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Replication and ML Enhancement on "The Effect of Minimum Wages on Low-Wage Jobs"

Introduction

This article primarily explores the impact of minimum wage policies on low-wage employment. The scholarly debate surrounding the employment effects of minimum wage adjustments is contentious, with the majority of research focusing on youth employment, specific industry effects, or the implications for low-wage workers prior to wage adjustments. There is comparatively less evidence concerning the broader implications on overall employment. By breaking down the standard difference estimates into distinct wage bands, this study aims to elucidate the effects of minimum wage policies on general employment levels and to capture a significant initial wage effect.

The paper also addresses discrepancies in previous research findings, suggesting that variations in the methodologies used to assess the impact on youth employment may contribute to these inconsistencies. Notably, the author observes that post-1992 standard estimates generally do not indicate a decline in teenage employment. Furthermore, the

study investigates the influence of minimum wage adjustments on overall wage inequality and presents a variety of evidence supporting the presence of such effects.

Finally, this paper makes a significant contribution to the literature that employs aggregate analysis to examine behavioral responses to public policies. It utilizes a difference-in-differences approach to construct counterfactual wage distributions and to estimate the numbers of excess and missing jobs. This methodological approach enhances our understanding of the nuanced effects of minimum wage policies on employment dynamics.

Replication

A critical finding of this paper is the inference of the employment impact of minimum wage on low-wage workers by examining shifts in wage distribution. The primary advantage of this methodology is its ability to evaluate the comprehensive effects of minimum wage policies on low-wage workers, who are the principal targets of such regulations. The study leverages 138 significant minimum wage increases for event-research analysis, offering a robust and thorough assessment of how minimum wages (MW) influence wage distribution frequencies. Additionally, it quantifies the number of missing jobs (Δb) just below the minimum wage, the number of excess jobs (Δa) just above the minimum wage, and job fluctuations at the higher end of the wage spectrum.

The principal findings reveal that the count of excess jobs slightly above the minimum wage closely matches the count of missing jobs just below it, with no evidence indicating changes in employment above a $4 minimum wage threshold. Furthermore, the research

indicates that the minimum wage levels examined—ranging from 37% to 59% of the median wage—have not reached a threshold that would result in significant job losses. Given these insights, Figure II in the article is identified for replication to further elucidate these findings.

The research primarily involved a comprehensive sequence of data preparation and regression analysis, including data setup, weight configuration, average computations, and detailed regression modeling. Below is an elaborate description:

1) The individual identifiers for the analysis were the wage bins of each state, with the quarterdate serving as the time identifier. The term "DMW_real" refers to the average calculated under specific conditions (no wage increases in the state, and the year being 1979 or later). The preprocessing of "MW_real" is quite similar to that of "DMW_real," but it incorporates historical data (denoted by the prefix 'F', indicating data from previous periods). Subsequently, the average of "Ycountpcall" was calculated over a set of combined conditions, and the results were stored in the local variable "epop".
2) For the regression of experimental and placebo groups, the analysis was executed under various treatment conditions (such as treatafter, placeboafter1, placeboafter2) and configured with multiple control variables. Following this, based on the outcomes from the stored regression models, several weighted expressions were constructed considering specific time lags. These expressions were then linearly combined to derive estimates and standard errors of the treatment effects.

3) Lastly, the code consolidates these estimates along with their 95% confidence intervals into a matrix for subsequent data analysis and graphical representation. The entire process is principally utilized to evaluate the impacts of policy alterations on economic indicators, providing a robust framework for understanding the effectiveness and consequences of such changes.

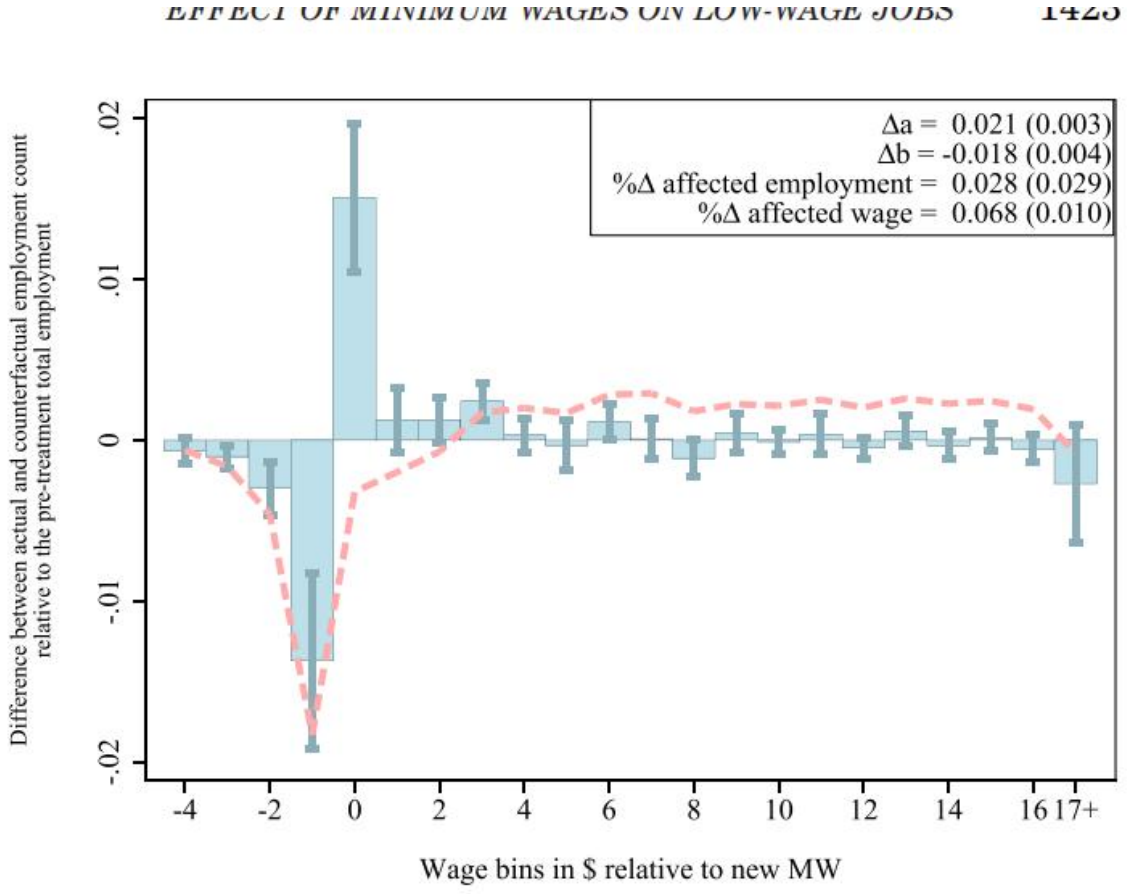
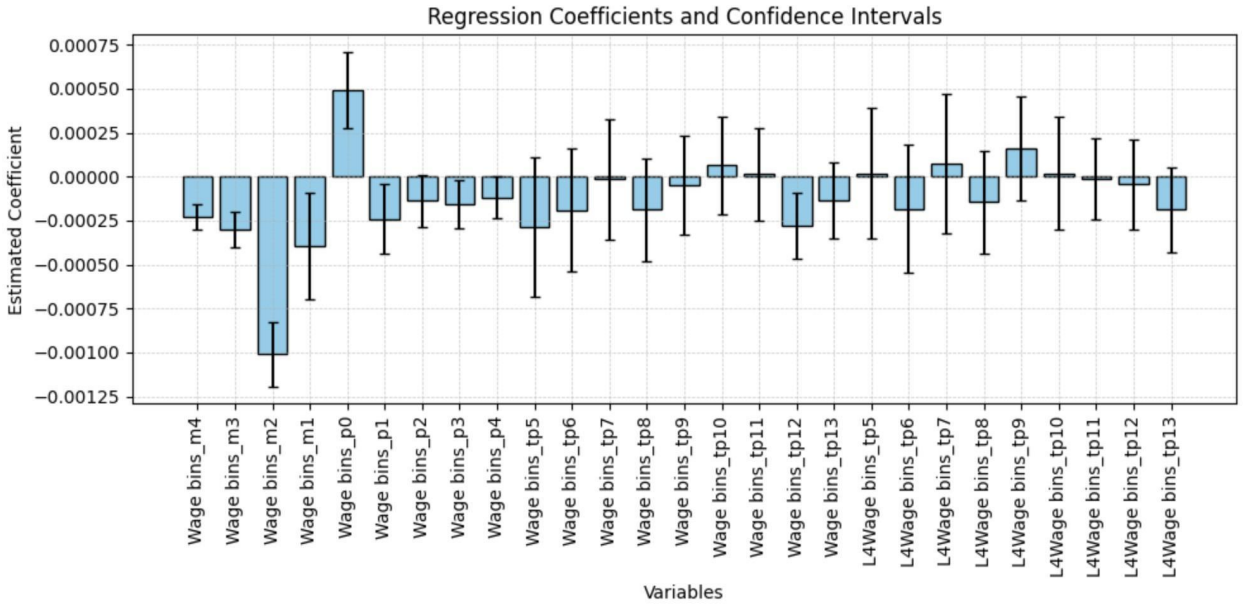


FIGURE II: "Impact of Minimum Wages on the Wage Distribution"



Replication of Figure Ⅱ

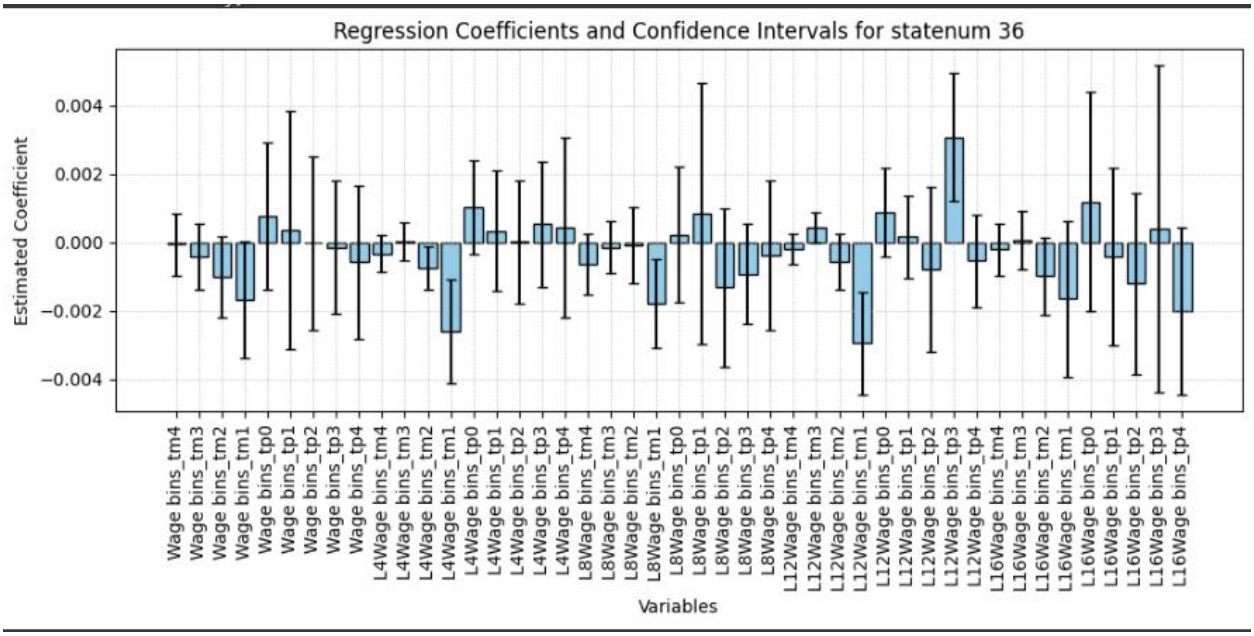
ML Enhancement

First, we begin by focusing on the outcome variables derived from the replication process, such as those similar to the "overallcountpc" column. The original regression equation incorporates approximately 30 control variables, all of which interact with each other and influence the outcome variable Y. To enhance the analysis with machine learning-based methods, these control variables are consolidated into a single dataframe for regression analysis. We then apply a placebo test, a critical component of the Difference-in-Differences (DiD) methodology, to this regression output. This yields a new set of coefficients that can be visualized in a plot, as presented in the research paper.

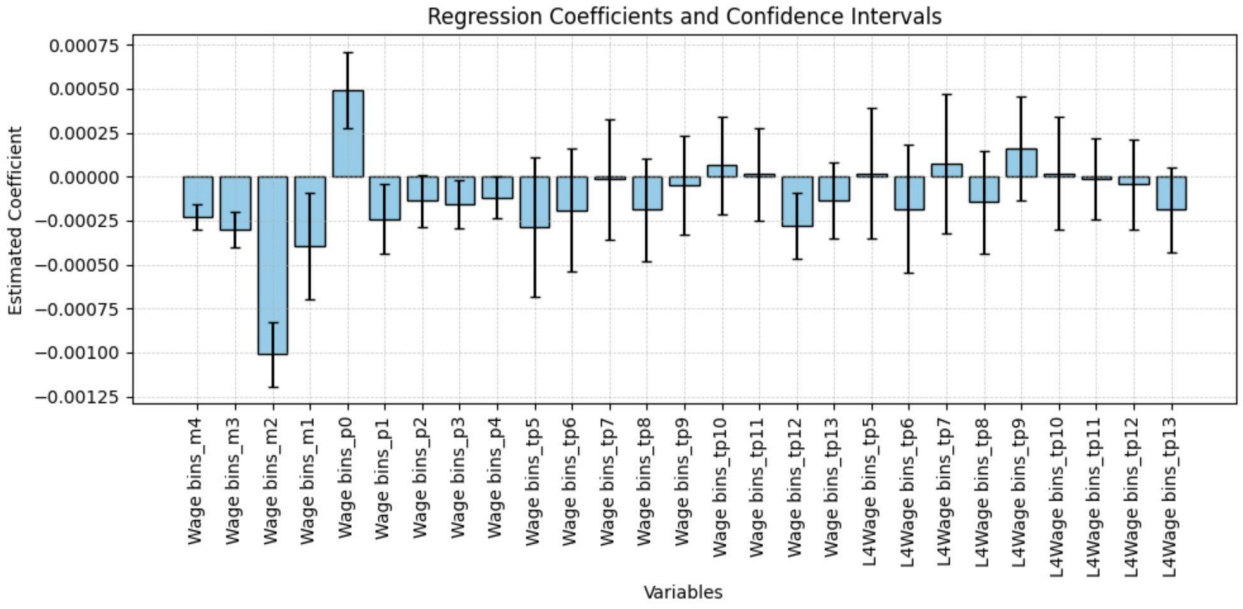
For ML enhanced analysis, through Double-Lasso, it identifies the treatment group as New York State (statenum = 36) between 1993 and 2003. Concurrently, the state of Arkansas,

serving as the control group (statenum = 5), is selected using the Double-Lasso technique based on its adherence to the parallel trends assumption. The regression analysis and the plotting are conducted solely with the two groups identified by the Double-Lasso procedure. This approach allows researchers to capture the impact of minimum wage changes on individuals across different wage levels.

The resulting plot is displayed below. For comparative purposes, a replication plot is also provided. It is evident that after applying the double lasso selection, the model is able to discern more precise and subtle effects that minimum wage changes exert on workers at varying wage tiers.



ML Enhancement Figure Ⅱ



Replication of Figure Ⅱ

Conclusion

This report has replicated and enhanced the study "The Effect of Minimum Wages on Low-Wage Jobs" through machine learning methodologies, specifically the Double-Lasso technique. The replication effort confirmed the original findings, that the employment effects of minimum wage hikes are nuanced, primarily affecting the distribution of jobs around the minimum wage value.

Consistent with the original study, the DiD analysis demonstrated that job losses below the new minimum wage levels were counterbalanced by job gains just above these thresholds, with no discernable effects on employment at wages significantly higher than the minimum wage.

Advancing the conversation, the ML-enhanced analysis identified nuanced patterns that were less discernible in the aggregate data. By focusing on New York State as the treatment group and Arkansas as the control group, which keeps the parallel trends assumption, the regression results provided a more granular view of the wage distribution's transformation due to policy changes. The findings suggest that the adjustments in minimum wage have variable impacts across different wage tiers, revealing the complexities of labor market responses to wage legislation.

Moreover, the application of the placebo test within the Difference-in-Differences framework shed light on the robustness of the model – of course the cross validation also do so, uncovering a set of new coefficients that indicate the specific impacts of minimum wage increases on various demographic groups and across distinct sectors. This granularity is crucial for policymakers aiming to fine-tune economic policies to the needs of a diverse workforce and to mitigate any unintended consequences, particularly in low-wage labor markets.

While the Double-Lasso methods refined the model to capture more specific and subtle influences, it is imperative to acknowledge that the quest to fully understand the dynamics at play in minimum wage adjustments is ongoing. The empirical findings presented in this report not only validate the original research but also open avenues for future inquiries that could further dissect the heterogeneous responses to minimum wage policies.

In conclusion, this study reinforces the original research's assertion that the impact of minimum wage increases is more intricate than a binary discussion of job loss or gain. It is a multifaceted issue that requires a nuanced approach to policy formulation and assessment. As we move forward, the empirical evidence gathered here can serve as a valuable asset to test and distinguish between the various theories of the low-wage labor market, thereby contributing to a more equitable and informed policy-making process .

Works Cited

Doruk Cengiz, Arindrajit Dube, Attila Lindner, Ben Zipperer, The Effect of Minimum Wages on Low-Wage Jobs, *The Quarterly Journal of Economics*, Volume 134, Issue 3, August 2019, Pages 1405–1454, https://doi.org/10.1093/qje/qjz014