

# Zoning: A Barrier or Solution to Truck Parking Infrastructure Shortages?

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## Abstract

This study explores the impact of local zoning regulations on the growing shortage of truck parking in the United States. We utilize traffic accident data as a proxy for truck parking demand to examine how zoning restrictions affect parking capacity. Employing an event study design, we categorize zoning regimes into Traditional, Exclusion, Reform, and Wild Wild Texas. Additionally, we implement a difference-in-differences approach to compare high-restrictive and low-restrictive areas.

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# 1 Agenda

1. Quantifying Truck Parking Shortage.
2. Do local economies respond to the need for truck parking or is it hindered?
3. Does land regulation limit truck parking creation?

## 2 Introduction

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model informs us about a potential answer to the question, and what are the comparative statics you can derive from the model? Contribution: If it's such an important question, why somebody couldn't have done it before? In other words, what is your unique empirical contribution

The United States hosts 90,056 local governments, each imposing unique zoning restrictions that shape land use. Among the pressing concerns influenced by these regulations is the growing shortage of truck parking ([American-Trucking-Association 2023](#)). Inadequate truck parking has led to dangerous or illegal practices, such as parking on highway shoulders or in unauthorized areas, which heightens traffic accident risks and imposes economic costs like increased fuel consumption, delivery delays, and inflated goods prices ([USDOT 2015](#)).

Despite the significant implications, there is limited empirical research quantifying the relationship between truck parking demand and the regulatory environment influencing its availability. Zoning regulations, in particular, often play a more decisive role in truck parking accessibility than geographic or transportation network factors ([Shertzer et al. 2018](#)). This study seeks to bridge this gap by leveraging traffic accident data as a proxy for truck parking demand and analyzing how land-use regulations impact parking availability.

Specifically, this research aims to test two hypotheses:

1. If restrictive local zoning laws drive truck parking shortages, regions with high truck parking-related accidents should exhibit minimal correlation with increased truck stop capacity.
2. Parking accidents involving trucks can serve as a quantitative proxy for truck stop demand, enabling the evaluation of truck stop shortages across regions.

this study employs an event study design, categorizing zoning regimes into four types—

Traditional, Exclusion, Reform, and Wild Wild Texas—based on (Puentes et al. 2006) (See Appendix B) . We hypothesize that restrictive zoning regimes (Traditional and Exclusion) are less responsive to truck parking demand compared to flexible regimes (Reform and Wild Wild Texas), resulting in lower truck parking capacity despite evident needs.

Additionally, this study will employ a difference-in-differences design to compare high-restrictive zoning areas with low-restrictive zoning areas. By controlling for the four zoning categories—Traditional, Exclusion, Reform, and Wild Wild Texas—we analyze the effects of a major trucking accident as the event of interest. This approach will allow us to assess how zoning restrictiveness influences truck parking capacity and whether high-restrictive regimes exacerbate the challenges associated with truck parking shortages in the aftermath of such incidents.

### 3 Background

Existing studies on zoning provide valuable context but are limited in scope. Research often focuses on single municipalities (Shertzer et al. 2016, Glaeser & Ward 2009) or international contexts (Anagol et al. 2021). Furthermore, most literature emphasizes residential zoning (Lens & Monkkonen 2016, Huang & Tang 2012) or office space (Cheshire & Hilber 2008), leaving industrial zoning and its implications for truck parking largely unexplored.

Initially designed to balance public welfare and economic development, zoning regulations have evolved, sometimes adapting to market forces or catering to local stakeholder interests, such as middle-class homeowners (Fischel 2024). While zoning has the potential to enhance economic productivity, it can also introduce inefficiencies, particularly in industrial applications (McDonald & Mcmillen 2012). Fragmented zoning governance often discour-

ages communities from accommodating truck parking, despite its regional benefits, due to localized decision-making dynamics. Furthermore, it is unclear whether the current state of land regulation optimizes welfare (Osman 2020). This paper aims to address this gap within the context of truck parking shortages these challenges,.

This research contributes to the broader discourse on zoning’s economic impact, extending the analysis to the critical issue of truck parking infrastructure. By examining the interplay between zoning classifications, parking-related accidents, and truck stop capacity, this study offers insights for policymakers aiming to mitigate the externalities of inadequate truck parking through thoughtful zoning reforms.

## 4 Data

Our data is (1990-Present) FMCA (Federal Motor Carrier Safety Administration) Crash file from USDOT (Department of Transportation) (Appendix A). We can see type of vehicle (ex. trucks), nature of the crash (ex. Crashed involving a “parked” vehicle), fatalities, injuries, number of vehicles involved, etc. We will also use WLIURA (zoning restriction index) dataset by Gyourko et al. (2008) and zoning classifications used by Puentes et al. (2006) .

## 5 Strategy

With no truck parking available trucks illegally park causing observed accidents such that areas increase truck parking availability.

No Truck Parking  $\rightarrow$  Trucks will illegally park  $\rightarrow$  **Accidents Occur** (observed) $\rightarrow$  Truck Parking Demand increases  $\rightarrow$  **Truck Parking Capacity Increase** (observation)

## 5.1 Event Study Model

The equation to estimate the effect of the Truck Parking Accident (TPA) on the creation of truck stops is specified as follows:

$$Y_{tj} = \sum_{i=-6}^6 \beta_i \text{TPA}_{i,j} + \gamma X_{tj} + \epsilon_{tj}$$

Where:

- $Y_{tj}$  is the change in truck stop capacity in year  $t$  for category  $j$ .
- $\beta_i$  are the coefficients for the event dummies ( $\text{TPA}_{i,j}$ ), where  $i$  represents the relative year to the Truck Parking Accident ( $i = -6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5, 6$ ).
- $\text{TPA}_{i,j}$  is the event dummy indicating the presence of a Truck Parking Accident in relative year  $i$  for category  $j$ . Specifically, when  $i = 0$ , this corresponds to the year in which the Truck Parking Accident occurs.
- $\gamma$  represents the coefficients for the control variables ( $X_{tj}$ ).
- $X_{tj}$  are the control variables in year  $t$  for category  $j$ .
- $\epsilon_{tj}$  is the error term for year  $t$  and category  $j$ .
- $j$  indicates a specific category used to isolate subsets of the data.

To analyze the impact of the Truck Parking Accident across different zoning categories, I will estimate to each corresponding category:

1. **Traditional:** This category evaluates the effects in conventional settings with typical zoning regulations.
2. **Exclusion:** This category examines the impacts in areas where truck stops are limited or restricted by zoning laws.

3. **Reform:** This category focuses on regions undergoing policy or structural reforms related to truck parking.
4. **Wild Wild Texas:** This category investigates the unique circumstances and effects in Texas, a state known for its lack of zoning regulation.

## 5.2 Difference-in-Differences (DiD) model

Furthermore, using the WLRUI index data and a DiD design, I will compare locations with a high restriction index to those with a low restriction index, controlling for truck parking categories. The model specification is as follows:

$$Y_{it} = \sum_{t=-6}^6 \theta_t HR_{it} + \sum_{t=-6}^6 \phi_t Post_{it} + \sum_{t=-6}^6 \psi_t (HR_{it} \times Post_{it}) + \gamma X_{it} + \epsilon_{it}$$

Where

- $Y_{it}$  is the change in truck parking capacity for category  $i$  at time  $t$ .
- $HR_{it}$  is the high restriction index indicator for category  $i$  at time  $t$ .
- $Post_{it}$  is the indicator for the post-TPA period for category  $i$  at time  $t$ .
- $HR_{it} \times Post_{it}$  is the interaction term that captures the treatment effect of being in a high restriction area after the truck parking accident.
- $\theta_t$  represents unique coefficients for the high restriction index across time periods  $t$ .
- $\phi_t$  represents unique coefficients for the post-TPA period across time periods  $t$ .
- $\psi_t$  represents unique coefficients for the interaction term across time periods  $t$ .
- $X_{it}$  is a vector of control variables for category  $i$  at time  $t$ .

- $\epsilon_{it}$  is the error term.

## 6 Limitations

Data only indicates any accidents involving any parked vehicle. The parked vehicle in question need not be a truck. The parked vehicle may also be a legally parked truck.

## 7 Robustness

Buses, as a category of large vehicles, may be comparable to trucks in some contexts, potentially introducing noise into our results. To ensure robustness, we propose conducting the study both with and without buses included in the dataset.

Accidents can be categorized as fatalities, injuries, or vehicles involved, each requiring its own specific dependent variable response. To address this, we will run our analysis separately for each category, treating them as controls.

Concerns may arise regarding the time variation of zoning classifications. However, this concern can be safely excluded, as zoning regimes or classifications tend to remain relatively stable across municipalities ([McLaughlin 2012](#)).

## 8 Improvements

There are other data sets found in ([NHTSA File Downloads / NHTSA n.d.](#)) or ([Fatality Analysis Reporting System April 2024 Analytical User's Manual, n.d.](#)) ; . That contain data that could potentially be more relevant that addresses any limitations in our design.

Insurance claims dataset are also another dataset worth looking into



## 9 Remarks

Most research on zoning restrictiveness focuses on housing, yet there is no reason to believe that a housing restrictiveness index cannot be adapted for studying industrial zoning restrictiveness.

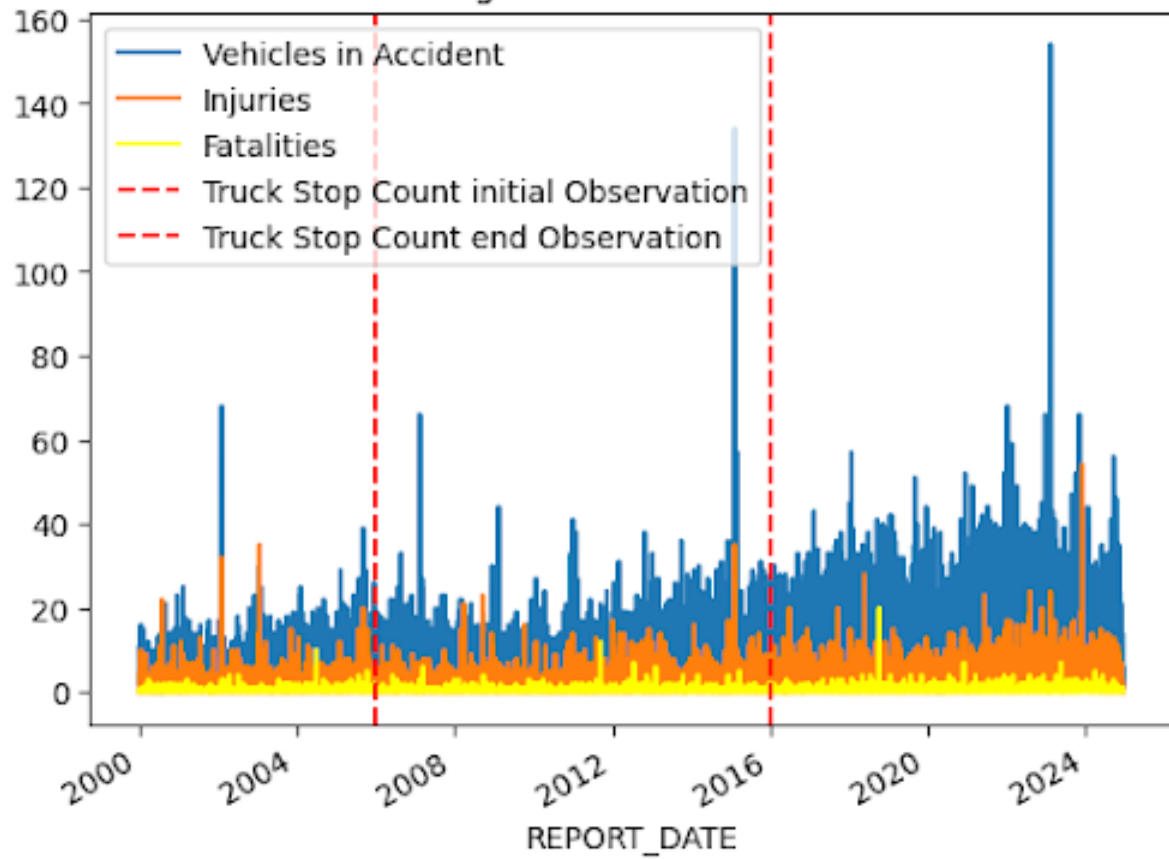
## 10 Appendix

### 10.1 A. Visualization of dataset.

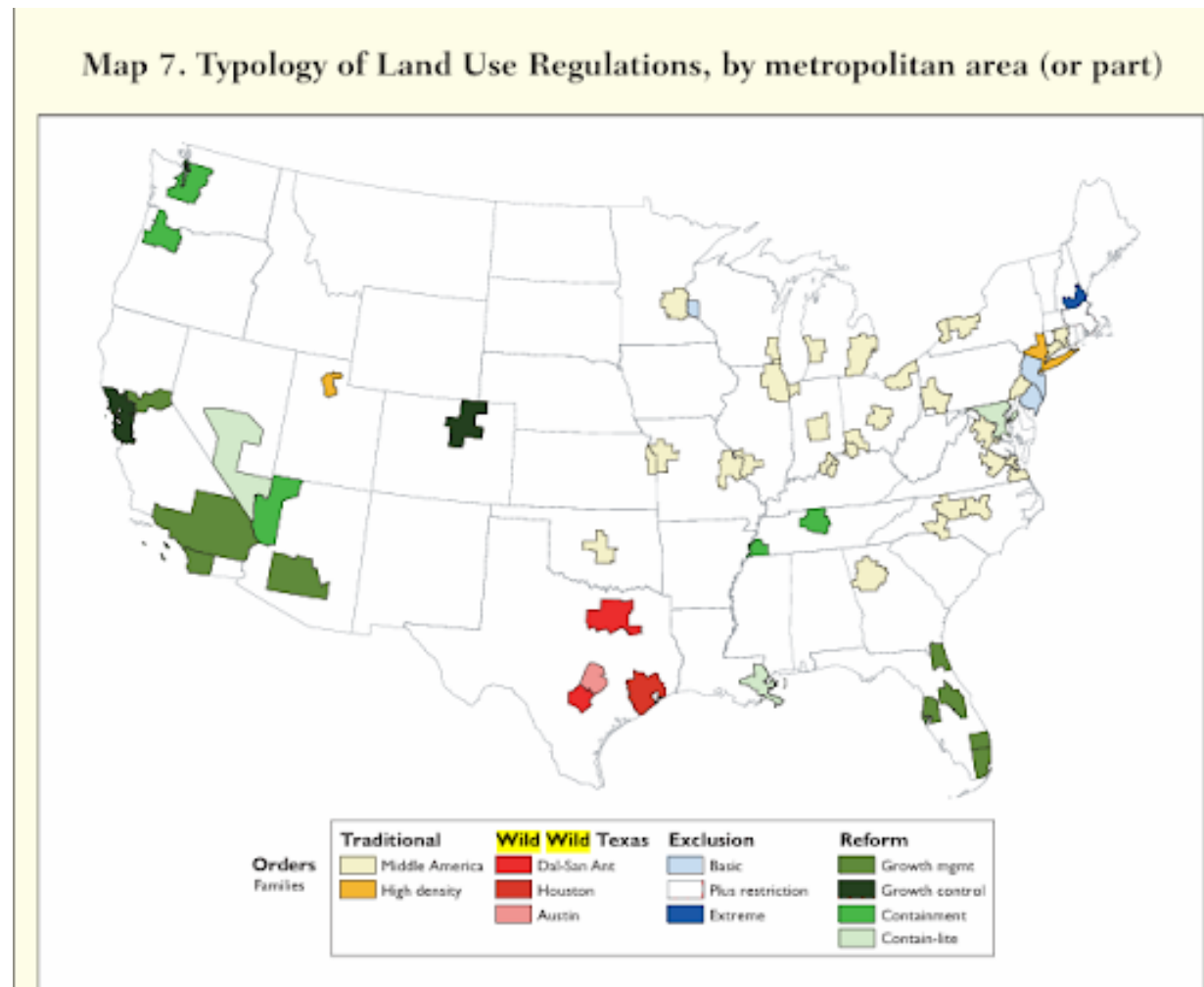
(Present Truck stop parking observatios also available [Truck Stop Parking | Geospatial at the Bureau of Transportation Statistics](#))

[ [Co \(2024\)](#)]

Accident Data Involving Trucks and Parked Vehicles Over Time



## 10.2 B. Map of Zoning Categories



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