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Analysis of the Wage-CPI Relationship Under the California Wage Privacy Act Based on DID Model

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Abstract:

In 2018, California initiated the implementation of the California Wage Privacy Act, which aims to promote gender and racial equality in employment issues. This paper explores the impact of the implementation of this law on the relationship between wages and the Consumer Price Index (CPI). The research employs a Difference-in-Differences (DID) model, utilizing annual data from 2015 to 2024 sourced from the U.S. Bureau of Labor Statistics and the Federal Reserve Bank of St. Louis. The data from Los Angeles, serving as the treatment group, is used for comparison with the data from four control cities-Boston, Chicago, New Jersey, and St. Louis. Empirical results indicate that although visual analysis shows that the policy has mitigated the wage-CPI relationship in Los Angeles, the key coefficients in the DID model are not statistically significant. This suggests that the impact of the policy on the overall CPI through channels such as increasing wage transparency and reducing the anchoring effect may be limited. Further research reveals that the influence of wage transparency legislation may be more pronounced within specific industries rather than at the overall economic level. This provides an important reference for evaluating the macroeconomic impact of labor regulations and suggests that the policy effects may be more evident at the industry level rather than the overall economic level. Therefore, this paper recommends that policymakers consider formulating industry-specific regulations and establishing a dynamic monitoring system to better evaluate and guide policy effectiveness.

Keywords: California Wage Privacy Act; Wage; CPI; DID model; Policy evaluation.

1. Introduction

The "California Fair Pay Act" enacted in 2015 is a pioneering law that emphasizes the "equal pay for equal work" standard, requiring employers to pay employees for "substantially similar jobs" the same salary, and protecting the right of employees to discuss salaries without being retaliated against. The "California Wage Privacy Act", which came into effect on January 1, 2018, is a representative bill derived from it. This bill extends the protection of equal pay to gender and race. Based on this, the bill stipulates that employers must not directly or indirectly ask job seekers about their historical salaries; even if employers obtain the salary history of job seekers, they must not use it as the basis for whether to hire the job seeker or set their salary; employers must proactively provide salary ranges. This policy shock provides a rare natural experiment for studying how the change in the wage determination mechanism affects macroeconomic indicators. Specifically, exploring the impact of this policy on the relationship between wages and CPI is of great significance for evaluating the macroeconomic effectiveness of labor market regulations and formulating subsequent policies [1].

The current research mainly focuses on the relationship between net wages and CPI. Some studies have shown that within a specific sample period (2000-2010), there is a statistically significant negative logarithmic relationship between net wages and CPI in Romania. However, due to the existence of heteroscedasticity, autocorrelation, and non-normal distribution of errors in the model, this relationship cannot be effectively used for predicting future trends [2]. At the same time, other studies have found that the minimum wage can significantly promote household consumption, mainly through two paths: increasing income and reducing precautionary savings. Moreover, its stimulating effect is more significant in developed regions and families without children [3]. However, there are relatively few studies that use quantitative methods to quantitatively analyze the indirect impact of wage privacy policies on price levels. There is still a gap in the comprehensive assessment of the macroeconomic effects of such policies.

This paper aims to fill this research gap by using the DID model. The study takes Los Angeles as the treatment group and selects four major cities in the United States (Boston, Chicago, New Jersey, and St. Louis) as the control groups. Using annual data from 2015 to 2024, it empirically examines the impact of the policy on the relationship between wages and CPI. The analysis includes parallel trend tests and visual analysis to enhance the robustness of the research results.

2. Method

2.1 Selection of samples

This study selects five U.S. cities-Los Angeles, Boston, Chicago, New Jersey, and St. Louis-as research subjects. Given that California enacted the California Salary Privacy Act on January 1, 2018, while no comparable legislation was implemented in other regions during the same period, the study selected Los Angeles, which is in California, as the treatment group. Considering the factors related to regional economic development levels, this article selects four major cities located in different states as the control groups, thereby making the research more representative. They are Boston, Chicago, New Jersey, and St. Louis.

2.2 Source of data

The data in this article covers a time span from 2015 to 2024 and is presented on an annual basis. Among the data, the consumer price indices for Los Angeles and New Jersey are sourced from the U. S. Bureau of Labor Statistics [4]. The consumer price indices for the remaining regions, the population figures of each state, and the weekly average wages of each state are all obtained from the website of the Federal Reserve Bank of St. Louis [5]. The variables and their definitions in the data are shown in Table 1.

Table 1: Main Variables and Definitions

Variable name	Definition
region_id	The names of each city
state_name	The abbreviation of the state to which each city belongs
year	Occurrence time
CPI	Consumer price index
wage_avg	Weekly average wages
Treat	Treat=1: treatment group, Treat=0: control group
Post	Post=1: after 2018, Post=0: before 2018
Population (Thousands)	Regional population, expressed in thousands

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Among these variables, the population figure and the consumer price index have not been seasonally adjusted, while the weekly wages have been seasonally adjusted.

2.3 Difference-in-differences model

This paper takes the California Salary Privacy Act enacted in 2018 as a policy shock and uses a difference-difference model to analyze the impact of wage changes on the consumer price index. There are three obvious advantages of using the difference-in-differences model. Firstly, it can avoid endogeneity issues [6]. By treating the California Paycheck Protection Law as an exogenous variable, it can effectively prevent the occurrence of reverse causality. Secondly, it can add control variables to alleviate the bias caused by omitted variables. Thirdly, by setting interaction terms (in this study, the product of Treat and Post), the net effect of the policy can be directly estimated. The basic model established is as shown in Equation (1):

$$CPI_{it} = \alpha_i + \lambda_i + \beta * (Treat * Post) + \epsilon_{it} \quad (1)$$

Where CPI_{it} represents the regional consumer price index. $Treat$ is a binary variable representing whether it is a treatment group. $Post$ is also a binary time dummy variable indicating whether the policy has been enacted. Due to the policy coming into effect in 2018, this variable is divided based on the year 2018 as the boundary point. α_i represents regional fixed effects, such as differences in temperature and consumption structure. λ_i represents time fixed effects, such as common macroeconomic shocks and seasonal factors gated by each region. ϵ_{it} is the random error term.

To prevent the influence of relevant variables on the accuracy of the research, this paper has decided to incorporate population size as a new variable to improve the model. The model improved is as shown in Equation (2):

$$CPI_{it} = \alpha_i + \lambda_i + \beta * (Treat * Post) + \gamma * Population + \epsilon_{it} \quad (2)$$

In this model, this paper focuses on the value and significance of the coefficient β in front of the interaction term $Treat * Post$.

The relative impact of the policy can be evaluated based on the coefficient b in the model. If β is significantly greater than 0, it indicates that the CPI in Los Angeles has risen significantly compared to the control group after the implementation of the policy; conversely, if β is significantly less than 0, it corresponds to a significant decline; and if β fails to pass the significance test, it suggests that the policy has not had a statistically significant relative impact.

3. Analysis and Empirical Results

3.1 Parallel trend assumption testing

As shown in Figure 1, the blue solid line represents the control group, and the red solid line represents the treatment group. The changing trends of CPI overtime for both groups are roughly the same, which conforms to the parallel trend assumption. Therefore, a difference-in-difference model can be used for analysis.

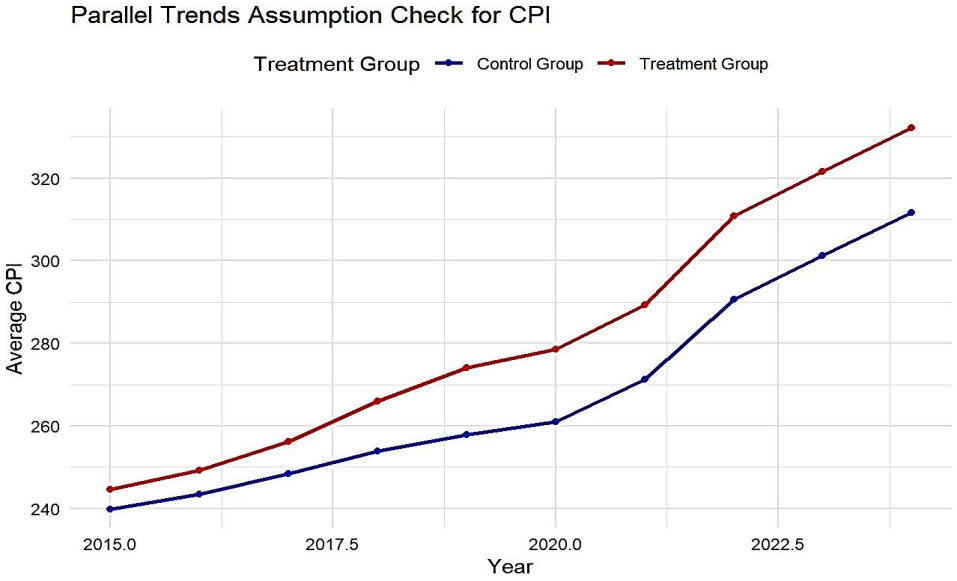

Figure 1: Parallel Trends Assumption Check for CPI

3.2 Visualized analysis

The horizontal axis of Figure 2 represents the average weekly salary, while the vertical axis represents the consumer price index. The red line represents the treatment group, and the blue line represents the control group. The circular coordinates represent the situation before the policy implementation, and the triangular coordinates represent the situation after the policy implementation.

As can be seen from Figure 2, the relationship between wage and CPI in the treatment group (Los Angeles) has undergone significant changes since the policy was implemented. Before and after the policy, the relationship between Los Angeles and other cities has become differentiated. Prior to the implementation of the policy, the relationships between wages and the CPI reflected by the red and blue curves were relatively similar, yet the curve of the treatment group was notably steeper. After the policy implementation, the slope of the wage-CPI relationship in the treatment group decreased slightly, indicating that as wages rose, the growth rate of the CPI in Los Angeles slowed down. In contrast, the changes in the control group were relatively limited.

Figure 2: Wage vs CPI (Controlled for Population)

The horizontal axis of Figure 3 represents wages, and the vertical axis represents the consumer price index. The left side represents the situation before the policy, and the right side represents the situation after the policy. The colors are used to classify the urban groups. The red line is the treatment group, and the blue line is the control group. The gray area represents the uncertain range of regression. Figure 3 can more intuitively show the changes of CPI in relation to wage before and after the policy. The curve of the control group remained almost parallel before and after the policy, with no significant change. The curve of the treatment group became gentler after the implementation of the policy, indicating that the growth rate of CPI in relation to wage increase has slowed down.

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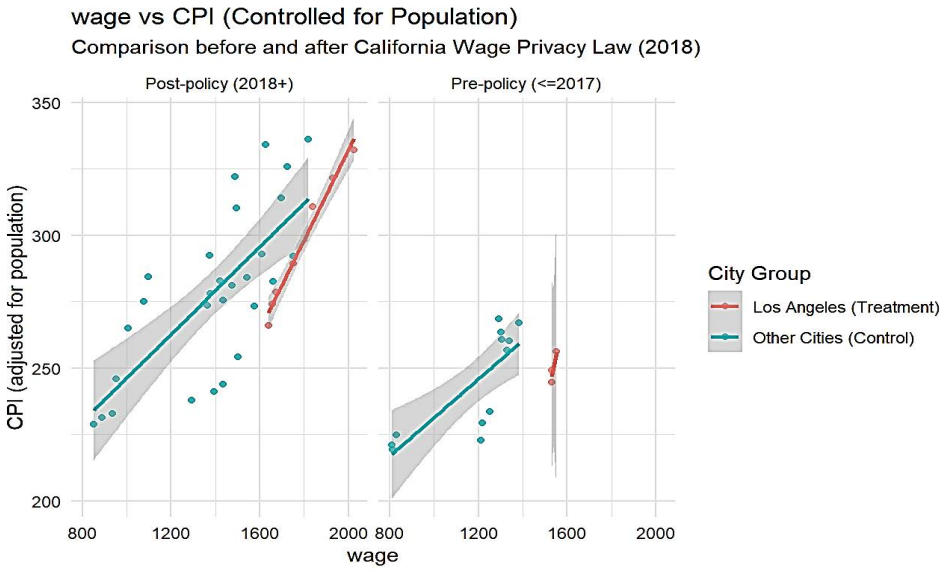

Figure 3: Wage vs CPI (Controlled for Population) Comparison before and after California Wage Privacy Law (2018)

Figure 4 shows that the change in the impact of coefficient wages on the CPI before and after the policy implementation. The vertical axis represents the coefficient of the impact of wages on CPI, and the horizontal axis represents the pre-policy (Pre) and post-policy (Post) periods. The coefficient is negative in both Pre and Post (Pre is close to -0.03, Post is close to -0.01). This indicates that after the regression model controlled for other variables, the marginal impact of wages on CPI is negatively correlated, but it is very insignificant.

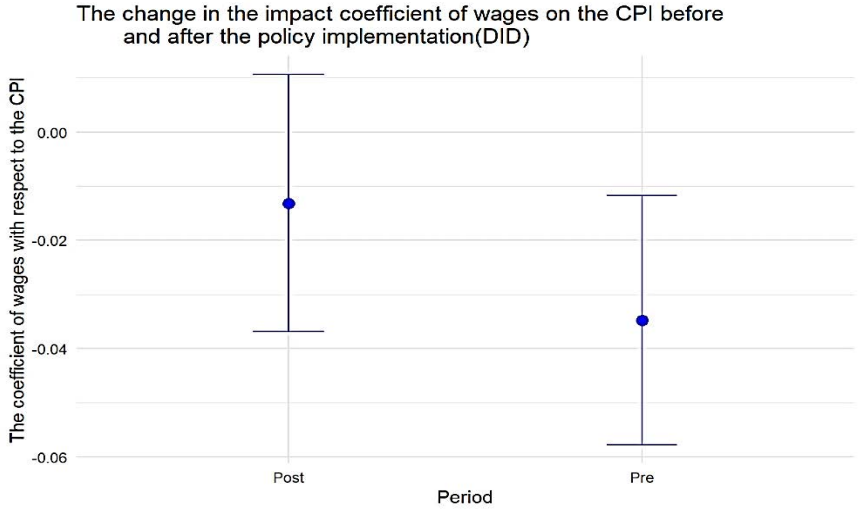

Figure 4: The Change in the Impact Coefficient of Wages on the CPI before and after Policy Implementation (DID)

4. Underlying Reasons and Policy Recommendations

4.1 Underlying Reasons

This article has created a residual plot to analyze the underlying reasons. Figure 5 is the residual diagnostic diagram of the model. The x-axis represents the fitted values, and the y-axis represents the residuals. It can be seen that the residuals are roughly distributed within the range of ±25. There are some obvious grouping phenomena. Some points are clearly concentrated in the positive direction, and some points are clearly concentrated in the negative direction. This indicates that the model may have missed some structural information, resulting in systematic bias. From the figure, the fluctuation amplitude of the residuals

within the fitted value range is approximately the same, and there is no trend of widening as the fitted value increases. Therefore, the problem of heteroscedasticity is not serious.

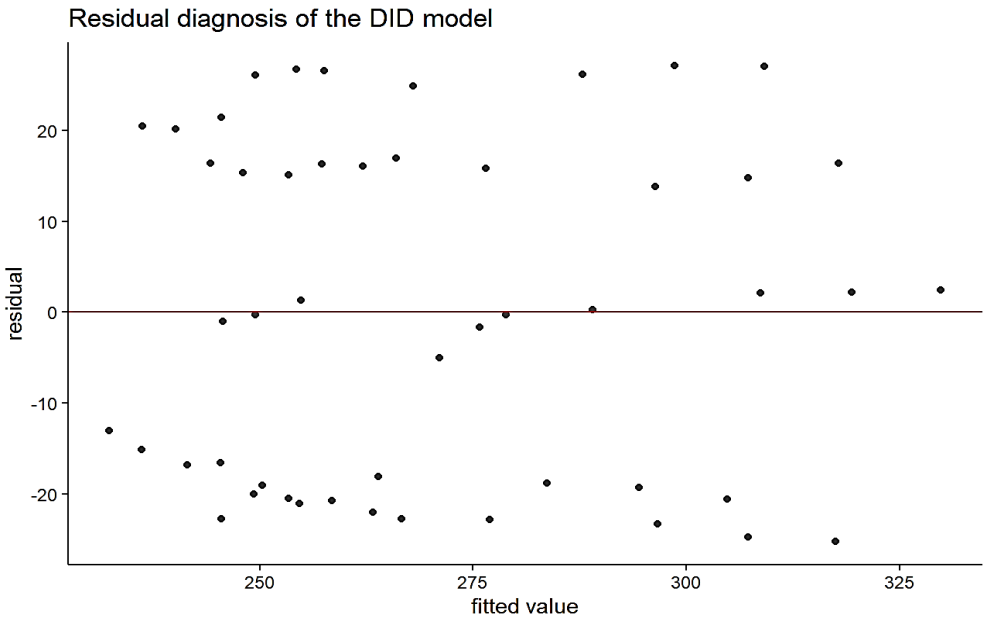

Figure 5: Residual Diagnosis of the DID Model

The traditional gender role concept is a significant factor contributing to the lower labor participation rate, lower career status and lower wage income of women in the labor market [7]. The California Salary Privacy Act aims to narrow the gender and racial pay gap and help minorities and women better participate in the labor market competition. The Wage Transparency Law requires companies to disclose wages in their job listings, enhancing the transparency of wage information in the labor market and thereby influencing the transmission effect of wage growth [8]. This has led to differences in the impact of wages on the CPI in Los Angeles and other cities. The Wage Privacy Act prohibits employers from asking job seekers about their past wages. This reduces the wage anchoring effect, meaning that employers can no longer rely on a candidate's previous low salary to set a lower offer. As a result, wages increase more rapidly. Wage increases will be transmitted to the CPI, but it may not be in a linear manner, causing the correlation between wages and CPI in Los Angeles after the policy, although it shows different performance compared to the control group, is not significant.

In conclusion, this policy improved the transparency of employment compensation and reduced the influence of wage historical information on the labor market, resulting in a change in the relationship between wages and CPI in Los Angeles after the implementation of the policy. The scatter plot and regression line show the differences in trends between the treatment group and the control group before and after the policy implementation. However, the formal estimation results of DID indicate that the coefficient of the impact of wages on CPI before and after the policy implementation did not change significantly. Maybe the wage privacy act mainly affects the wage negotiation process but has a relatively weak impact on the overall consumer price index.

4.2 Policy Recommendations

The wage privacy act has little impact on the overall CPI, but it may have a significant effect on certain cutting-edge industries. This is because in high-skilled industries, there are large salary differences and there is a serious information asymmetry between employers and job seekers [9]. Job seekers tend to switch to high-paying companies. In contrast, in low-income industries, wages are close to the minimum wage standard, and salary information within the industry is relatively transparent.

The government can formulate industry-specific support policies, requiring high-income industries such as technology and finance to disclose salary ranges for positions, while allowing low-income industries to flexibly adjust the wage negotiation model within a certain range to promote fairness among industries. The regulatory departments should establish a dynamic tracking system for wages and CPI, which cannot only assess the effectiveness of policies but also intervene promptly in case of inflation, ensuring fair development in all regions [10].

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5. Conclusion

This study employed the DID model to empirically analyze the impact of the "California Wage Privacy Act" implemented in 2018 on the relationship between wages and CPI. The study designated Los Angeles as the treatment group, selected four other major cities outside California in the United States as the control groups, and controlled for the factor of population size, aiming to isolate the effect of the policy. Visual analysis indicated that this policy had a moderating effect on the wage-CPI relationship in Los Angeles, and the slope of this relationship became gentler after the implementation of the policy. However, the core estimation results of the double difference model showed that the coefficient of the interaction term (Treat*Post) was not statistically significant. This suggests that although the policy may have changed the wage dynamics in the local area, its transmission effect on the overall price level is not strong enough. The main impact of this policy seems to be limited to the wage negotiation process itself, and its transmission effect on the overall consumer prices is limited and not statistically significant.

Although this study adopted a structured approach, some limitations still need to be acknowledged. Firstly, the sample size of this study is limited, consisting of only 50 data points, and the time span is relatively short, which restricts the statistical power and generalizability of the research results. Additionally, the analysis may be influenced by unobserved macroeconomic shocks uncontrolled structural economic differences between cities. Residual analysis also indicates potential omitted variable bias. Future research should overcome these limitations by including more cities, more specific period divisions, and larger data sets. Moreover, subsequent research can delve deeper into industry-level heterogeneity to reveal significant effects within specific industries that might have been masked in the overall analysis.

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