1 Overview of Research Statement

My research investigates the complex dynamics of labor markets, focusing on the interplay of immigration policies, technological change, robot automation, human innovation, and market concentration. Employing innovative methodologies —including the application of large language models to U.S. patent descriptions, difference-in-differences analyses with novel instruments, and general equilibrium frameworks— I provide empirical evidence and theoretical insights into how global economic forces reshape labor markets.

2 Impact of Temporary Foreign Workers on Labor Markets

My job market paper, titled "How the Reduction of Temporary Foreign Workers Led to a Rise in Vacancy Rates in South Korea," has been submitted to the *Journal of Human Capital* and has received an invitation for revise and resubmit. It investigates the causal impact of reducing low-skilled temporary foreign workers (TFWs) on job vacancies in South Korea's manufacturing sectors. Utilizing a difference-in-differences analysis with a shift-share instrument based on the COVID-19 quarantine shock, I examine how the sudden reduction in TFWs affected unfilled vacancy rates.

Key findings reveal that sectors heavily dependent on TFWs experienced significant increases in unfilled vacancy rates for two years following the pandemic's onset. Domestic workers were unable to fill the gap left by TFWs, particularly in sectors with intense workloads and long hours. The study underscores the critical role of TFWs in mitigating labor shortages and challenges the notion that reducing foreign labor automatically benefits domestic workers.

To corroborate these findings, I utilized the Local Projection (LP) method developed by Jordà (2005), which augmented the robustness of the results. The analysis revealed that subsequent to a negative shock in foreign labor supply, the vacancy rate exhibits an initial increase, followed by a gradual decline, ultimately converging to its baseline level. This observed pattern is consistent with the extant literature (Pissarides, 2000; Anastasopoulos et al., 2021; Schiman, 2021; Iftikhar and Zaharieva, 2019).

The referees have requested an investigation into the factors contributing to the decline in vacancy rates following the two-year pandemic period. Potential explanations that will be investigated include the return of TFWs after the relaxation of quarantine measures, market exits by firms (Abramitzky et al., 2019), and the implementation of labor-saving technologies such as automation and robotics (Clemens et al., 2018; Acemoglu, 2010). A thorough examination of these factors is necessary to address the referees' comments and enhance the paper's contributions.

3 Measuring Routine and Cognitive Task Indices

"Measuring Routine and Cognitive Task Indices Using Large Language Models to Analyze Occupational Change in the United States" is currently under review for *Labour Economics*, pending revision requests. This study introduces an innovative methodology for quantifying Routine Task Intensity (RTI) and Cognitive Task Intensity (CTI) by employing large language models (LLMs) to analyze O*NET task descriptions at a granular six-digit SOC level.

This approach addresses limitations in existing RTI measures (Autor and Dorn, 2013; Autor et al., 2003; Goos et al., 2009; Fernández-Macías and Hurley, 2017; Marcolin et al., 2016) by harnessing the natural language understanding capabilities of LLMs. The research findings demonstrate a consistent decline in routine occupations across service and sales sectors. Furthermore, the study identifies a significant upward trend in the cognitive impact on wages for female workers, particularly pronounced in service, sales, and management occupations.

4 Automation, Human Task Innovation, and Labor Share

The study "Automation, Human Task Innovation, and Labor Share" examines the global decline in labor share since 2005, emphasizing the effects of robotic and human innovation within a general equilibrium framework. The research addresses endogeneity issues across countries and sectors by employing novel shift-share variables, including operational robot data, patent descriptions' similarity to automation vocabularies using semantic technology, and cognitive task intensity scores.

To the best of my knowledge, the study by Autor et al. (2024) is the only empirical investigation that examines robotic and human innovation within a unified framework. While sharing similarities, this study distinguishes itself in two key aspects: firstly, it incorporates country variation, with a focus on EU nations. Secondly, it employs a diverse array of novel shift-share instruments that were developed by this author.

The findings indicate that human innovation positively impacts labor share, whereas robotic innovation predominantly exerts a negative influence. Furthermore, the elasticity of substitution between labor and non-robot capital is found to be less than unity, indicating a complementary relationship. This observation aligns with the prevailing literature, as noted by Chirinko (2008), Grossman and Oberfield (2022), and Glover and Short (2020).

5 Market Concentration and Labor Share in the EU

Building upon Autor et al. (2020)'s 'superstar firms' hypothesis, which postulates a global trend of increasing market concentration leading to a declining labor share, this study specifically examines whether this pattern holds in EU countries. Utilizing Orbis Historical firm-level data, I investigate trends in EU market concentration.

The initial results indicate a potentially divergent pattern in the EU compared to the United States. First, the study observes that concentration has declined over three decades, corroborating the findings of Kalemli-Özcan et al. (2024). Second, I find no significant correlation between markups and concentration. Third, there appears to be no substantial correlation between concentration and labor share. Additional analyses are being conducted to examine these findings by distinguishing between foreign-based and domestic-based firms, as their implications may differ significantly, as demonstrated by (Kalemli-Özcan et al., 2024).

To enhance the robustness and persuasiveness of our analysis, I am also developing an alternative model that explains these novel findings.

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