1. **INTRODUCTION**

Each year, wildfires cause an extensive amount of property and wildlife damage in the United States, especially during the summer months in California and across the West. This is a serious policy issue since wildfires result in indirect damage such as property damage and suppression costs and indirect damage such as lost tax revenue to local governments, detrimental health impacts from smoke, carbon emissions, and lost environmental values. To combat the issue, one must understand the underlying causes of the problem to eliminate it at its source. A fact included in the article by Hafez reveals the severity of the situation "Since 2007, trends show an increase in the number of wildfires ignited, the total area burned, and total impact on ecosystems" (Hafez, 2020).

Wildfire incidents and fire season length increases are attributed to global warming, natural causes, or human activities such as campfires or debris burning, which is only expected to worsen in the coming years. Surprisingly, the most dangerous and more massive wildfires are those that are caused by electric utility companies. According to Hafez's article, "five percent of wildfire ignitions in California are attributed to electric utilities" (Hafez, 2020). The reason is that when the wind picks up, it can lower power lines or conductors and can push animals or vegetation into contact with power lines, sparking wildfires. To make matters worse, strong winds can use utility-ignited wildfires to spread, resulting in more damage.

The majority of the time, courts find electric utility companies accountable for all costs associated with property damages, suppression costs, and other economic and natural resource damages stemming from a wildfire caused by a utility company. Holding utility companies liable for their actions stems from the concept of inverse condemnation, which holds a public entity responsible for private property damage in pursuit of a public purpose, and must provide just compensation. The practice of inverse condemnation is not unique to California, but the way it is applied is. The majority of the time, inverse condemnation holds government agencies accountable for private property damage while providing a public service; however, in the Golden State, inverse condemnation can be used against utility companies since they offer a public service. As a result, in article 1, section 19 of California's constitution, utility companies are held accountable for any wildfire damage caused by their equipment, whether negligent or not, as long as their equipment was involved (Baker, 2019).

In 1999, the California Supreme Court found an investor-owned utility company liable for wildfire damages resulting from its power lines. The court's decision was based on the fact that even if a private entity is owned, it still could be liable as far as inverse condemnation is concerned. This paper employs a synthetic control analysis to examine this court ruling's potential role in fire management in California. While previous literature focuses on wildfire increases, it does not use this approach, and there is a low amount of studies on ways to mitigate wildfire suppression costs. Even though most of the results turned out to be insignificant, this research, similar to an unpolished gem, lays the foundation for future research opportunities. This study's policy implications are to develop policies that mitigate the main contributing factors of wildfire risk for the public’s good, such as creating more stringent measures against utility companies and human activities, maintaining vegetation management, and implementing recycled water sprinklers.

1. **LITERATURE REVIEW**

As far as the literature is concerned, there are no known econometric studies that employ a synthetic control analysis to study how court rulings, specifically in California, hold utility companies accountable for wildfires, to my knowledge. Furthermore, econometrics studies have not examined the research question if a more stringent stance against utility companies in California would mitigate the occurrence of wildfires or not. Suppose one were to search for California utility company wildfire liability; in that case, some of the studies that come up are related to fire suppression and shareholder influence on a decrease in wildfire occurrences.

There is a lot written about the growing prevalence of wildfire risk, especially in California, but few studies identify variables that impact wildfire suppression costs. Research that addresses this topic is the analysis by Donovan et al. (2011), which uses a two-stage least squares approach to examine how newspaper coverage and political pressure impact wildfire suppression costs in the United States. There is also not much research on how companies mitigate risks imposed on the environment and disclose these risks.

One analysis by Flammer et al. (2019) employs a two-stage least squares design and studies how increasing shareholder support can better manage companies' environmental threat.

There are many research articles on California's strict stance on holding utility companies liable for wildfires. Still, they are unrelated to economics and econometrics and center around the public policy subject area. These writings focus on utility company wildfire liability in the West and how electric utility companies are liable for wildfire damages under California's constitution instead of the rest of the United States. They also cover several court judgments that directly hold utility companies accountable for wildfires in California. All of the research is conducted to improve wildfire risk management (Gradwohl 2019; Hafez 2019; Kousky et al. 2018; Nordman and Hall 2020).

1. **DATA & METHODS**

The data used in this study comes from the United States of Agriculture (USDA) Forest Service website, which provides a variety of excellent over a range of environmental topics such as fire and aviation, forest management, vegetation, etc. The dataset used in this study is the National Interagency of Fire Occurrence dataset between 1992-2009 and consists of 882 observations after the data is cleaned. A synthetic control matching in which California represents the treatment, while the other U.S. states represent the control. In this case, the treatment will be the way California applies inverse condemnation (U.S. Forest Service).

1. **Empirical Model**

The central model assumes the following functional form. Yit represents the outcome of interest for an individual unit in year t. Dit serves as the treatment indicator and is equal to 1 if unit i has received the treatment prior to time t and is equal to 0 if otherwise. represents the heterogeneous treatment effect on unit i at time t, while represents the unobservable component.

1. **RESULTS**

Figure 1 depicts the time series of two graphs over time and the weighted average from the synthetic control group. The first graph uses fire size on the y-axis, while the second graph uses the number of fires on the y-axis and does not include controls. As is visible in the graphs, there are no effects of the court case as indicated by the two lines not being close together. Figure 2 depicts the two graphs under the same conditions as the initial figure, with the exception of controls. The first control that is selected is the statistical cause of the fire, 1 indicates lightning, 2 indicates equipment use, 3 indicates smoking, 4 indicates campfire, 5 indicates debris burning, 6 indicates railroad, 7 indicates arson, 8 indicates children, 9 indicates miscellaneous, 10 indicates fireworks, 11 indicates structure, and 12 indicates missing or undefined. The second chosen control is the primary owner or entity responsible for managing the land at the time of a wildfire incident. Different values are associated with the owner type, 0 represents foreign, 1 Bureau of Land Management (BLM), 2 represents Bureau of Indian Affairs (BIA), 3 represents National Park Service (NPS), 4 is Fish and Wildlife Service (FWS), 5 is U.S. Forest Service (USFS), 6 is other federal, 7 represents state, 8 represents private, 9 is tribal, 10 represents United States Bureau of Reclamation (BOR), 11 represents state or private, and finally 12 represents missing or not specified. The graph lines once again are far away from one another, indicating insignificance.

Figure 3 plots estimated effects for California in black and placebo effects for the other U.S. States in blue. The graph showcases the line representing California remains the same before 1999 and after 1999. Last but not least, figure 4 illustrates a histogram of the RMSPE ratios. It displays the estimated effects for California and placebo effects for the donor countries. California turns out to be among the top 25 U.S. states. The quasi p-value is 2.27, or 25/11.

1. **DISCUSSION AND CONCLUSIONS**

The findings do not illustrate an effect of the 1999 California court ruling as displayed in the figures. A potential caveat to the analysis is that the dataset utilized in this research only is from 1992-2009. A more comprehensive dataset consisting of a larger timespan, especially in more recent years, would increase the study's accuracy. Promising future research avenues would include other controls to reduce omitted variable bias and examine how they influence the central estimation equation.

Wildfires pose high costs, whether they are financial, human lives, or environment lost. Even though the results were insignificant with and without controls, the study opens the door to future research opportunities to discover the impact of inverse condemnation on electric utility companies' impact of wildfire mitigation in California. With temperatures expected to continue to rise in the coming years due to climate change, wildfire damage is an inevitable reality. Therefore, the main policy recommendation is to develop more stringent measures to hold those accountable for wildfires caused by electric utility companies or human activities. Reducing wildfire risk will preserve the ecosystem and decrease the costs it imposes on society to prevent future wildfire disasters.

** Figure 1**

**Figure 2**

**Figure 3**

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**Figure 4**

**Macintosh HD:Users:MusicMelody:Downloads:Wildfire_MSPE.pdf**

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