. Automation, Immigration, and Aging

This theme studies both directions of interaction between technology and demographics: how automation and AI substitute for or complement workers, and how immigration and aging alter firms' technology choices. Paper 4 supplies the framework; Paper 5 studies labor supply's effects on technology, while Paper 6 examines technology's effects on workers.

Paper 4: Yoshida (2026b), “Immigration, Automation and the U.S. Cities: A Task-based Framework for Welfare Analysis”

Working Paper

Immigration and automation offer aging economies two responses to persistent labor shortages. I incorporate immigration's effects on firms' automation investment into a dynamic regional model, structurally estimated using data from over 700 U.S. regions for 1980–2015. Instruments based on historical settlement patterns by country of origin identify regional elasticities of robot deployment and skill prices with respect to immigration. Together with factor income shares, these allow me to recover substitution relationships among native-born workers, immigrants, and robots semiparametrically. **Low-skilled immigration initially lowers similarly skilled natives' wages, but slowing robotization can reverse this effect in the long run and improve domestic welfare.**

This framework underpins Paper 5 and my climate–immigration project. Under the provisional title “Robots or Immigrants under Population Aging,” I am refocusing the paper on enforcement against unauthorized low-skilled immigrants under Secure Communities (2008–2013) and the acceleration of robot adoption amid aging. A model with fixed automation costs, disciplined by Paper 5's estimates, will project through 2050 how much robots offset immigration restrictions in aging regions and the implications for natives' wages and welfare.

Paper 5: Yoshida (2026c), “Robots or Natives? Immigration Enforcement and the Reallocation of Dangerous Jobs”

Working Paper presented at JEA, 2025; KAKENHI project, 2023–2026

This project extends Paper 4's wage and welfare analysis to occupational injuries. Improvements in U.S. workplace safety have stalled since the Great Recession despite growing robot adoption. Combining injury, immigration, and robot investment data, I show that immigrant-intensive sectors such as agriculture and construction are dangerous and labor intensive, while robot investment concentrates in safer manufacturing. **I hypothesize that immigrants absorb natives' injury risks while discouraging long-run automation, allowing dangerous, labor-intensive tasks to persist.**

Using the staggered county rollout of Secure Communities in 2008–2013 in a difference-in-differences design, I test the model's prediction that tasks' amenability to automation determines whether enforcement reallocates dangerous work to robots or native-born workers. Because immigration restrictions may impose injury costs as well as wage costs, the project seeks to identify burdens overlooked by conventional policy evaluations, with implications for deportation policy and workplace safety regulation.

Planned submission to Journal of Labor Economics in the second half of 2027

Paper 6: Owan and Yoshida (2025), “Singularity and Seniority: Evidence from Japanese Chess Hierarchy”

Working Paper presented at JEA, 2025

With Hideo Owan at Waseda University's Faculty of Political Science and Economics, I study how AI changes knowledge workers' life-cycle productivity by shifting comparative advantage between younger and older workers. Forty years of professional shogi records follow the same individuals through round-robin leagues with promotion and relegation. Limited entry and exit create a setting resembling competition within firms. Rankings measure relative productivity; a common AI benchmark measures playing strength. **I analyzed every move with a state-of-the-art AI, recording scores for played moves and its top five candidates, and whether played moves match those candidates. I also extracted thinking times, game start and end times, and locations through text mining.**

Preliminary results based on rankings and AI evaluations of moves show that peak productivity shifted to younger ages during ICT diffusion in the 1990s and older ages during AI diffusion in the 2010s. ICT digitized game records and broadened information access, but opportunities to develop strategies depended on elite young players' networks. AI may have widened those opportunities and reduced

network disadvantages. This is consistent with AI substituting for younger workers' skills while complementing seniors' and mitigating age-related decline. This Japanese individual panel complements my U.S. regional research by examining dynamic adaptation within individuals.

4. Earlier Work on Bargaining Theory and Laboratory Experiments

My earlier papers in the *Journal of Industrial Economics* and *International Journal of Game Theory* examine how deadline design affects bargaining power and trade efficiency. A durable-goods monopolist can use a fixed “hard” deadline to pressure buyers into accepting its terms. [Yoshida \(2025\)](#) proposes a “soft” deadline, under which the opportunity to trade may end early with some probability. The idea builds on the Coase conjecture: without a deadline, buyers can wait for future price cuts, limiting a monopolist’s pricing power. I show that soft deadlines strengthen this competitive pressure even when a final deadline exists. Contrary to the conventional view that shorter fixed deadlines strengthen monopoly power, *probabilistically* shortening a deadline can weaken it.

[Yoshida \(2026d\)](#) shows that an interim deadline with probabilistic early termination can improve expected welfare through negotiation duration and agreement rates. I developed an experiment at the [Missouri Social Science Experimental Lab \(MISSEL\)](#), collecting 1,161 bargaining observations from 62 undergraduates. More credible deadlines elicited earlier concessions than theory predicts and improved efficiency, consistent with fairness preferences. Together, theory and experiments inform institutional design.

5. Research Outlook

Over the next five years, after completing my main projects, I will pursue three priorities. First, I extend Paper 1 to Disability Insurance (DI). In Kaneko and Yoshida (2026), we combine unpublished annual recipient data for approximately 3,000 U.S. counties, 1970–2018, provided by Timothy Moore at Purdue, with public state-level monthly applications and awards this century. We find that hot days increase DI applications and receipt, motivating further investigation of the mechanisms.

Second, “Too Hot to Marry?” (Yoshida, 2026e) extends the analysis to family formation among millennials reaching marriageable ages amid accelerating warming. A fifty-year panel of approximately 700 commuting zones shows that hot days contribute to rising never-married shares among young men without college degrees. Eroding outdoor comparative advantage may delay marriage through withdrawal from the labor force or full-time work and increased co-residence with parents.

Third, “Too Hot to Deport?” (Yoshida, 2026f) connects climate and immigration. Combining daily weather, O*NET outdoor-work measures, the 1980–2019 commuting-zone panel, and occupational fatalities by birthplace, I examine whether Latin American immigrants enabled native-born workers to leave outdoor work while absorbing injury, heatstroke, and mortality risks on extremely hot days. Interacting Paper 5's enforcement intervention with extreme heat, I test whether the combined shocks increase native-born workers' exposure to hazardous work and heat.

Ultimately, I aim to understand how changes in climate, technology, and demographics create employment opportunities for some while imposing economic and social costs on others. I seek to inform policies that ease adjustment in advanced economies, including Japan, where these changes are unfolding together.

References

Yoshida (2025), “Using a Soft Deadline to Counter Monopoly,” *Journal of Industrial Economics*, 73(3), 446–457.

Yoshida (2026d), “Deadline Credibility and Trade Efficiency,” *International Journal of Game Theory*, 55(2), 31.

Kaneko and Yoshida (2026), “Climate Change and the Growth of Disability Rolls: Evidence from US Counties.”

Yoshida (2026e), “Too Hot to Marry? Rising Temperature and Declining Marriage among Millennials.”

Yoshida (2026f), “Too Hot to Deport? Immigrant Labor and the Incidence of Heat Risk at Work.”

Research Grants

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