

# **Empirical Project: Affordable Housing Legislation**

How do Affordable Housing Policies Change Rent Prices  
in the Mountain West?

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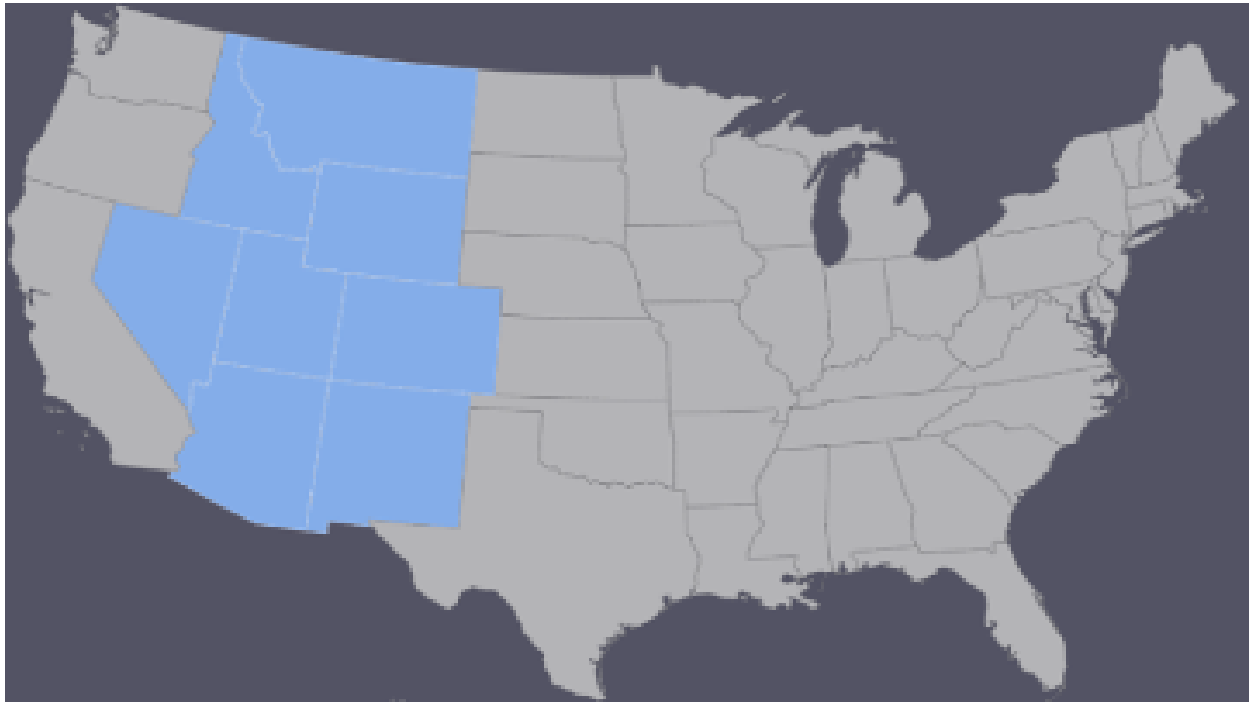
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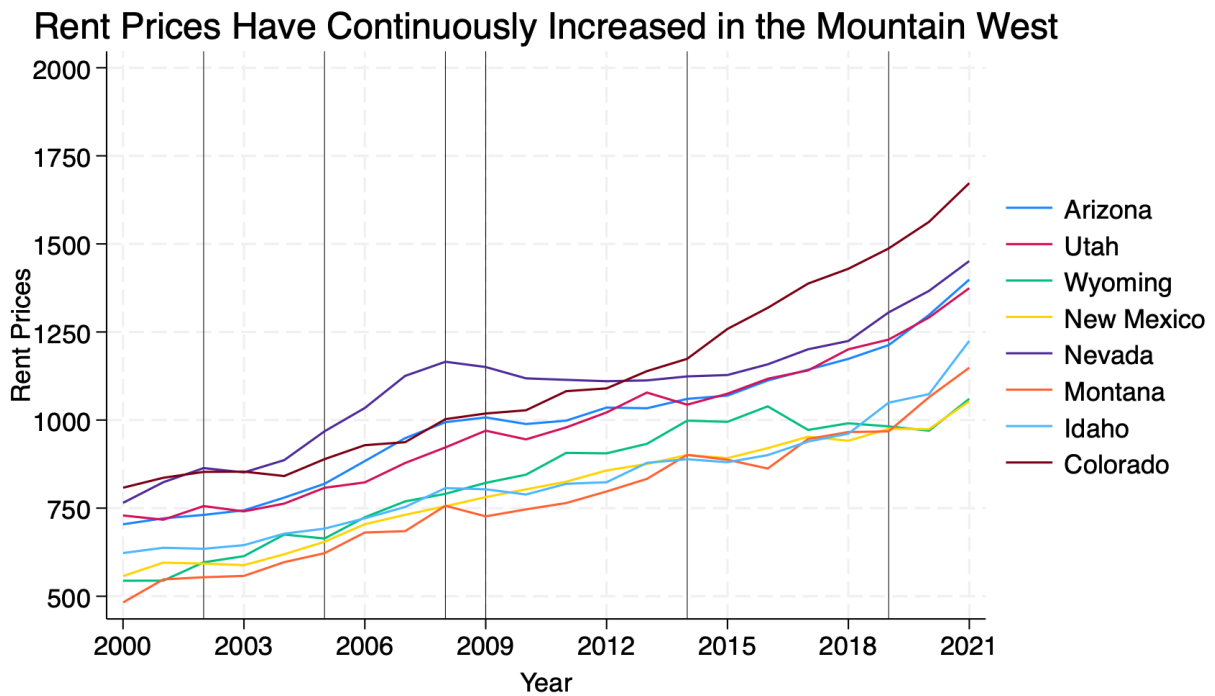
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## Background

Since the turn of the century, the persistent rise in housing costs across the United States has posed challenges for most individuals, especially prospective first-time homeowners aiming to accumulate long-term wealth through real estate ownership. These spikes in housing prices have also resulted in increased homelessness, the generational wealth gap worsening, and delayed retirement. These price increases have directly hindered the ability of younger generations to enter the real estate market forcing them to rent instead. The direct effect of housing price increases on the rental market compounds the overall effect of this issue. This research aims to assess the impact of state legislature initiatives focused on housing affordability on rent prices within the Mountain West region (Figure 1). Amidst widespread media coverage highlighting the substantial increases in rental prices in recent years, this study seeks to empirically examine the relationship between legislative interventions and rental market trends.



**Figure 1** displays the states of interest for this analysis. The states highlighted in blue represent the Mountain West States.



**Figure 2** displays rent prices by state between 2000 and 2021. The vertical lines denote the times of treatment (Housing affordability legislature).

Figure 2 provides evidence for the claim that rent prices have been continuously increasing for all states throughout the Mountain West. It is important to note the dip in rent prices around the year 2009 caused by the Great Recession. Interestingly, rent prices in New Mexico and Wyoming have remained stable during this time, suggesting that the housing market in these states is potentially less sensitive to nationwide economic factors. Furthermore, the states of Colorado, Nevada, Arizona, and Utah historically have higher rent prices than Idaho, Montana, New Mexico, and Wyoming. After further research, it was found that the states with historically lower rent prices also had lower state populations relative to the other states using data from the West Region 2020 census.

## **II. Empirical Strategy**

### *Data*

To determine the impact of the affordable housing legislature on rent prices, data was gathered from the American Community Survey (ACS), which was created by the Census Bureau to record population and household statistics each year. The collected data contains statistics spanning from the year 2000 through 2021 and holds variables that include the state, year, rent prices, and when an affordable housing policy was enacted for each given state in the Mountain West. Since rent prices are collected at the household level, all of the extracted data was observed at the same household level. In order to correctly run our empirical models, we aggregated this data into the average rent price in a state each year. The specific legislature geared towards affordable housing in each state was found on government websites for each state in the Mountain West. The goal was to find a significant policy that directly affected rent prices in each state.

### *Empirical Methods*

We implemented two strategies to analyze the effect of affordable housing legislation on rental prices in the Mountain West. The two empirical methods that we used in our analysis were an event study and the local projections difference-in-differences model (LP-DID).

The event study is a statistical method that centers observations around when a treatment has occurred. In our situation, we centered our states around when legislation was enacted and analyzed our findings from there. This event study allowed us to validate the common trends assumption as well as analyze how Mountain West states reacted post-policy. All eight Mountain West states passed an affordable housing act between 2002 and 2019 as shown below in Figure 3. The LP-DID model is a more advanced event study that helps solve some biases that arise with how controls are used in a model. This empirical model provided a secondary view of the relationship between rental prices and the Mountain West.

State	Year	Treatment/Policy/Bill
Arizona	2002	<b>Arizona Low Income Housing Tax Credit:</b> This program aimed to incentivize the construction of affordable housing.
Montana	2005	<b>Montana Coal Tax Affordable Housing Program:</b> This program utilized coal tax revenue to fund affordable housing projects.
Utah	2008	<b>Utah Housing Preservation Initiative:</b> This initiative aimed to preserve and rehabilitate affordable housing units.
New Mexico	2009	<b>Affordable Housing Tax Credit:</b> This tax credit program encouraged affordable housing development.
Wyoming	2014	<b>Wyoming State Loan and Investment Board Housing Trust Fund:</b> Established to support affordable housing projects.
Nevada	2019	<b>SB 151:</b> This bill established the Nevada Affordable Housing Account to fund affordable housing initiatives.
Idaho	2019	<b>HB 409:</b> This bill aimed to improve affordable housing availability by addressing regulatory barriers. Includes property tax cap.
Colorado	2019	<b>House Bill 19-1319:</b> This bill addressed Colorado's affordable housing funding and initiatives.

***Figure 3** breaks down the treatments of housing affordability legislation in each state. The first column includes the states of interest, the second column contains the year legislation was enacted, and the third column has a brief description for each legislature.*

Both the event study and LP-DID model controlled for state and time-fixed effects in their overall analysis. By controlling for state-fixed effects, differences across states such as GDP are accounted for. Additionally, the year fixed effects account for factors that vary across years such as a nationwide policy on housing prices being enacted in a specific year. Removing variability over years and by state helps eliminate most sources of omitted variable bias that would occur in our models. The negative weighting biases are solved by the LP-DID model and by comparing that to our event study, we are able to analyze the magnitude of those specific biases.

Our event study model is as follows:

$$Y_{st} = \sum_{\tau} \beta_{\tau} 1(t - E_s = \tau) + \gamma_s + \theta_t + \varepsilon_{st}$$

Where,

$Y_{st}$ : Outcome

$t$ : Calendar year

$t - E_s$ : Event time

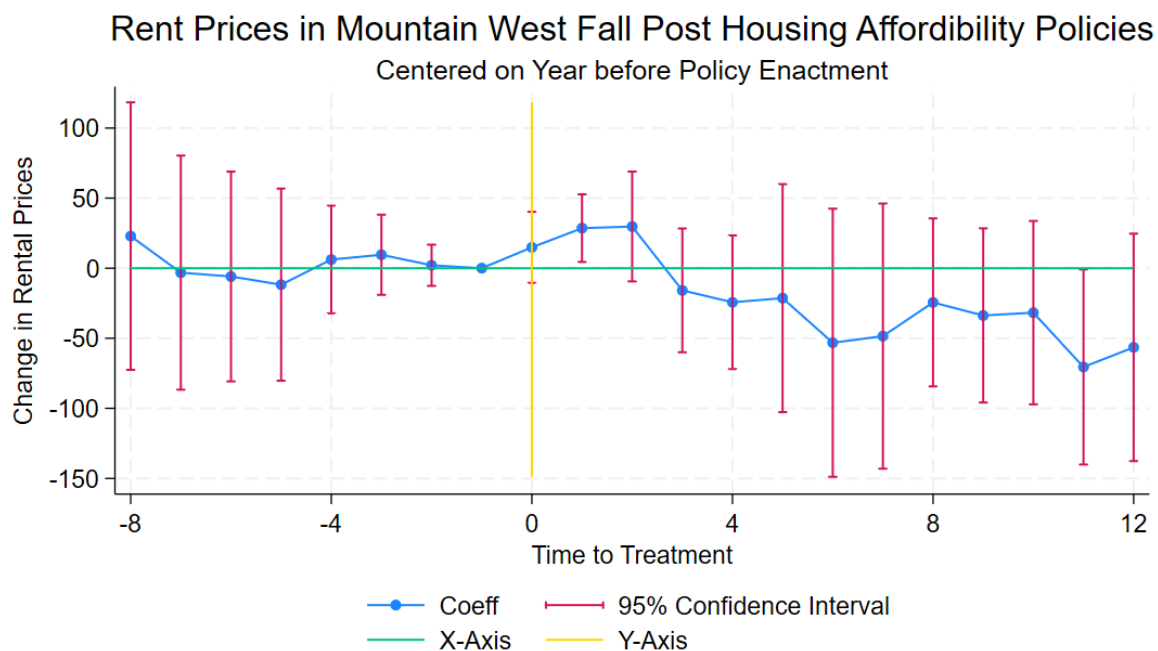
$E_s$ : Year of first policy enactment

$\beta_T$ : Average change in rental prices between time T and the year before policy enactment

$\gamma_s$ : State fixed effects

$\theta_t$ : Year fixed effects

In this setting,  $t-E_s$  is what differentiates states that have already enacted a policy from those that have not yet. This equation is used in calculating the overall event time of the study which is what centers all observations on the year of legislation. Event time is the driving force behind running an event study and LP-DID model.



**Figure 4** is a plotted event study that is centered on event time = -1. This chart explains the impact of affordable housing legislation on rent prices in Mountain West states, and how these states were trending pre-policy

### III. Analysis

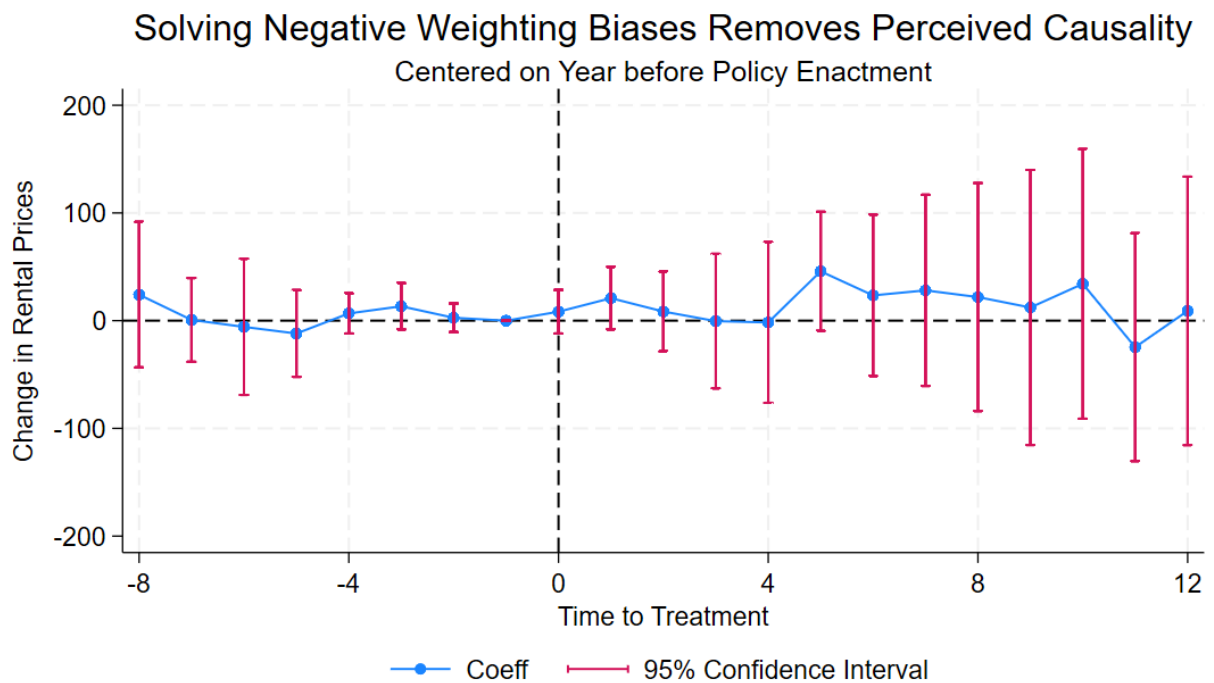
The visualization above (Figure 4) depicts an event study of rent prices in the Mountain West with the observed event being affordable housing policies were enacted. This event study is centered on event time = -1, the period before an affordable housing act was enacted in a given state. By centering our observations on the year before

policy enactment, we are able to observe the effect that enacted legislation had. By observing our 95% confidence intervals we can draw two conclusions from this empirical method. The common trends assumption is satisfied, and we are not able to fully determine causality from this analysis.

The common trends assumption is validated when the observed groups move similarly to each other pre-treatment. All confidence intervals with a negative event time have confidence intervals that cross the x-axis. By crossing the x-axis, there is a possibility that our observations have a zero effect at this period. Because of this, we can come to the conclusion that there were no pre-trends in our model.

Unfortunately, our 95% confidence intervals also cross the x-axis post-treatment. Looking at just the plotted coefficients, it seems as though we have reasonable causality. There is a slight increase in rental prices after policy enactment, which can be explained by things such as long-term tenet contracts or that the legislation took some time for the impact to be felt truly. In the third year after the policy, we see the change in rental prices go negative and continue to trend in that direction. This is following our overall hypothesis, but as we were observing earlier, the confidence intervals all cross zero. With this in mind, there is a possible scenario where the housing legislation had no overall effect on rental prices.

Although we are not able to determine negative causality, we observe a likely scenario where rental prices are not changing. This is even more interesting when taking a step back and once again looking at the background of this analysis. Rental prices have been consistently increasing throughout the 21st century. After legislation has been enacted, this rental price increase is predicted to stall or even fall. With most of the confidence intervals being below the x-axis, we can conclude that it is more likely than not that rental prices stagnated or decreased post-policy. There still exists a scenario where prices continue to increase, but that alternative is not as likely as our hypothesis. While we are not able to determine the true effect of this legislation, we can test pre-trends and validate the common trends assumption.



**Figure 5** is a visualization of a local projections difference-in-differences model. This chart solves negative weighting issues that exist in event studies while still describing the overall relationship between Mountain West rental prices before and after affordable housing legislation

Figure 5 displays a local projections difference-in-differences model (LP-DID). Similar to the event study, this model is studying rent prices with the observed event being enactments of affordable housing policies. This model is also centered on the period before an affordable housing act was enacted. This LP-DID model is not only similar to the event study in the way the data was used, but they have similar characteristics in how their models are estimated. The main difference between these models is how they define what controls to use in their overall estimations.

There are two types of states in our study, those who received a policy early and those who received a policy late. These two groups can be compared in four ways: early vs. never treated, early vs. late, late vs. early, and late vs. never treated. In our analysis, we do not have any states that never received treatment, so we only have two groups we are analyzing. The group that causes bias within our model is when we compare a late policy state to an early policy state. This bias occurs because if the policy affects the state earlier than the state we are analyzing, then using that as a comparison group does not define the true deviation for the late enactment state. These



incorrect estimates are defined as negative weighting and the LP-DID model accounts for this by redefining how they use states as controls.

In our model, a state is used as a control if they were not treated one year prior to the year we are observing. For example, Montana passed their affordable housing program policy in 2005. The LP-DID model uses rental price observations from Montana as a control from 2000 through 2005. It includes the year the policy was passed in Montana as a control because our specification is validation that this state did not have a policy in the previous year. By doing this, we are removing the negative weighting bias that existed in our base event study model.

Looking at the unbiased outcome of our method, we can come to some similar conclusions as we were able to with the event study. Once again, the 95% confidence intervals pre-treatment all cross zero and our estimates stay close to the x-axis. This reinforced the common trends assumption by showing that these observations were not being impacted by the negative weighting issues. After legislation, our observations have shifted from being negative to being mostly positive. These observations once again have confidence intervals that cross zero and are much closer to the x-axis than they were previously. There exists a likely scenario that rental prices increased or stalled, with the possibility of price decreases still existing. The removal of these negative weight biases switches the likely scenario from negative price decreases in the event study to positive price movements in our LP-DID model. This indicates that the negative weight that was removed by the LP-DID model was having a large effect on the overall estimates. We can come to a similar conclusion that we are not able to determine the true effect of this legislation as the confidence intervals all cross the x-axis.

#### **IV. Conclusions and Limitations**

Our study delved into the effects of affordable housing legislation on rent prices in the Mountain West region throughout the 2000s. Analyzing data from the American Community Survey (ACS) and utilizing an event study and local projections difference-in-differences model, we observed a consistent upward trend in rent prices across all regional states. Moreover, the research resulted in an improved grasp of the

limitations of the analysis and the complexities of the real estate market, underscoring the requirement to consider more nuanced or sporadic economic factors influencing rental prices.

The event study hinted at a modest post-policy downtrend in rental prices. However, the confidence intervals crossing the x-axis indicated potential zero effects during that period, ultimately resulting in an inability to define the true causal relationship. Using the LP-DID model, control groups were selected to minimize biases resulting from overlapping control and treatment groups. The LP-DID model mitigated negative weighting issues and the results were both similar and different to those of the event study. In both models, almost all confidence intervals crossed the x-axis post-treatment. The differing aspect between our models was the coefficient estimates; the event study had negative estimates while the LP-DID model had mostly positive estimates. This difference can be attributed to our negative weighting biases. With confidence intervals crossing in similar areas, we can ultimately describe these models as fairly similar. The limitations of both models were that causality could not be determined due to the confidence intervals containing zero. This leaves the possibility that there is zero effect of housing affordability legislation on rent prices. The intricacies of the real estate market, varying policy implementation timelines, and the potential lag in policy impact contribute to the uncertainty surrounding our conclusions. As policymakers grapple with housing affordability, our research stresses the importance of considering regional variations and additional economic factors in crafting effective policy measures.