Did Early Termination of Pandemic Unemployment Benefits Reduce Unemployment? Evidence from U.S. States in 2021

Michael Zhao

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Abstract

In the summer of 2021, the benefits were terminated early in twenty-six U.S. states to alleviate the problem of labor shortages, whereas the other states continued the benefits until their expiration in September. This study examines the causal effect of the reduction in the generosity of the unemployment insurance benefits using the natural experiment of the policy divergence in the continuation of the benefits in the states. A panel dataset is created by combining the labor market data from the BLS. The empirical model is based on the current version of the DiD estimator developed by Callaway and Sant'Anna [1], which is a robust approach to addressing the substantial negative weighting biases that are present in the TWFE model under the scenario of the staggered adoption of the policy. Following the macroeconomic evaluation literature, it is expected that the early termination of the benefits encouraged the beneficiaries to return to the labor market, which could reduce the unemployment rate by up to 0.3 percentage points. However, the results do not support this simple expectation. The statistical results show that in treated states, an early end to the pandemic unemployment benefits had some marginal effects on the higher state unemployment rate in comparison to the control group states, and the overall positive

effect on the state unemployment rate was mainly influenced by the June 2021 sample. Moreover, the dynamics also reveal that the positive effect of the early termination of the pandemic unemployment benefit did not come into play right away, but it grew gradually over time.

1 Introduction

One of the most important components of the welfare system is unemployment benefits, which help stabilize household income during periods of job loss. At the same time, unemployment benefits may also affect incentives to search for work and accept employment. The unprecedented disruption in the labor market caused by the COVID-19 pandemic led to equally unprecedented fiscal intervention in the United States. Through legislation such as the CARES Act and the American Rescue Plan, the federal government expanded unemployment insurance (UI) through programs such as Pandemic Unemployment Assistance (PUA) and Federal Pandemic Unemployment Compensation (FPUC), extending coverage to nontraditional workers and substantially increasing the generosity of benefits.

In classical macroeconomic theory, especially in the Mortensen–Pissarides search and matching framework, UI benefits create a central trade-off. On the one hand, they act as automatic stabilizers by supporting aggregate demand during downturns. On the other hand, they may reduce job-search intensity by increasing reservation wages and lowering the urgency of re-employment. In theory, more generous UI benefits can lengthen unemployment duration and slow the transition back into employment. Because pandemic-era benefits often raised replacement rates to historically unusual levels, sometimes exceeding prior earnings for low-wage workers, the COVID period provides an especially useful setting for evaluating how benefit generosity affects labor market outcomes.

An important feature of the U.S. labor market in 2021 is that the expanded federal UI programs did not end at the same time in every state. In June and July 2021,

governors in twenty-six states chose to terminate participation in programs such as FPUC and PUA before the nationwide expiration in September 2021. This staggered policy timing created a natural experiment: some states experienced an earlier reduction in benefit generosity, while others continued under the federal programs for several more months. This cross-state policy divergence provides a useful setting for estimating the effect of a sudden reduction in UI generosity on state-level unemployment.

The discussion surrounding this policy changed in 2021 to be focused on labor shortages during the recovery phase of the economy. Those who opposed the federal pandemic unemployment assistance programs suggested that these benefits were so generous that they could possibly have discouraged people from returning to work. The rationale behind this is clear: some states ended their unemployment assistance programs before their official end in September 2021 because of this reason. It is possible that the June and July treatment groups differ based on how long after the termination of the state's program these programs ended federally.

The theoretical contributions of the literature on unemployment insurance considered in this paper include Acemoglu and Shimer's discussion of the impact of unemployment insurance in terms of income smoothing, search behavior, wage determination, unemployment probability, and investment. Hence, the literature shows that the labor-market effects of unemployment insurance may not be limited to providing a disincentive mechanism in just one direction [4]. During the pandemic crisis, Marinescu, Skandalis, and Zhao find that the $600 FPUC supplement decreased the quantity of job application submissions without reducing vacancy creation, thereby helping explain how larger unemployment benefits did not lead to lower employment levels in a situation of extreme labor-market disruption [5]. Regarding the 2021 period in question, Coombs et al. note that early termination of UI payments led to higher employment levels among some beneficiaries, although their earnings increases were not able to compensate for the lost unemployment benefits and spending levels dropped significantly as well [6]. Holzer, Hubbard, and Strain study early benefit expiration across states and estimate

that the policy increased transitions from unemployment to employment, which would have lowered the national unemployment rate by around 0.3 percentage points if the entire country had ended benefits in June [7]. Compared to these studies, this paper analyzes state-level monthly unemployment rates in a June–July treatment-group design by using the Callaway and Sant'Anna framework.

To identify this effect, this paper uses the multi-period Difference-in-Differences framework developed by Callaway and Sant'Anna (2021) [1]. This approach is especially appropriate because treatment timing differs across states and the effects of treatment may vary across groups and over time. In such settings, the standard Two-Way Fixed Effects (TWFE) estimator may not recover a causally meaningful average treatment effect. Goodman-Bacon (2021) shows that, under staggered adoption, TWFE is a weighted average of many two-by-two comparisons, and some of those weights can be problematic when treatment effects are heterogeneous [2]. Sun and Abraham (2021) further show that conventional event-study specifications with leads and lags can be contaminated by treatment effects from other periods, which can even create misleading pre-trend patterns [3]. For this reason, I rely on the group-time average treatment effect, $ATT(g,t)$, which compares each treated cohort to clean control units and is more appropriate for this staggered policy setting.

This paper studies whether the early termination of pandemic unemployment benefits reduced unemployment rates during the recovery period. Section 2 introduces the data and variables. Section 3 presents the empirical methodology based on Callaway and Sant'Anna (2021). Section 4 reports the main results and graphical evidence. Section 5 discusses the findings. Section 6 concludes.

2 Data and Variables

2.1 Data Sources

This paper utilizes a panel dataset of the 50 U.S. states from January 2020 to December 2022. The data are collected from the Bureau of Labor Statistics and accessed through the Federal Reserve Economic Data (FRED) system [8]. The sample period is chosen to cover the beginning of the labor market disruption triggered by the COVID-19 pandemic in 2020, the peak of the disruption in 2020, the policy divergence in 2021, and the recovery in 2022.

The treatment-related data are based on the early termination of federal pandemic unemployment programs in 2021. During June and July 2021, some states discontinued their participation in Pandemic Unemployment Assistance (PUA) and Federal Pandemic Unemployment Compensation (FPUC) before the nationwide expiration in September 2021. Out of the full sample, 26 states are classified as treated states and 24 states are classified as comparison states. Washington, DC is not included in the dataset, and therefore the analysis is based only on the 50 states.

2.2 Variables

The primary outcome variable is the monthly unemployment rate, denoted by Y_{it}, where i indexes states and t indexes months. This variable measures the share of the labor force in state i that is unemployed in month t.

For the descriptive analysis, I construct the indicator $EverTreated_i$. This indicator equals 1 if a state terminated the federal pandemic unemployment programs early in 2021 and 0 otherwise.

For the causal analysis, the main treatment-timing variable is the first month in which a state terminated the federal programs. In the dataset, this is recorded as `termination_month`. States that did not terminate the programs early are classified as never-treated units. I also use the post-treatment indicator `treated`, which equals

1 if a state is in the post-termination period and 0 otherwise. Although the `treated` indicator is used in the analysis in the next section, the main empirical strategy relies on treatment timing rather than a simple treatment dummy.

Table 1 reports the main variables used in the analysis.

Table 1: Variable Definitions

Variable	Description
`unemployment_rate`	Monthly state unemployment rate (%).
`termination_month`	First month of early termination in YYYYMM format; coded as 0 for never-treated states. In the current dataset, the treatment timing values are 202106, 202107, or 0.
`treated`	Indicator equal to 1 if the observation is in a post-termination month for a treated state, and 0 otherwise.
`state`	Two-letter state abbreviation.
`month_year`	Calendar month in YYYYMM format.

2.3 Descriptive Statistics

Table 2 presents summary statistics for the unemployment rate over the full sample period. The average state unemployment rate in the full sample is 5.18 percent. The treated states have a lower average unemployment rate than the comparison states, with means of 4.63 percent and 5.77 percent, respectively. The full sample maximum is 30.5 percent, reflecting the very large pandemic spike observed in April 2020.

Table 2: Summary Statistics of State-Level Unemployment Rate, 2020–2022

Group	Obs.	Mean (%)	Std. Dev.	Min (%)	Max (%)
Full Sample (All States)	1800	5.18	2.95	1.80	30.50
Treated States (Early End)	936	4.63	2.41	1.80	16.90
Control States (Maintained)	864	5.77	3.35	2.10	30.50

To better compare labor market conditions across time, Table 3 reports average unemployment rates by treatment status for three periods: the pre-treatment period, the

summer 2021 divergence window, and the post-expiration period. In the pre-treatment period from January 2020 to May 2021, treated states had an average unemployment rate of 6.08 percent, while comparison states had an average of 7.63 percent. During the divergence window from June to August 2021, the corresponding averages were 4.21 percent and 5.43 percent. In the post-expiration period from September 2021 to December 2022, the averages fell further to 3.18 percent and 3.85 percent.

These differences show that treated states had lower unemployment levels even before the policy change. For that reason, the empirical analysis should not rely on simple level comparisons alone. Instead, the identification strategy in the next section focuses on differences in trends and treatment timing across states.

Table 3: Average Unemployment Rate by Period and Treatment Status

Period	Treated States	Control States	Difference (T-C)
Pre-Treatment (Jan 2020–May 2021)	6.08	7.63	-1.55
Divergence Window (Jun 2021–Aug 2021)	4.21	5.43	-1.22
Post-Expiration (Sep 2021–Dec 2022)	3.18	3.85	-0.67

2.4 Graphical Evidence

Figures 1, 2, and 3 depict choropleth maps of state-level unemployment rates in January 2020, April 2020, and December 2022. The time periods were chosen to represent the beginning, peak, and end of our sample. Each map uses a standard color scale ranging from 0 percent to 30.5 percent. This enables cross-sectional comparison of unemployment rate intensities. The difference in January 2020 and April 2020 represents the significant increase in unemployment rates during the initial pandemic shock. The map for December 2022 shows that unemployment rates had returned to much lower levels at the end of our sample.

Figures 4 and 5 illustrate state-level unemployment rate trajectories for the early termination states and comparison states, respectively. The distinction between the two figures makes it possible to evaluate patterns in each group. For the early termination states, the vertical line in each panel represents the month in which early termination

occurred. Both sets of states exhibit significant increases in unemployment rates in early 2020, followed by decreases in subsequent periods. However, there is considerable variation in state-level trajectories. This visual evidence motivates the difference in differences that follows.

3 Methodology

3.1 Empirical Strategy

This study seeks to investigate the effects of the termination of federal pandemic unemployment benefits on the unemployment rates of states in the United States. The dependent variable used in this analysis is the monthly unemployment rate of each state. The treatment states include those states that terminated the pandemic unemployment benefits in June or July 2021, whereas the comparison states are those that maintained the federal pandemic unemployment programs until the nationwide expiration in September 2021.

The analysis follows a standard Difference-in-Differences (DiD) design, which compares changes in unemployment rates in the treatment states with those in the comparison states. However, the analysis in this study does not fall strictly within the simple two-group, two-period Difference-in-Differences framework because the treatment timing is not uniform across states. Some states terminated the pandemic unemployment benefits in June 2021, whereas others terminated them in July 2021.

3.2 Callaway and Sant'Anna's DiD Method

This study utilizes the multi-period Difference-in-Differences approach developed by Brantly Callaway and Pedro H. C. Sant'Anna [1]. This Difference-in-Differences approach is specifically designed for studies that involve multiple time periods and heterogeneous treatment timing. The proposed approach does not assume a common aggregate effect of the program for all treated states. Instead, it separately estimates

the effect for each treatment group. Let G_i denote the first treatment period for state i, where $G_i = 0$ for never-treated states. The main parameter of interest is the group-time average treatment effect, $ATT(g,t) = E\left[Y_t(1) - Y_t(0) \mid G_i = g\right]$, where g represents the initial treatment period for a specific group and t represents the time period in which the effect is measured. In this setting, $ATT(g,t)$ captures the average effect of early benefit termination for states first treated in period g when evaluated in period t.

This approach is appropriate for this study because the standard Difference-in-Differences approach, as implemented by the two-way fixed effects (TWFE) estimator, does not perform well in staggered treatment designs. Goodman-Bacon shows that if the timing of treatment varies across groups, the TWFE estimator becomes a weighted average of many Difference-in-Differences estimates [2]. The results of TWFE are difficult to interpret when treatment effects vary across time periods. In addition, Sun and Abraham show that the standard event-study regression, even with leads and lags, may suffer from bias when treatment effects differ across periods [3]. Therefore, the approach proposed by Callaway and Sant'Anna appears to be more appropriate for this study [1].

For this study, the treatment groups are the states that terminated the benefits for the first time in June 2021 and the states that terminated the benefits for the first time in July 2021. The states that did not terminate the benefits early are considered the never-treated group. Once the group-time effects are estimated, they can be combined to compute the aggregate effect of the program.

3.3 Identification Assumptions

The first assumption used for identification is the parallel trends assumption. In this case, it means that in the absence of the early termination of benefits, the trends in unemployment rates for treated states and untreated states would be similar. This assumption does not require treated and untreated states to be similar in terms of levels. Rather, it requires that the untreated trends of these states be similar over time.

The second assumption is no anticipation. This assumption requires that states should not experience any treatment effect prior to the termination month. In other words, unemployment outcomes should not already reflect the policy effect before the official termination of the federal programs.

The third assumption is irreversibility. This means that once states terminate the programs early, they remain treated in all subsequent periods. This assumption is satisfied in this setting because states did not return to the untreated status after terminating the programs.

3.4 Estimation and Dynamic Effects

This estimation follows a series of steps. First, the timing of treatment for each state is determined based on the month in which the federal unemployment programs were terminated. States that terminated the federal unemployment programs in June 2021 are considered one treatment group, whereas states that terminated them in July 2021 are considered a separate treatment group. States that did not terminate the federal unemployment programs early are considered the never-treated group.

Second, the estimation of $ATT(g, t)$ for each treatment group and time period is carried out. In other words, this involves comparing the unemployment outcomes of the treated states with those of the never-treated states. According to Callaway and Sant'Anna, this can be achieved through outcome regression, inverse probability weighting, or a combination of both.

Third, the estimated group-time effects are combined in a way that produces both an average treatment effect and a dynamic effect by event time. Combining the results allows for a better understanding of the impact of terminating unemployment benefits. This is important because the effect of terminating unemployment benefits may not appear immediately, but instead may build up over time.

For inference, standard errors and confidence intervals are reported. The results may also be presented graphically to show the evolution of the effect of terminating

unemployment benefits over time. This helps determine whether the estimated effects are close to zero before treatment begins and how they evolve afterward.

4 Results

4.1 Main Result

The main finding of this study is that the early termination of federal pandemic unemployment benefits is associated with a higher unemployment rate in treated states relative to comparison states. Using the Callaway and Sant'Anna multi-period Difference-in-Differences method, the overall aggregated treatment effect is estimated to be about 0.495 percentage points. The estimate is statistically significant, with a 95 percent confidence interval ranging from 0.194 to 0.796. This means that, on average, states that terminated the federal unemployment programs early had unemployment rates that were about half a percentage point higher than those of the comparison states after treatment.

This result does not support the simple expectation that ending unemployment benefits early would immediately reduce unemployment. Instead, the estimates suggest that early termination was associated with somewhat worse unemployment outcomes, although the size of the effect is not very large when measured using the state-level unemployment rate.

4.2 Dynamic Effects

Figure 6 plots the dynamic treatment effects by length of exposure. The pre-treatment estimates are generally close to zero, which provides some support for the parallel trends assumption. However, there is also noticeable instability in the earlier pre-treatment periods, especially at event time -14, where the estimate is unusually negative and imprecise.

The post-treatment estimates show a clearer pattern. In the early post-treatment

periods, the estimates are close to zero. As the length of exposure increases, the estimates become more positive. In the later post-treatment periods, the estimated effects are around 0.8 to 0.9, and the confidence intervals no longer include zero. This suggests that the effect of terminating federal unemployment benefits early was not immediate. Instead, it built up gradually over time.

Overall, the dynamic aggregation results suggest that early termination did not produce a sharp decline in unemployment. Rather, the estimated treatment effect becomes more positive as exposure length increases, which is consistent with higher unemployment rates in treated states over time.

4.3 Cohort-Specific Results

Table 4 reports selected post-treatment group-time effects for the June 2021 cohort and the July 2021 cohort. For the June 2021 cohort, the estimate is close to zero in the treatment month itself, at -0.0158. As time passes, the estimates become larger. The estimate rises to 0.2316 after three months and to 0.4565 after six months. It continues to increase, reaching 0.6584 after nine months, 0.8236 after twelve months, and 0.8451 by December 2022. Beginning around six months after treatment, the confidence intervals no longer include zero, which suggests that the effect becomes statistically meaningful over time.

These results show that the June 2021 cohort is the main source of the positive overall treatment effect. For this group, the estimated effect grows over time and remains positive through the end of the sample period.

The pattern for the July 2021 cohort is much weaker. The estimates are smaller and much less precise. The estimate in the treatment month is -0.0780, and the following estimates remain negative or close to zero for several months after treatment. Although the estimates later become slightly positive, the confidence intervals remain wide and continue to include zero throughout. By December 2022, the estimate is only 0.0190, again with a wide confidence interval.

Taken together, these results suggest that the overall positive effect is driven mainly by the June 2021 cohort rather than the July 2021 cohort. One possible explanation is that the July 2021 cohort is estimated less precisely.

Table 4: Selected Post-Treatment Group-Time Effects

Cohort	Month	Months Since	ATT(g,t)	Std. Error	95% CI
June 2021 cohort	2021-06	0	-0.0158	0.0322	[-0.1075, 0.0759]
June 2021 cohort	2021-09	3	0.2316	0.1280	[-0.1328, 0.5960]
June 2021 cohort	2021-12	6	0.4565	0.1545	[0.0167, 0.8964]
June 2021 cohort	2022-03	9	0.6584	0.1822	[0.1396, 1.1772]
June 2021 cohort	2022-06	12	0.8236	0.2135	[0.2158, 1.4315]
June 2021 cohort	2022-12	18	0.8451	0.2345	[0.1774, 1.5128]
July 2021 cohort	2021-07	0	-0.0780	0.0449	[-0.2057, 0.0497]
July 2021 cohort	2021-10	3	-0.1680	0.1366	[-0.5571, 0.2211]
July 2021 cohort	2022-01	6	-0.1200	0.2061	[-0.7068, 0.4668]
July 2021 cohort	2022-04	9	0.1020	0.2981	[-0.7469, 0.9509]
July 2021 cohort	2022-07	12	0.2370	0.3470	[-0.7509, 1.2249]
July 2021 cohort	2022-12	17	0.0190	0.4589	[-1.2875, 1.3255]

4.4 Interpretation

Overall, the results do not suggest that early termination reduced unemployment. If anything, the estimates indicate somewhat higher unemployment in treated states after treatment, although this pattern is driven mainly by the June 2021 cohort and should be interpreted with caution.

5 Discussion

The findings of this paper are counter to the simple expectation that reducing unemployment benefits should quickly improve labor market outcomes. The early termination of pandemic unemployment benefits did not go together with falling state-level unemployment in the current sample. Instead, the estimates reveal somewhat higher unemployment rates in treated states after the policy, with the net positive effect being driven largely by the June 2021 cohort. Therefore, the results do not provide grounds for claiming that early termination led to better labor-market outcomes during the

recovery period.

One explanation is that the reduced generosity did not lead to immediate and robust increases in employment. The unemployment rates at state levels depend not only on the job search decisions of individual beneficiaries but also on aggregate factors and dynamics. As a consequence, even if the reduction had some effect, the labor market might have taken time to adjust to the changed conditions. The above explanation appears consistent with the observed dynamic pattern where effects were almost zero at the earliest post-treatment horizons but started moving toward more positive figures at the subsequent periods. Hence, the results suggest that the process of adjusting labor markets to changes in the generosity of benefits was not immediate.

An additional reason could be that the 2021 labor market was still recovering from the pandemic, and thus, the adjustments occurred slowly and complicatedly. People in need might not have found appropriate jobs yet, and the employers did not make enough efforts to adjust their hiring practices, leading to the failure to observe any immediate changes. Moreover, the labor market in 2021 was likely affected by several phenomena simultaneously, such as patterns of reopening and different degrees of recovery across states. Overall, the process of adjusting to lower unemployment benefit generosity became a part of the overall recovery and thus was hardly noticeable.

The difference between the effects of early termination among June and July 2021 cohorts is also noteworthy. The former one demonstrates much more consistent results than the latter one, with estimates being much less precise in the latter case. It can be interpreted either as evidence that the states making earlier decisions had a more extensive window of observation prior to the nationwide cutoff in September or as the result of lower precision. Nevertheless, it means that the general finding is specific to the June 2021 cohort.

Some precautionary notes should be added. First, the pre-treatment estimates include some fluctuations and, hence, cannot be considered entirely stable. Second, the July 2021 cohort appears to be estimated with far less precision compared to the other

one. Altogether, those findings do not mean that unemployment insurance does not affect labor supply behavior or that the reduction of benefits always leads to negative outcomes on labor markets. On the contrary, the results suggest that in this specific context, it did not lead to the expected improvements in state-level unemployment in 2021.

6 Conclusion

This study aims to evaluate the impact of the early withdrawal of federal pandemic unemployment benefits on the labor market in the United States during 2021. Using state-level monthly unemployment data from January 2020 to December 2022, we apply the multi-period difference in differences approach developed by Callaway and Sant'Anna. This approach aims to evaluate whether the withdrawal of federal pandemic unemployment benefits reduced unemployment in the United States during the recovery period.

The study finds that the withdrawal of federal pandemic unemployment benefits did not result in reduced unemployment. Rather, it shows that the unemployment rate in treated states is marginally higher than that in comparison states. The study also finds that the aggregate treatment effect is positive and statistically significant. This shows that the withdrawal of federal pandemic unemployment benefits did not result in the expected immediate labor market improvement. The dynamic specification also shows that the treatment effect is small in the first post-treatment periods but intensified in later periods. Furthermore, the study shows that the positive aggregate effect is driven by the June 2021 cohort. However, estimates for the July 2021 cohort have lower precision.

In total, these findings suggest that decreased generosity of the unemployment insurance program did not lead to lower state-level unemployment in the short run. Overall, it can be concluded that the effect of the change in the generosity of the unemployment insurance program on workers' behavior cannot be seen in terms of its purely disincen-

tive impact. Nevertheless, the discussed conclusions must be treated carefully because of the presence of a noisy signal in pre-treatment estimates and low estimation quality for the group in July 2021.

The findings above collectively imply that the termination of the pandemic-related benefits did not generate the expected improvement in unemployment.

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A Figures



Figure 1: State Unemployment Rates in January 2020

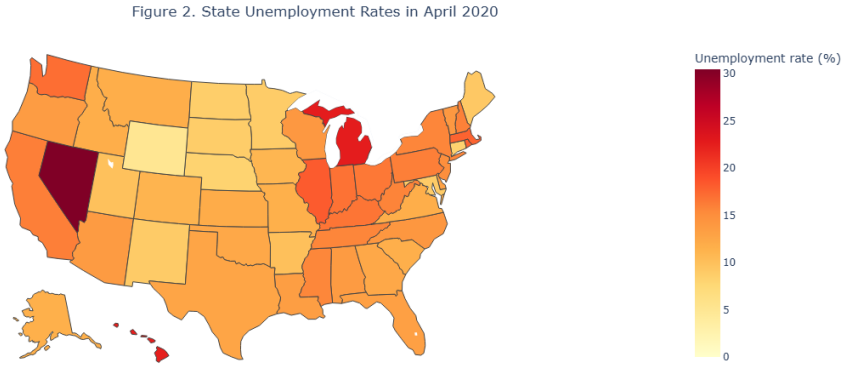


Figure 2: State Unemployment Rates in April 2020

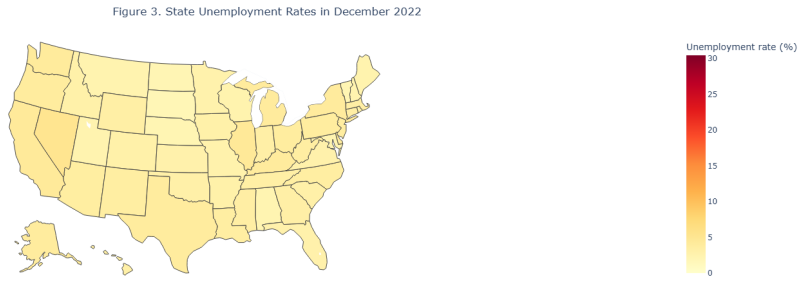


Figure 3: State Unemployment Rates in December 2022

Figure 3. State-by-State Unemployment Paths: Early Termination States

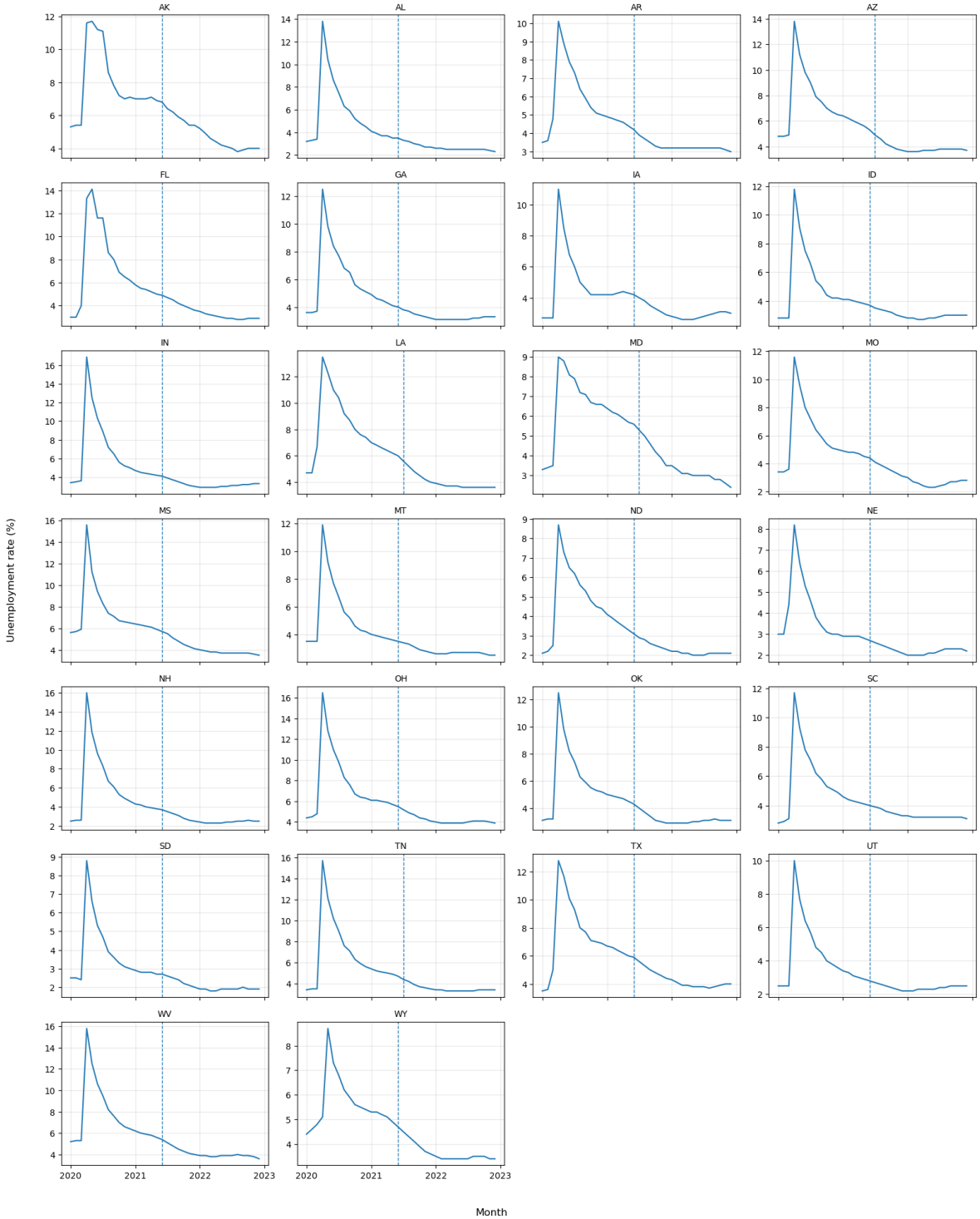


Figure 4: State-by-State Unemployment Paths: Early Termination States

Figure 4. State-by-State Unemployment Paths: Comparison States

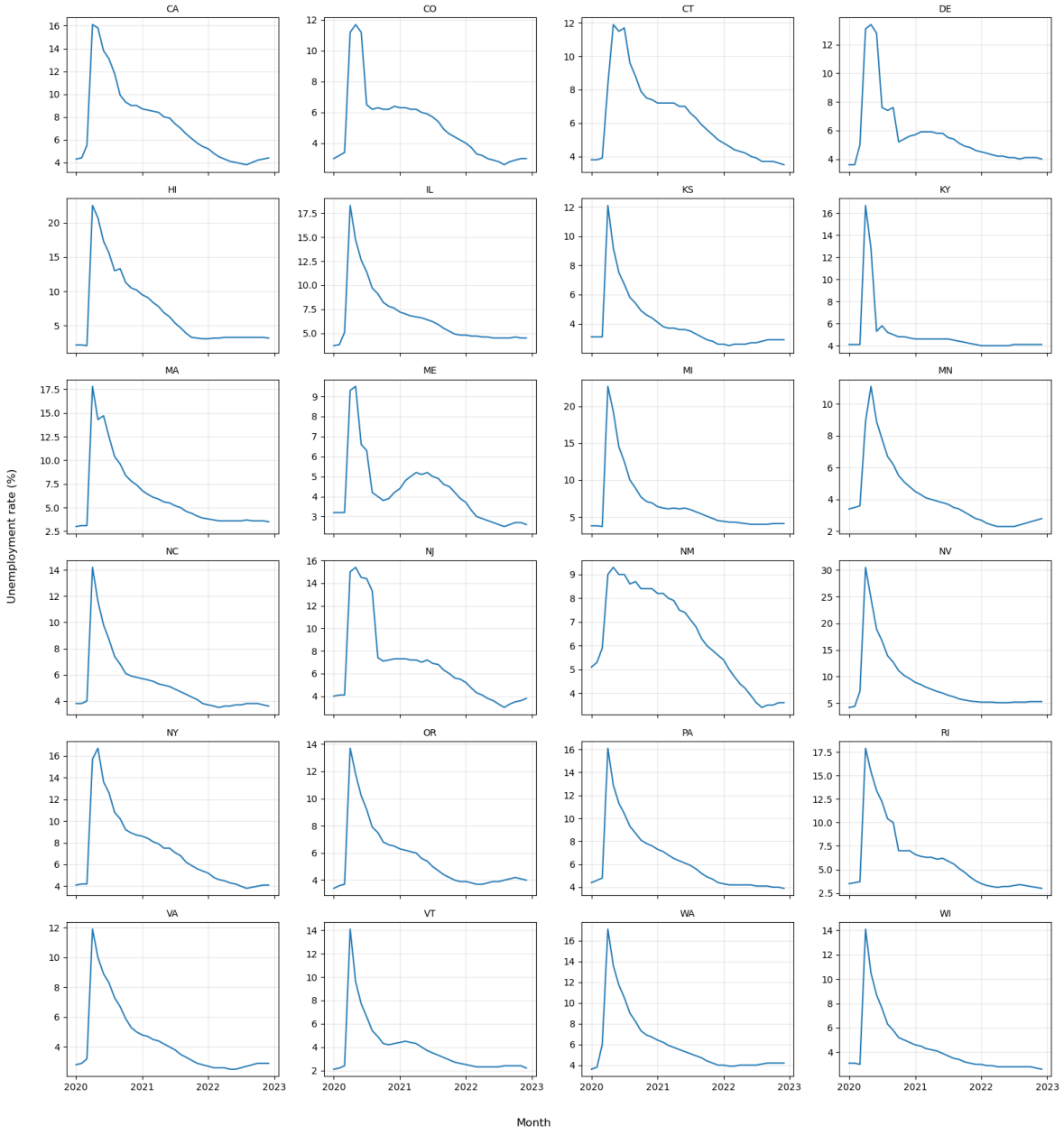


Figure 5: State-by-State Unemployment Paths: Comparison States

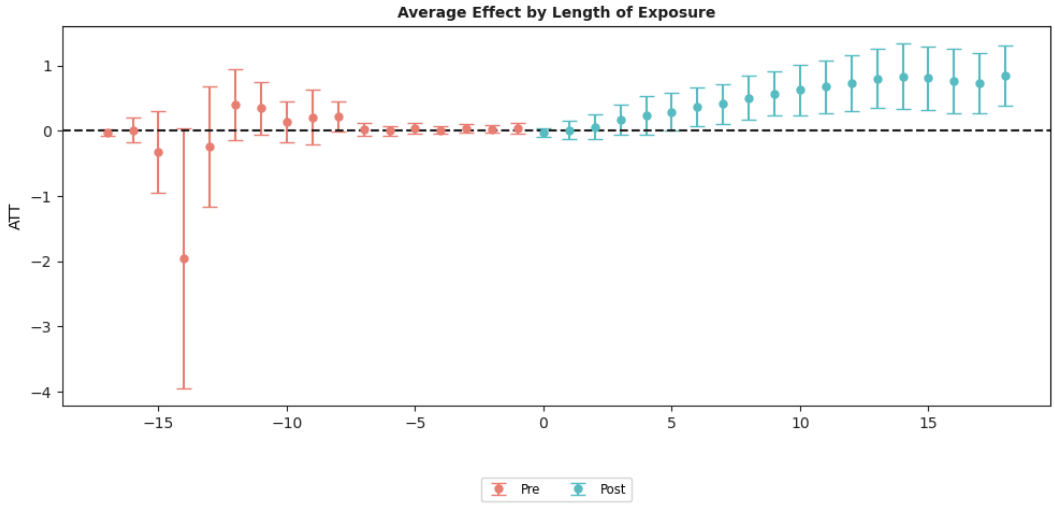


Figure 6: Dynamic Treatment Effects by Length of Exposure