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Studies of the Relationships Between Labor Unions, the Labor Environment, and Health

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Abstract

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This dissertation is comprised of three essays studying right to work laws, labor unions, unemployment, workplace injuries, and self-rated health. The first essay focuses on the recent resurgence in right to work laws. While previous research focused on how right to work laws impact labor unions and the economy, little is known about how recent policy adoptions can influence workplace injury rates. Using a difference-in-differences approach on U.S. panel data from 1992 to 2018, I examine the impact of right to work enactments on fatal and nonfatal workplace injury rates. Findings suggest that a right to work passage leads to a small increase in fatal injuries while also decreasing nonfatal injuries, primarily nonfatal injuries which result in days away from work. The second essay analyzes the relationship between the unemployment rate and workplace injuries. The United States has been experiencing a decline in workplace injuries since the 1970s, driven by workplace safety legislation and improvements in technology. However, workplace injuries flattened with an economic expansion in 2010. Previous research studied an era of the US which vastly differs from the labor force today. I examine the relationship between the unemployment rate and workplace injuries in a new era. My findings show that a one percent increase in unemployment is related to a 17.8% increase in nonfatal workplace injuries. The third essay analyzes the effect of labor union membership and representation on self-reported health. Union density has continued to decline despite the number of studies showing their positive influence on a worker's wage, job training, healthcare benefits, work environment, and psyche. However, empirical evidence of the labor union effect on worker health is lacking. I examine the effect of labor union membership and representation on worker self-reported health which is a strong indicator of health outcomes. My findings suggest that labor unions lead to an increase in self-reported health for union members when compared to those who are not represented by a union.

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Dissertation Introduction

Labor force participation for those between 20 and 64 in the United States is around 78%. Within in this large population exists individuals with a few years of education or some with graduate degrees, who have low or high incomes, who work in the private or public sector, which work in many different industry types, who work in white collar or blue collar occupations, who are part of a labor union or are not, and who also differ in their own demographic characteristics. Each of these characteristics, along with many others, creates a unique labor environment that each labor force participant navigates and which can each effect the health and well-being of these participants. Which of these effects which health outcomes and by how much is important to understand for both employers and policy makers.

This dissertation consists of three essays which focus on how differences in the labor environment effect different health outcomes. The first essay, beginning on page 6, focuses on the effect of right to work laws on workplace injury rates. Right to work laws are shown to decrease labor union density and increase industrial growth. These two mechanisms have potential conflicting effects on workplace injuries making an empirical analysis necessary. The second essay, beginning on page 47, again studies workplace injury rates and how they are related to the unemployment rate. Firms and employees are known to change their behavior due to changes in the unemployment rate. These changes have a potential effect on workplace injuries. The third essay, beginning on page 74, analyzes the effect of labor union membership on self-rated health. Labor unions are known to improve the interests of its members. These improvements have the potential to improve self-rated health which is highly correlated with other health outcomes.

Previous right to work research primarily focused its effect on labor unions, wages, and the economy leaving its effect on health outcomes unknown. I use fatal workplace injuries as well as three nonfatal workplace injuries which differ in severity to help answer this question. Ultimately, the results show that right to work laws may increase fatal injuries while drastically decreasing nonfatal injuries which result in workers compensation. Other types of nonfatal injuries are not effected by right to work passages.

The second essay focuses on the same types of workplace injuries as the first essay. Previous research has found that workplace injuries are pro-cyclical meaning that as the unemployment rate increases, the workplace injury rate decreases and as the unemployment rate decreases, the workplace injury rate increases. I find this same relationship with concurring point estimates. I further previous research by studying recent data which uses a labor force which differs drastically from previous years studied in terms of its size, gender structure, and age structure. Furthermore, essay 2 studies this relationship during expansionary and recession periods which have the potential to differ and within different industries and sectors. Results show that the unemployment rate is negatively related to both fatal and nonfatal injuries. This contradicts the primary mechanism that many researchers cite which is reporting bias. Further, the construction industry results are shown to have a stronger relationship than other industries studied.

There exists a large literature regarding labor unions and their effect on different interests of its members. However, little is known about how labor unions effect health outcomes. There exists a few papers which study the effect of labor unions on self-rated health. However, their conclusions of this effect on the full labor force, male workers, female workers, high and low educated workers, and high and low income workers are mixed. This paper adds to and is an improvement upon previous literature by verifying results found for previously studied subgroups and by analyzing differences between the private and public sectors and differences between white and blue collar workers. Further, differences between union members and those who are not members but are represented by a union are analyzed. Results show that labor unions increase the probability of reporting higher self-rated health and that this probability is doubled when considering blue collar workers. Certain subgroups such as white collar workers and public sector workers are shown to have a smaller labor union effect. However, when comparing labor union members to workers who are represented by a union but are not members, results show that choosing not to be a member increases the probability of reporting self-rated health for low wage and white collar workers while decreasing the probability of reporting self-rated health for blue collar workers.

Each essay uses estimation techniques which improve upon faults in previous research. Essay one starts by using differences-in-differences on state-level U.S. panel data from 1992 to 2018. However, due to failings in the parallel trends assumption which can bias the results, a generalized synthetic control method is used. The generalized synthetic control method corrects for parallel trends while also allowing differences in treatment timings. The first essay also analyzes each treatment state individually using both difference-in-differences and synthetic difference-in-differences to assure that the results from the generalized synthetic control method are not being driven by one or two treatment states. The second essay uses a two-way fixed effects model on the same state-level U.S. panel data. Because this estimation strategy assumes that the effect on workplace injuries from a decrease in unemployment is equal to the effect on workplace injuries from an increase in unemployment, I split the data dependent on whether a state-year observation is within an expansionary period or a recession to test for asymmetry. I use three definitions of recession or expansion for robustness. The final essay has self-rated health, which is an organized categorical variable, as the dependent variable. Therefore, I use an ordinal logistic regression. To make a comparison with previous research findings, I also create a binary variable from the self-rated health observation and use a nominal logistic regression. Because of the possibility of selection bias, propensity score matching and coarsened exact matching are used to attain unbiased estimates.

Analyses when studying by industry become less precise because of the sparsity of injuries that occur when looking within a state-year-industry. This creates a limitation in the conclusions that can be drawn on when studying both right to work laws and unemployment by industry. Results by industry do illustrate that differences in effect size exist, but identification of an accurate point estimate is lacking for each industry. This is especially true in essay two when several hypotheses are tested increasing the possibility of false significance. Multiple hypothesis testing does remove significance from many industry results which better controls for type II error

The underlying mechanisms within each chapter are discussed theoretically. However, identification of which mechanisms are strongest and by how much they effect the dependent variable in each chapter is lacking. Using both fatal and nonfatal injuries does allow better understanding of when misreporting is occurring for injuries in essays one and two. Controlling for income in essay three does illustrate that labor unions do increase self-rated health through income, but this is not the only mechanism. Further research which better captures the underlying mechanisms would be beneficial.

Both employers and policy makers should use educated research to better understand what is effective and ineffective at improving labor force health outcomes. This information is also useful for employees and labor unions who can further their understanding of what effects their health. Results from the first essay show that following a right to work passage, safety levels are likely decreasing due to the shown increase in fatal injuries. However, the large decrease in nonfatal injuries which specifically result in workers' compensation indicates that misreporting is likely occurring in order for businesses to avoid the costs associated with workers' compensation. Hence, policy makers should be aware that a right to work passage leads to these two outcomes. I am not advocating that policy makers should not pass a right to work law. Rather, policy makers should reduce the miss-reporting and improve safety simultaneously with a right to work passage to avoid these negative outcomes. By better understanding the relationship between unemployment and workplace injuries, policy makers can understand when employees are potentially more at risk of being injured on the job. Essay three provides further evidence of the positive influence labor unions can have for its employees. This is especially true when considering certain occupations such as those who work in blue collar positions. Hence, if policy makers are wanting to prevent the continued decline in labor union density, they should focus on removing the abilities employers have at preventing labor union representation. Overall, this dissertation provides results which can be used to better the health of labor force workers.

Chapter 1

Does Right to Work Hinder Your Right to Safety? The Effect of Right to Work Laws on Workplace Injuries

1.1 Introduction

Each day in 2018 in the US, 14 people died from a fatal workplace injury and over 8000 suffered from a nonfatal workplace injury. The level of safety within a workplace environment and the worker's ability to avoid error are the factors which determine the rate at which these injuries occur. These two factors have been shown by previous research to be influenced by labor unions, the economy, and other mechanisms. Discussions about whether or not to pass a right to work law revolves around its impact on these same mechanisms, labor unions and the economy. Yet, there is little discussion about how right to work laws impact workplace injury rates.

A right to work (RTW) law prohibits labor unions from requiring financial support from workers as a condition of employment. These state laws were primarily adopted following the Labor Management Relations Act in 1947 which allowed their passage. A recent resurgence in RTW support has led to six more states to adopt this law bringing the total number of supporting states to 27. Previous findings indicate that RTW laws decrease unionization, increase the number of non-paying employees in a union workplace (free-riders), and increase industrial growth within a state (Moore [1998]). Both labor unions and industrial growth have been studied extensively with regards to workplace injury rates and both have been shown to have significant impacts. However, no study has been conducted to analyze the potential impact right to work laws have on a state's workplace injury rate. The estimated average cost of a nonfatal injury which resulted in time away from work is $41,000 while the estimated average cost of a worker fatality is $1.2 million (NSC 2019 & Biddle 2011). Hence, estimating the effect RTW laws have on workplace injuries can be used to inform a policy maker's decision to adopt this law within their state or be used to understand if additional safety measures should be put in place following a RTW passage.

The purpose of this paper is to study the effect that right to work law adoptions may have on workplace injury rates in today's economy using the six recent adopters of this law. In order to avoid any issues regarding multicollinearity or endogeniety, a reduced form analysis is conducted leaving out any control variables related to labor unions or economic growth. Because RTW laws are shown to have differing economic and union impacts by industry and because most RTW laws are only for the private sector, individual analyses will be conducted for the private and public sectors as well as the following private sector industries: construction, manufacturing, wholesale trade, retail trade, transportation and warehousing, financial activities, and services. These separate analyses not only can bolster national findings but can show that some industries may be more or less influenced by RTW passages with regards to workplace injury rates than others.

Using US panel data from 1992 to 2018, I estimate the effect of a right to work law passage on five different measures of workplace injury rates for the total workforce, private and public sectors, and seven industries using a difference-in-differences estimation. The use of five different outcome measures, four nonfatal injury outcomes and a fatal injury outcome, helps illustrate which types of injuries are changing as a result of a RTW adoption. The four types of nonfatal injuries studied are all nonfatal injuries, nonfatal injuries which result in lost workdays, nonfatal injuries which result in job transfer or restriction, and nonfatal injuries which do not result in time away or job restriction or transfer. To avoid bias resulting from violations in the parallel trends assumption and uncorrelated treatment assumption, I use a generalized synthetic control method. Unlike a traditional synthetic control setting, this generalized synthetic control allows for differences in treatment timing allowing me to take advantage of the full sample. Due to the small amount of treatment states within the time period studied, the results can be biased if the six treatment states are inherently different than other states. Hence, six individual difference-in-differences case studies are conducted along with a synthetic difference-in-differences method to check for any bias occurring from the small amount of treatment.

Findings from the multi-state difference-in-differences estimation show that a RTW passage is associated with an increase in the rate of fatal workplace injuries by 11.9% and decreases the rate of lost workday nonfatal workplace injuries by 13.9%, significant at the 5% and 1% level respectively. Total nonfatal injuries are shown to decrease by 8.0%, significant at the 5% level. These results are bolstered through the generalized synthetic control method which shows an increase in fatal injuries and similar decreases in lost workday injuries. I argue that these results indicate a decrease in the average workplace safety level following a RTW passage and increase a firm's incentive to under-report or dissuade employees from reporting injuries which could result in workers' compensation claims. Results from studying different industries and sectors show that changes in workplace injury rates can differ drastically in response to a RTW passage.

1.2 Background

1.2.1 *Right to Work Laws*

In 1935, the National Labor Relations Act (NLRA) established an employee's right to organize and form a labor union. Once formed, a labor union acts as a mediator between the members of the unionized workforce and its employers. Labor unions can even bargain on behalf of the employees who are not members of the union through a process called collective bargaining. When a labor union collectively bargains, they bargain on behalf of all employees giving them the most bargaining power possible. In order to fund the union, dues are typically required from its members and can even be required from non-members. By federal law, the dues required from non-members is only meant to cover the costs of union representation through collective bargaining. Hence, paying dues to a labor union can be unavoidable. To stop this, the NLRA was amended by the Taft-Hartley Act in 1947 which allows states to pass Right to Work (RTW) laws. A RTW law prevents unions from collecting any dues from non-members.[1] However, the non-members can still obtain benefits from unions collectively bargaining such as safer work environments or better health insurance options. Twenty-seven states have passed a RTW law. As seen in Table 1.1, twenty-one of these states adopted a RTW law in the 20th century with most being in the 40's and 50's. Five states have passed a RTW law within the last decade showing a resurgence in its popularity.

Supporters of right to work laws argue that the law enhances personal freedom and employer flexibility leading to better economic performance within the state. Econometric evidence is mixed but somewhat supports the conjecture of industrial growth (Moore [1998]). Opponents of RTW laws argue that these laws restrict necessary union funding by incentivizing employees to stop paying dues and free ride the benefits received from collective bargaining (Sobel [1995]). Without proper funding, unions can become ineffective or be forced to disband (Ichniowski and Zax [1991]). Previous research is somewhat

[1] In a non-RTW state, the labor union does not necessarily have to require dues from all employees. Rather, requiring dues in a non-RTW state is optional and requiring dues is prohibited in a RTW state.

mixed but primarily shows that RTW laws lead to less labor union representation and increase the number of labor union free riders, as seen in Table 1.2. The enactment of the Taft-Hartley Act marks the beginning of a continual decline in private sector labor union representation.

Table 1.1: Right-to-Work States

State Name	Year
Alabama	1953
Arizona	1946
Arkansas	1947
Florida	1944
Georgia	1947
Idaho	1985
Indiana	2012
Iowa	1947
Kansas	1958
Kentucky	2017
Louisiana	1976
Michigan	2012
Mississippi	1954
Nebraska	1946
Nevada	1951
North Carolina	1947
North Dakota	1947
Oklahoma	2001
South Carolina	1954
South Dakota	1946
Tennessee	1947
Texas	1947
Utah	1955
Virginia	1947
West Virginia	2016
Wisconsin	2015
Wyoming	1963

States not in table do not have a right to work law enacted.
The six treatment states in the study are Indiana, Kentucky, Michigan, Oklahoma, West Virginia, and Wisconsin.
Several of the passages occur in the 1940's and 1950's because the Taft-Hartley Act enabled RTW in 1947.

As summarized by Moore and Newman [1985] and Moore [1998] in their right to work law literature reviews, RTW laws have been shown to decrease union formation, encourage free riding, and increase industrial growth and economic development.[2] It is through these types of mechanisms that a RTW law can impact workplace injury rates. However, whether or not these hold true for recent right to work adopters is unknown as research on right to work laws since the 1990's is lacking. How labor unions and economic growth impact workplace injuries will be discussed in the next sections along with a section discussing other impacts on workplace injuries which are likely exogenous to RTW.

Table 1.2: Studies of the Impact of Right-to-Work Laws on Unionization

Study	Years Studied	Cross-sectional Unit	Union Variable	Effect	Significant
Lumsden and Peterson (1975)	1939, 53, 68	States	Unionization	Neg.	No
Moore and Newman (1975)	1950, 60, 70	States	Flows into Unions	Neg.	Yes
Warren and Strauss (1979)	1972	States	Unionization	Neg.	Yes
Hirsch (1980)	1973-75	SMSA[a]	CBA[b] Coverage	Neg.	Yes
Wessels (1981)	1970	States	Nonagricultural Unionization	Neg.	No
Farber (1983)	1977	Individuals	Unionization and Union Demand	Neg.	Yes
Hunt and White (1983)	1973-75	SMSA	Membership Dummy	Pos.	No
Carroll (1983)	1964-78	States	Unionization	Neg.	Yes
Koeller (1985)	1970	States	Unionization	Undetermined	No
Moore et al. (1986)	1964-78	States	Unionization	Pos.	No
Ichniowski and Zax (1991)	1980	Departments[c]	Many[d]	Neg.	Yes
Davis and Huston (1995)	1991	Individuals	Membership Dummy	Neg.	Yes
Sobel (1995)	1989, 91	Individuals	Free-Riders[e]	Neg.	Yes

[a] Standard Metropolitan Statistical Area
[b] Collective Bargaining Agreement
[c] Five public departments are police, fire, sanitation, public welfare, and highways
[d] 1) Percent of employees in department who are members of a union 2) Dummy variable for the presence of a nonbargaining association 3) Dummy variable for the presence of a bargaining union
[e] Data only includes union members and non CBA covered nonmembers. This allows the author to capture the union free-rider problem.

1.2.2 *How Right to Work Laws Impact Workplace Injuries Through Unions*

The National Labor Relations Board states that mandatory bargaining subjects between a labor union and employers include wages, hours, pensions, healthcare and working conditions. Theoretically, a workplace with a labor union which collectively bargains

[2]They further argue that RTW laws are shown to have no impact on wages.

for higher workplace safety standards should have less risk of an injury when compared to the same workplace whose employees individually bargain with less power for higher workplace standards. Research has shown that unionized workplaces are more likely to be compliant with safety regulations than nonunion workplaces (Weil [1991], Weil [1996], Weil [2001], and Gray and Mendeloff [2005]). If labor unions do increase workplace safety, then right to work laws, which reduce unionization, should decrease workplace safety. However, empirical literature has shown mixed results on a labor unions impact on workplace injuries. More specifically, the literature agrees that labor unions reduce fatal workplace injuries, but the impact labor unions have a nonfatal injuries is unclear. Findings from previous research is summarized in Table 1.4.[3] Donado [2015] gives five reasons why researchers have found that unions may increase nonfatal workplace injuries. These are: 1) Reporting, 2) Selection 3) Wages for Safety, 4) Moral Hazard, and 5) Distribution Shifting. Understanding these and the impact labor unions have on workplace injuries is meant to improve our understanding of how right to work laws can impact workplace injuries. For a brief summary of the ways in which labor unions can influence workplace injury rates, see Table 1.3.

The first plausible reason why previous literature overwhelmingly shows that labor unions increase nonfatal injuries is because researchers only have access to injuries which are reported. When an injury is reported, the firm can experience costs through time spent filing an injury, lost workdays from the employee, and even workers' compensation to cover missed wages and hospital bills. Because the reporting of a workplace injury is costly to a firm, firms have an incentive to under-report workplace injuries or dissuade its employees from reporting injuries. Employees may feel more comfortable reporting an injury in a unionized workplace because the union protects them from any management retaliation such as "disciplinary action, denial of overtime or promotion opportunities, stigmatization, drug testing, harassment, or job loss" (Azaroff *et al.* [2002]). If this misreporting is more likely to occur in a nonunionized workplace, it would help explain

[3]This table is similar to Donado's Table 1. However, I have excluded papers whose primary focus is not unions vs health/safety and have updated the table with more recent literature.

why labor unions are shown to increase reported nonfatal injuries. To avoid this reporting bias, previous research has used fatal or severe nonfatal injuries and have found that labor unions are successful at reducing these types of injuries (Morantz [2013], Boal [2009], Donado [2015]). Any large differences between how a RTW law impacts fatal and less severe nonfatal injuries could be because of this same reporting bias.

The next reason why researchers believe labor unions have shown a positive relationship with nonfatal workplace injuries is because of selection bias. Employees working in a riskier work environment may be more likely to form a labor union. Hence, it might not be that unions are causing more injuries, but unionized workplaces are inherently more risky. This selection issue or reverse causality problem may produce biased estimates leading to false conclusions. It is repeatedly cited by previous researchers as the main flaw of their paper. The inclusion of a union rate control is not only highly correlated with RTW leading to a possible classic multicollinearity problem but is arguably endogeneous to injuries because of this selection issue. However, this selection problem is avoided when studying a reduced form of how right to work laws impact workplace injuries because of the exclusion of a union control variable. Further, any reverse causality concern regarding large decreases in workplace injuries leading to RTW passages is unlikely.

Some researchers have argued that unions directly increase workplace injury rates because labor unions are able to negotiate higher wages as a trade-off for workplace safety. Employee interviews conducted by Brown *et al.* [1984] have shown that some labor unions do behave in this manor. Hence, if right to work laws decrease labor union representation then a RTW passage may stop this trade-off from occurring at some unionized workplaces leading to a decrease in injuries. This idea of wages for safety directly contradicts the concept that labor unions bargain for higher safety standards. While it may be true that some unionized workplaces trade away safety for higher wages, findings that unionized workplaces are more likely to be following OSHA standards is evidence against wages for safety for most labor unions.

Moral hazard is another reason why labor unions may not be effective at reducing workplace injuries. Employees in a safer work environment may exhibit riskier work practices which offsets any attempt the union makes to create a safer environment. Further, because unions can increase job security when injured, workers could be less worried about getting injured knowing that, if they do, their job is secure. These two ideas behind moral hazard can hinder the ability of labor unions to decrease injuries and may instead increase them.

The last way in which labor unions may impact workplace injury rates is through distribution shifting. If increased safety from a union only decreases the severity of workplace injuries, then fatal or severe nonfatal injuries may decrease while the amount of less severe injuries may increase. Donado [2015] finds distribution shifting to be true but argues that it explains only a small portion of why unions are shown to increase less severe nonfatal injuries.

Reporting, selection, wages for safety, moral hazard, and distribution shifting are the argued reasons why labor unions are shown to increase nonfatal injuries. Morantz [2018] states that "the existing literature is fraught with empirical biases that may mask unions' true health and safety impact" and only suggests possible solutions leaving a unions true effect on less severe workplace injuries unknown. Hence, a right to work law's impact on less severe workplace injuries through its effect on unions is also ambiguous.

The most recent literature which studies the impact of labor unions on fatal workplace injury rates comes from Zoorob [2018] who finds that a one percentage point increase in the unionized workforce leads to a 4.9% decrease in the workforce fatality rate. This research goes a step further than previous studies by attempting to relieve the selection bias through the use of an instrument. Zoorob [2018] uses RTW passages as an instrumental variable for unionization. Because RTW laws may influence things other than union rates such as expansion of riskier firms, increased number of large firms, or changes in industry composition, using RTW laws as an instrument for state unionization could lead to a biased result. No attempt is made to see how labor unions impact nonfatal injuries. While not the main focus of the paper, Zoorob [2018] also runs a reduced form equation of RTW laws and workplace fatalities. He finds that the passage of a RTW law increases the fatal workplace injury rate by 14.2% which he attributes to its impact on labor unions.

This paper improves upon this previous literature in several ways. First, I study not only fatal injuries but four additional nonfatal injury measures which vary in average severity level. Second, I use multiple estimation strategies to account for possible biases naturally formed by the data set. Lastly, I study the impact of RTW on workplace injuries for the entire workforce, make a comparison between the private and public sectors, and study seven different private sector industries in order to show any differences RTW may have on these different groups. Zoorob [2018] attributes a RTW law's impact on fatal workplace injuries to changes in unionization. However, the economic signal that RTW laws send to expanding and newly forming firms may have just as large of an impact on workplace injuries.

Table 1.3: Theories For the Ways Unions Affect Workplace Injuries

Theory	Direction	Explanation
Bargaining for Safety	Decrease	Labor unions can bargain for workplace safety better than individuals due to increased bargaining power. Research shows that unionized workplaces are more likely to follow OSHA standards.
Firms Under Reporting	Increase	Because injuries are costly to a firm, firms have an incentive to under report injuries. Unionized workplace may be better at preventing this under reporting.
Employees Under Reporting	Increase	Employees are more likely to lose their job after reporting an injury. However, labor unions can increase job security meaning employees are more likely to report injuries when unionized.
Wages for Safety	Increase	Labor unions may bargain for higher wages and trade-off workplace safety
Distribution Shifting	Increase & Decrease	Through increased safety measures provided by labor unions, fatal or severe injuries become less severe injuries.
Selection	Increase	Riskier work environments are more likely to unionize
Moral Hazard	Increase	Labor unions provide a sense of higher safety leading employees to have riskier behavior.

Table 1.4: Studies of the Impact of Unions on Fatal and nonfatal Occupational Injuries

Study	Country	Industry	Years	Data Type	Cross-sectional unit	Union Variable	Injury Variable(s)	Results	Possible Bias
Leigh (1982)	US	Many	1977	Cross-sectional	Blue Collars	Member Dummy	Survey Questions	Union members report more hazardous working conditions	Union strength not measured Actual injuries not measured Reverse Causality
Worrall and Butler (1983)	US	Many	1978	Cross-sectional	Blue Collars	Member Dummy	Survey Questions Injury Rate Lost Workday Rate	Union members report more accidents and hazardous conditions and experience higher Injury and Lost Workday rates	Actual injuries not measured Reverse Causality
Appleton and Baker (1984,1985)	US	Coal Mining	1979	Cross-sectional	Coal Mines	Member Dummy	Reported Injuries	Union mines experience higher reports of injuries	Job bidding system, low productivity, labor characteristics, other institutional factors
Fairris (1992)	US	Private, nonagricultural sector	1969-70	Cross-sectional	Blue Collars	CBA[d] Dummy	Injuries per mil- lion employee hours	Industries in union setting have slightly higher injury rates	Job bidding system, trading wages for safety
Reilly et al. (1995)	UK	Manufacturing	1990	Cross-sectional	Establishments	Many[a]	Severe Injury Rate	Establishments with joint consultative committees for health and safety saw a reduction in injuries compared to manager dealt health and safety	Small establishments are excluded from dataset Many zeroes in count data
Reardon (1996)	US	Coal Mining	1986-1988	Panel	Coal Mines	Membership Dummy	Injury type and count	Union mines experience lower probability of severe injuries	Selection Other institutional factors
Litwin (2000)	UK	Many	1998	Cross-sectional	Workplaces	Membership Dummy Union monotonic increases	Likelihood of Injury Injury Rate	Trade unions appear in more accident-prone workplaces but then proceed to reduce injury rates except when density exceeded 80 but without a closed shop	Wage for safety Non-unions mimic unions in order to deter union organization

Studies of the Impact of Unions on Fatal and nonfatal Occupational Injuries (Continued)

Fenn and Ashby (2004)	UK	Many	1998	Cross-sectional	Workplaces	Union Density Safety Committee Dummy	Injury Counts Establishment Size	Large establishments have lower probability of injury Higher union density and safety committees led to higher reported injuries	Poor instruments Unions have higher reporting
Nichols, Tasiran, Walters (2007)	UK	Manufacturing	1990	Cross-sectional	Establishment	Many[b]	Injury count	Trade unions reduced injuries when safety committees are assigned by unions	Unions over reporting
Boal (2009)	US	Coal Mining	1902-29	Panel	US States	Union Rate	Fatal Injuries	Unions decrease fatal injuries	Reverse Causality
Boal (2009)	US	Coal Mining	1897-28	Panel	Coal Mines	Member Dummy	Fatal injuries	Unions decrease fatal injuries	Reverse Causality
Morantz (2013)	US	Coal Mining	1993-2010	Panel	Coal Mines	Union Status	Fatal, severe, and non-severe injuries	Union mines have less fatal and severe injuries. Non-severe are higher pointing to higher reporting by unions	Age differentials Mine profitability differentials
Donado (2015)	US	Many	1988-2000[c]	Panel	Individual	Membership Dummy	nonfatal Injury/Illness occurred Coverage Dummy	Unions have a non-negative affect on nonfatal injuries	Moral Hazard Distribution Shifting
Amick et al.(2015)	Canada	Construction	2006-12	Panel	Firms	Union Status	Reported claims	Unions increase injury reports and reduce severe injury reports	Misclassification of union status
Li et al. (2019)	US	Many	1965-2010	Panel	Establishment	Union Election Passings	DART case rate	Unions have no detectable effect on workplace safety Did shift case rate distribution down	Reporting Non-random sorting
DeFina and Hannon (2019)	US	Many	1999-2016	Panel	US States	Union density	Drug death rates	Decreases in state unionization led to increases in drug deaths	Omitted variables Reverse causality

[a] The independent variables are split into eight groups depending on how the safety committee is constructed

[b] Similar to Reilly et al., the independent variables are 1) Unions select some safety committee members 2) Unions select no safety committee members 3) there are representatives only 4) management alone decides

[c] Years 1991, 1995, 1997, and 1999 were not included.

[d] Collective Bargaining Agreement

1.2.3 *How Right to Work Laws Impact Workplace Injuries Through An Economic Signal*

Supporters of right to work legislation claim that its passage leads to a "favorable business climate" (Moore [1998]). The idea is that a RTW passage is a signal to businesses that opening a new location or expanding a current location within that state is less likely to result in a labor union formation compared to if they had opened the same business in a non-RTW state. If true, a RTW law would indeed lead to economic growth. Increases in production have been shown to have a direct impact on nonfatal injury rates and some researchers have found the same for fatal injuries as well (Davies *et al.* [2009], Boone and Van Ours [2006], Boone *et al.* [2011], and Amuedo-Dorantes and Borra [2013]). Theories as to why economic growth can affect workplace injuries can be found in Table 1.5. Assuming previous literature is correct in finding a direct relationship between economic growth and workplace injuries, it is reasonable to believe that a RTW passage can increase workplace injury rates through its ability to encourage economic growth.

If RTW leads to large amounts of new businesses within the state then this may also lead to increases in new hires which are unfamiliar with their work environment. This unfamiliarity or environment inexperience would lead to higher rates of injury as inexperienced workers are more liable to injury. Hence, RTW may increase injuries through increases in inexperienced workers. Further, it is plausible that businesses which see a RTW passage as a "favorable business climate" are the same businesses which offer below average safety standards causing a selection issue. This selection would further a RTW law's ability to increase workplace injury rates.

Firm size is another factor when considering workplace injury rates. Larger firms have a lower safety education cost per worker than smaller firms due to economies of scale. This can help larger firms have a lower injury rate than smaller (Conway and Svenson [1998]). However, larger firms also have higher bargaining power which can lead employees as individuals unable to bargain for higher safety. Recent large firms such as Amazon have been associated with high workplace injuries and fatalities due to unsafe working conditions (Wich and Magee [2020]). If the passage of a RTW law leads to changes in firm size composition within a state, then this is yet another way RTW can influence workplace injury rates.

Each theory in this section implies that RTW will lead to increases in workplace injury rates through its impact on economic factors. The economic factors occur due to a right to work law signaling to businesses that the new RTW state is favorable for their business expansion. For a brief overview of all the ways in which RTW can influence workplace injuries, see Table 1.6. When considering every mechanism, the impact RTW has on workplace injuries becomes ambiguous which creates the need for empirical evidence. Because a RTW passage influences more than just union rates, this paper focuses on using a reduced form strategy to estimate the effect right to work laws have on different measures of workplace injury rates.

Table 1.5: Theories For the Ways the Economy Affects Workplace Injuries

Theory	Direction	Explanation
Keeping Workers Safe When Needed	Decrease	High levels of production increase the value of workers to the firm. Hence, the firm increases safety precautions to reduce risk of losing an employee.
Production Per Worker	Decrease	When unemployment is high, the level of production per worker increases leading to higher rates of injury and vice versa.
Firm's Underreporting	Decrease	High levels of production increase the value of workers to the firm. Hence, the firm dissuades reporting in order to keep employees working.
Switching Industries	Decrease	When unemployment is high, workers may be forced to seek employment in industries with which their experience is low. Inexperienced workers are more at risk of injury.
The Safety Production Trade-off	Increase	When production is high, the relative cost of safety increases. Hence, a firm may decrease safety to focus on the high production.
New Hires	Increase	When unemployment is low, there may be an influx of new and inexperienced employees. Inexperienced employees are at higher risk of injury.
Employee's Underreporting	Increase	Reporting an injury increases the chance of job loss. Hence, when unemployment is high, employees underreport injuries to avoid job loss during a recession.

1.2.4 *Exogenous Workplace Injury Rate Factors*

The two previous subsections discussed workplace injury rate factors which are correlated with a RTW passage. There are several other factors which determine workplace injury rates which are likely independent to RTW passages. The Occupational Health and

Table 1.6: Theories For the Ways Right to Work Laws Affect Workplace Injuries

Right to Work Impacts	Direction	Explanation
Labor Unions	Unknown	Right to work laws are shown to decrease union member rates, decrease the rate at which unions form, and increase the number of union free riders. Each of these hinder the effectiveness of a labor union and their ability to provide safety to the workplace. However, previous research is unclear if labor unions reduce workplace injuries.
Economic Signal	Unknown	A RTW passage can act as a signal to businesses that the state has a favorable "business climate". This signal may lead to industrial growth, increase the number of new hires, and decrease average workplace safety through selection bias. While industrial growth has been shown to decrease injury rates, new hires and a dangerous firm selection could increase injury rates making the effect of this economic signal on injury rates ambiguous.

Safety Administration (OSHA) has implemented federal health and safety regulations which act as a mechanism to entice firms to invest more into safety. OSHA enforces its regulations through safety inspections without advanced notice. Failure to follow safety guidelines can lead to fines for the firm. Twenty-eight states have adopted their own state run OSHA's with regulations which are more strict than the federal regulations put in place. Many states have also put safety mandates into place which require all or high risk workplaces to have a written safety plan or have a safety committee. These state run OSHA's and safety mandates have been shown to be effective in reducing workplace injuries.[4] However, because a RTW adoption should have no influence on OSHA inspection rates or safety standards and vice versa, controlling for these will not result in an endogeniety issue.

Before large fraudulent reforms in the 1980's and 1990's, workers' compensation benefits were thought to increase workplace injuries. As benefits increase, the incentive to fraudulently obtain these benefits increases leading to higher reported workplace injuries (Ruser [1985], Ruser [1991], Chelius [1982], Krueger [1990], Smitha *et al.* [2001]). However, recent studies find no evidence that workers' compensation benefits have any effect on workplace injuries ruling out any workers' compensation moral hazard (Huet-Vaughn and Benzarti [2020]). These reforms along with the formation of OSHA in 1971 are considered to be the driving force behind the large decline in occupational injury rates over the last several decades.

[4]See Gray and Scholz [1989], McCaffrey [1983], Weil [2001], Bartel and Thomas [1985], Weil [1996], Gray and Jones [1991], Scholz and Gray [1990], Ruser and Smith [1991], Curington [1986], Gray and Mendeloff [2005], Marlow [1982], Ruser and Smith [1988], Viscusi and others [1979], Viscusi [1986], Lanoie [1992], Robertson and Keeve [1983], Rea [1981] and Smitha *et al.* [2001].

Other factors which can impact workplace injury rates that are exogenous to RTW passages are age, education, and weather. Younger workers are typically found to be less experienced and less risk averse leading to higher workplace injuries among them (Mitchell [1988]). Results for education are consistent at showing that a more educated population leads to less workplace injuries (cite). Rainfall and heat exposure are positively related to injury rates for outside workplaces (Varghese *et al.* [2018]). Other factors or policies may exist which influence workplace injury rates. However, their inclusion should have no impact when studying the effect of RTW on injuries due to them being exogenous to RTW passages.

1.3 Empirical Strategy

As discussed above, right to work laws can impact union rates and economic signaling within a state which, in turn, influence both fatal and nonfatal workplace injuries. Due to opposing theories, it is unclear what effect RTW laws have on fatal and nonfatal workplace injuries. The primary estimation strategy, multi-state difference-in-differences, takes full advantage of the pooled cross-sectional data obtained. This approach allows a comparison of a state before and after it implements a RTW law, while differencing out trends from control states who experience no change in law. A generalized synthetic control method is used to bolster results found and to correct any bias resulting in failed parallel trends.

To compare potential differences between the private and public sector as well as differences between private sector industries, the multi-state difference-in-differences strategy will be run for each of these. Because of the volatile nature of workplace injuries from year to year, splitting the data creates smaller n's and less precise estimates. This precision is further diminished when performing case studies making inference difficult. Hence, case study analyses will forgo analysis of separate sectors and industries and will only focus on the complete workforce.

1.3.1 ***Multi-State Difference-in-Differences***

My primary difference-in-differences equation which estimates the reduced form impact of RTW laws on workplace injury outcomes is the following:

$$I_{st} = \alpha + \beta_1 \mathrm{RTW}_{st} + \beta_2 \mathbf{X}_{st} + \sigma_s + \tau_t + \epsilon_{st} \tag{1.1}$$

The dependent variable, I_{st}, represents the natural log of fatal injuries, all nonfatal injuries, nonfatal injuries which resulted in days away from work, nonfatal injuries which resulted in job restriction or transfer, and all other nonfatal injuries within state s and year t. RTW_{st} is an indicator for if a state s is a right to work state in year t. The state fixed effect σ_s is used to absorb unobserved time-invariant state characteristics such as a state's anti-union sentiment. Similarly, τ_t represents year fixed effects which capture unobserved national trends. The usage of these fixed effects can be thought of as a higher level difference-in-differences model. The vector $\mathbf{X}_{st}$ is comprised of the following time-varying state-specific variables: fraction male, age groupings, race variables, marital variables, fraction of lower house Republican, the number of inspections done by OSHA, and weather variables regarding temperature and precipitation. The error term ϵ_{st} is clustered at the state level to allow for intrastate correlation. Variables such as union rates, industry composition, firm size, and unemployment have been left out of equation 1.1 for multicollinearity and endogeniety concerns and to estimate a reduced form.

There are two issues with the suggested difference-in-differences design in my setting. First, the assumption of parallel trends in the pre-treatment period may be violated. That is, the trends in workplace injury rates within a treatment state before treatment may be different than the trends in the control states. Results from a DiD design can be completely driven by trends in pre-treatment which are not parallel. As seen in Figures A.1a - A.1e in the appendix, parallel trends hold in some cases but fails in others. Second, the assumption that treatment is randomly assigned may be potentially violated. This can be seen in Figure 1.1 as the five newest adopters of Right to Work are in the Midwest region. These states may have felt pressure to adopt RTW laws in order to stay relevant with firms seeking to expand. The generalized synthetic control (GSC) method does not require random treatment, allows for differences in treatment timing, and is a solution for dealing with violations in the parallel trends assumption.

1.3.2 *Generalized Synthetic Control*

Abadie and Gardeazabal [2003] and Abadie *et al.* [2010] introduced a technique which they called synthetic control. This technique creates a control for a treated unit by using a weighted average of the controls. The weights are chosen such that the mean squared prediction error of the outcome variable in the pre-treatment period is minimized. By doing so, the synthetic control unit has a similar pre-treatment trend to the treated unit. This is useful in cases when the parallel trends assumption is weak or fails to hold in the typical difference-in-differences framework. The original synthetic control technique was created for individual case studies with a treatment dummy. Studies with multiple treatment units who have identical treatment timing have used a synthetic control approach on each individual treatment unit and then aggregated the results for each treated unit. However, in this paper, treatment timing differs from state to state meaning a simple aggregation of individual synthetic case studies can lead to biased results.

The generalized synthetic control (GSC) method is an extension of Abadie *et al.* [2010] and Bai [2009] created by Xu [2017] of which difference-in-differences is a special case. The GSC method works in three steps. First, it estimates an interactive fixed effects (IFE) model derived by Bai [2009] in order to obtain a fixed number of latent factors. The model is

$$I_{st} = \beta_1 \mathrm{RTW}_{st} + \beta_2 \mathbf{X}_{st} + \beta_3 x_{st} + f_t \lambda_s + \epsilon_{st} \tag{1.2}$$

where x_{st} represents for a fixed effect for every state/year pair, f_t is a vector of unobserved time-varying latent factors, λ_s is a vector of state-specific factor loadings, and ϵ_{st} is the independent stochastic error term. The set of dependent and independent variables used in the IFE model are identical to equation 1.1. The first step estimates the parameters β_3,

λ_s and the vector f_t using the control group data only. Second, the factor loadings, λ_s, are then estimated by linearly projecting the treated outcomes in the pre-treatment period onto the space spanned by the factors, f_t, found in step one. In other words, similar to the idea behind Abadie *et al.* [2010]'s synthetic control method, factor loadings are chosen such that the mean squared error of the predicted treated outcomes is minimized in the pre-treatment period. Third, the synthetic control in the post-treatment period, $\widehat{I}_{st}$, is imputed based on the latent factors and factor loadings from steps one and two.

Let $\mathcal{T}$ be the set of treatment states and N be the number of treatment states. The average treatment effect on the treated can then be calculated for each period as follows:

$$ATT_t = \frac{1}{N} \sum_{s \in \mathcal{T}} \left[I_{st} - \widehat{I}_{st} \right] \tag{1.3}$$

Results from this estimation strategy are likely the least bias and result in the most accurate estimation of a RTW laws' affect on workplace injury outcomes. However, due to the few pre-treatment periods for Oklahoma when considering nonfatal workplace injury outcomes, the GSC method drops Oklahoma as a treatment state. However, results will show that estimates for nonfatal injury outcomes remain nearly identical between the difference-in-differences analysis and GSC method.

1.3.3 *Case Study Analyses*

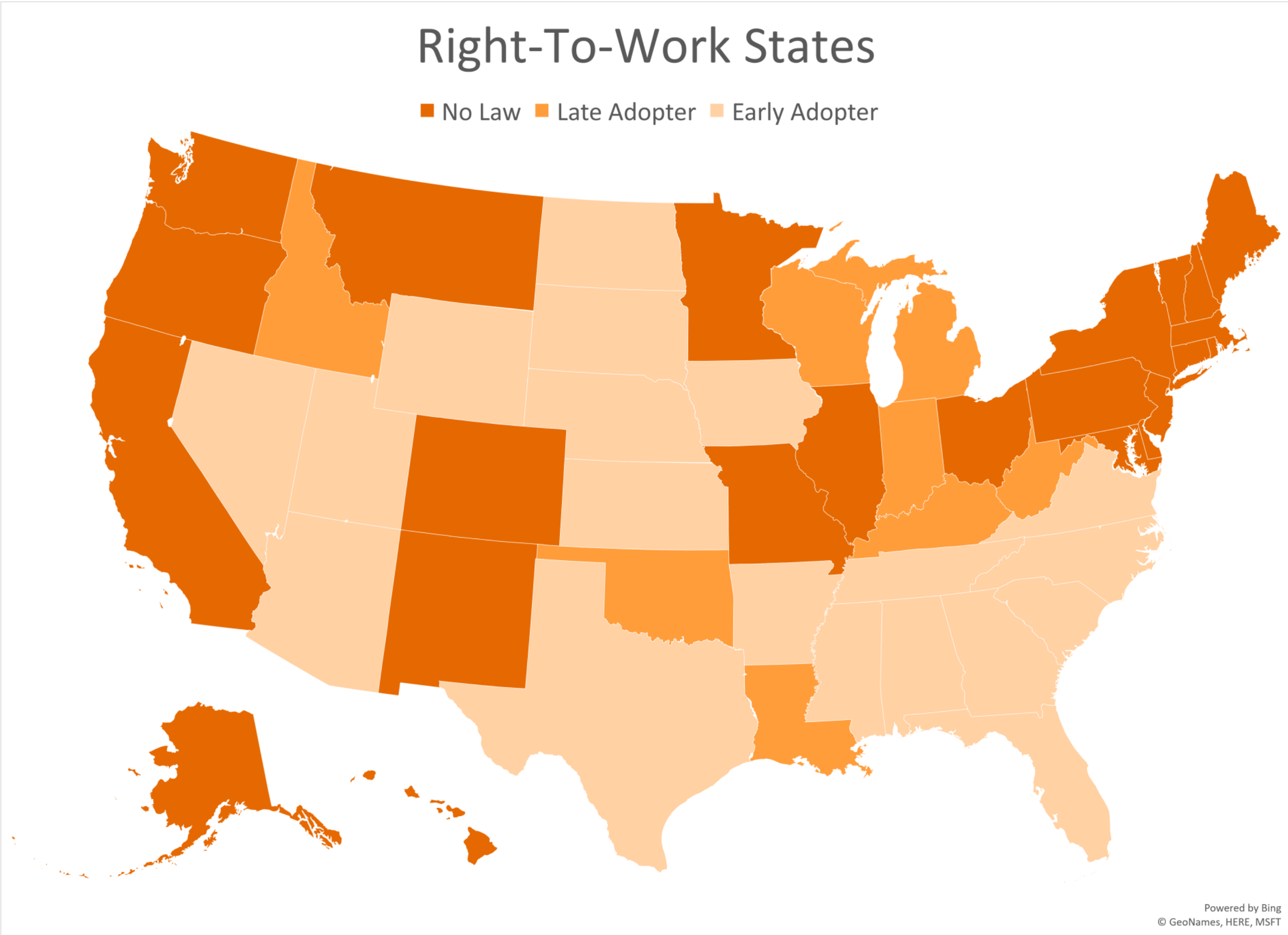
Due to the lack of treatment states, the two previous estimation methods may be biased if the six treatment states studied are inherently different than the control states. To check for this bias and to bolster the results from a multi-state analysis, I will also conduct a difference-in-differences case study on every state that changes treatment status. When performing a case-study analysis on a specific treatment state, all other treatment states are dropped. Equation 1.1 will be adapted for case study analysis as follows:

$$I_{st} = \alpha + \beta_1 POST_t + \beta_2 State_s + \beta_3 Post \times State_{st} + X\beta_4 \mathbf{X}_{st} + \epsilon_{st} \tag{1.4}$$

The variables $POST_t$ and $State_s$ are indicator variables for if the treatment year has occurred and if the state is the case-study treatment state, respectively. The difference-in-differences variable that is of interest is the interaction term $Post \times State_{st}$. The controls contained in $\mathbf{X}_{st}$ are identical to those found in equation 1.1. All other states are used as controls including those who have already passed a RTW law. As a robustness check, previous adopters of RTW laws will be dropped as well. Inference becomes difficult in this setting for two reasons. One, in this state-year clustering framework, the assumption that the number of states is large enough to allow correlation within cluster is violated (Wooldridge [2006]). Two, the use of a single treatment state shrinks the degrees of freedom leading to a larger sampling variance. To alleviate such concerns, I will implement a randomization test similar to Buchmueller *et al.* [2011]. This test reruns equation 1.4 for all control states. The results from the additional placebo estimates are then used as the sampling distribution for the treatment state. Hence, rather than using the asymptotic standard error, the results from the placebos are used to calculate much more conservative confidence intervals than those given by standard clustered errors.

Similar to the multi-state analysis, each case study analysis relies on the assumption of parallel pre-trends. Because this is likely violated and to bolster results, case-study synthetic difference-in-differences will be used. This new estimation strategy produced by Arkhangelsky *et al.* [2021] is similar to Abadie and Gardeazabal [2003] and Abadie *et al.* [2010]'s synthetic control method in that it re-weights and matches pre-treatment trends to alleviate failings in the parallel trend assumption. This new synthetic difference-in-differences method further estimates time weights which balance pre-treatment time periods with post-treatment periods. From here, it uses these weights in a basic difference-in-differences estimation. The use of weights emphasizes control units which are most similar to the treated state and pre-treatment periods which most closely match post-treatment periods allowing for a more ideal comparison. Again, inference is near impossible when considering a single treatment unit. I use the placebo variance estimation when performing synthetic difference-in-differences which calculates confidence intervals based on placebo estimates from the untreated units. Results from case-study analyses should not be used for inference but rather is a way to check that no individual state appears to drive the results for the multi-state analyses.

Figure 1.1: Right-to-Work States



1.4 Data

The primary data sources for this research come from the Bureau of Labor Statistics (BLS). They provide both the Survey of Occupational Injuries and Illnesses (SOII) and the Census of Fatal Occupational Injuries (CFOI). Employers are required to report injuries, illnesses, and fatalities under the Occupational Safety and Health Administration (OSHA) guidelines. It is important to note that not all states are participants in SOII. Participation varies from year to year. If a state has full participation, then data ranges from 1996 to 2018. Figure 1.2 shows state participation by year. The Census of Fatal Occupational Injuries has full participation from all states in all years. This data has a slightly larger time span running from 1992 to 2018.

The SOII and CFOI publish both counts and rates of workplace injuries. However, rate calculations are not available for every year. To keep a consistent workplace injury rate, I divide workplace injury counts by total hours worked estimates obtained from the Current Population Survey (CPS).[5] This is then multiplied by 200,000 (100 workers working 40 hours per week for 50 weeks a year) to generate rates as injuries per 100 full-time workers. This generates five injury outcomes rates: Fatal, all nonfatal, lost workday nonfatal cases, job restriction or job transfer nonfatal cases, and nonfatal cases which do not result in lost workdays or job restriction or transfer which I have labeled "other" nonfatal injuries. Any injuries which were the result of some outside force, such as the Oklahoma City bombing in 2005, are excluded. I argue that, on average, injuries which result in days away from work are more severe than injuries which result in job restriction or transfer which are more severe than injuries which result in neither. Table 1.7 supports this claim showing that severe injuries such as amputations, punctures, and fractures are more common with lost workday cases and injuries such as sprains or bruises are more common with job restriction or transfer cases. The separation of these nonfatal injuries

[5] Injury counts for all workers, the private sector, the public sector, and each private sector industry studied within each state and year are divided by the total hours worked within the same sector/industry, state, and year. For example, the number of nonfatal workplace injuries in the construction industry in Georgia in 2007 is divided by the total hours worked by construction workers in Georgia in 2007.

gives insight into how RTW laws impact injury severity.

Table 1.7: Lost Workday and Job Restriction or Transfer Nonfatal Injury Causes

Injury Type	Lost Workday	Job Restriction or Transfer
Sprains, strains, tears	34.3%	43.6%
Soreness, pain	17.7%	11.5%
Fractures	8.8%	3.4%
Bruise, contusions	8.8%	12.7%
Cuts, lacerations	8.6%	15.2%
Multiple traumatic injuries	2.6%	2.4%
Punctures (excluding gunshot wounds)	1.7%	0.9%
Amputations	0.7%	0.08%
Carpal tunnel syndrome	0.6%	0.2%
Chemical burns and corrosions	0.4%	0.1%
Tendonitis	0.2%	0.5%
Other	14%	6.8%

Percentages calculated using 2018 data from the Bureau of Labor Statistics.

Each of these outcome variables are collected for the public and private sectors as well as the following seven private industries: construction, manufacturing, wholesale trade, retail trade, transportation and warehousing, finance and real estate, and services. Due to changes in industry classification from the Standard Industrial Classification (SIC) to the North American Industrial Classification System (NAICS) in 2003, it is not possible to use the rate data from BLS for the transportation and warehousing, finance and real estate, and services industries. However, collecting injury counts and using correspondence tables comparing the SIC to the NAICS allows me to keep consistent industry rates despite the swap of classification. Depending on the type of injury and industry studied, some injury counts are zero. In order to allow for log transformation, these zero values are replaced with one one-thousandth. Changing this value to a different small number has a negligible impact on the results found.

The CPS is used to estimate the following state labor force demographic variables: fraction male, age, race, marital status, and education. Males may have riskier work practices leading a work force population with more males to have higher injury rates. Age variables are broken into the fraction of the working population who is between the ages of 15 and 24, 25 and 34, 35 and 44, 45 and 54, and 55 and 64.[6] This is done because younger, new workers are likely less experienced and are at higher risk of a workplace injury than a middle-aged worker. Hence, it is important to control for any labor force age differences between states. The CPS breaks race variables into 28 separate categories. I have chosen to control for three of the larger ones which are white, black, and asian. Marital status is split into the fraction of the working population who is single, married, or divorced. The two education variables are the fraction of workers who have at least a highschool diploma and the fraction who have at least a bachelor's degree. Since the CPS is individual level data and the individual's industry and sector is recorded, I am also able to obtain the same set of control variables by sector and for each type of private sector industry.

Data on which states have implemented a state run OSHA plan and data on the number of workplace inspections is obtained directly from OSHA. State run OSHA programs either cover private and state/local government workplaces or just state/local government workplaces. A state which is covered by a federal OSHA program (no state program) only covers the private sector and does not cover state and local government workers. This helps explain why some states implement state OSHA programs which only cover state and local government workers. Within the time period studied, New Jersey (2001), Illinois (2009), and Maine (2015) implemented state OSHA program which cover state and local government workers only. For a full list and map of state run OSHA programs, see Table A.1 and Figure A.2 in appendix A. This small amount of variation in state OSHA program adoptions only occurs in control states making its inclusion in the analysis of little value. However, controlling for the workplace inspection rate better captures OSHA's impact on workplace safety within a given state and year. This rate is calculated using the number of OSHA inspections in a state and year divided by the number of firms. The log transformation is taken for this control variable as well.

[6]The omitted age group are those between 15 and 24. Therefore, this age group is the reference group.

Since previous research has shown that outside temperature and inclement weather increase workplace injuries, data on the average maximum temperature and precipitation levels are collected from the National Oceanic and Atmospheric Administration.

Lastly, data on when each state began enforcing their RTW law is collected from the National Right To Work Committee. For a map and table of when states passed a RTW law, see Figure 1.1 and Table 1.1. Right to work legislation is fairly identical from state to state with the exception of Michigan whose RTW law covered both private and public sector employees. One interesting component of RTW laws is that they do not cover the railroad and airline industries. This is because employees in the railway and airline industries are covered by the Railway Labor Act (RLA). Hence, results when studying the transportation and warehousing industry are less likely to be influenced by changes in union representation.

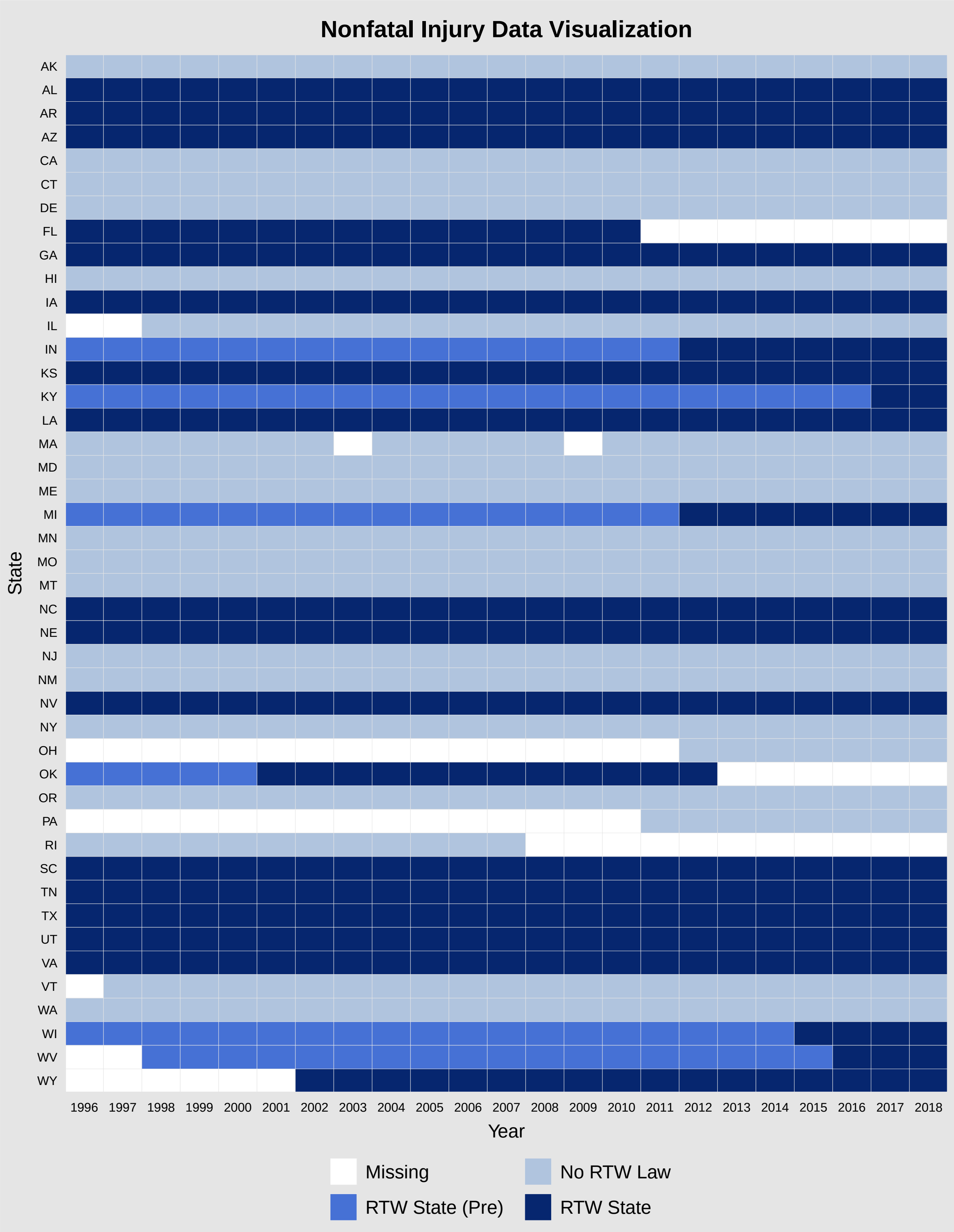
The aggregated dataset results in a strongly balanced panel of 1,350 observations with respect to fatal injuries and an imbalanced panel of 943 observations for nonfatal injuries. The full participation for fatal injuries holds true when analyzing the private and public sectors as well as the different private industries. However, this is not the case for nonfatal injuries as some industry counts are not reported resulting in lower observation levels. These observation levels for each sector and industry are included in the table of results. Means and standard deviations for each dependent and independent variable within each treatment state are provided in Table 1.8 averaging the years from 1992 to 2018. For additional summary statistics for the full nation, see Table A.7 in appendix A. Summary statistics for the treatment states show that some states such as West Virginia are more prone to fatal injuries but have lower rates of nonfatal injuries. Overall, treatment states do not appear to be wildly different than the average control state or the average state which was an early adopter of RTW legislation.

Table 1.8: Treatment States Summary Statistics 1992 - 2018

	Oklahoma mean/sd	Indiana mean/sd	Michigan mean/sd	Wisconsin mean/sd	West Virginia mean/sd	Kentucky mean/sd	Early Adopters mean/sd	Never Treated mean/sd
Year RTW Adpoted	2001	2012	2012	2015	2016	2017	1952.7	.
	(0)	(0)	(0)	(0)	(0)	(0)	(10.25)	(.)
Fatal Injuries per 100,000	6.256	5.402	3.742	4.158	8.686	7.114	6.523	4.612
	(0.633)	(0.721)	(0.452)	(0.648)	(2.362)	(1.770)	(2.652)	(3.694)
Nonfatal Injuries per 100	3.997	4.853	4.646	4.933	3.923	4.796	3.784	4.076
	(0.691)	(1.643)	(1.761)	(1.815)	(0.851)	(1.488)	(1.298)	(1.180)
Lost Workdays Cases per 100	1.240	1.144	1.134	1.425	1.703	1.425	1.019	1.406
	(0.332)	(0.465)	(0.388)	(0.536)	(0.512)	(0.464)	(0.345)	(0.446)
Job Restriction/Transfer Cases per 100	0.805	1.130	1.148	0.957	0.343	0.970	0.764	0.646
	(0.109)	(0.244)	(0.456)	(0.238)	(0.0364)	(0.266)	(0.264)	(0.328)
Other Cases per 100	1.952	2.579	2.363	2.550	1.879	2.401	2.001	2.023
	(0.358)	(0.971)	(0.944)	(1.060)	(0.366)	(0.783)	(0.785)	(0.698)
Right to Work	0.667	0.259	0.259	0.148	0.111	0.0741	1	0
	(0.480)	(0.447)	(0.447)	(0.362)	(0.320)	(0.267)	(0)	(0)
OSHA Inspection Rate	0.00848	0.0159	0.0275	0.0110	0.0127	0.0152	0.0129	0.0167
	(0.00172)	(0.00689)	(0.00585)	(0.00212)	(0.00272)	(0.00413)	(0.00882)	(0.0138)
Aged 15-24	0.158	0.155	0.167	0.170	0.146	0.159	0.163	0.148
	(0.0146)	(0.0180)	(0.0171)	(0.0128)	(0.0179)	(0.00833)	(0.0259)	(0.0166)
Aged 25-34	0.224	0.219	0.215	0.214	0.216	0.226	0.227	0.220
	(0.0153)	(0.0211)	(0.0218)	(0.0239)	(0.0134)	(0.0196)	(0.0227)	(0.0265)
Aged 35-44	0.228	0.246	0.238	0.235	0.240	0.240	0.233	0.237
	(0.0282)	(0.0287)	(0.0291)	(0.0334)	(0.0284)	(0.0274)	(0.0291)	(0.0336)
Aged 45-54	0.210	0.214	0.223	0.213	0.219	0.215	0.209	0.219
	(0.0166)	(0.0254)	(0.0224)	(0.0226)	(0.0163)	(0.0201)	(0.0223)	(0.0224)
Aged 55-64	0.132	0.128	0.122	0.131	0.138	0.121	0.126	0.134
	(0.0238)	(0.0331)	(0.0339)	(0.0380)	(0.0356)	(0.0283)	(0.0307)	(0.0358)
Fraction Male	0.541	0.533	0.534	0.526	0.541	0.531	0.535	0.529
	(0.00637)	(0.00568)	(0.00744)	(0.00615)	(0.0124)	(0.00815)	(0.0134)	(0.0120)
Fraction White	0.806	0.906	0.841	0.919	0.953	0.908	0.831	0.832
	(0.0423)	(0.0182)	(0.0160)	(0.0180)	(0.0105)	(0.0147)	(0.104)	(0.149)
Fraction Black	0.0685	0.0746	0.118	0.0455	0.0313	0.0733	0.127	0.0738
	(0.00579)	(0.00857)	(0.00470)	(0.00571)	(0.00465)	(0.00830)	(0.109)	(0.0694)
Fraction Asian	0.0167	0.0107	0.0264	0.0177	0.00619	0.0110	0.0222	0.0630
	(0.00528)	(0.00573)	(0.00879)	(0.00736)	(0.00259)	(0.00446)	(0.0180)	(0.122)
Fraction Single	0.225	0.257	0.304	0.302	0.235	0.250	0.270	0.297
	(0.0199)	(0.0232)	(0.0186)	(0.0156)	(0.0202)	(0.0280)	(0.0279)	(0.0291)
Fraction Married	0.606	0.589	0.556	0.565	0.604	0.594	0.580	0.561
	(0.0309)	(0.0236)	(0.0199)	(0.0177)	(0.0318)	(0.0384)	(0.0341)	(0.0269)
Fraction Divorced	0.126	0.119	0.108	0.103	0.121	0.117	0.109	0.104
	(0.0107)	(0.00729)	(0.00505)	(0.00636)	(0.0145)	(0.00972)	(0.0162)	(0.0161)
Obtained HS Degree Only	0.633	0.650	0.634	0.637	0.677	0.636	0.618	0.582
	(0.0190)	(0.0202)	(0.0222)	(0.0214)	(0.0197)	(0.0116)	(0.0380)	(0.0493)
Obtained Bachelor's Degree	0.250	0.234	0.271	0.262	0.216	0.238	0.257	0.315
	(0.0309)	(0.0407)	(0.0442)	(0.0374)	(0.0401)	(0.0357)	(0.0492)	(0.0582)
Fraction of Lower House Republican	0.840	0.602	0.513	0.508	0.370	0.744	0.664	0.409
	(0.205)	(0.165)	(0.115)	(0.0919)	(0.350)	(0.154)	(0.267)	(0.325)
Maximum Temperature	94.80	85.22	80.39	80.61	83.67	87.67	89.40	83.04
	(3.173)	(2.702)	(2.789)	(2.882)	(2.021)	(2.482)	(4.684)	(6.324)
Monthly Precipitation	2.988	3.644	2.792	2.791	3.913	4.154	3.005	3.154
	(0.510)	(0.428)	(0.231)	(0.288)	(0.533)	(0.562)	(1.481)	(1.082)
Union Member Rate	0.0725	0.130	0.198	0.149	0.141	0.107	0.0716	0.155
	(0.0154)	(0.0312)	(0.0337)	(0.0362)	(0.0208)	(0.0140)	(0.0307)	(0.0474)
Unionized Workforce Rate	0.0865	0.142	0.209	0.159	0.154	0.124	0.0874	0.170
	(0.0163)	(0.0332)	(0.0351)	(0.0373)	(0.0231)	(0.0146)	(0.0347)	(0.0473)

Means are reported with standard deviations in parenthesis.
Early Adopters are states who adopted a right to work law before this dataset began in 1992. Never Treated are states who have not enacted a RTW law. Fatal and nonfatal injury rates are calculated by dividing counts by total working hours. Therefore, Fatal injuries here represent the number of fatal injuries per 100,000 full-time employees.
OSHA Inspection Rate is calculated by taking the number of OSHA inspections performed divided by the number of firms within a state.
Control variable rates (excluding the political and weather variables) are calculated by dividing by the number of employees.
Fraction of Lower House Republican is calculated by taking the number of Republican representatives in the House of Representatives in the state and dividing by the total number of representatives in that state's house. Temperature is in Fahrenheit.
When using fatal injuries as an outcome, data is a balanced panel of 1,350 observations.
When using nonfatal injuries, data is an unbalanced panel of 943 observations.
Means are not national averages but rather the average of the states over the period 1992-2018.

Figure 1.2: Right-to-Work Law Adoptions and Nonfatal Injury Data



Note that all treated states are participants in SOII. However, since the data begins in 1996, Oklahoma has only 5 pre-treatment periods which is insufficient for the Generalized Synthetic Control method.

1.5 Results

1.5.1 *Multi-State Difference-in-Differences*

Table 1.9 contains the results formed by equation 1.1. The outcome variables in columns (1) and (2) are both the log of fatal injuries. However, the sample is column (2) is identical to the sample for nonfatal injuries. This robustness check is done to allow for proper comparison between fatal and nonfatal effect estimates and to check that estimates from column (1) are not a result of the larger sample size. The outcome variables in columns (3) - (6) are the log of all nonfatal injuries, log of nonfatal injuries resulting in days away from work, log of nonfatal injuries resulting in job restriction or transfer, and log of nonfatal injuries resulting in neither lost workdays nor job restrictions or transfer. Results for the right to work variable should be interpreted as treatment is associated with a percent increase or decrease in a workplace injury outcome and results for the control variables should be interpreted as a one percentage point increase in the control variable leads to a percent increase or decrease in the workplace injury outcome.

The results from Table 1.9 show that, on average, the passage of a RTW law leads to a 11.9% increase in the fatal occupational injury rate within the treated state, significant at the 1% level. This estimate is similar to the one found by Zoorob [2018]. Column (2) gives a similar estimate to column (1) which gives confidence that the results in columns (3) - (6) are not simply a factor of the difference in sample size. Column (3) shows that, on average, the passage of a RTW law leads to a 7.95% decrease in all reported nonfatal injuries, significant at the 5% level. This appears to be primarily driven by lost workday cases which is shown to decrease by 13.9% following a RTW passage, significant at the 1% level. Both job restriction or transfer cases and other cases are found to be non-positive and insignificant signifying a small or null impact.

Table 1.10 gives results for equation 1.1 for the private and public sectors as well as the studied private sector industries.[7] Results for the private sector nearly mimic the results

[7] To see all coefficient estimates for every industry and sector, see tables A.10 - A.18 in appendix A.

Table 1.9: Mutli-State Analysis Full Workforce Results

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	0.119**	0.127**	-0.0795**	-0.139***	-0.0480	-0.0514
	(0.0549)	(0.0500)	(0.0356)	(0.0311)	(0.0686)	(0.0503)
Inspection Rate	1.785	1.859**	0.209	0.172	-1.399	0.822*
	(1.102)	(0.837)	(0.340)	(0.495)	(1.101)	(0.460)
Age 25-34	-0.959	-1.262	-1.608***	-2.065***	-2.119*	-1.405**
	(0.989)	(0.942)	(0.498)	(0.695)	(1.115)	(0.696)
Age 35-44	-2.033*	-1.565	-1.893**	-2.059**	-2.807*	-1.834*
	(1.189)	(1.302)	(0.720)	(0.832)	(1.463)	(0.985)
Age 45-54	0.00343	-0.151	-2.459***	-2.255**	-5.032***	-2.156**
	(1.167)	(1.484)	(0.801)	(0.926)	(1.442)	(0.949)
Age 55-64	0.154	-0.458	-1.036	-1.142	-1.483	-0.613
	(1.349)	(1.734)	(0.753)	(0.776)	(1.456)	(1.105)
Male	2.537**	1.617	0.255	-0.360	1.923**	0.301
	(1.223)	(1.215)	(0.588)	(0.806)	(0.847)	(0.771)
White	-0.242	0.0271	-0.443	-0.769	-1.288	-0.0463
	(0.697)	(0.671)	(0.508)	(0.531)	(0.907)	(0.688)
Black	0.954	1.194	0.459	0.105	-1.056	1.084
	(1.278)	(1.222)	(0.680)	(0.780)	(1.373)	(0.953)
Asian	-0.245	0.120	0.00834	-0.371**	0.0391	0.247
	(0.647)	(0.499)	(0.206)	(0.172)	(0.439)	(0.448)
Single	0.350	-0.0869	-0.767	-0.741	-1.313	-0.748
	(0.829)	(1.126)	(0.497)	(0.601)	(1.013)	(0.649)
Divorced	4.643***	2.866***	0.986*	0.625	-0.344	1.971**
	(0.780)	(0.879)	(0.500)	(0.542)	(1.267)	(0.775)
HS Degree Only	-0.640	-0.384	-0.378	-0.642	-0.846	-0.272
	(0.632)	(0.780)	(0.546)	(0.609)	(1.119)	(0.700)
Obtained Bachelor's Degree'	1.309	1.753	0.113	0.540	-0.881	-0.257
	(0.989)	(1.098)	(0.456)	(0.599)	(0.973)	(0.640)
Frac. of Lower Rep.	0.0719	-0.0293	-0.0219	-0.0537*	0.0215	0.00622
	(0.0617)	(0.0533)	(0.0305)	(0.0314)	(0.0709)	(0.0530)
Maximum Temperature	0.00360	0.00322	0.00280**	0.00167	0.00469**	0.00279
	(0.00254)	(0.00379)	(0.00132)	(0.00148)	(0.00224)	(0.00181)
Monthly Precipitation	0.0144	0.0308***	0.00290	-0.00353	0.00501	0.00733
	(0.0109)	(0.00949)	(0.00516)	(0.00514)	(0.00944)	(0.00759)
Constant	-6.404***	-6.266***	3.425***	3.216***	3.228*	2.014
	(1.633)	(1.759)	(0.851)	(0.937)	(1.723)	(1.253)
N	1350	943	943	943	943	943
r2	0.861	0.854	0.944	0.948	0.939	0.923

Standard errors clustered as state level.
Equation 1 results for the private and public sectors combined.
Outcomes are log variables.
Results for the RTW variable should be interpretted as "a RTW passage leads to a x change in the outcome variable" where x is the point estimate.
Results for other variables should be interpretted as "a 1 percentage point increase leads to a x change in the outcome variable" where x is the point estimate.
Column (1) gives results for the log fatal workplace injury rate. Column (2) is the same outcome variable but using the sample in which nonfatal injuries are available.
Columns (3) - (6) represent All Nonfatal workplace injuries, nonfatal workplace injuries which resulted in days away from work, nonfatal workplace injuries which resulted in job restriction or job transfer, and nonfatal injuries which did not result in either lost workdays or job restriction or job transfer.
For a description of the control variables, see Table 1.8.

found for the private and public sectors combined. This is to be expected because the private sector makes up around 95% of jobs in the US. Results for the public sector show that a RTW passage increases fatal workplace injuries by 20.8% on average which is equivalent to around 3 additional deaths in an average sized state. The coefficient for lost workday nonfatal injuries is -12.5% which further supports the idea that RTW passages lead to a decrease in lost workday injuries. The coefficients for all nonfatal injuries, injuries resulting in job restriction or transfer, and other nonfatal injuries in the public sector are closer to zero and all injury measures are insignificant for the public sector.

Table 1.10: Right to Work Coefficient Comparison From Multi-State Analyses

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
All	0.119**	0.127**	-0.0795**	-0.139***	-0.0480	-0.0514
	(0.0549)	(0.0500)	(0.0356)	(0.0311)	(0.0686)	(0.0503)
N	1350	943	943	943	943	943
r2	0.861	0.854	0.944	0.948	0.939	0.923
Private	0.107*	0.121**	-0.0655***	-0.119***	-0.0469	-0.0323
	(0.0560)	(0.0521)	(0.0183)	(0.0363)	(0.0623)	(0.0273)
N	1350	943	943	943	943	943
r2	0.855	0.847	0.966	0.956	0.940	0.957
Public	0.208	0.115	0.0140	-0.125	0.0347	0.0696
	(0.136)	(0.144)	(0.0580)	(0.0927)	(0.128)	(0.0621)
N	1350	762	762	762	744	762
r2	0.386	0.393	0.849	0.885	0.843	0.796
Construction	-0.0187	0.0347	-0.0680	-0.143	0.0723	-0.0292
	(0.110)	(0.0815)	(0.0812)	(0.145)	(0.214)	(0.0876)
N	1350	941	941	941	941	941
r2	0.419	0.442	0.886	0.820	0.406	0.863
Manufacturing	0.160	0.115	-0.0771	-0.131**	0.0489	-0.0338
	(0.163)	(0.161)	(0.0474)	(0.0629)	(0.135)	(0.0373)
N	1350	942	942	942	942	942
r2	0.429	0.405	0.928	0.811	0.641	0.944
Wholesale Trade	0.165	0.219*	-0.0319	-0.138	0.0803	0.0928**
	(0.112)	(0.111)	(0.0289)	(0.0882)	(0.164)	(0.0428)
N	1349	932	933	933	933	933
r2	0.374	0.422	0.683	0.613	0.616	0.520
Retail Trade	-0.0856	-0.0373	-0.0412	-0.0964**	-0.0887	0.00414
	(0.129)	(0.149)	(0.0422)	(0.0475)	(0.0907)	(0.0512)
N	1349	939	940	941	940	940
r2	0.458	0.381	0.808	0.802	0.776	0.869
Transportation and Warehousing	0.122	0.148	-0.0398	-0.0103	-0.0759	-0.0392
	(0.191)	(0.125)	(0.0726)	(0.0730)	(0.154)	(0.0737)
N	1350	936	936	934	934	936
r2	0.523	0.554	0.764	0.698	0.385	0.758
Finance and Realestate	0.132	0.134	-0.00841	0.129	0.0722	-0.0917
	(0.106)	(0.118)	(0.0839)	(0.196)	(0.339)	(0.251)
N	1350	912	912	907	903	909
r2	0.131	0.152	0.505	0.433	0.551	0.393
Services	0.0698	0.129	0.00490	-0.0677	-0.00327	0.0544*
	(0.0981)	(0.0890)	(0.0202)	(0.0523)	(0.0686)	(0.0292)
N	1350	913	913	907	909	910
r2	0.346	0.368	0.878	0.892	0.804	0.816

Standard errors clustered as state level.
Results for each sector and private industry are given in rows with columns representing log outcomes.
Controls along with state and year fixed effects are included.
Results for the RTW variable should be interpretted as "a RTW passage leads to a x change in the outcome variable" where x is the point estimate.
Results for other variables should be interpretted as "a 1 percentage point increase leads to a x change in the outcome variable" where x is the point estimate.
Column (1) gives results for the log fatal workplace injury rate. Column (2) is the same outcome variable but using the sample in which nonfatal injuries are available.
Columns (3) - (6) represent All Nonfatal workplace injuries, nonfatal workplace injuries which resulted in days away from work, nonfatal workplace injuries which resulted in job restriction or job transfer, and nonfatal injuries which did not result in either lost workdays or job restriction or job transfer.
For a description of the control variables, see Table 1.8.

Results for individual industries are primarily insignificant. The rate of workplace injuries can fluctuate greatly from year to year. Given a large enough sample, the fluctuations are minimized as seen by the curves in Figure B.1 in appendix B. As the data is split by state and then by industry, the level of volatility of workplace injuries increases from year to year creating noisier estimates. Even without statistical significance, there are some interesting points to take away from these estimates. First, the coefficients for fatal workplace injuries are all positive with the exception of retail trade industry. While none of these point estimates are significant, they support the conclusion that most industries should expect an increase in the number of workplace fatalities following a RTW passage. Second, the lost workday injury estimates are all negative with the exception of the finance and real estate industry. The estimate for the manufacturing industry shows a decline of 13.1% in lost workday cases, significant at the 5% level. These estimates further confirm that most industries can expect a decline in lost workday cases following a RTW passage and this decline is somewhere around 13%. Third, there is evidence that total nonfatal workplace injuries decline. This is strongest in the manufacturing industry which shows an insignificant 7.7% decrease in total nonfatal workplace injuries. Estimates for job restriction or transfer cases and all other nonfatal workplace injury cases are insignificant and mainly small with two exceptions. The Wholesale trade industry and the services industry both show a significant increase in other nonfatal injuries following a RTW passage of 9.3% and 5.4% respectively. These nuances between industries shows that industries can expect different outcomes following a RTW passage.

Fatal injuries are not subject to the reporting biases that nonfatal injuries are subject to. Firms are unlikely to under report fatal injuries but may be able to under report nonfatal injuries or even convince employees to not report nonfatal injuries. Unlike fatal injuries, employees have the choice to not report a nonfatal injury which might be done in fear of job loss. These ideas can help explain why right to work laws are shown to increase workplace fatality rates while decreasing nonfatal lost workday cases. Because the fatal injury rate is shown to increase, it is likely that the average workplace safety level within a state decreases following a right to work passage. This decrease in safety may be coming from decreases in labor union representation or increases in the number of newly hired or poorly trained employees. However, these same ideas should also increase the rate of lost workday cases. A positive coefficient for fatal injuries and a negative coefficient for lost workday cases is evidence that either firms are under reporting nonfatal injuries that would result in lost workdays (likely to avoid workers' compensation payments) or employees are purposely not reporting injuries that would result in time away from work or both. It is also possible that decreases in average safety shifts the distribution of injuries towards more fatal injuries but this does not explain the large decrease in the number of lost workday case injuries.

As a robustness check, results from tables 1.9 and 1.10 are re-estimated using a sample which excludes all states which are treated before the time period studied. This is done to make the sample of control states as similar as possible to the treatment states. As seen in Tables A.8 and A.9 in appendix A, estimates are primarily unchanged.

Figures A.1a-A.1e visually show that the assumption of parallel trends fails to hold for most treated state/outcome pairs. Rather than relying purely on an "eye-test", the following equation from Autor [2003] is estimated:

$$I_{st} = \alpha + \sum_{j=-m}^{q} \beta_j D_{st+j} + \Gamma \mathbf{X}_{st} + \sigma_s + \tau_t + \epsilon_{st}$$

where D_{st+j} is an indicator for if state s in year $t + j$ is the treatment state and if it is year $t + j$ and m and q are the number of pre-treatment periods and post-treatment periods, respectively. The indicator for the year of adoption is removed to avoid the dummy variable trap and is hence used as the baseline. If the outcome trends between the treatment state and the control group are the same, then all β's before the treatment year should be insignificant. Tables A.2 - A.6 give the results for these estimations. These results show that there are only a few cases in which the parallel trends assumption holds.

1.5.2 *Generalized Synthetic Control*

Reduced form results of RTW laws on all workplace injury outcomes using generalized synthetic controls can be found in Table 1.11. The weights generated for each state to create the synthetic control state are given in tables A.19 - A.23 in appendix A. The ATT.Average in the first column of Table 1.11 is the average of all ATT's calculated from the post-treatment periods, weighted by the number of treatment states as in equation 1.3.[8] Similar to the multi-state difference-in-differences results, RTW laws are shown to increase fatal workplace injuries but by 9.8% rather than 11.9%. Unlike the first analysis, the coefficient for fatal injuries is insignificant with a p-value of 0.35. Panel (a) in Figure 1.3 shows the six treated states averaged in black with each treated state being in light gray. There does appear to be a clear separation between the treated average (black line) and the synthetic control state (dotted blue line). The insignificance of the point estimate is clearly coming from the volatility of fatal workplace injuries in the treated states. Hence, the exact impact RTW has on fatal workplace injuries is unclear but is likely positive.

Table 1.11: Generalized Synthetic Control Estimates for Right-to-Work laws on Different Workplace Injury Outcomes

Workplace Injury Outcome Variable	Effect Size (ATT.Average)	Standard Error	p-value	ATT for Period 1	ATT for Period 3	# Factors
Fatal Injuries						
Fatal Injuries	0.098	0.115	0.35	0.012	0.099	r=1
Nonfatal Injuries						
All	-0.044	0.047	0.117	-0.051	-0.010	r=1
Lost Workday	-0.139	0.041	0.000	-0.137	-0.139	r=2
Job Restriction/Transfer	0.031	0.077	0.892	0.049	0.014	r=4
Other	-0.007	0.070	0.583	-0.029	0.030	r=1

Control variables are identical to those from equation 1.1. Descriptions can be found in table A.7.
Effect Size (ATT.Average) is calculated using equation 1.3.
Number of Factors is selected through cross-validation procedure. Number of factors are chosen such that the lowest mean squared prediction error is chosen. See Xu [2017] for further details.

Because nonfatal workplace injuries are more likely than fatal, results for these indepen-

[8] For example, there are six states with a period immediately following treatment but only Oklahoma has an ATT 10 periods after treatment.

dent variables are more precisely estimated. Panels (c) - (f) in Figure 1.3 show how well the synthetic control matches the pattern of the treatment average in the pre-treatment period. Unlike the results for the multi-state DiD analysis, the estimates for job restriction or transfer injuries and all other nonfatal injuries are close to zero implying a null result. An overall decrease in nonfatal workplace injuries is further confirmed with this GSC method and this decrease is primarily driven by lost workday workplace injuries. The point estimates using GSC are slightly smaller though showing that a RTW passages decreases total nonfatal injuries by 5.6% with a p-value of 0.051 and lost workday injuries by 11.8% significant at the 1% level.

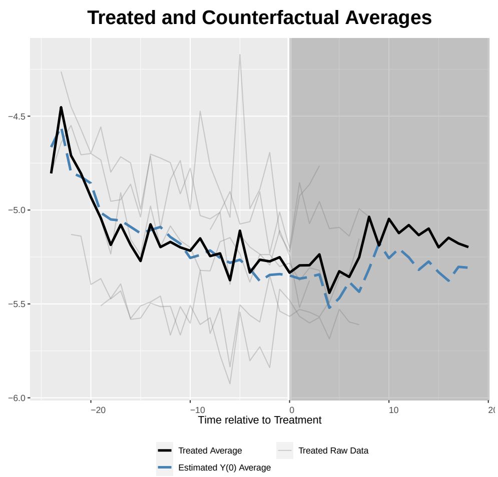
1.5.3 *Case Studies*

Estimation results from equation 1.4 can be found in Table 1.12 with full results for each state being in tables A.24 - A.29 in appendix A. The reduction in sample size in each case study is the result of dropping the other five treated states. Oklahoma, Indiana, Michigan, and Wisconsin each give a positive result for fatal injuries while West Virginia gives a null result and Kentucky gives a large negative result. Because four of the six states have a positive estimate, it is unlikely that one state is the driving force behind fatal injury results in the multi-state analysis. Placebo tests in Figure 1.4a show that only results for Oklahoma and Kentucky are significant at the 5% level. Results for job restriction or transfer nonfatal injuries and for other nonfatal injuries vary from state to state with all results being insignificant in the permutation tests. For lost workday nonfatal injuries, Indiana, Wisconsin, and West Virginia each have a significant negative estimate with all states having a negative estimate. This is strong evidence that lost workday cases decline preceding a RTW adoption. Total nonfatal injuries are shown to decline due to the large effect on lost workday cases.

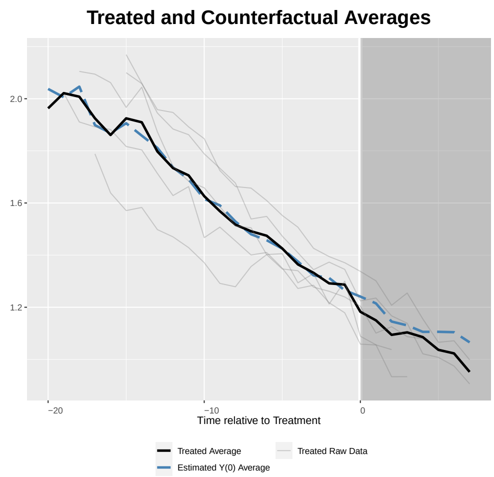
Results from Synthetic Difference-in-Differences in Table 1.13 tell a similar story as the results from Difference-in-Differences. Figure 1.4b graphically illustrate how the estimator is calculated, show which pre-treatment periods received weight, and the overall fit of the synthetic control in the pre-treatment period. The donor pool for these synthetic

Figure 1.3: Generalized Synthetic Control Raw Data Comparison

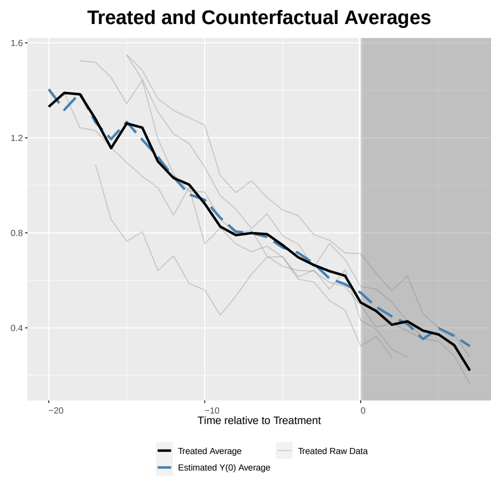
(a) Fatal Injuries



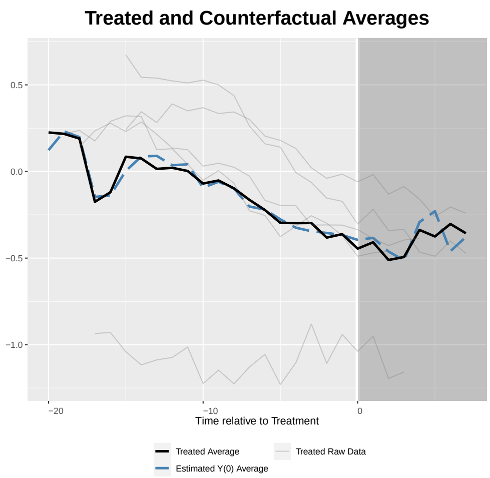
(b) All Nonfatal Injuries



(c) Other Nonfatal Injuries



(d) Job Restriction/Transfer Cases



(e) Lost Workday Cases

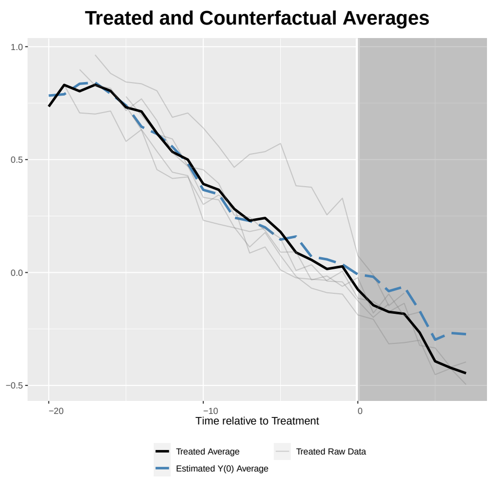


Table 1.12: Case Study Results

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
Oklahoma	0.239***	0.0910***	-0.0496*	0.0663	0.183***
	(0.0455)	(0.0201)	(0.0252)	(0.0419)	(0.0324)
N	1215	830	830	830	830
r2	0.864	0.944	0.950	0.939	0.922
Indiana	0.0779**	-0.133***	-0.219***	-0.0367	-0.142***
	(0.0296)	(0.0180)	(0.0206)	(0.0327)	(0.0234)
N	1215	836	836	836	836
r2	0.863	0.946	0.951	0.942	0.926
Michigan	0.201***	-0.170***	-0.107***	-0.266***	-0.153***
	(0.0260)	(0.0201)	(0.0194)	(0.0314)	(0.0248)
N	1215	836	836	836	836
r2	0.864	0.946	0.952	0.940	0.926
Wisconsin	0.143***	-0.110***	-0.149***	-0.0646*	-0.120***
	(0.0370)	(0.0183)	(0.0164)	(0.0362)	(0.0247)
N	1215	836	836	836	836
r2	0.863	0.944	0.950	0.940	0.924
West Virginia	-0.00698	-0.0531**	-0.302***	0.311***	0.0539
	(0.0452)	(0.0198)	(0.0244)	(0.0491)	(0.0324)
N	1215	834	834	834	834
r2	0.865	0.945	0.952	0.939	0.923
Kentucky	-0.340***	-0.106***	-0.122***	-0.104**	-0.0991***
	(0.0339)	(0.0231)	(0.0226)	(0.0421)	(0.0286)
N	1215	836	836	836	836
r2	0.865	0.946	0.952	0.940	0.925

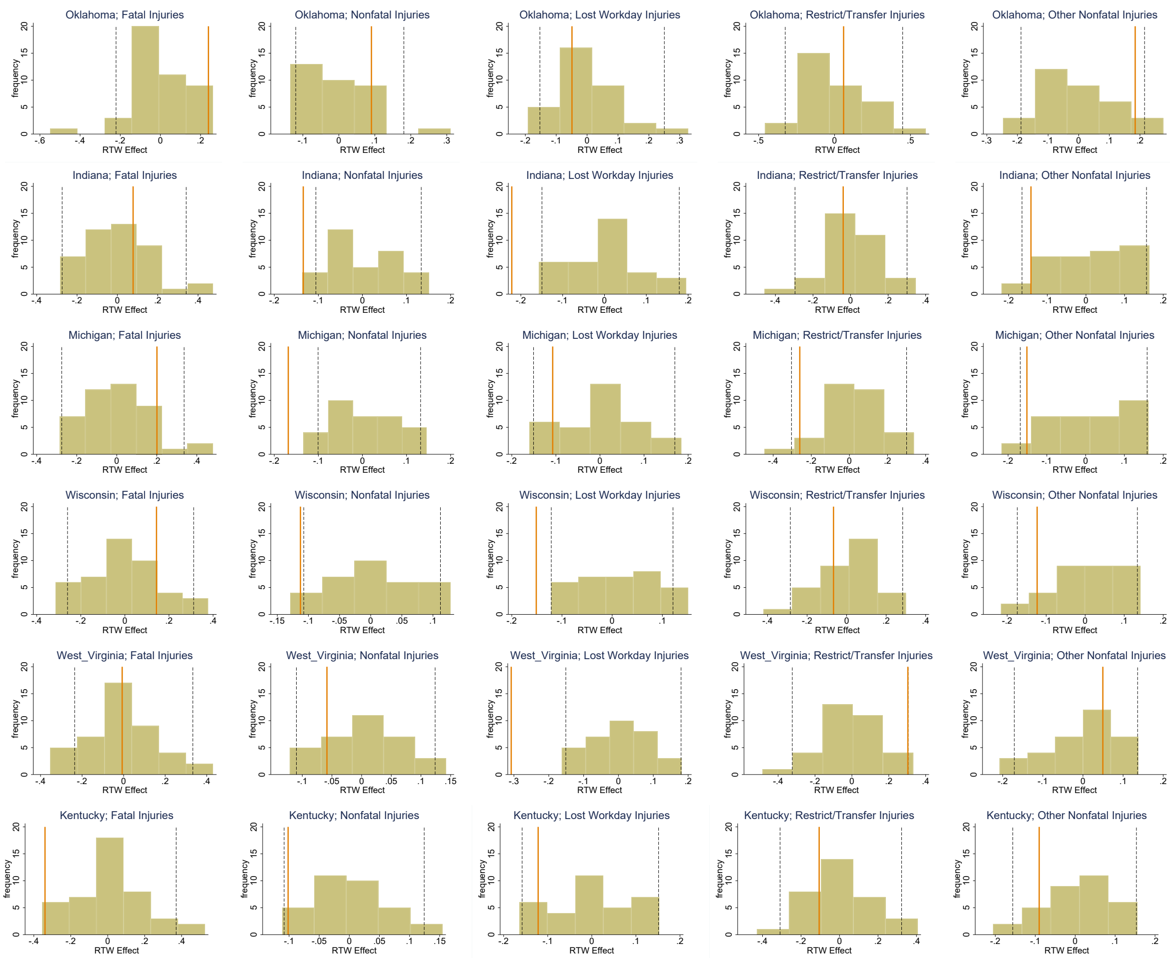
Standard errors clustered as state level.
Rows represent each treatment state while columns are the log outcome variables.
Each estimation includes both control variables and state and year fixed effects.
For a description of control variables, see Table 1.8.
Differences in n's for case study results come from dropping all other treatment states when performing a case study.

Table 1.13: Synthetic Difference-in-Differences Results

	Oklahoma	Indiana	Michigan	Wisconsin	West Virginia	Kentucky
Treatment Year	2001	2012	2012	2015	2016	2017
Fatal	0.222	0.117	0.143	0.049	0.077	-0.227
	(0.132)	(0.143)	(0.174)	(0.169)	(0.198)	(0.188)
Nonfatal	0.067	-0.034	-0.087	-0.017	-0.137^{***}	-0.045
	(0.109)	(0.065)	(0.064)	(0.038)	(0.040)	(0.056)
Lost Day	-0.108	-0.107*	-0.082*	-0.049	-0.300^{***}	-0.075
	(0.084)	(0.061)	(0.054)	(0.040)	(0.047)	(0.067)
Transfer/Restriction	0.068	0.029	-0.083	0.042	-0.030	-0.044
	(0.213)	(0.102)	(0.098)	(0.071)	(0.089)	(0.105)
Other	0.059	-0.033	-0.055	0.010	-0.050	-0.025
	(0.122)	(0.082)	(0.085)	(0.053)	(0.062)	(0.074)

difference-in-differences estimates are all states which were never treated in the data set. Using standard errors from placebo results, results for Oklahoma, Indiana, and West Virginia are found to be negative and significant for lost workday cases. However, inference in these case studies is near impossible due to the use of one treatment variable. Instead, the results indicate that, again, no one state is behind the multi-state results.

Figure 1.4a: Case Study Placebo Results for the Full Workforce



1.6 Discussion

Using a difference-in-differences estimation strategy on U.S. state level data from 1992-2018, this study finds that a right to work passage increases the fatal workplace injury rate while decreasing the nonfatal workplace injury rate, primarily the nonfatal injuries which result in days away from work. The primary difference-in-differences model estimates that for the full workforce, a right to work passage increases the fatal workplace injury

Figure 1.4b: Synthetic Difference-in-Differences Results

rate by 11.9% significant at the 5% level. This estimate is bolstered through robustness checks. A generalized synthetic control model finds a similar point estimate of 9.8% but with a larger standard error. Case study results find that this estimate is perhaps larger for some states. While fatal injuries are found to increase, nonfatal injuries are found to decrease by 7.95% in the primary difference-in-differences model for the full workforce. However, results from the generalized synthetic control model find that nonfatal injuries may instead decrease by a smaller amount of around 4.4%. Results for the effect of a right to work passage on lost workday nonfatal workplace injuries are the most consistent across each robustness check and model. The primary difference-in-differences model finds that a RTW law decreases lost workday nonfatal injuries by 13.9% significant at the 1% level. Using generalized synthetic control gives the same point estimate also being significant at the 1% level. Case study results all argue in favor of a large decrease in lost workday nonfatal injury cases and that this result is not being driven by one individual state. Results for both job restriction or transfer nonfatal cases and all other nonfatal cases are small and largely insignificant in the primary analysis. Generalized synthetic control bolsters the idea that these nonfatal workplace injury types are largely unaffected by a right to work passage.

The coefficient for fatal injuries implies that a RTW passage can lead to 13 more fatal injuries on average based on 2018 fatal injury counts. When considering a larger state such as New York which is not a RTW state, a right to work passage could lead to 38 more worker deaths per year. The average total cost of a fatal workplace injury has been estimated to be around 1.2 million dollars (NSC 2019 & Biddle 2011). Therefore, a RTW passage can increase a state's costs associated with wage and productivity loss, administrative expenses, and employer costs by about $15.6 million on average. The coefficient for all nonfatal injuries implies 4,623 less injuries on average based on 2018 nonfatal injury counts. Lost workday injuries are shown to decline by 2,720 cases on average. Finding an estimate for the average cost per nonfatal workplace injury is difficult due to the wide variety of injury types. However, the National Council of Compensation Insurance's (NCCI) estimates that the average cost of worker's compensation claims for lost-time workers was \$41,000 in 2017 and 2018. Hence, a decline of 2,720 lost workday cases could potentially decrease workers' compensation spending by \$111.5 million. This cost excludes other costs experienced from an injury such as current and future lost earnings and fringe benefits. Leigh [2011] estimates that workers' compensation covers less than 25 of medical and indirect costs experienced following a workplace injury. Hence, cost savings for the decrease in nonfatal injuries experienced from a RTW passage is likely much larger than the \$111.5 million suggested.

Overall, the results point to a story about incentives to misreport. If right to work laws do indeed increase the number of fatalities occurring at workplaces, this is strong evidence of lower workplace safety standards following a RTW passage. This is because it is difficult to believe that these increases in fatal injuries are coming from some other mechanism. If workplace safety is truly diminished after a RTW passage, then this should also be reflected in nonfatal injury rates. However, this is not the case. In fact, it is found that the rate of lost workday nonfatal injuries decreases. The results arguably find that nonfatal injuries which do not result in days away from work are unaffected by a right to work passage. Because nonfatal injuries which result in time away from work leads to workers' compensation benefits, decreasing the number of these injury reports directly benefits businesses. This increase in misreporting could be an overall increase in misreporting from existing firms or a large amount of misreporting from newly established firms who were looking to expand in a new right to work state. Either way, if safety is indeed diminished following a RTW passage, then misreporting is the most likely mechanism to explain a decrease in lost workday cases.

Chapter 2

The Relationship Between the Unemployment Rate and Workplace Injuries

2.1 Introduction

In 2018, 3 in every 100 American workers suffered a debilitating workplace injury. This is down from 8% in 1992 but in recent years the decline in workplace injury rates has begun to flatten. This flattening coincides with a significant increase of worker complaints citing unsafe and unfair working conditions, the decline in labor union representation which has been shown to promote workplace safety standards, and a resurgence in the passage of right-to-work laws (Wich and Magee [2020] and Sinclair *et al.* [2010]). However, an overlooked contributing factor which aligns with the 2010 workplace injury deceleration is the large economic expansion that occurred at the same time.

The unemployment rate constantly fluctuates at a national level but even more so when considering individual states and industries. While the national unemployment rate in 2010 was 9.6%, construction workers in Alabama experienced an unemployment rate higher than 20%. At the same time, workers in the finance industry in Kansas continued to see unemployment below 4%. Understanding and measuring the correlation between the unemployment rate and workplace injuries is necessary for creating effective injury preventative measures. This can help reduce the estimated 67 billion dollars in medical costs experienced from workplace injuries in 2007 (Leigh [2011]). Worker's compensation is estimated to cover 25% of this cost meaning the other 75% is falling on the firms and on individuals. While injuries are costly, providing safety is also a large expense for a firm. Cutbacks to safety may occur when recessions occur, unemployment is high and firms are looking for cost savings (Chelius [1974]). The unemployment rate has the potential to influence workplace injuries because of its ability to influence incentives for both the firm and the workers (Leigh [1985] and Kossoris [1938]). Conflicting incentives lead to a theoretical ambiguity which researchers have addressed by empirically testing the direction of the association between business cycle indicators and occupational injuries.

Results from previous research illustrate that unemployment and workplace injuries are inversely related. However, little evidence is provided as to which mechanisms lead to injuries being pro-cyclical. Previous studies also overlook the potential differences in the sensitivity between the business cycle and workplace injuries within different industries. Furthermore, they do not study differences between the private and public sector, and no study has separately measured the changes on workplace injury rates during an expansionary period and a recession. The most recent estimates on the relationship between unemployment and workplace injury rates in the United States come from studies using data from 1976 to 1991. Since this time period of study, the labor force has changed dramatically with regards to its size, gender structure, and age structure (of Labor Statistics [1992 2018]). Each of these changes to the labor force impact workplace injury rates. Technology advancement, the rise and fall in public sector and private sector labor unions, and national occupational composition changes further distinguish today's era from the era studied by previous researchers.

The purpose of this paper is to look at the relationship between unemployment and injuries in a new era. To verify previously found estimates, a study using data on the entire workforce is conducted. Because industries vary drastically in safety sensitivity and focus, the same analysis is conducted using data on the following seven industries: construction, manufacturing, wholesale, retail, transportation and warehousing, financial activities, and services. Applying a national estimate to an industry such as extremely safety-sensitive construction may grossly underestimate the relationship between unemployment and workplace injuries. Further, applying the same estimate to the less risky finance sector may overestimate a result. While conventional wisdom states that workplace injuries are pro-cyclical, this blanket statement is perhaps wrong for certain industries necessitating analysis for each industry individually. I also conduct analyses to compare the private and public sector because their differences in business incentives may lead to differing estimates.

I estimate the correlation between unemployment and workplace injury rates during recessionary and expansionary periods for the U.S. workforce, private and public sectors, and seven industries using four different two-way fixed effect equations. This allows me to fully exploit the large amount of variation in the US panel data from 1992 to 2018. My research advances the literature in several ways. First, I use recent US data which will provide estimates for a new era. Second, while previous studies have primarily focused on an individual country or a few specific industries, this study analyzes several industries including those which have not been previously studied. Further, estimates for the private and public sector will be compared which has not previously been done. Third, five different measures of workplace injury rates with differing severity of injury will be used to better help understand the mechanisms between unemployment and workplace injuries. Lastly, using a modern estimation strategy, the correlation between unemployment and injuries will be studied when a recession is occurring and compared to when an expansion is occurring in order to test whether the impact on injuries from a decrease in unemployment is equal to the impact on injuries from increases in unemployment. This is assumed to be true by previous estimation techniques when it may not be.

My findings when studying all workers show that a one percent increase in unemployment is related to a 17.8% decrease in nonfatal workplace injuries. Contrary to several studies, a one percent increase in unemployment is also found to decrease fatal injuries by 13.2%. These results equate to a decrease of 120,000 injuries and 6,500 deaths. These pro-cyclical results are even stronger for the high-risk construction industry. Other industries such as the wholesale or service industry exhibit a counter-cyclical nonfatal workplace injury rate. The public sector exhibits null results showing it is only the private sector which has a relationship. Through multiple definitions of recessions and expansions for robustness, I cannot reject that the decrease in workplace injury rates during a recessionary period is equal to the increase experienced during expansionary periods. However, this is not always the case depending on the industry and type of injury studied.

2.2 The Relationship Between Unemployment and Workplace Injuries

Multiple theories point to either a direct or inverse relationship between unemployment and workplace injuries. For a condensed version of these theories, see Table 2.1. Previous researchers have theories which compare the business cycle to workplace injuries. This paper's focus is on the relationship between unemployment and workplace injuries. However, the business cycle is strongly correlated with unemployment and is used interchangeably in the context of these theories.[1] Asfaw *et al.* [2011] splits these mechanisms into three sets of explanatory variables: working conditions, labor composition, and reporting.

Kossoris [1938] theorized that the increased pace of work experienced during economic expansions can lead to higher risk of injury at the workplace. Economic expansions may also lead to things such as longer work hours, overtime, and worker fatigue. These have been shown to be associated with increased workplace injury rates (Dembe *et al.* [2005]

[1]The business cycle consists of expansionary periods and recessionary periods. During expansions, businesses experience an increase in production which in turn leads to lower levels of unemployment. The opposite is true for recessions.

Table 2.1: Theories for the Relationship Between Unemployment and Workplace Injuries

Theory	Direction	Explanation
Keeping Workers Safe When Needed	Direct	High levels of production increase the value of workers to the firm. Hence, the firm increases safety precautions to reduce risk of losing an employee.
Production Per Worker	Direct	When unemployment is high, the level of production per worker increases leading to higher rates of injury and vice versa.
Firm's Underreporting	Direct	High levels of production increase the value of workers to the firm. Hence, the firm dissuades reporting in order to keep employees working.
Switching Industries	Direct	When unemployment is high, workers may be forced to seek employment in industries with which their experience is low. Inexperienced workers are more at risk of injury.
The Safety Production Trade-off	Inverse	When production is high, the relative cost of safety increases. Hence, a firm may decrease safety to focus on the high production.
New Hires	Inverse	When unemployment is low, there may be an influx of new and inexperienced employees. Inexperienced employees are at higher risk of injury.
Employee's Underreporting	Inverse	Reporting an injury increases the chance of job loss. Hence, when unemployment is high, employees underreport injuries to avoid job loss during a recession.

and Dembe *et al.* [2008]).[2] Hence, workers may be more injury prone during an economic expansion. Asfaw *et al.* [2011] also argues that booms lead to other safety risks such as less training given by firms and fewer breaks given. In contrast, recessionary periods can lead to slower and fewer working hours for employees leading to an opposite, but perhaps not equal, effect. These ideas lend to workplace injury rates being pro-cyclical.

Chelius [1974] also considers how a firm may respond during economic upturn. A firm may see that the relative cost of providing safety increases when production is high and allow working conditions to deteriorate in the interest of increasing output. This would further the idea of injuries being pro-cyclical. However, when production is high, losing a worker to an injury could be detrimental to the company. Replacement of the injured employee is likely difficult due to the low levels of unemployment. Therefore, a firm may pursue higher safety standards leading workplace injuries to be counter-cyclical. The combination of these conflicting mechanisms creates uncertainty as to whether working conditions and safety become better or worsen during economic upturns and vice versa.

[2] There also exists evidence that overtime has no impact on injury rates Schuster and Rhodes [1985].

Kossoris [1938] and Robinson [1988] also theorized that the business cycle can impact the level of new or inexperienced employees in a workplace. These new hires have been shown to be more injury prone as they have less working experience (Keyserling [1983], Oh and Shin [2003], Chi *et al.* [2005], Fabiano *et al.* [2010], Leung *et al.* [2009]). Empirical research has argued that during economic upturns, the level of new hires increases. This can lead to a workforce that is overall more inexperienced which increases workplace injury rates (Davies *et al.* [2009], Fernández-Muñiz *et al.* [2018], Asfaw *et al.* [2011]). Not only are there increases of inexperienced new hires, but job switching for experienced workers also increases during expansions (Akerlof *et al.* [1988]). So far, these theories relating to labor composition support a direct relationship. Conversely, during recessions, unemployed workers may be more likely to take positions in an industry which do not match their previous experience (cite). Because workers may swap industries when unemployment is high, recessions may also lead to increases in inexperienced workers. It is therefore unclear if expansions or recessions have a greater impact on workplace injuries due to inexperienced workers. Chang *et al.* [2018] finds empirical evidence suggesting that inexperienced workers do not lead to changes in workplace injury rates. Further research is needed to clarify whether this mechanism has an impact when considering the relationship between the business cycle and workplace injury rates.

Leigh [1985] theorized that workers are less likely to file an injury claim when unemployment is high. This is because injury claims increase the chance of job loss which can be detrimental during a recession (Boone and Van Ours [2006] and Boone *et al.* [2011]). This reporting bias would push workplace injury rates to be pro-cyclical. A workplace injury claim is costly to a firm for several reasons including time to file the report, lost production from the employee, possible increases in insurance premiums, or, if self-insured, out-of-pocket costs. Hence, an incentive exists to under report workplace injuries to avoid these costs. If this incentive is higher during an expansion then this can also become a source of reporting bias. However, this reporting bias would push workplace injury rates to be counter-cyclical. Again, these conflicting mechanisms create uncertainty about the relationship between the business cycle and workplace injuries. Previous literature has tested this reporting mechanism by studying fatal and non-fatal workplace injury rates. The idea is that fatal injury rates are not subject to the same reporting bias as non-fatal injury rates. Davies *et al.* [2009], Boone and Van Ours [2006], Boone *et al.* [2011], and Amuedo-Dorantes and Borra [2013] all argue in favor of Leigh [1985]'s hypothesis of reporting bias, finding that fatal injuries or severe nonfatal injuries are not affected by the business cycle while less severe nonfatal injuries are. However, Nielsen *et al.* [2015] finds a negative relationship between unemployment and both nonfatal and fatal workplace injury rates. These contradicting results exacerbates the need for further empirical evidence to help clarify this mechanism's potential impact.

The majority of previous literature using U.S. data is outdated, studying an economy with a vastly different labor force with regards to its size, gender and age structure, and occupational composition (Kossoris [1938], Chelius [1974], Smith [1976], Leigh [1985], Shea [1990]). The two recent studies which use US data are Asfaw *et al.* [2011] and Boone and Van Ours [2006] but even these use data with the most recent year being 1976 and 1991, respectively. Additionally, these studies primarily focus on a single industry or single state. Other studies which include several industries are focused in Canada (Lanoie [1992] and Brooker *et al.* [1997]), Spain (de la Fuente *et al.* [2014], Fernández-Muñiz *et al.* [2018], Amuedo-Dorantes and Borra [2013]), Denmark (Nielsen *et al.* [2015] and Lander *et al.* [2016]), and other countries (Chang *et al.* [2018], Davies *et al.* [2009], Boone *et al.* [2011], Al-Arrayed and Hamza [1995], Fabiano *et al.* [1995]). Since the US labor force and economy are experiencing rapid transformations with regards to labor unions (Zepeda [2021]), worker composition (**?**) and unemployment, a new study of the United State's sectors and major industries is warranted.

2.3 Estimation Strategies

I use a multi-state two-way fixed effect estimation strategy to take full advantage of the panel data constructed. The following equation estimates the reduced form impact of unemployment on workplace injuries:

$$I_{st} = \alpha + \beta_1 \text{UNEMP}_{st} + \beta_2 \mathbf{X}_{st} + \sigma_s + \tau_t + \epsilon_{st} \tag{2.1}$$

The dependent variable, I_{st}, represents the natural log of five workplace injury variables which vary in injury severity. UNEMP_{st} is the unemployment rate within state s and year t. The vector $\mathbf{X}_{st}$ comprises time-varying state-specific control variables. Log variables are used for all controls with the exception of the political variable due to the large amount of zeros. The state fixed effect σ_s absorbs unobserved time-invariant state characteristics. Similarly, the year fixed effect τ_t captures unobserved factors changing each year that are common to all states for a given year. Models are estimated with OLS and standard errors are clustered at the state level.

To capture the reduced form effect of unemployment on workplace injuries, certain variables are intentionally omitted from equation 2.1 such as labor union representation or firm size. A labor unions purpose is to give greater bargaining power to the employees. This increase in bargaining power can allow employees to receive increased benefits in the form of salary, fringe benefits, job security, and even safety. Changes in the unemployment rate may influence employees to form or disband unions which in turn impacts workplace injury rates. Similarly, a state's average firm size may fluctuate with unemployment. Changes in firm size can also lead to changes in workplace safety. Omission of these variables is to show the total effect that may work through the various mechanisms.

Previous study results suggest that β_1 from equation 2.1 will be negative. A negative sign on β_1 would mean that when unemployment increases, the rate of workplace injuries would decrease, and a positive sign would mean that when unemployment increases, the rate of workplace injuries would increase. The setup of equation 2.1 postulates that the impact on workplace injury rates from a decrease in unemployment is equal to the impact on workplace injury rates from an increase in unemployment. However, the impact from a recession and an expansion may be asymmetric making equation 2.1 misleading. To test this asymmetry, I will follow Mocan and Bali [2010]'s estimation strategy. This is done by defining the workplace injury rate as an asymmetric function of the unemployment rate using the following equation:

$$I_{st} = \alpha + \beta_{+}\text{UNEMP}^{+}_{st} + \beta_{-}\text{UNEMP}^{-}_{st} + \beta_2 \mathbf{X}_{st} + \sigma_s + \tau_t + \epsilon_{st} \tag{2.2}$$

where

$$\begin{aligned} \text{UNEMP}^{+}_{st} &= \text{UNEMP}_{st} \quad \text{if} \quad \text{UNEMP}_{st} \geq \text{UNEMP}_{s(t-1)} \quad \text{and} \quad = 0, \quad \text{otherwise} \\ \text{UNEMP}^{-}_{st} &= \text{UNEMP}_{st} \quad \text{if} \quad \text{UNEMP}_{st} < \text{UNEMP}_{s(t-1)} \quad \text{and} \quad = 0, \quad \text{otherwise} \end{aligned}$$

In other words, UNEMP_{st} from equation 2.1 is split into the two variables, UNEMP^{+}_{st} and UNEMP^{-}_{st}, based on whether unemployment experiences an increase or decrease from the previous period. All other variables are identical to equation 2.1. This separation of unemployment should capture any impact differences between expansions and recessions.

Using UNEMP^{+}_{st} and UNEMP^{-}_{st} to represent an expansion and recession may seem crude since the National Bureau of Economic Research (NBER) defines a recession to be a significant decline in economic activity for a few months measured by real GDP, real income, employment, industrial production, and wholesale-retail sales. However, the NBER defines a recession nationally. For state level business cycle data, researchers have used the State Coincident Indexes published by the Federal Reserve Bank of Philadelphia (Crone and Clayton-Matthews [2005], Bram *et al.* [2009], Crone and others [2006], Novak and others [2008]). The following equation is estimated to study possible asymmetric relationship using a more formal definition of recession and expansion:

$$I_{st} = \alpha + \beta_{+}\text{UNEMP}_{st}\mathbb{1}_{st}(\text{SCI}^{-}) + \beta_{-}\text{UNEMP}_{st}\mathbb{1}_{st}(\text{SCI}^{+}) + \beta_2 \mathbf{X}_{st} + \sigma_s + \tau_t + \epsilon_{st} \tag{2.3}$$

where the indicators for whether a state s in time t is experiencing a recession or an expansion is defined by whether the State's coincident index experienced an average increase or decrease from the previous year. As a robustness check, this indicator will be changed to whether there are two quarterly declines in the SCL.

Equations 2.1 and 2.2 will be estimated first for all industries combined, second for public and private sectors and finally for specific industries. The indicators in equation 2.3 cannot be broken down by industry or sector. If some industries thrive while others struggle within the same state and year, breaking equation 2.3 down by industry or sector can result in inaccuracies. Before the definition change of a recession by the NBER, a recession was defined by Julius Shiskin (1974) as a period when GDP declines for two consecutive quarters. Using this definition, the following equation can be estimated for each industry and sector listed:

$$I_{st} = \alpha + \beta_{+}\text{UNEMP}_{st}\mathbb{1}_{st}(\text{GDP}^{-}) + \beta_{-}\text{UNEMP}_{st}\mathbb{1}_{st}(\text{GDP}^{+}) + \beta_2\mathbf{X}_{st} + \sigma_s + \tau_t + \epsilon_{st} \quad (2.4)$$

where $\mathbb{1}_{st}(\text{GDP}^{-})$ is one if a state s in year t experienced a second quarter of decline in GDP and $\mathbb{1}_{st}(\text{GDP}^{+})$ is the opposite.

Having additional definitions of what a declining economy is in the form of equations 2.3 and 2.4 serves as a form of robustness. Further, unlike equation 2.3 and similar to equations 2.1 and 2.2, equation 2.4 can be done at the industry and sector level. However, monthly GDP data at the industry level is only available beginning in 2005 resulting in a smaller sample size. Because of the data restrictions on equations 2.3 and 2.4, they should be viewed as a robustness with equations 2.1 and 2.2 being the primary analysis.

2.4 Data

The U.S. Bureau of Labor Statistics provides both the Survey of Occupational Injuries and Illnesses (SOII) and the Census of Fatal Occupational Injuries (CFOI) which give information on nonfatal and fatal workplace injuries, respectively. I aggregate multiple data sources to construct a strongly balanced panel of 1,350 state-year observations from 1992 to 2018 for fatal workplace injuries and an unbalanced panel of 943 state-year observations from 1996 to 2018 for national nonfatal workplace injuries. The panel for nonfatal workplace injuries is unbalanced because some states choose not to participate in the SOII, some fully participate, and others participate some years and not others. Non-participation from state governments is likely because the costs are shared between BLS and the state government. These counts, along with estimates of total employment from the Current Population Survey (CPS), are used to calculate the rate of workplace injuries for each state-year. There are five outcome measures, namely, rates of fatal and nonfatal injuries, lost workday injuries, job restriction/transfer injuries, and all other nonfatal injuries. Lost workday cases are nonfatal injuries which resulted in time away from work. Job restriction or job transfer cases are nonfatal injuries which resulted in the inability to perform the employee's tasks but did not result in time away from work. "Other" nonfatal injuries are nonfatal injuries which did not result in lost workdays or job restriction/transfer. Injuries which are more severe are more likely to result in time away from work while small injuries may result in no time away from work and may not result in any job restrictions at all. The SOII and the CFOI is provided for each industry and the public and private sectors allowing for independent and comparison analyses.[3]

The CPS provides the unemployment rate for each state-year-industry. This dataset is further used to estimate multiple state demographics including fraction male, age, marital status, and education variables for each state-year. A state's industry composition is also estimated from CPS in order to help control for states which may have higher concentrations of riskier industries within a certain year. Controls for industry composition are used for estimations on the nation and private sector but are excluded when studying individual industries. The Federal Reserve Bank of Philadelphia provides the State Coincident Indexes which allows me to calculate recession periods at the state level and

[3]Some data on nonfatal injuries by industry are omitted resulting in slightly smaller sample sizes. For example, some states did not start with including the public sector in their counts leading the public sector nonfatal injury sample size to be 762.

the Bureau of Economic Analysis provides state-industry level GDP data for equations 2.3 and 2.4, respectively. GDP data for equation 2.4 is only available from 2005 at the month-state-industry level.

The Occupational Health and Safety Administration (OSHA) has played a key role in the reduction of workplace injury rates since its formation in 1970 through the use of inspections and penalties (Weil [1996]). The federal OSHA program covers most private sector workers. Twenty-eight states have enacted their own state OSHA plans covering public sectors with twenty-two of them also giving additional effectiveness to the private sector. Little variation exists on when states enacted a state OSHA plan meaning controlling for whether a state has a state plan would be swallowed by state fixed effects. However, OSHA provides information on when inspections were done by state and industry which can fluctuate significantly from year to year within a state. Using this and the number of establishments in each state from the United States Census Bureau, I calculate and control for the OSHA inspection rate.

To further account for other potential confounders, weather data from the National Oceanic and Atmospheric Administration is included. Varghese *et al.* [2018] show that an increase of heat exposure is positively related to workplace injuries for primarily outside working industries. Rainfall may have a similar impact as well. For a full list of variables and national summary statistics, see Table 2.2.

All data previously mentioned is collected for the following industries: construction, manufacturing, wholesale trade, retail trade, transportation and warehousing, financial activities, and services.[4] Industries can vary in some key factors such as rates of injury, unemployment, and labor unions which impact the equations listed previously. For example, the nonfatal workplace injury rate in 2019 for the finance industry was 0.5% but was 4.5% in transportation and warehousing industry. The difference in safety levels between

[4]The state coincident indexes and the OSHA inspection rate are only available at the state-year level meaning this data is identical for each industry. Hence, equation 2.3 is only run at the national level. Further, some variables are not collected at the industry level by nature such as weather and political variables.

industries can lead some industries to experience larger fluctuations in injury rates. The unemployment rate began to rise in 2009 for all industries, but some industries, such as construction and manufacturing, experienced a much larger rise in unemployment. For a comparison of unemployment rates by industry, see figure 2.1. Further, the objectives of a workplaces labor union can differ depending on the needs of the employees. A construction labor union may focus more on increased safety standards while a teacher labor union may focus on salary. This is important because labor union representation varies from industry to industry. For example, while the private sector has experienced a decline in labor union representation, the public sector has had a continual increase. Private sector union representation was 6.2% in 2019 while 33.6% of the public sector had union representation. As private sector firms may be driven by profits, the public sector can be less revenue driven and have stricter policies and procedures with regards to workplace safety. Hence, results from the estimation strategies previously listed may vary drastically by industry and sector substantiating the importance of studying each. Looking at the relationship between unemployment and workplace injuries as a whole may lead to a result which is a large underestimate for some industries and an overestimate for others. For a full list of mean differences which may influence the workplace injury rate, see table 2.2.[5]

2.5 Results

The results section will first focus on the entire workforce. Differences will then be shown between the private and public sectors along with different industry results. I will finish the results section discussing robustness checks.

2.5.1 *National Results*

Table 2.4 presents results from equations 2.1 - 2.4 using data on the whole workforce. Controls and fixed effects are included but their results are excluded from the table. See

[5]For standard deviation, minimum, and maximum, see tables B.1 through B.10 in appendix B.

Table 2.2: Summary Statistics by Sector and Industry

	All	Private	Public	Construction	Manufacturing	Wholesale	Retail	Transportation	Finance	Service
Unemployment Rate	0.056	0.058	0.025	0.089	0.056	0.041	0.062	0.045	0.031	0.047
	(0.019)	(0.019)	(0.014)	(0.043)	(0.027)	(0.023)	(0.020)	(0.022)	(0.017)	(0.015)
Fatal Injuries per 100,000	4.924	4.668	10.158	11.273	3.543	4.453	1.915	16.875	0.640	1.432
	(2.883)	(2.790)	(7.870)	(7.012)	(7.712)	(6.182)	(1.740)	(13.501)	(1.410)	(1.064)
Nonfatal Injuries per 100	3.548	3.240	12.472	3.683	5.804	6.160	3.594	4.713	1.146	2.411
	(1.174)	(1.201)	(4.892)	(1.899)	(3.434)	(2.162)	(1.104)	(1.921)	(0.543)	(0.698)
Lost Workdays Cases per 100	1.094	0.992	3.999	1.415	1.539	2.128	1.072	2.108	0.355	0.699
	(0.401)	(0.389)	(2.098)	(0.729)	(1.197)	(0.871)	(0.402)	(0.929)	(0.220)	(0.276)
Job Restr./Transfer Cases per 100	0.643	0.622	1.408	0.456	1.537	1.410	0.681	0.941	0.116	0.386
	(0.290)	(0.288)	(0.873)	(0.279)	(0.883)	(0.675)	(0.283)	(0.459)	(0.119)	(0.195)
Other Cases per 100	1.811	1.625	7.100	1.814	2.733	2.633	1.844	1.670	0.658	1.325
	(0.689)	(0.697)	(3.072)	(1.109)	(1.782)	(1.314)	(0.797)	(0.963)	(0.360)	(0.413)
Aged 15-24	0.156	0.161	0.054	0.125	0.099	0.096	0.289	0.081	0.097	0.157
	(0.022)	(0.023)	(0.021)	(0.038)	(0.030)	(0.036)	(0.059)	(0.029)	(0.033)	(0.027)
Aged 25-34	0.223	0.224	0.205	0.250	0.222	0.233	0.215	0.204	0.237	0.225
	(0.024)	(0.025)	(0.043)	(0.042)	(0.044)	(0.054)	(0.031)	(0.051)	(0.042)	(0.024)
Aged 35-44	0.236	0.234	0.270	0.266	0.263	0.260	0.184	0.259	0.246	0.233
	(0.031)	(0.031)	(0.051)	(0.044)	(0.045)	(0.056)	(0.026)	(0.056)	(0.041)	(0.036)
Aged 45-54	0.214	0.211	0.276	0.215	0.246	0.229	0.160	0.261	0.226	0.212
	(0.023)	(0.023)	(0.045)	(0.041)	(0.042)	(0.054)	(0.032)	(0.046)	(0.037)	(0.023)
Aged 55-64	0.130	0.129	0.157	0.116	0.142	0.141	0.107	0.155	0.144	0.130
	(0.034)	(0.033)	(0.052)	(0.040)	(0.048)	(0.052)	(0.035)	(0.054)	(0.044)	(0.030)
Fraction Male	0.532	0.532	0.544	0.907	0.697	0.720	0.493	0.753	0.418	0.381
	(0.013)	(0.013)	(0.046)	(0.020)	(0.043)	(0.049)	(0.036)	(0.045)	(0.053)	(0.032)
Fraction White	0.838	0.840	0.812	0.898	0.832	0.882	0.839	0.810	0.863	0.827
	(0.124)	(0.124)	(0.137)	(0.107)	(0.131)	(0.124)	(0.132)	(0.155)	(0.118)	(0.124)
Fraction Black	0.096	0.094	0.122	0.054	0.093	0.066	0.093	0.133	0.079	0.103
	(0.090)	(0.089)	(0.112)	(0.060)	(0.102)	(0.069)	(0.090)	(0.124)	(0.072)	(0.093)
Fraction Asian	0.040	0.041	0.030	0.020	0.051	0.035	0.042	0.033	0.039	0.044
	(0.086)	(0.086)	(0.089)	(0.079)	(0.094)	(0.093)	(0.091)	(0.092)	(0.088)	(0.086)
Fraction Single	0.281	0.286	0.184	0.257	0.225	0.218	0.404	0.211	0.215	0.287
	(0.033)	(0.033)	(0.045)	(0.041)	(0.041)	(0.051)	(0.050)	(0.058)	(0.048)	(0.044)
Fraction Married	0.572	0.568	0.649	0.601	0.621	0.643	0.457	0.626	0.633	0.562
	(0.033)	(0.033)	(0.051)	(0.043)	(0.044)	(0.059)	(0.041)	(0.065)	(0.053)	(0.042)
Fraction Divorced	0.108	0.107	0.129	0.112	0.116	0.107	0.098	0.126	0.115	0.107
	(0.016)	(0.016)	(0.032)	(0.027)	(0.023)	(0.034)	(0.022)	(0.033)	(0.030)	(0.018)
Obtained HS Degree Only	0.604	0.606	0.583	0.710	0.657	0.658	0.693	0.752	0.578	0.532
	(0.048)	(0.048)	(0.071)	(0.068)	(0.074)	(0.074)	(0.042)	(0.047)	(0.088)	(0.044)
Obtained Bachelor's Degree	0.282	0.277	0.391	0.109	0.217	0.254	0.151	0.152	0.390	0.374
	(0.061)	(0.061)	(0.077)	(0.034)	(0.076)	(0.073)	(0.047)	(0.047)	(0.094)	(0.054)

Standard deviations given in parenthesis.
Statistics come from all state-years within the data.
All workplace injury rates are calculated by taking the total number of injury type within a state and year over the number of employees (CPS) within the same state and year.
Lost workday cases are nonfatal injuries which resulted in days away from work. These injuries are the most severe nonfatal injuries.
Job restriction/transfer cases are nonfatal injuries which resulted in job restriction or job transfer. Employees remained at work after the injury.
Other Cases are nonfatal injuries which did not result in lost workdays or job restriction/transfer. These are the least severe nonfatal injuries.
Nonfatal Injury Rate is the sum of the three different types of nonfatal injuries.
The unemployment rate is from CPS.
OSHA inspection rate (aggregated from Occupational Health and Safety Administration) is the total number of OSHA inspections within a state-year over the total number of fi
rms within the same state-year.
Weather data comes from the National Oceanic and Atmospheric Administration.
Maximum Temperature is in Fahrenheit.
Amount of monthly precipitation is in inches.
Summary statistics about the industrial composition of each state are not listed in this table but can be found in Table 2.3.
Minimum and Maximums can be found for each variable and sector/industry in tables B.1 - B.10 in the appendix.

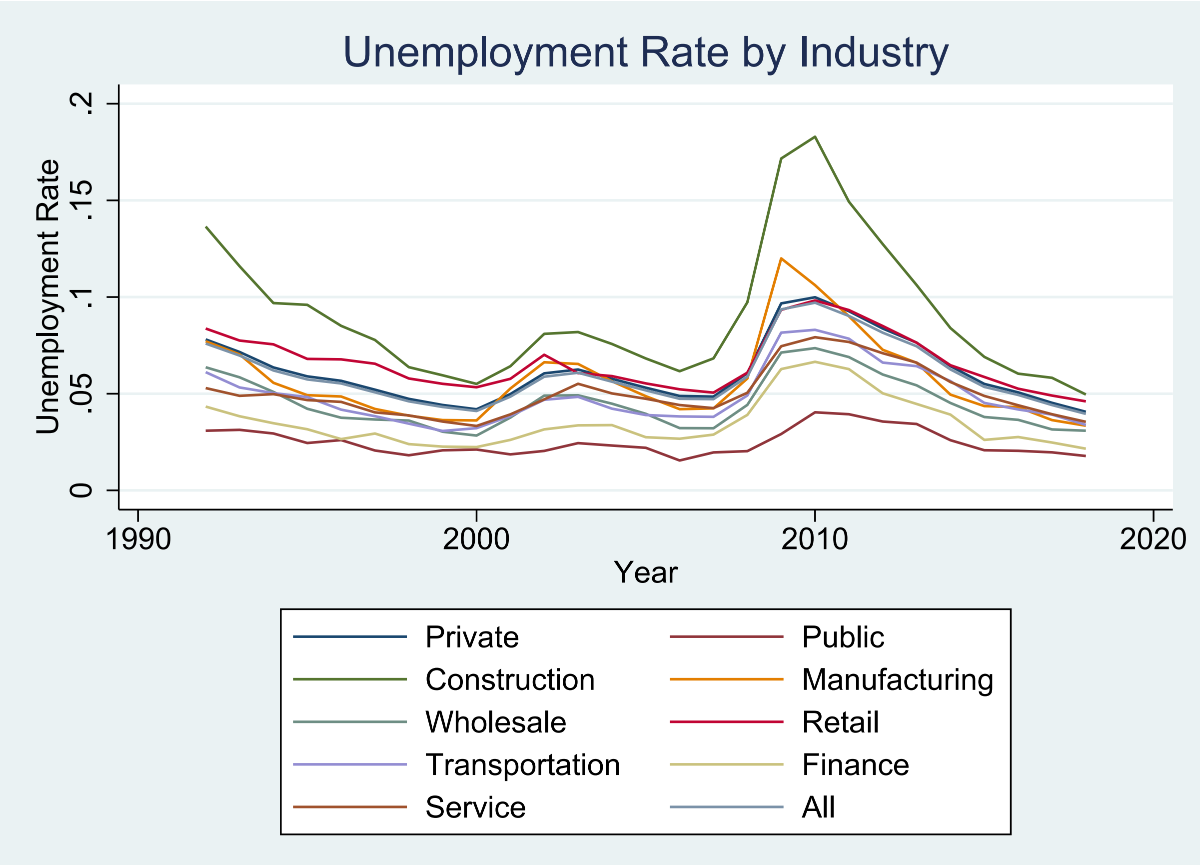


Figure 2.1: Each line represents the average unemployment rate among the 50 U.S. states for a specific sector or industry.

Tables B.11 - B.14 in appendix B for full regression tables for each equation. Column (1)'s outcome variable is log fatal workplace injury rates. Column (2) is for log all nonfatal workplace injuries. Columns (3)-(5) are log rates of lost workday injuries, job restriction/transfer injuries, and all other nonfatal injuries. Of the different types of nonfatal injury outcomes, lost workday injuries are the most severe, job restriction/transfer cases are less severe, and "other" nonfatal injuries are the least severe.

According to model 2.1, no matter the severity of the injury, a one percent decrease in the unemployment rate is estimated to increase workplace injuries somewhere between 13.2% and 22.6%. These point estimates align with findings from previous studies. The estimate for fatal injuries translates to 693 more fatal workplace injuries in relation to a one percent increase in national unemployment. Further, on average, a one percent decrease in national unemployment is correlated with about 500,000 more nonfatal injuries. Assuming unemployment is a proxy for the business cycle, these results suggest

Table 2.3: States With Missing Nonfatal Injury Data

State Name	**Excluded Years**
Colorado	Excluded
Florida	2011-2018
Idaho	Excluded
Illinois	1996-1997
Massachusetts	2003 & 2009
Mississippi	Excluded
New Hampshire	Excluded
North Dakota	Excluded
Ohio	1996-2011
Oklahoma	2013-2018
Pennsylvania	1996-2010
Rhode Island	2008-2018
South Dakota	Excluded
Vermont	1996
West Virginia	1996-1997
Wyoming	1996-2001

States not in table are available for years 1996 to 2018.
States which are "Excluded" are not available for any year
Nonfatal injury data begins in 1996 and is available until 2018.

that when states experience an expansionary period, they also experience more fatal and nonfatal workplace injuries and vice-versa, i.e., workplace injuries are pro-cyclical.

Model 2 in Table 2.4 splits the unemployment rate dependent on whether unemployment experienced a decrease or increase relative the previous year. The coefficient during periods of rising unemployment, β_+, suggests that a one percent increase in state unemployment rate decreases fatal workplace injuries by 13.4% and nonfatal workplace injuries by 20.5%. Similarly, the coefficient during periods of decreasing unemployment, β_-, suggests that a one percent decrease in the state unemployment rate increases workplace injuries by 13.3% for fatal workplace injuries and 19.7% for nonfatal workplace injuries. The null hypothesis of the equality of the coefficients UNEMP_t^+ and UNEMP_t^- is conducted for each outcome with the results of this test given in the F_diff and p_diff. Because the null hypothesis testing the equality between UNEMP_t^+ and UNEMP_t^- cannot be rejected for columns (1), (3), and (4), the decrease in workplace injury rates during a recessionary period is equivalent to the increase in workplace injury rates during an expansionary

Table 2.4: Full Workforce Results

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
Unemployment	-0.132**	-0.178***	-0.193***	-0.226***	-0.159***
	(0.0593)	(0.0405)	(0.0403)	(0.0554)	(0.0549)
N	1350	943	943	943	943
r2	0.863	0.947	0.949	0.944	0.926
Recession (UNEMP+)	-0.134**	-0.205***	-0.207***	-0.248***	-0.192***
	(0.0655)	(0.0450)	(0.0439)	(0.0587)	(0.0612)
Expansion (UNEMP-)	-0.133**	-0.197***	-0.203***	-0.241***	-0.182***
	(0.0631)	(0.0431)	(0.0425)	(0.0573)	(0.0587)
N	1350	943	943	943	943
r2	0.863	0.948	0.949	0.944	0.927
F_diff	0.0153	6.423	2.651	2.237	5.606
p_diff	0.902	0.0150	0.111	0.142	0.0225
Recession (SCI Decreased)	-0.114*	-0.178***	-0.187***	-0.229***	-0.160***
	(0.0622)	(0.0410)	(0.0419)	(0.0575)	(0.0544)
Expansion (SCI Increased)	-0.129**	-0.178***	-0.191***	-0.227***	-0.159***
	(0.0595)	(0.0406)	(0.0406)	(0.0558)	(0.0547)
N	1350	943	943	943	943
r2	0.863	0.947	0.949	0.944	0.926
F_diff	3.053	0.00205	0.904	0.0866	0.102
p_diff	0.0869	0.964	0.347	0.770	0.750
Recession (Julius Shiskin)	-0.213***	-0.0927	-0.126**	-0.0446	-0.0686
	(0.0761)	(0.0569)	(0.0544)	(0.0653)	(0.0737)
Expansion	-0.217***	-0.0871	-0.124**	-0.0313	-0.0619
	(0.0726)	(0.0554)	(0.0534)	(0.0652)	(0.0730)
N	700	577	577	577	577
r2	0.868	0.909	0.938	0.963	0.879
F_diff	0.147	2.193	0.156	4.865	2.101
p_diff	0.703	0.146	0.695	0.0328	0.154

Results for equations 2.1 - 2.4.
Each estimation includes controls, state fixed effects, and time fixed effects.
Robust standard errors are clustered at the state level.
Each outcome is log transformed as well as the main variable of interest listed.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

period. However, the null hypothesis that $\text{UNEMP}_t^+ = \text{UNEMP}_t^-$ can be rejected at the 5% level for columns (2) and (5). This result suggests that the decrease in total nonfatal injuries and less severe workplace injury rates during a recessionary period is less than the increase in less severe workplace injury rates during an expansionary period.

Saying that a state's economy experienced a recession because unemployment may have increased slightly is a crude definition of what a recessionary period is. Hence, model 3 uses the State Coincident Indexes (SCI) to provide a better definition of when a state-year was experiencing a recession or expansion. If a state experiences at least two quarters of a decreasing SCI, than that state is labeled to have experienced a recession that year. Point estimates from model (3) are all slightly less than those found in model (2). Tests for whether the regression coefficients found are equal are given for model (3) as well and tell a different story than model (2). Model (3) suggests that there is equality for the two regression coefficients when nonfatal injuries are studied but that the decrease in fatal injuries during a recession is less than the decrease experienced during an expansion. As a robustness check, the definition of recession is changed to whether or not a state's average SCI decreased for the year. Results for this robustness check are shown in Table B.44. Differences between a yearly and a quarterly definition of recession show some changes in results but these changes are small.

Model 4 uses GDP data and the Julius Shiskin defintion of a recession to give indicators of when a state-year was experiencing a recession. These results differ slightly from the previous models but do point towards the same pro-cyclical relationship. One possibility for a few of the differences is the change in sample size.This is because GDP data at the state and industry level is only available beginning in 2005. Although more noisy, model 4 primarily indicates that the relationship between the unemployment rate and workplace injuries is about the same whether or not the economy is experiencing a recession or expansion.

The consistent pro-cyclical relationship for fatal workplace and more severe workplace injuries also contradicts finding from Davies *et al.* [2009], Boone and Van Ours [2006], Boone *et al.* [2011], and Amuedo-Dorantes and Borra [2013] who find no relationship for these types of injuries. These researchers argue that since they find no relationship for these types of injuries but do see a relationship for less severe workplace injuries, then there is a high plausibility of the reporting bias mentioned in section 2. Because fatal workplace injuries are likely not impacted by any reporting bias, my results suggest that the mechanism for the correlation between workplace injuries and unemployment is not any type of reporting bias. This aligns with findings from Nielsen *et al.* [2015] and Chang *et al.* [2018]. This leaves changes in working conditions and changes in worker experience as commonly cited mechanisms for the relationship found.

2.5.2 *Private vs Public Sector*

For easy comparisons, Tables 2.5 - 2.9 give the estimations for equations 2.1, 2.2, and 2.4 for the private and public sectors as well as each industry. Each table represents a different type of injury.[6] Results for the private sector are somewhat similar to those found for the nation as a whole. There are a few important differences when studying the private sector in comparison to national results. When studying fatal workplace injuries, point estimates appear to be slightly higher for the private sector. Point estimates for nonfatal injuries are slightly less in models (1) and (2) for the private industry in comparison to the full workforce. Model (4) results are slightly higher for the private sector and show two point estimates that are much closer in value further suggesting no difference between the relationship of unemployment and injuries during expansions and recessions for the private sector. Results for nonfatal injuries resulting in days away from work are very similar to those found for the full workforce. The null hypothesis for the equality of $UNEMP_{+}$ and $UNEMP_{-}$ in model 2 for job restriction/transfer cases cannot be rejected for the private sector which differs from the results found for the total workforce. However, this hypothesis can be rejected for the private sector when studying all other nonfatal injuries which also differs from the results found for the total workforce.

The results for the public sector are largely different than those discussed so far. Results for fatal injuries are statistically insignificant and close to zero for models (1) and (2) and are positive and insignificant for model (4). Results for nonfatal injuries are also statistically insignificant and much closer to zero for every model studied giving further evidence to the lack of correlation between the unemployment rate and workplace injuries in the public sector. Although insignificant, these results have small standard errors

[6]For a table of results including controls and fixed effects, see Tables B.15 - B.20 in the appendix.

showing that the true results likely are null or close to a one percent change.

The mechanisms discussed in section 2 can be summarized under three categories: working conditions, labor composition, and reporting. The public sector may not be impacted by these mechanisms. For example, while a private sector firm may change provided safety levels based on production rates, a public firm is more likely to continue to follow safety protocols set by the state or federal government. Further, when the number of new hires increases, the public sector may do a better job at training new employees to follow safety guidelines than a private sector firm. Reporting is also likely not a mechanism that a public firm deals with due to differences in incentives compared to a private firm. The null results found for the public sector likely come from either industry composition differences between the private and public sectors or incentive differences.

Table 2.5: Fatal Injury Results

	(1) All	(2) Private	(3) Public	(4) Construction	(5) Manufacturing	(6) Whole Sale	(7) Retail	(8) Transportation	(9) Finance	(10) Service
Unemployment	-0.132**	-0.157**	-0.0205	-0.623**	-0.166	-0.0242	-0.250	-0.0490	0.0647	0.422
	(0.0593)	(0.0629)	(0.0550)	(0.240)	(0.317)	(0.0971)	(0.406)	(0.156)	(0.102)	(0.485)
N	1350	1350	1350	1350	1350	1349	1349	1350	1350	1350
r2	0.863	0.855	0.329	0.433	0.508	0.503	0.568	0.546	0.375	0.486
Recession (UNEMP+)	-0.134**	-0.168**	-0.0464	-0.768**	-0.226	-0.113	-0.268	0.0965	-0.0312	0.310
	(0.0655)	(0.0683)	(0.0561)	(0.334)	(0.380)	(0.120)	(0.465)	(0.213)	(0.134)	(0.536)
Expansion (UNEMP-)	-0.133**	-0.164**	-0.0262	-0.701**	-0.205	-0.0461	-0.263	0.0412	0.0194	0.342
	(0.0631)	(0.0662)	(0.0530)	(0.282)	(0.349)	(0.0986)	(0.439)	(0.186)	(0.112)	(0.516)
N	1350	1350	1350	1350	1350	1349	1349	1350	1350	1350
r2	0.863	0.855	0.330	0.434	0.509	0.504	0.568	0.546	0.376	0.486
F_diff	0.0153	0.453	0.436	0.754	0.114	1.663	0.00791	1.615	0.858	0.444
p_diff	0.902	0.504	0.512	0.389	0.737	0.203	0.930	0.210	0.359	0.509
Recession (Julius Shiskin)	-0.213***	-0.212**	0.171	-0.985**	-0.318	-0.100	-0.577	-0.0153	0.143	0.909
	(0.0761)	(0.0852)	(0.150)	(0.413)	(0.413)	(0.159)	(0.730)	(0.277)	(0.119)	(0.580)
Expansion	-0.217***	-0.222***	0.0829	-1.077**	-0.309	-0.0101	-0.656	-0.0711	0.227	0.915
	(0.0726)	(0.0807)	(0.118)	(0.423)	(0.420)	(0.0883)	(0.732)	(0.288)	(0.151)	(0.597)
N	700	700	700	700	700	699	699	700	700	700
r2	0.868	0.861	0.374	0.461	0.544	0.505	0.541	0.538	0.367	0.503
F_diff	0.147	1.007	1.298	1.119	0.0188	0.563	0.760	1.005	0.758	0.00248
p_diff	0.703	0.321	0.260	0.295	0.892	0.457	0.388	0.321	0.388	0.960

Results for equations 2.1 - 2.4.
Each estimation includes controls, state fixed effects, and time fixed effects.
Robust standard errors are clustered at the state level.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's is the result of industries choosing not to report or errors in reporting injuries.

2.5.3 *Differences in Industries*

As before, Tables 2.5 through 2.9 can be used for quick comparisons between industries.[7] Of the seven industries studied, the construction industry, manufacturing industry, and

[7]For a full set of results, see Tables B.21 - B.41 in the appendix.

Table 2.6: Nonfatal Injury Results

	(1) All	(2) Private	(3) Public	(4) Construction	(5) Manufacturing	(6) Whole Sale	(7) Retail	(8) Transportation	(9) Finance	(10) Service
Unemployment	-0.178***	-0.168***	-0.0114	-0.103***	-0.0344	0.00549	-0.0400	0.0193	0.0165	-0.0349
	(0.0405)	(0.0258)	(0.00699)	(0.0337)	(0.0367)	(0.00408)	(0.0385)	(0.0210)	(0.0177)	(0.0295)
N	943	943	762	941	942	933	940	936	912	913
r2	0.947	0.970	0.842	0.888	0.925	0.697	0.802	0.777	0.498	0.876
Recession (UNEMP+)	-0.205***	-0.185***	-0.00831	-0.158***	-0.0631	-0.00273	-0.0750*	0.0126	0.00447	-0.0460
	(0.0450)	(0.0272)	(0.00856)	(0.0399)	(0.0475)	(0.00730)	(0.0395)	(0.0224)	(0.0137)	(0.0356)
Expansion (UNEMP-)	-0.197***	-0.180***	-0.0104	-0.135***	-0.0533	0.00367	-0.0655*	0.0150	0.0113	-0.0428
	(0.0431)	(0.0264)	(0.00699)	(0.0358)	(0.0432)	(0.00435)	(0.0385)	(0.0213)	(0.0145)	(0.0336)
N	943	943	762	941	942	933	940	936	912	913
r2	0.948	0.970	0.842	0.890	0.926	0.698	0.803	0.777	0.499	0.876
F_diff	6.423	6.488	0.257	11.26	3.054	2.039	4.401	0.375	0.558	0.905
p_diff	0.0150	0.0145	0.615	0.00166	0.0877	0.161	0.0418	0.543	0.459	0.347
Recession (Julius Shiskin)	-0.0927	-0.0993***	-0.0145	-0.0823*	-0.0324	0.00387	-0.00715	0.0290	0.0133	0.0216
	(0.0569)	(0.0364)	(0.0101)	(0.0434)	(0.0504)	(0.0127)	(0.0518)	(0.0296)	(0.0256)	(0.0369)
Expansion	-0.0871	-0.0982***	-0.0134	-0.0869**	-0.0332	0.00545	-0.00680	0.0286	0.00730	0.0232
	(0.0554)	(0.0353)	(0.00896)	(0.0423)	(0.0503)	(0.00442)	(0.0489)	(0.0282)	(0.0275)	(0.0368)
N	577	577	529	577	577	571	576	575	552	554
r2	0.909	0.958	0.804	0.848	0.885	0.608	0.673	0.713	0.438	0.876
F_diff	2.193	0.0931	0.0369	0.280	0.0449	0.0215	0.00446	0.00244	0.215	0.168
p_diff	0.146	0.762	0.849	0.599	0.833	0.884	0.947	0.961	0.645	0.684

Results for equations 2.1 - 2.4.
Each estimation includes controls, state fixed effects, and time fixed effects.
Robust standard errors are clustered at the state level.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's is the result of industries choosing not to report or errors in reporting injuries.

retail industry are the three which stand out as exhibiting multiple negative point estimates. Results for the construction industry suggest that a one percent increase in the unemployment rate is related to a 62.3% decrease in the fatal injury rate significant at the 5% level. Both models (2) and (4) cannot reject the equality of this decrease during a recession and expansion. When looking at nonfatal injuries, a one percent increase in the unemployment rate is found to decrease nonfatal injuries by 10.3% significant at the 1% level. Results for days away from work, job restriction, and other nonfatal injuries are similar for the construction industry with results for other nonfatal injuries being significant at the 5% level. When studying the manufacturing industry, results seem null for total nonfatal injuries, lost workday cases, and other nonfatal injuries. However, a one percent increase in the unemployment rate is found to increase job restriction or transfer nonfatal cases by 17.1% which is fairly consistent across each model. Fatal injury results in the manufacturing industry suggest a large decrease following an increase in unemployment but results are insignificant. This is also true for the retail industry which is shown to have small results for lost workday cases and other nonfatal injuries, large and insignificant results for fatal injuries, and significant results for job restriction or transfer

Table 2.7: Days Away from Work Injury Results Injury Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	All	Private	Public	Construction	Manufacturing	Whole Sale	Retail	Transportation	Finance	Service
Unemployment	-0.193***	-0.181***	-0.0139*	-0.0814	-0.0189	0.0116**	-0.0274	-0.0186	-0.0633	-0.0184
	(0.0403)	(0.0406)	(0.00714)	(0.0512)	(0.0546)	(0.00560)	(0.0511)	(0.0290)	(0.0472)	(0.0358)
N	943	943	762	941	942	933	941	934	907	907
r2	0.949	0.958	0.880	0.824	0.803	0.620	0.796	0.704	0.434	0.894
Recession (UNEMP+)	-0.207***	-0.193***	-0.0130	-0.137**	-0.0757	0.00148	-0.0615	-0.00253	-0.0539	-0.0451
	(0.0439)	(0.0436)	(0.00854)	(0.0577)	(0.0879)	(0.00902)	(0.0585)	(0.0321)	(0.0598)	(0.0421)
Expansion (UNEMP-)	-0.203***	-0.190***	-0.0136*	-0.114**	-0.0563	0.00932	-0.0523	-0.00827	-0.0592	-0.0374
	(0.0425)	(0.0425)	(0.00729)	(0.0536)	(0.0760)	(0.00588)	(0.0557)	(0.0304)	(0.0470)	(0.0399)
N	943	943	762	941	942	933	941	934	907	907
r2	0.949	0.958	0.880	0.826	0.804	0.621	0.796	0.705	0.434	0.894
F_diff	2.651	2.442	0.0304	8.157	2.340	2.360	2.176	1.670	0.0395	4.058
p_diff	0.111	0.125	0.862	0.00658	0.133	0.132	0.147	0.203	0.843	0.0502
Recession (Julius Shiskin)	-0.126**	-0.142***	-0.0164	-0.0912	-0.0645	0.00324	-0.0224	-0.0149	-0.0983	0.0182
	(0.0544)	(0.0506)	(0.0154)	(0.0728)	(0.118)	(0.0192)	(0.0646)	(0.0359)	(0.0995)	(0.0572)
Expansion	-0.124**	-0.145***	-0.0203*	-0.0935	-0.0681	0.0115**	-0.0281	-0.0144	-0.0959	0.0163
	(0.0534)	(0.0511)	(0.0114)	(0.0747)	(0.120)	(0.00540)	(0.0613)	(0.0351)	(0.0980)	(0.0560)
N	577	577	529	577	577	571	576	573	547	548
r2	0.938	0.947	0.851	0.735	0.711	0.534	0.761	0.590	0.463	0.897
F_diff	0.156	0.267	0.234	0.0409	0.212	0.224	0.659	0.00228	0.00244	0.0618
p_diff	0.695	0.608	0.631	0.841	0.648	0.638	0.421	0.962	0.961	0.805

Results for equations 2.1 - 2.4.
Each estimation includes controls, state fixed effects, and time fixed effects.
Robust standard errors are clustered at the state level.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's is the result of industries choosing not to report or errors in reporting injuries.

cases showing that a one percent increase in unemployment is related to a 14% decrease in the injury rate. There is perhaps a decrease in nonfatal injuries as well for the retail industry but this is inconsistent across models.

The four other industries studied, wholesale, transportation and warehousing, finance, and services, have results which are mixed. Most models and outcomes for these four industries have insignificant results with small point estimates. However, some estimates jump out as being important. Overall the wholesale trade industry shows null results with some results being significant when studying days away from work cases. However, these significant point estimates are very small. Job restriction or transfer nonfatal injuries are shown to decrease during increasing unemployment for the finance industry significant at the 5% level. Results for the transportation and warehousing, finance, and service industries suggest that not all industries show either a null or inverse relationship between unemployment and workplace injuries. These three industries give multiple instances of a direct relationship between the two. The transportation industry has positive coefficients for other nonfatal cases in model (4) and the service industry has large positive coefficients

Table 2.8: Job Restriction or Transfer Injury Results

	(1) All	(2) Private	(3) Public	(4) Construction	(5) Manufacturing	(6) Whole Sale	(7) Retail	(8) Transportation	(9) Finance	(10) Service
Unemployment	-0.226***	-0.237***	0.000391	-0.129	-0.171**	0.0311	-0.140**	0.316	-0.106**	-0.123
	(0.0554)	(0.0528)	(0.00880)	(0.125)	(0.0821)	(0.0434)	(0.0588)	(0.198)	(0.0519)	(0.0822)
N	943	943	744	941	942	933	940	934	903	909
r2	0.944	0.945	0.845	0.410	0.647	0.613	0.778	0.394	0.551	0.808
Recession (UNEMP+)	-0.248***	-0.269***	-0.00761	-0.156	-0.179*	0.0894	-0.184**	0.319	-0.0772	-0.142
	(0.0587)	(0.0557)	(0.0148)	(0.122)	(0.103)	(0.0535)	(0.0706)	(0.253)	(0.0943)	(0.0850)
Expansion (UNEMP-)	-0.241***	-0.259***	-0.00208	-0.145	-0.176*	0.0440	-0.172**	0.318	-0.0935	-0.137
	(0.0573)	(0.0545)	(0.0101)	(0.119)	(0.0934)	(0.0435)	(0.0666)	(0.232)	(0.0667)	(0.0837)
N	943	943	744	941	942	933	940	934	903	909
r2	0.944	0.946	0.845	0.410	0.647	0.616	0.779	0.394	0.551	0.808
F_diff	2.237	6.632	0.640	0.167	0.0273	2.915	2.623	0.00127	0.174	0.742
p_diff	0.142	0.0135	0.428	0.685	0.870	0.0950	0.113	0.972	0.679	0.394
Recession (Julius Shiskin)	-0.0446	-0.0527	-0.0226	0.0732	-0.175*	-0.0677	-0.000534	0.435*	-0.120**	0.183**
	(0.0653)	(0.0635)	(0.0220)	(0.139)	(0.0988)	(0.0945)	(0.0668)	(0.251)	(0.0501)	(0.0683)
Expansion	-0.0313	-0.0455	-0.000509	-0.0166	-0.215*	0.0278	0.00487	0.428*	-0.0595	0.194***
	(0.0652)	(0.0631)	(0.0115)	(0.132)	(0.107)	(0.0438)	(0.0674)	(0.238)	(0.0763)	(0.0681)
N	577	577	517	577	577	571	575	573	543	550
r2	0.963	0.961	0.852	0.459	0.550	0.623	0.846	0.404	0.578	0.901
F_diff	4.865	1.189	1.886	1.937	1.876	1.830	0.771	0.102	1.191	0.670
p_diff	0.0328	0.282	0.177	0.171	0.178	0.183	0.385	0.751	0.281	0.418

Results for equations 2.1 - 2.4.
Each estimation includes controls, state fixed effects, and time fixed effects.
Robust standard errors are clustered at the state level.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's is the result of industries choosing not to report or errors in reporting injuries.

for job restriction or transfer nonfatal cases in model (4). These significant findings are perhaps the result of type I error. The probability of type I error occurring increases as the number of hypotheses tested increases which could be the case for some of the estimates found. However, given the number of positive estimates found, the results suggest that the negative relationship between unemployment and workplace injuries that is commonly found in previous literature may not hold for every industry and this relationship may even be positive for some industries.

2.5.4 ***Multiple Hypothesis Testing***

When several hypothesis are tested simultaneously, the probability of falsely rejecting true null hypotheses increases. Each model studied uses the same data with a slightly different independent variable of interest. Further, while different data is used when studying the total workforce, the private and public sectors, and the seven different industries, each data set likely follows a similar trend. This paper has studied three models in ten different settings each with five different outcomes. In models (2)-(4), there are two independent variables of interest. Further, model (3) is studied for the total workforce and the public

Table 2.9: Other Nonfatal Injury Results

	(1) All	(2) Private	(3) Public	(4) Construction	(5) Manufacturing	(6) Whole Sale	(7) Retail	(8) Transportation	(9) Finance	(10) Service
Unemployment	-0.159***	-0.139***	-0.0104	-0.0973**	-0.0362	-0.000728	0.00441	0.0237	0.0210	-0.0442
	(0.0549)	(0.0288)	(0.00923)	(0.0389)	(0.0353)	(0.00861)	(0.0362)	(0.0231)	(0.0266)	(0.0397)
N	943	943	762	941	942	933	940	936	909	910
r2	0.926	0.961	0.788	0.866	0.943	0.531	0.866	0.771	0.390	0.808
Recession (UNEMP+)	-0.192***	-0.153***	-0.00636	-0.143***	-0.0552	-0.0153	-0.0422	0.00841	0.0223	-0.0410
	(0.0612)	(0.0302)	(0.0121)	(0.0468)	(0.0424)	(0.0118)	(0.0430)	(0.0309)	(0.0362)	(0.0461)
Expansion (UNEMP-)	-0.182***	-0.149***	-0.00916	-0.124***	-0.0487	-0.00396	-0.0296	0.0139	0.0216	-0.0420
	(0.0587)	(0.0293)	(0.00939)	(0.0417)	(0.0394)	(0.00844)	(0.0403)	(0.0268)	(0.0273)	(0.0437)
N	943	943	762	941	942	933	940	936	909	910
r2	0.927	0.961	0.789	0.867	0.943	0.531	0.868	0.771	0.390	0.808
F_diff	5.606	1.827	0.208	4.303	1.698	2.126	6.120	0.606	0.00205	0.0398
p_diff	0.0225	0.184	0.651	0.0441	0.199	0.152	0.0174	0.440	0.964	0.843
Recession (Julius Shiskin)	-0.0686	-0.0664	-0.0133	-0.0467	-0.0335	-0.0129	0.0650	0.0727**	0.0243	-0.0101
	(0.0737)	(0.0459)	(0.00966)	(0.0570)	(0.0377)	(0.0198)	(0.0415)	(0.0321)	(0.0335)	(0.0543)
Expansion	-0.0619	-0.0647	-0.0105	-0.0465	-0.0333	-0.00264	0.0617	0.0672*	-0.00218	-0.00582
	(0.0730)	(0.0450)	(0.0101)	(0.0554)	(0.0379)	(0.00973)	(0.0403)	(0.0335)	(0.0385)	(0.0552)
N	577	577	529	577	577	571	575	575	549	551
r2	0.879	0.947	0.769	0.820	0.917	0.364	0.775	0.726	0.292	0.828
F_diff	2.101	0.136	0.203	0.000227	0.00326	0.298	0.459	0.243	1.456	0.858
p_diff	0.154	0.714	0.654	0.988	0.955	0.588	0.502	0.625	0.234	0.359

Results for equations 2.1 - 2.4.
Each estimation includes controls, state fixed effects, and time fixed effects.
Robust standard errors are clustered at the state level.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's is the result of industries choosing not to report or errors in reporting injuries.

sector. Hence, there are a total of $10 * 5 + 2 * 10 * 5 + 2 * 2 * 5 + 2 * 10 * 5 = 270$ coefficients of interest that are estimated. To avoid type I error, multiple hypothesis testing adjustments are made using the Romano-Wolf method (Clarke *et al.* [2020]).

Table 2.10 gives the orignial p-value calculated along with the new Romano-Wolf adjusted p-value which accounts for the large number of hypotheses tested. (Not sure how to present these p-values. I'd like to just adjust the standard errors but haven't found an easy way to implement this into stata/latex). After the Romano-Wolf correction, no estimates for fatal injuries remain significant. The volatility in the fatal outcome measure has lead to larger increases in adjusted p-values than for nonfatal estimates. While it is likely that estimates for fatal injuries are negative, as always, there is the possibility that this is not the case and the Romano-Wolf p-values are evidence of this. Further, only estimates which studied the private sector and total workforce remained significant after adjustment as well as nonfatal model (2) results for the construction industry.

2.6 Discussion

Using a fixed effects model on U.S. state level data from 1992 - 2018, this paper provides evidence that increases in the unemployment rate may lead to decreases in both fatal and nonfatal workplace injury rates. When studying the total labor force, I find that a one percent decrease in the unemployment rate is related to a 13.2% increase in fatal injuries and a 17.8% increase in nonfatal injuries. Based on the number of fatal and nonfatal injuries in 2018, a 1 percent decrease in the unemployment rate nation wide is related to an increase of 693 fatal injuries and about 500,000 more nonfatal injuries. Because unemployment is highly correlated with the business cycle, results from this paper give further evidence that workplace injuries are pro-cyclical. In order to test for potential relationship differences, the nonfatal injury rate is split into three outcomes which differ in level of severity. Unlike previous research findings, results give evidence that, no matter the injury severity, the unemployment rate in inversely related to workplace injuries. This result is evidence against a reporting bias story that is told by previous researchers because fatal injuries are not likely to suffer from misreporting. Instead, the inverse relationship found is more likely to be the result of changes in the amount of new hires or untrained employees and a firms decision to provide lower safety standards during lower levels of unemployment.

Using three different models to split the unemployment rate during recessionary and expansionary periods, this paper also provides evidence that the decreases experienced in the workplace injury rate from increases in unemployment during an expansionary period may be less than the decreases experienced during a recessionary period. However, any differences which are found to be statistically different are usually less than a one percent difference, i.e., it is likely that the decreases in injury rates from increases in unemployment are equal during a recession and expansion.

I also run these same models for the private and public sectors as well as seven different private sector industries. My findings show that workplace injuries are pro-cyclical in the private sector but there is no relationship between unemployment and workplace injuries in the public sector. A common mechanism to explain the correlation between unemployment and workplace injuries is the number of new hires that occur during lower levels of unemployment. Both the private and public sectors are likely to have increases in new hires during lower levels of unemployment. However, the null results from the public sector may indicate that public sector firms do a better job at safety training new hires than private sector firms.

Results from the construction, manufacturing, and retail industries indicate that the magnitude of change from changes in unemployment is higher for these industries than for others, especially for construction. Other industries such as the finance and service industries may have injury rates which are actually counter-cyclical. This evidence demonstrates why assuming injuries are pro-cyclical for all industries can result in incorrect conclusions. Results for the wholesale trade and for the transportation and warehousing industries indicate a small or null relationship between unemployment and workplace injuries.

Table 2.10: Multiple Hypothesis Testing: P-value Comparison Romano-Wolf

	All	Private	Public	Construction	Manufacturing	Whole Sale	Retail	Transportation	Finance	Service
Fatal Injuries										
Unemployment	[0.0305]	[0.0161]	[0.7110]	[0.0124]	[0.6025]	[0.7594]	[0.5404]	[0.7554]	[0.3357]	[0.3885]
	[0.5804]	[0.4236]	[1.0000]	[0.3766]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]
Recession (UNEMP+)	[0.0460]	[0.0176]	[0.4122]	[0.0258]	[0.5548]	[0.3642]	[0.5670]	[0.6529]	[0.8863]	[0.5648]
	[0.7143]	[0.4535]	[1.0000]	[0.5395]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]
Expansion (UNEMP-)	[0.397]	[0.0000]	[0.6233]	[0.0162]	[0.5599]	[0.6141]	[0.5524]	[0.8258]	[0.8024]	[0.5114]
	[0.6543]	[0.4366]	[1.0000]	[0.4266]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]
Recession (SCI)	[0.0719]	[0.0386]								
	[0.8482]	[0.6474]								
Expansion (SCI)	[0.347]	[0.0184]								
	[0.6154]	[0.4695]								
Recession (JUL)	[0.6680]	[0.5647]	[0.9307]	[0.4070]	[0.6768]	[0.7274]	[0.3889]	[0.3571]	[0.6925]	[0.1891]
	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[0.9970]
Expansion (JUL)	[0.5666]	[0.3931]	[0.2482]	[0.1679]	[0.8693]	[0.9939]	[0.6563]	[0.5686]	[0.3960]	[0.2262]
	[1.0000]	[1.0000]	[0.9990]	[0.9920]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[0.9980]
Non-fatal Injuries										
Unemployment	[0.0001]	[0.0001]	[0.1118]	[0.0038]	[0.3549]	[0.2456]	[0.3050]	[0.3624]	[0.4447]	[0.2435]
	[0.0210]	[0.0000]	[0.9451]	[0.2038]	[1.0000]	[0.9990]	[1.0000]	[1.0000]	[1.0000]	[0.9990]
Recession	[0.0000]	[0.0000]	[0.3368]	[0.0003]	[0.1910]	[0.5650]	[0.0640]	[0.5760]	[0.0203]	[0.2033]
	[0.0150]	[0.0010]	[1.0000]	[0.0500]	[0.9980]	[1.0000]	[0.8112]	[1.0000]	[1.0000]	[0.9980]
Expansion	[0.0000]	[0.0000]	[0.1445]	[0.0005]	[0.2245]	[0.5147]	[0.0959]	[0.4845]	[0.5385]	[0.2092]
	[0.0150]	[0.0010]	[0.9790]	[0.0759]	[0.9980]	[1.0000]	[0.9221]	[1.0000]	[1.0000]	[0.9980]
Recession (SCI)	[0.0001]	[0.0000]								
	[0.0260]	[0.0010]								
Expansion (SCI)	[0.0001]	[0.0000]								
	[0.0210]	[0.0010]								
Recession (JUL)	[0.0000]	[0.0000]	[0.0759]	[0.0075]	[0.2016]	[0.6251]	[0.2448]	[0.2598]	[0.2933]	[0.2766]
	[0.0130]	[0.0030]	[0.8581]	[0.2957]	[0.9980]	[1.0000]	[0.9990]	[0.9990]	[1.0000]	[1.0000]
Expansion (JUL)	[0.0001]	[0.0000]	[0.1378]	[0.0068]	[0.1953]	[0.1603]	[0.2302]	[0.3146]	[0.4191]	[0.3077]
0.0170]	[0.0030]	[0.9720]	[0.2787]	[0.9980]	[0.9890]	[0.9990]	[1.0000]	[1.0000]	[1.0000]	
Days Away Injuries										
Unemployment	[0.0000]	[0.0001]	[0.0589]	[0.1189]	[0.7303]	[0.0619]	[0.5942]	[0.5235]	[0.1904]	[0.6101]
	[0.0110]	[0.0170]	[0.7892]	[0.9550]	[1.0000]	[0.8022]	[1.0000]	[1.0000]	[0.9980]	[1.0000]
Recession	[0.0000]	[0.0001]	[0.1343]	[0.0224]	[0.3938]	[0.9723]	[0.2989]	[0.9375]	[0.4402]	[0.2892]
	[0.0130]	[0.0190]	[0.9700]	[0.5125]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]
Expansion	[0.0000]	[0.0001]	[0.0690]	[0.0399]	[0.4630]	[0.1656]	[0.3529]	[0.7870]	[0.2367]	[0.3528]
	[0.0110]	[0.0180]	[0.8322]	[0.6513]	[1.0000]	[0.9910]	[1.0000]	[1.0000]	[0.9990]	[1.0000]
Recession (SCI)	[0.0001]	[0.0001]								
	[0.0170]	[0.0270]								
Expansion (SCI)	[0.0000]	[0.0001]								
	[0.0130]	[0.0210]								
Recession (JUL)	[0.0003]	[0.0009]	[0.3988]	[0.2561]	[0.5196]	[0.8297]	[0.9438]	[0.7215]	[0.2875]	[0.5471]
	[0.0500]	[0.1029]	[1.0000]	[0.9990]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]
Expansion (JUL)	[0.0002]	[0.0004]	[0.0560]	[0.2288]	[0.4441]	[0.0608]	[0.7915]	[0.6165]	[0.4466]	[0.4679]
	[0.0440]	[0.0659]	[0.7712]	[0.9980]	[1.0000]	[0.7972]	[1.0000]	[1.0000]	[1.0000]	[1.0000]
Restrict/Transfer Injuries										
Unemployment	[0.0002]	[0.0001]	[0.9647]	[0.3063]	[0.0437]	[0.4760]	[0.0219]	[0.1175]	[0.0105]	[0.1404]
	[0.0380]	[0.0170]	[1.0000]	[1.0000]	[0.6953]	[1.0000]	[0.5075]	[1.0000]	[0.3387]	[0.9760]
Recession	[0.0001]	[0.0000]	[0.6095]	[0.2076]	[0.0895]	[0.905]	[0.0126]	[0.2152]	[0.2660]	[0.1011]
	[0.0260]	[0.0090]	[1.0000]	[0.9980]	[0.9111]	[0.9111]	[0.3736]	[0.9980]	[1.0000]	[0.9321]
Expansion	[0.0001]	[0.0000]	[0.8374]	[0.2287]	[0.0661]	[0.3052]	[0.0133]	[0.1787]	[0.0613]	[0.1089]
	[0.0270]	[0.0110]	[1.0000]	[0.9980]	[0.8252]	[1.0000]	[0.3836]	[1.0000]	[0.8012]	[0.9421]
Recession (SCI)	[0.0003]	[0.0001]								
	[0.0480]	[0.0260]								
Expansion (SCI)	[0.0002]	[0.0001]								
	[0.0390]	[0.0180]								
Recession (JUL)	[0.0000]	[0.0000]	[0.2197]	[0.5802]	[0.0230]	[0.4990]	[0.0014]	[0.1980]	[0.0043]	[0.0782]
	[0.0130]	[0.0080]	[0.9980]	[1.0000]	[0.5175]	[1.0000]	[0.1259]	[0.9980]	[0.2168]	[0.8651]
Expansion (JUL)	[0.0001]	[0.0000]	[0.4240]	[0.2153]	[0.0239]	[0.4002]	[0.0014]	[0.1675]	[0.2534]	[0.0738]
	[0.0220]	[0.0080]	[1.0000]	[0.9980]	[0.5245]	[1.0000]	[0.1259]	[0.9920]	[0.9990]	[0.8521]
Other Injuries										
Unemployment	[0.0060]	[0.0000]	[0.2641]	[0.0162]	[0.3103]	[0.7513]	[0.9037]	[0.3103]	[0.6145]	[0.2716]
	[0.2627]	[0.0100]	[1.0000]	[0.4176]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]
Recession	[0.0030]	[0.0000]	[0.6022]	[0.0039]	[0.1999]	[0.1288]	[0.3311]	[0.7869]	[0.7158]	[0.3780]
	[0.1808]	[0.0070]	[1.0000]	[0.2058]	[0.9980]	[0.9630]	[1.0000]	[1.0000]	[1.0000]	[1.0000]
Expansion	[0.0034]	[0.0000]	[0.3352]	[0.0049]	[0.2223]	[0.4625]	[0.4682]	[0.6072]	[0.6272]	[0.3425]
	[0.1908]	[0.0070]	[1.0000]	[0.2338]	[0.9980]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]
Recession (SCI)	[0.0052]	[0.0000]								
	[0.2398]	[0.0090]								
Expansion (SCI)	[0.0058]	[0.0000]								
	[0.2567]	[0.0080]								
Recession (JUL)	[0.0014]	[0.0001]	[0.1003]	[0.0020]	[0.2437]	[0.8630]	[0.8885]	[0.3357]	[0.3447]	[0.4577]
	[0.1239]	[0.0260]	[0.9311]	[0.1489]	[0.9990]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]
Expansion (JUL)	[0.0052]	[0.0001]	[0.3146]	[0.0060]	[0.2861]	[0.9614]	[0.9049]	[0.4948]	[0.9550]	[0.5699]
	[0.2398]	[0.0270]	[1.0000]	[0.2627]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]	[1.0000]

Number of matches and off support for propensity score matching

Coarsened exact matching results in all treated being matched meaning number of matches is sum of matches and off support in table

Chapter 3

The Effect of Labor Unions on Self-Rated Health

3.1 Introduction

Labor unions have been a part of the United States labor force structure since the first labor union formation in 1794. Researchers have shown time and time again a union's effectiveness at increasing worker wages, providing improved health coverage, reducing discrimination, improving safe working conditions, providing additional sick leave, and much more. Despite these positive outcomes for workers, private sector labor union coverage has been reduced from 29.3% in 1964 to 10.3% in 2021. While there does exist a large amount of evidence for labor unions successfully bargaining for the interests of those it covers, evidence on the indirect effect on worker health is lacking. Researchers who do not focus on labor unions have shown that pathways such as increased wages or improved job training do improve worker health. Hence, there does exist a theoretical bridge when linking these two types of literature together (Leigh and Chakalov [2021]).

This paper seeks to provide empirical evidence for the existence of a direct relationship between labor unions and worker health. Further, this study examines subgroups such as private sector workers, blue collar workers, and low income workers which are potentially at higher risk of worse health than their counterparts. Because of this, labor unions which cover these types of members may have different incentives or interests to bargain for making their effectiveness at increasing the health of its workers greater. Emphasizing these differences in empirical results is important for policy makers who should consider tailored legislation based on the type of worker rather than creating blanket laws, such as right to work laws, which affect all private sector labor unions. Labor union density has been able to decline due to the employer's ability to mitigate their formations. This employer power to prevent labor unions was increased with the Taft-Hartley act starting in the 1950's. By studying the effect of labor unions on worker self-rated health, this paper can act as evidence that labor unions are either effective or ineffective at improving worker health.

Using Current Population Survey (CPS) data from 1996 to 2018, I estimate the effect of labor unions on an individual's self-reported health using both an ordinal and nominal logistic regression, propensity score matching, and coarsened exact matching. While self-rated health is not an exact measure of an individuals health, previous research has shown that self-rated health is an effective predictor of one's functional abaility, healthcare utilization, morbidity, and mortality (Ferraro and Farmer [1999], Idler and Benyamini [1997], Marques *et al.* [2019]). Logistic regression and propensity score matching are both used because of the survey nature of the self-rated health variable and to verify the results from previous research which have used similar estimation strategies. Because the CPS surveys individuals over a sixteen month window, difference-in-differences comparing treated individuals from one year to the next against non-treated individuals is possible. However, there is a lack of variation due to the small amount of switching between treated and non-treated making difference-in-differences unreasonable. While comparing non-unionized workers to union members is one focus, this paper also explores potential self-rated health differences between union workers who work in a unionized workplace but are non-members (referred to as non-members for the remainder of the paper) and union members. Non-members receive many of the same benefits as members while paying less dues to the union. This extra income could increase their self-rated health, or the benefits non-members potentially miss out on compared to members could decrease their self-rated health.

Findings from the ordinal and nominal logistic regressions as well as from propensity score and coarsened exact matching show an increase in the probability of reporting higher self-rated health scores. This does not change through a series of robustness checks. This probability is doubled when considering blue collar workers. In some estimations, health scores are lowered for members in white collar positions. Public sector positions show a small positive or null result. Low wage members are also found to have a positive increase in self-health scores, but this probability is not much higher than the effect for high wage members in most estimates. When studying the differences between being a non-member and member, estimations show that being a non-member increases self-rated health for low wage workers and white collar workers. However, blue collar workers are potentially hindered by being a non-member compared to being a member in terms of self-rated health. Overall, it seems that legislation should focus on giving more power to labor unions in the private sector and, more particularly, for blue collar workers if worker health is to be prioritized.

3.2 Mechanisms and Literature Review

3.2.1 *Indirect Effect*

Employees and employers share a relationship in which they bargain for the level of wages and benefits that the employee will receive in return for the labor which they provide. The higher bargaining power the employee holds, the higher wage and benefit that employee can receive from their employer. One way in which employees can increase their bargaining power is through the formation of a labor union. By banding together with their coworkers, a labor union is a special type of cartel which can restrict the supply of labor to the employers giving increased bargaining power to the union of employees. While there is a large literature which studies different effects of labor unions and a large literature which studies each of these effects on health, there are very few direct studies which look at how labor unions effect health outcomes of its employees. Leigh and Chakalov [2021] provides a model based off the literature on Social Determinants of Health (SDoH) and Occupational Medicine which postulates that there are five categories which labor unions are shown to impact that are also tied to worker health. These categories are Economic Stability, Education, Health and Healthcare, Environment and Work Organization, and Psychosocial. Leigh and Chakalov [2021] breaks these five categories down into twenty-eight pathways in which labor unions can indirectly impact worker health. This section will go into further detail than what is discussed in the table.

Labor unions are most commonly associated with fighting for higher wages. This question has been studied for decades with some differing results. Leigh and Chakalov [2021] concludes through the studies of Cooper and Kroeger [2017], Ehrenberg *et al.* [2021], Kaufman and Hotchkiss [2000], and McConnell and Brue [2017] that unions do indeed raise wages and also minimize wage theft meaning unions prevent paying below minimum wage and withholding overtime pay. A recent empirical study by Wilmers [2017] also concludes that increases in union spending leads to increases in a proxy for union member wages. An older study by Boal and Pencavel [1994] finds that labor unions had no impact on wages in the coal industry from 1897 to 1938. However, I would argue that there is substantial evidence that labor unions today are shown to increase wages of its employees. Further, labor unions are shown to both reduce wage inequality (Kaufman and Hotchkiss [2000], McConnell and Brue [2017]) and increase pensions (Ehrenberg *et al.* [2021], Kaufman and Hotchkiss [2000], McConnell and Brue [2017], Mishel *et al.* [2015]). Studies on how labor unions impact the job security of its workers are lacking with the most recent from Bender and Sloane [1999] finding increases in job security but others such as Freeman R.B. [1984] and Montgomery [1991] finding no difference or increased layoffs. Evidence from studies which show that employees are more likely to take sick days or have days off for vacation are evidence that employees feel more job secure (Mishel *et al.* [2015], Ehrenberg *et al.* [2021], Kaufman and Hotchkiss [2000]). Lastly, in the category of Economic Stability, unions are shown to reduce discrimination with regards to employment, wage, or other factors (Bivens *et al.*, Farber *et al.* [2021], Jones *et al.*

[2014]). Each of the studies mentioned so far do not directly show the impact of unions on worker health. However, increased wages improve health for low-wage workers, higher pensions improve health, increased job security likely leads to improved health, and less workplace discrimination likely improves both mental and physiological health (Leigh *et al.* [2019], Dench and Grossman [2019], Card *et al.* [2012], Herd *et al.* [2008], Western and Rosenfeld [2011], Barling and Kelloway [1996], Darity Jr [2003], Krieger [2001]). Hence, although direct empirical evidence does not exist, unions likely improve health through their impact on these pathways.

Studies which analyze changes to general or safety training caused by a union conclude that unions do push for improved training (McConnell and Brue [2017], Sinclair *et al.* [2010], Hilyer *et al.* [2000]). Improvements in these trainings, especially safety training, is shown to reduce workplace injuries (Colligan and Cohen [2004]). Hence, it is likely that the average labor union lowers workplace injuries resulting from poor safety training and therefore, improve worker health. A more educated workforce is also shown to have increased health (Glymour *et al.* [2014]). However, there does not exist strong evidence that unions increase or decrease the overall education of its employees (Blanchflower [2006] Ewer [2000]).

Labor unions are also found to expand and improve employer-provided health insurance (Ehrenberg *et al.* [2021] McConnell and Brue [2017], Kaufman and Hotchkiss [2000]). These improvements are shown to improve health outcomes compared to employees with no health insurance (O'Brien [2003]) meaning labor unions likely improve health outcomes through their ability to better employer-provided health insurance. Unions are also found to increase paid sick leave and paid family leave which are both determinants in worker health (Mishel [2012], Park *et al.* [2019], Abay Asfaw *et al.* [2017], Rossin [2011]). Researchers have argued that unions likely promote healthy catering practices, sun protection practices, disability access, and restrictive smoking policies. However, empirical evidence of this is disputed (Holman *et al.* [1998], Kenkel and Supina [1992]). These types of practices are shown to improve worker health meaning if unions are effective at promoting these practices, this is another avenue in which unions improve worker health (Kuoppala *et al.* [2008]).

Unions are also associated with improving safety standards within in the workplace and studies have shown that they are effective in doing so (Ehrenberg *et al.* [2021], Kaufman and Hotchkiss [2000], Leigh [1981]). Further, unionized workplaces are more likely to be in line with the Occupational Health and Safety Administration guidelines (Weil [1991]). Reducing safety hazards and increased inspection rates are both shown to improve health outcomes (Levy [2006], Li and Singleton [2019]). After a worker is injured, unions are shown to increase receipts of workers' compensation benefits and workers are more likely to take advantage of restricted production when returning to work (Budd and McCall [1997], Hirsch *et al.* [1997], Kaufman and Hotchkiss [2000], McConnell and Brue [2017]). Both of these are argued to be beneficial for an employees' health (Cylus *et al.* [2015], Stuckler *et al.* [2009], Krause and Lund [2004]). Unions are further argued to reduce excessive overtime, reduce the amount of graveyard shifts, and improve schedule flexibility. However, evidence for this is lacking with some researchers disputing these claims (Booth and Francesconi [2003], Trejo [1993], Cotti *et al.* [2014], Duncan and Stafford [1980], Kaufman and Hotchkiss [2000], Keune [2013]). So although improvements in these areas likely would improve worker health, it's unclear if unions have an effect these areas (Wagstaff and Lie [2011], Butler *et al.* [2009], Grzywacz *et al.* [2007]). Labor unions are shown to reduce the prevalence of contingent or alternative employment and instead work to change these positions to employee positions leading to better benefits (Tronsor [2018], OECD [2019], Keune [2013]). However, the literature is unclear if these gig jobs have negative health impacts in comparison with a regular employee position with Howard [2017] and Benach *et al.* [2014] arguing that they are harmful and Apouey and Stabile [2021] showing evidence for beneficial. Labor unions are also argued to reduce incentive or piece-rate pay and instead push for hourly or salary pay (Kaufman and Hotchkiss [2000], Garen [1999]. This likely improves the health of low production workers but could harm the health of high production workers who see less benefits with an hourly wage when compared to an incentive pay (DeVaro and Heywood [2017]). Lastly, with regards to the work environment and work organization, unions are shown to increase both paid vacation and non-paid vacation time (Ehrenberg *et al.* [2021], Kaufman and Hotchkiss [2000]). A study by Aronsson and Gustafsson [2005] argues that increased vacation time likely improves health. However, other studies such as Strauss-Blasche *et al.* [2005] argue that vacations can negatively impact health dependent on weather differences and time-zone differences leading to workplace fatigue.[1]

Evidence for how unions impact the psychosocial atmosphere of the workplace is much more unclear than the other topics mentioned up to this point. Because labor unions are meant to argue for employees' interests, one may expect unions to improve job satisfaction, reduce job strain, improve social support, improve work fairness, and improve a worker's self-esteem and dignity. However, evidence for these topics are mixed. The exception here is social support which is likely shown to be promoted by unions (Hagedorn *et al.* [2016], Lott [2014]). The primary issue when studying these topics is reverse causality. It is unclear whether a union improves job satisfaction or if low job satisfaction increases the probability of union formation (Laroche [2016]). Hence, it is common for researchers to find a correlation between low job satisfaction and labor unions. Hence, whether or not labor unions improve the psychosocial atmosphere of the workplace is unknown. However, if a labor union did improve the psychosocial atmosphere, several researchers have shown that improved job satisfaction, reduced job strain, improved social support, increased fairness, and improved self-esteem and dignity lead to improved health outcomes (Faragher *et al.* [2013], Dragano *et al.* [2011], Kivimaki *et al.*, Schnall *et al.* [1994], Park *et al.* [2004], De Vogli *et al.* [2007], Jacobson [2007]).

The previous paragraphs discuss the plausible mechanisms unions have to influence health outcomes. After looking through previous research and studying the literature review by Leigh and Chakalov [2021], the evidence points to the conclusion that an indirect effect exists. However, literature proving any connection to health outcomes is lacking or disputed.

[1] de Bloom *et al.* [2010] finds that health improves while on vacation. However, health levels return to pre-vacation levels about a week after returning to work.

3.2.2 *Direct Effects*

There are few papers which study the direct relationship between labor unions and some health outcome. The health outcomes that are studied along with their papers are compiled in table 3 of Leigh and Chakalov [2021]'s research. This paper focuses on health outcome 32 of that table which is the self-rated physiological and psychological health. Both Reynolds and Brady [2012] and Dollard and Neser [2013] argue in favor of unions increasing self-reported health. However, a more recent study by Eisenberg-Guyot *et al.* [2021] argues that unions have a null effect on both self-rated health and moderate mental illness and that this null effect does not vary when studying subgroups.

Reynolds and Brady [2012]'s research uses the National Opinion Research Center's General Social Survey from 1973 to 2006 to study the effect of labor union membership on self-rated health. Rather than using the full variation of the self-rated health outcome, they dichotomize the variable into excellent/good health and fair/poor health. Using a nominal logistic regression and propensity score matching, they find that unions increase self-rated health when properly controlling for demographics and labor market characteristics. They argue that the primary driving force is the increase in wages from labor unions. However, the increase in income does not fully explain the increase in self-reported health for low educated and low income men. Studied sub-samples are split by gender, income, and education which leaves potential differences between occupations and the private and public sectors unknown. This paper will conduct a similar analysis using more recent data as a way to verify results found. Further, this paper will study sub-groups which were not previously studied such as the private and public sectors as well as blue collar and white collar workers.

Dollard and Neser [2013] compile and aggregate data by country on union density, GDP, and self-reported health for 31 wealth European countries. Their analysis using correlational and linear and hierarchical regression leads them to conclude that increases in union density lead to higher self-reported health which, in-turn, increases GDP. Further, they note that it is not the quality of work conditions which led to higher self-reported health, but rather workplace protective factors which increased self-reported health. This study has several limitations with regards to potential worker differences between countries and small differences in survey data between countries. Further, the large aggregation to compare 31 countries reduces sample size dramatically reducing the power of the results.

The most recent research which studies the impact of labor unions on self-rated health was conducted by Eisenberg-Guyot *et al.* [2021]. Using the Panel Study of Income Dynamics from 1985 to 2017, they find a null effect on both self-rated health and mental illness. This is done by applying a parametric g-formula to contrast cumulative incidence of the outcomes under a scenario in which all employed-person-years are union-members to a scenario in which no employed-person-years are union-members. This approach is also used to contrast differences in gender, race, and education, but all results are null for any of these subgroups. Again, this paper studies sub-groups besides differences in gender, race, and education. Further, I analyze the effect of the choice of being a non-member compared to their member counterpart.

3.3 Empirical Strategy

The dependent variable is this paper is a measure of self-health from the CPS. Because this variable is categorical, linear regression will not be estimated. Instead, the following ordinal logistic regression will be estimated:

$$SRH = \alpha + \beta_1 U + \beta_2 \mathbf{X} + \sigma_s + \tau_t + \epsilon \tag{3.1}$$

The dependent variable, self-rated health, is an ordered categorical variable from one to five with one being poor health and five being excellent. This ordering allows for an ordinal logit rather than a nominal logit. In order to compare results to those from Reynolds and Brady [2012], a nominal logistic regression will also be run by dichotomizing the self-rated health variable where zero is for a self-rated health score of three and below and one is for a self-rated health score of four or five. While creating a binary dependent variable will slightly reduce the variation and statistical power, its interpretation is simpler and is commonly used. The primary independent variable of interest, denoted by U, is union status. An individual either does not work at a unionized work place, is represented by a union but is not a union member, or is a member of the union. The variable U in equation 3.1 will be a dummy variable which either compares union members to those who are not represented by a union or non-members who are represented by a union to union members with the former in each case being $U = 1$. The matrix $\mathbf{X}$ contains control variables which can be seen in Table 2.2. Note that control variables which would take away from the effect of unions on health are excluded such as income or the number of overtime hours worked. State and year fixed effects are included in equation 3.1. The error term given by ϵ is estimated using individual level weights from the Current Population Survey.

As discussed previously, there is one major threat to validity when studying any effect of labor unions. While researchers may be interested in how labor unions effect "X", it is difficult to know if labor unions truly effect "X" or if a low or high value of "X" causes employees to unionize. This selection bias or reverse causality issue may bias the results from equation 3.1. Although, Reynolds and Brady [2012] argues against the existence of this bias. As recommended by Leigh and Chakalov [2021], propensity score matching will be used to avoid this potential bias. Propensity score matching compares each individual with $U = 1$ in the data to another individual with $U = 0$ who has a similar likelihood of being treated. This predicted probability of being treated is calculated through a probit model. Using the recommendation from Morgan and Winship [2015], this probit is estimated first with all controls included. Next, controls are removed from the model in order to alleviate any problems with balancing the sample within a bound of propensity scores. Using each control including state and year fixed effects led to balancing for each estimation with the number of matches listed within each results table. Further suggested by Morgan and Winship [2015] is the use of nearest neighbor matching with replacement, calipers of 0.2, and within the region of common support.

While Leigh and Chakalov [2021] recommends the use of propensity score matching in their literature review in order to avoid any selection bias, many recent researchers critique propensity score matching stating that it is imprecise and should not be used (Abadie and Imbens [2016], de los Angeles Resa and Zubizarreta [2016], King and Nielsen [2019]). Advice is given on how to better use PSM in order to avoid higher imbalance, model dependence, and bias. However, the use of other matching methods such as Coarsened Exact Matching (CEM) is recommended which may better avoid over pruning of the data. Hence, although the literature shows that PSM, when used properly, will result in proper matching and results, CEM is also performed as a robustness check. Coarsening occurs on the same covariates with bins being auto-generated except for education which is coarsened into elementary, middle, high, bachelor, and graduate education.

Unions may disproportionately affect different types of workers. Blue collar workers may experience more health benefits from a union than a white collar worker. Similarly, private sector workers may experience more health benefits from a union than public sector workers. These comparisons have not been made in previous research but are potentially important for understanding where the need for unions is. In order to make comparisons to results found by Reynolds and Brady [2012] and Eisenberg-Guyot *et al.* [2021], subgroups by sex and socioeconomic status will be made and estimated on to see if effect size changes for any of these groups.

3.4 Data

This paper's primary data source is the Current Population Survey (CPS) which is a voluntary survey sponsored by the Bureau of Labor Statistics and the U.S. Census Bureau. Households are chosen to create a representative sample of the U.S. population. Individuals within the household who are ages 15 and older are surveyed via phone or in-person for four consecutive months. After these four months, individuals are resurveyed eight months later for an additional four consecutive months. Questions in the survey provide statistics on demographics, workforce participation, employment characteristics, and unemployment.

Additional questions regarding information on social and economic characteristics are asked for a subset of the individuals who are surveyed in March. These supplemental questions are currently referred to as the Annual Social and Economic (ASEC) supplement. It is within this survey that individuals are asked the question "Would you say (name's/your) health in general is excellent, very good, good, fair, or poor?" giving an insight to an individuals self-reported health. Because this variable is the primary focus in this paper, only surveys from the month of March are used. Due to the survey pattern of the CPS, most individuals who fully participate and who are surveyed in the month of March will answer the ASEC supplemental questions two years in a row. This longitudinal format of the CPS will allow for additional estimation strategies which compare the same individual over time.

The CPS also provides insight into the labor union status of each participant. However, unlike most data sets which are only concerned with the membership status of an individual, the CPS provides further insight to the relationship between the individual and its potential labor union. That is, the CPS distinguishes between whether an individual is a labor union member, if they are working in a unionized workplace but have chosen not to be a member, and if the individual does not work in a unionized workplace. This information will be beneficial in comparing those who have chosen to be a union member and those who choose not to be a union member. Researchers have commonly called these individuals "free-riders" as many of them can benefit from the advantages of a labor union while paying lesser union dues. In fact, some pay no union dues depending on if the individual works within a state who has adopted a Right to Work law.

Control variables that will be included are age, sex, race, marital status, state of residence, year surveyed, citizenship status, industry, changes in occupation from the previous year, class of worker, and educational attainment. Variables such as class of worker, income, sex, and industry will allow for sub-sample comparisons between blue and white collar workers, private and public sector industries, male and female, and socioeconomic status.

Table 3.1: Summary Statistics

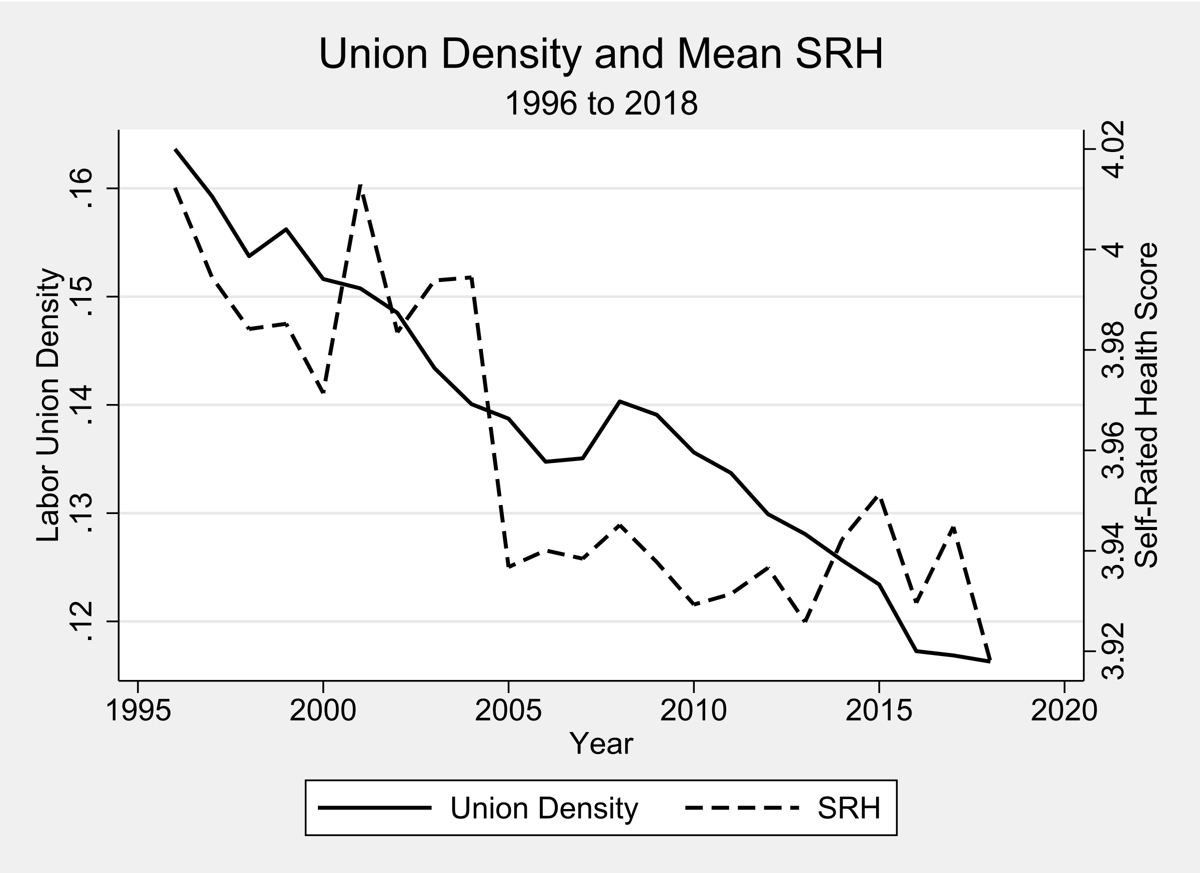
	Full Sample	Union Member	Non-Member	No Union	Blue Collar	Private	Public	Low Wage	Mid Wage	High Wage
health	3.939	3.943	3.907	3.939	3.820	3.938	3.947	3.835	3.927	4.113
	(0.005)	(0.016)	(0.041)	(0.005)	(0.011)	(0.006)	(0.013)	(0.010)	(0.007)	(0.011)
Healthy	0.688	0.692	0.701	0.687	0.630	0.686	0.697	0.639	0.683	0.766
	(0.003)	(0.008)	(0.023)	(0.003)	(0.006)	(0.003)	(0.006)	(0.005)	(0.004)	(0.005)
Union Member	0.109	1.000			0.143	0.065	0.346	0.071	0.129	0.112
	(0.002)	(.)			(0.004)	(0.002)	(0.007)	(0.003)	(0.003)	(0.004)
Non-Member	0.012		1.000		0.008	0.007	0.036	0.009	0.013	0.012
	(0.001)		(.)		(0.001)	(0.001)	(0.003)	(0.001)	(0.001)	(0.001)
No Union	0.879			1.000	0.849	0.927	0.619	0.920	0.857	0.876
	(0.002)			(.)	(0.004)	(0.002)	(0.007)	(0.003)	(0.003)	(0.004)
Age	41.758	44.724	44.532	41.353	42.132	41.217	44.688	38.277	42.642	44.442
	(0.081)	(0.228)	(0.642)	(0.087)	(0.172)	(0.089)	(0.194)	(0.151)	(0.110)	(0.177)
Female	0.480	0.458	0.530	0.482	0.152	0.463	0.579	0.517	0.467	0.462
	(0.003)	(0.009)	(0.025)	(0.003)	(0.004)	(0.003)	(0.007)	(0.005)	(0.004)	(0.006)
HS Degree	0.935	0.963	0.957	0.931	0.865	0.927	0.980	0.887	0.947	0.974
	(0.001)	(0.003)	(0.010)	(0.001)	(0.004)	(0.001)	(0.002)	(0.003)	(0.002)	(0.002)
Bachelor's Degree	0.392	0.457	0.531	0.382	0.100	0.361	0.562	0.217	0.392	0.638
	(0.003)	(0.009)	(0.025)	(0.003)	(0.004)	(0.003)	(0.007)	(0.005)	(0.004)	(0.006)
Personal Income	59551.267	63856.487	64516.759	58950.037	47653.054	58985.801	62939.575	24916.390	53880.087	122104.652
	(415.827)	(891.147)	(3421.918)	(457.544)	(649.660)	(459.778)	(983.460)	(138.656)	(236.317)	(1697.337)
Low Wage	0.287	0.187	0.219	0.300	0.360	0.300	0.215	1.000	0.000	0.000
	(0.003)	(0.007)	(0.021)	(0.003)	(0.006)	(0.003)	(0.006)	(.)	(.)	(.)
Middle Wage	0.508	0.602	0.573	0.495	0.535	0.499	0.560	0.000	1.000	0.000
	(0.003)	(0.008)	(0.025)	(0.003)	(0.006)	(0.003)	(0.007)	(.)	(.)	(.)
High Wage	0.205	0.211	0.207	0.204	0.104	0.201	0.225	0.000	0.000	1.000
	(0.002)	(0.007)	(0.020)	(0.002)	(0.004)	(0.002)	(0.006)	(.)	(.)	(.)
Single	0.339	0.257	0.232	0.351	0.329	0.354	0.261	0.534	0.280	0.212
	(0.003)	(0.008)	(0.022)	(0.003)	(0.006)	(0.003)	(0.006)	(0.005)	(0.004)	(0.005)
Married	0.518	0.581	0.638	0.508	0.512	0.506	0.580	0.239	0.586	0.738
	(0.003)	(0.009)	(0.024)	(0.003)	(0.006)	(0.003)	(0.007)	(0.004)	(0.004)	(0.006)
Divorced	0.127	0.148	0.107	0.125	0.145	0.125	0.139	0.200	0.119	0.045
	(0.002)	(0.006)	(0.016)	(0.002)	(0.004)	(0.002)	(0.005)	(0.004)	(0.003)	(0.003)
Veteran	1.048	1.067	1.063	1.045	1.077	1.043	1.075	1.036	1.054	1.048
	(0.001)	(0.004)	(0.012)	(0.001)	(0.003)	(0.001)	(0.004)	(0.002)	(0.002)	(0.003)
Citizen	1.520	1.404	1.548	1.534	1.693	1.558	1.302	1.613	1.492	1.459
	(0.007)	(0.018)	(0.065)	(0.007)	(0.017)	(0.008)	(0.013)	(0.014)	(0.009)	(0.014)
Observations	43569	4641	555	38373	9156	36012	7346	12294	22528	8747

Means given with standard deviation in parenthesis
Estimates from year 2018 only
Low wage workers are those who reported a household income below $50,000
Middle wage workers are those who reported a household income between $50,000 and $150,000
High wage workers are those who reported a household income above $150,000

Income is not controlled for in any estimation to avoid controlling for a main contributing factor of union membership.

The final data set results in 1,625,649 individuals for a total of 2,116,441 observations from 1996 to 2018. To avoid any changes in reported health due to covid, recent years are excluded. Not all individuals appear twice in the data. This is either because their first year was in 1995 which is excluded or their second year is in 2019 which is also excluded. Further, additional individuals are surveyed during the ASEC which are part of the ASEC oversampling. Not all individuals from the oversampling portion of the ASEC are able to be tracked from one year to the next. A list of summary statistics for unions and self-rated health along with statistics for control variables are given in Table 3.1 for the year 2018. Statistics for different sub-populations such as union workers, blue collar workers, private and public sectors, and wage type are given. Notice that the self-rated health of individuals who are part of a union is higher on average than for non-members and workers who are not represented by a union. Further, blue collar workers report lower health along with low wage families. Workers who are in a non-unionized workplace are younger on average, have a lower average wage, and are more likely to be single. To see changes in the union density and self-health ratings for each sub-group over time and to see the differences in self-health ratings for each type of union status, see Figures 3.1, 3.2, 3.3, and 3.4. Notice in Figure 3.1 that both union density and self-health ratings decline over time in the data.

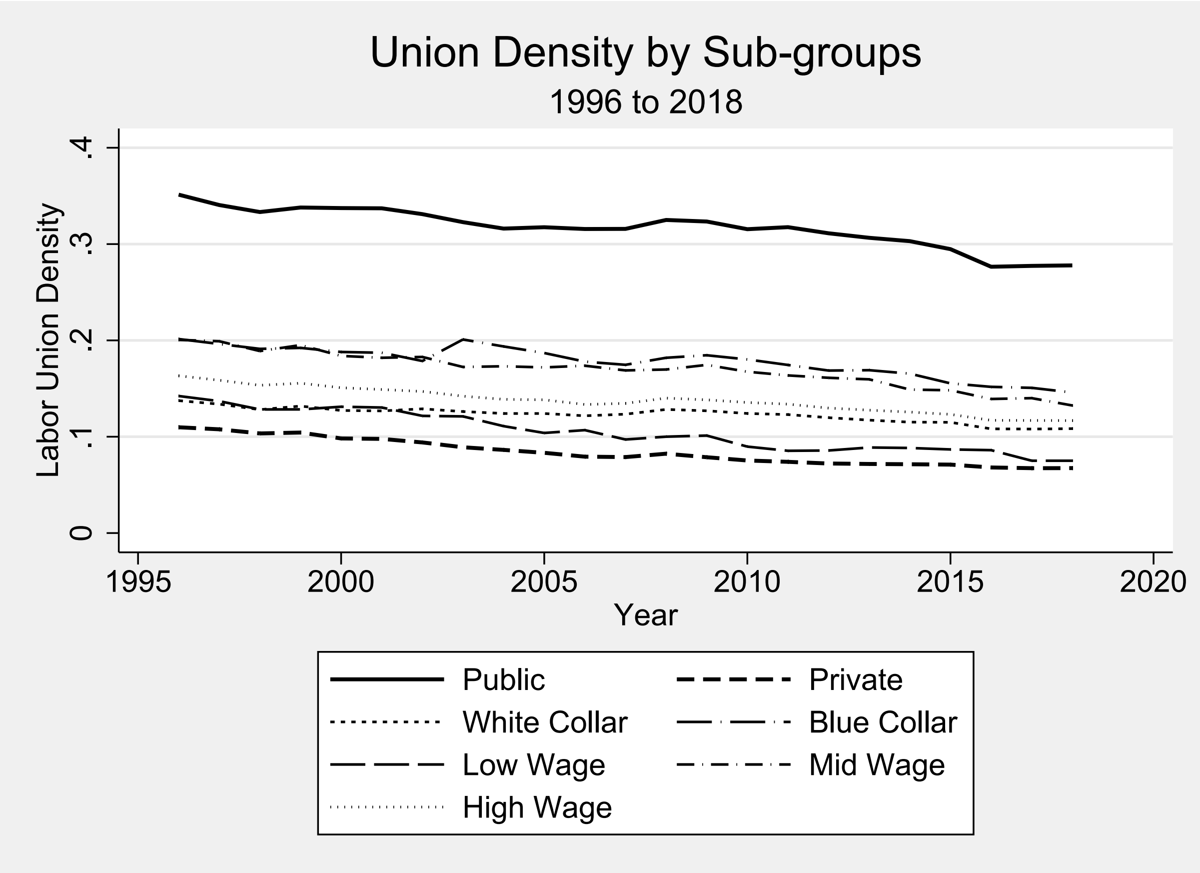
Figure 3.1: Comparing Union Density and Self-Rated Health Over Time



3.5 Results

Both the ordinal and nominal logistic regression results are provided in Table 3.2. This table includes estimations comparing members to those not represented by a union and non-members to members. Each estimation is also rerun while including a control for

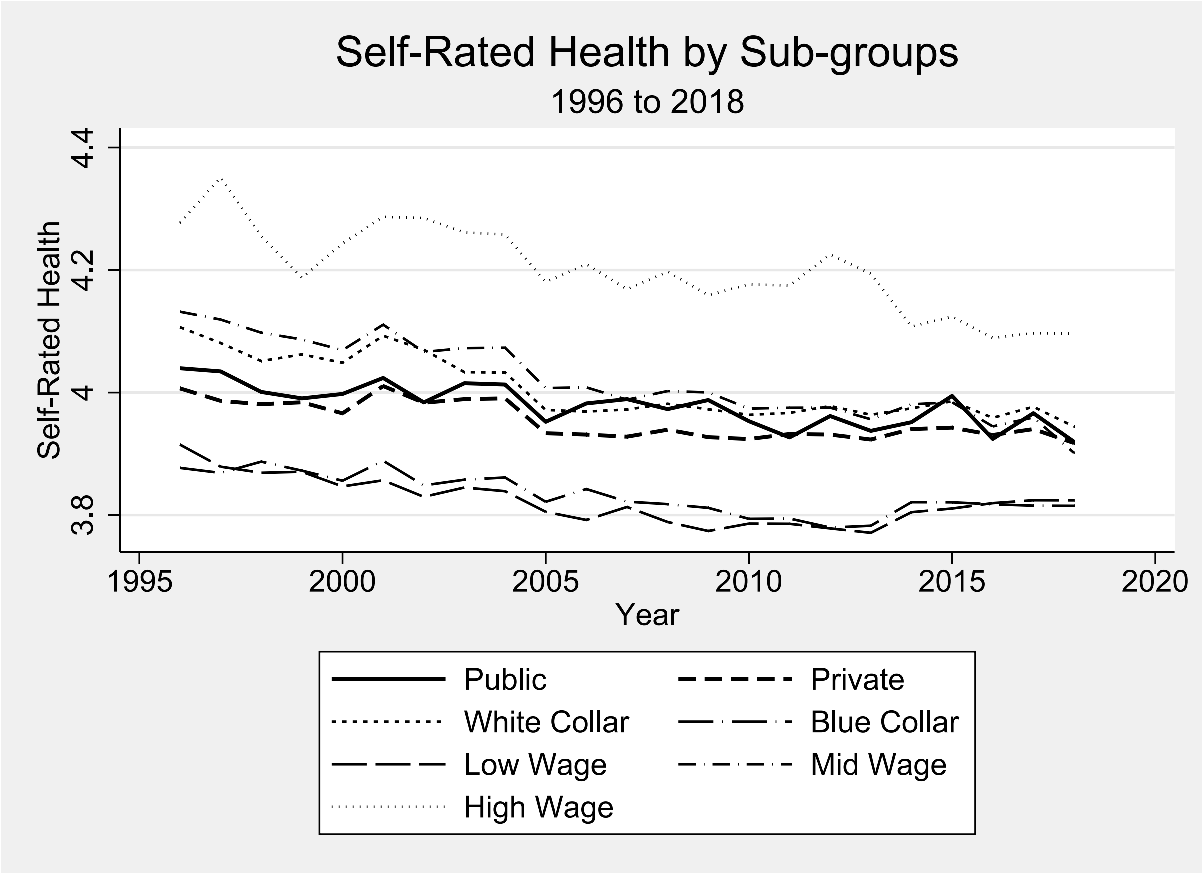
Figure 3.2: Comparing Union Density and Self-Rated Health Over Time



income in order to better understand what effect labor unions have on health through changes in income. Robustness checks of each of these estimations is included in Table C.2 in appendix C. Cut points are excluded from Table 3.2 but can be seen in Tables C.5 - C.8 for the ordinal logistic regressions. All logistic results are transformed to odds ratios for interpretation purposes. For each logistic regression, propensity score matching, and coarsened exact matching, the same eight groups are studied. Column one focuses on the full labor force. Column two restricts workers to only those working in the public sector. For comparison, column three focuses on individuals working in the private sector. Similarly, column four and column five compare blue collar occupations to white collar occupations. Columns six, seven, and eight study low wage, middle wage, and high wage earners in terms of family income. Survey weights are used in the primary logistic regression while PSM and CEM use their respective estimated weights.

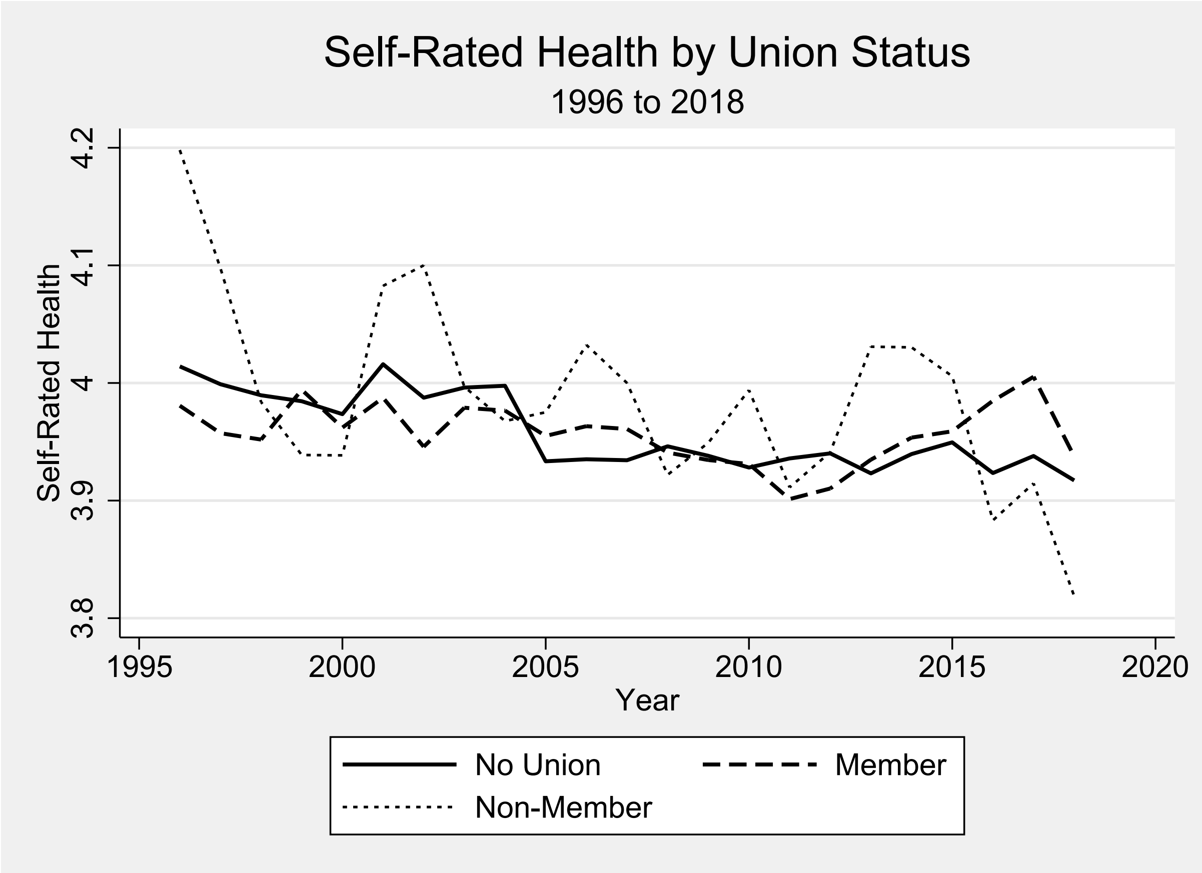
For the full workforce, being a union member as opposed to working in a non-union

Figure 3.3: Comparing Union Density and Self-Rated Health Over Time



workplace is shown to increase your probability of reporting a self-health score of 5 compared to all other categories by 1.077 times or it is shown to increase your probability of a high health score by 1.102 times. Both of these results are significant at the 1 percent level. The result for the nominal logit align closely with those found by Reynolds and Brady [2012] in their Table 3 model 4. For the public sector, unions are again shown to increase the probability of reporting higher self-reported health. However, this increase is smaller than for the full workforce and even smaller when compared to the private sector. Private sector unions are shown to increase the probability of an individual member reporting a self-health score of 5 by 1.101 times or 1.128 times with regards to a binary self-health score. This shows that the motivations behind a private sector union is potentially more health related than for a public sector union. This may be because public sector jobs already provide higher health standards resulting in higher self-reported health scores as seen in table 2.2. Further, public sector workers are shown to have higher incomes on average which may also impact their self-reported health. Hence, public sector

Figure 3.4: Comparing Union Density and Self-Rated Health Over Time



labor unions may focus on other aspects which are less health related. Similarly, columns four and five give the effect of labor unions on self-reported health for blue collar and white collar workers, respectively. Individuals who are members of a labor union in a blue collar job are shown to report higher health scores than non-union blue collar workers. The probability increases of 1.204 in the ordinal logit model and 1.223 in the nominal logit model are the largest increases estimated. Hence, it is likely that blue collar unions are more focused on improving the health of its workers. This would naturally be the primary focus of a blue collar union as blue collar workers report the lowest self-rated health of any subgroup studied in Table 2.2. Results for white collar workers are small and insignificant in the ordinal model and small and significant at the 1 percent level in the nominal model. When studying the results in columns six, seven, and eight for low, middle, and high wage workers, it is interesting to note that there does not appear to be a linear decrease as wages increase. Of the three, unions which represent low wage workers are found to have the most impact showing that unions increase the probability of reporting a health score of five by 1.089 times and 1.114 times with regards to a positive health binary score. Unions which represent middle wage workers are shown to have a positive influence on self-rated health, but these results are small in comparison to low wage union members. Finally, high wage union members have an increased probability of reporting higher health scores than high wage non-union workers. In fact, unions which represent high wage workers appear to be more effective at increase self-reported health than unions which represent middle wage workers. However, both middle wage and high wage workers who are union members have a lower probability of reporting higher health outcomes than for the full labor force in column one.

Table 3.2: Ordinal and Nominal Logistic Regression Results

	Full Workforce	Public	Private	Blue Collar	White Collar	Low Wage	Middle Wage	High Wage
Ordinal Logistic Results								
Member	1.077***	1.020*	1.101***	1.204***	1.008	1.089***	1.034***	1.059**
	(0.00728)	(0.0121)	(0.00948)	(0.0130)	(0.00879)	(0.0127)	(0.00931)	(0.0253)
Member - Income Control	1.069***	1.014	1.089***	1.145***	1.011	1.027**	1.015*	1.064***
	(0.00722)	(0.0120)	(0.00937)	(0.0128)	(0.00883)	(0.0121)	(0.00914)	(0.0255)
Non-Member	1.009	1.025	1.000	0.956	1.030	1.071**	0.990	0.995
	(0.0194)	(0.0274)	(0.0279)	(0.0378)	(0.0228)	(0.0357)	(0.0251)	(0.0639)
Non-Member - Income Control	1.013	1.030	1.001	0.986	1.029	1.100***	0.999	0.989
	(0.0195)	(0.0276)	(0.0280)	(0.0392)	(0.0228)	(0.0367)	(0.0253)	(0.0636)
Nominal Logistic Results								
Member	1.102***	1.040***	1.128***	1.223***	1.029***	1.114***	1.048***	1.094***
	(0.00910)	(0.0152)	(0.0118)	(0.0157)	(0.0112)	(0.0154)	(0.0116)	(0.0347)
Member - Income Control	1.086***	1.030**	1.106***	1.138***	1.030***	1.037***	1.023**	1.099***
	(0.00897)	(0.0151)	(0.0115)	(0.0151)	(0.0112)	(0.0145)	(0.0113)	(0.0348)
Non-Member	1.033	1.056	1.023	0.985	1.057**	1.078*	1.025	1.049
	(0.0248)	(0.0356)	(0.0353)	(0.0469)	(0.0295)	(0.0430)	(0.0330)	(0.0928)
Non-Member - Income Control	1.043*	1.063*	1.032	1.024	1.058**	1.108**	1.036	1.042
	(0.0251)	(0.0359)	(0.0357)	(0.0491)	(0.0296)	(0.0443)	(0.0333)	(0.0921)

Each row represents a separate estimation
Rows labeled "Member" compare union members to individuals not represented by a union
Rows labeled "Non-Member" compare non-members who are represented by a union to union members
In ordinal logit, dependent variable has worst self-rated health at 1 and best at 5
Results are given in odds ratios
The comparison group for labor union members are those who are not represented by a union
The comparison group for non-members are labor union members
Robustness checks are excluding the second wave of all individuals

Table 3.2 includes estimation results for comparing non-members to members. All workers who do not work in a unionized workplace are excluded resulting in a much smaller sample size. The differences between these two groups is small. Non-members still receive many of the benefits that union members receive while also paying lower or no labor union dues. Hence, these "free-riders", as some researchers call them, may potentially have increased health benefits due to any increased wages from not paying union dues. However, union members can receive some increased benefits from a labor union compared to those who chose not to be a member. This benefits could better their health. Therefore, it's unclear what should be expected when comparing these two groups. Most results indicate that non-members have an increased probability in reporting higher health scores than union members. However, most results are small and insignificant with a few exceptions. When using the nominal logistic model, both white collar workers and low wage workers who chose not to join their labor union have an increased probability of reporting good health by 1.057 and 1.078 times and significant at the 5 and 10 percent levels, respectively. Any increases in the probability of higher self-reported health are likely due to wages which are not spent on union dues. While insignificant, odds ratio results for blue collar workers being less than one is evidence that members are receiving additional benefits which improves their health.

Table 3.2 also shows how the primary coefficient changes when controlling for income. This control removes the effect labor unions have on health through changes in income. In nearly all cases, controlling for income reduces the point estimate. Some increases are found but are very small and are in subgroups that are expected such as white collar workers. These results indicate that income is one mechanism in which unions affect health, but it is clearly not the only one.

Propensity score matching results which mimic the estimation strategy of Reynolds and Brady [2012] are given in Table 3.3. I find that being a member increases the likelihood of higher self-reported health as opposed to not working in a unionized workplace. My point estimate of 0.023 for the full labor force is similar to the findings of Reynolds and Brady [2012] who find a point estimate of 0.029 using propensity score matching on the General Social Survey from 1973 to 2006. Furthering previous research, I also show that this estimate is halved when considering public sector workers and is nearly doubled for blue collar workers. Low wage workers are also shown to have a slightly higher estimate than the full workforce. All results for members are significant with the exception of high wage workers making their outcome less known but likely positive. The estimated differences between non-members and members is negligible and insignificant for all subgroups with a couple of exceptions. White collar workers and middle wage workers are both significant at the 10 percent level when using the full sample with point estimates of 0.01 and 0.011, respectively. However, the estimate for middle wage workers becomes close to zero and insignificant when shrinking the sample down to just second wave individuals. Overall, the differences in self-reported health between non-members and members is likely null. Table 3.4 gives these same results but using logistic regression allowing easier comparison to non-matching results.

Table 3.3: Propensity Score Matching Results

	Full Workforce	Public	Private	Blue Collar	White Collar	Low Wage	Middle Wage	High Wage
Nominal Logistic Results								
Members	0.0234^{***}	0.012^{***}	0.021^{***}	0.044^{***}	0.011^{***}	0.028^{***}	0.013^{***}	0.020^{***}
	(0.002)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.007)
Members - Robustness	0.022^{***}	0.013^{***}	0.015^{***}	0.041^{***}	0.007^{*}	0.025^{***}	0.014^{***}	0.009
	(0.003)	(0.005)	(0.004)	(0.006)	(0.004)	(0.006)	(0.004)	(0.009)
Non-members	0.003	0.007	0.009	-0.006	0.010^{*}	0.010	0.011^{*}	-0.003
	(0.005)	(0.007)	(0.008)	(0.012)	(0.006)	(0.010)	(0.007)	(0.016)
Non-members - Robustness	-0.011	-0.017	0.005	-0.007	0.010	0.004	-0.009	0.018
	(0.008)	(0.011)	(0.013)	(0.019)	(0.009)	(0.016)	(0.011)	(0.026)

Each row represents a separate estimation
Rows labeled "Member" compare union members to individuals not represented by a union
Rows labeled "Non-Member" compare non-members who are represented by a union to union members
Dependent variable is binary self-reported health
Estimates from linear regression after PSM to mimic results from Reynolds and Brady [2012]
Ordinal and Nominal logistic regression results given in Table 3.4
Full matching occurs for both PSM and CEM with number of matches for each estimation given in Table C.1

Results for coarsened exact matching are similar to those found for propensity score matching with a few key differences. The nominal and ordinal results are given for CEM in Table C.4 which can be compared to logistic estimates from PSM in table 3.4. Again, the full workforce sees an increased probability of reporting higher health by about 8%. Blue collar workers and low wage workers are also the most effected showing an increase in probability of about 28% and 13%, respectively. However, the primary difference appears to be with the private and public sectors which have seemed to switch positions. Further, high wage workers no longer share a similar effect as low wage workers but now

Table 3.4: Propensity Score Matching Results

	Full Workforce	Public	Private	Blue Collar	White Collar	Low Wage	Middle Wage	High Wage
Ordinal Logistic Results								
Members	1.098***	1.046***	1.076***	1.197***	1.040***	1.091***	1.051***	1.079***
	(0.00733)	(0.0100)	(0.0100)	(0.0131)	(0.00876)	(0.0134)	(0.00896)	(0.0245)
Non-members	1.016	1.007	1.001	0.958	1.029	1.053	1.022	0.910
	(0.0207)	(0.0280)	(0.0302)	(0.0419)	(0.0238)	(0.0368)	(0.0277)	(0.0615)
Nominal Logistic Results								
Members	1.118***	1.063***	1.110***	1.219***	1.062***	1.111***	1.056***	1.118***
	(0.00885)	(0.0124)	(0.0121)	(0.0153)	(0.0109)	(0.0155)	(0.0109)	(0.0328)
Non-members	1.015	1.037	1.043	0.973	1.055*	1.049	1.060*	0.980
	(0.0252)	(0.0353)	(0.0378)	(0.0495)	(0.0300)	(0.0428)	(0.0353)	(0.0880)

Each row represents a separate estimation
Rows labeled "Member" compare union members to individuals not represented by a union
Rows labeled "Non-Member" compare non-members who are represented by a union to union members
Dependent variable is binary self-reported health
Estimates given in odds ratios
Full matching occurs for both PSM and CEM with number of matches for each estimation given in Table C.1

see a decrease in probability. Coarsened exact matching results for wage differences fit theoretical expectations. Comparisons between non-members and members tells the same story as before which is that blue collar workers who do not join the union are negatively impacted in their self-rated health.

3.6 Discussion

Unions have been studied extensively by labor economists to better understand their effect on commonly studied labor outcomes such as wages, fringe benefits, and inequalities. Also, there is a clear connection between an individual's labor force conditions and their health. Yet, the understanding of a union's influence on the health of its members and those it covers is lacking.

This paper uses self-rated health which has been shown to be a strong indicator of an individual's physical and mental status. Two previous studies find conflicting evidence about the effect of labor union membership on workplace injuries driving the need for further investigation. Similar to this study, Reynolds and Brady [2012] and Eisenberg-Guyot *et al.* [2021] both use survey data to answer this question. However, Reynolds

Table 3.5: Coarsened Exact Matching

	Full Workforce	Public	Private	Blue Collar	White Collar	Low Wage	Middle Wage	High Wage
Ordinal Logistic Results								
Members	1.087***	0.981***	1.121***	1.285***	1.073***	1.134***	1.026***	0.969*
	(0.00548)	(0.00672)	(0.00959)	(0.0109)	(0.00677)	(0.0103)	(0.00673)	(0.0166)
Non-members	1.054***	1.070***	1.014	0.930**	1.034*	1.094***	1.056***	1.006
	(0.0160)	(0.0239)	(0.0210)	(0.0298)	(0.0180)	(0.0287)	(0.0212)	(0.0503)
Nominal Logistic Results								
Members	1.107***	0.997	1.135***	1.312***	1.090***	1.155***	1.031***	0.968
	(0.00669)	(0.00808)	(0.0118)	(0.0130)	(0.00840)	(0.0121)	(0.00820)	(0.0217)
Non-members	1.076***	1.085***	1.039	0.932*	1.062***	1.094***	1.089***	1.066
	(0.0199)	(0.0292)	(0.0265)	(0.0345)	(0.0228)	(0.0336)	(0.0270)	(0.0711)

Each row represents a separate estimation
Rows labeled “Member” compare union members to individuals not represented by a union
Rows labeled “Non-Member” compare non-members who are represented by a union to union members
Estimates given in odds ratios
Full matching occurs for CEM. Hence, number of matches is sum of matches and off support in Table C.1

and Brady [2012] use a nominal logit approach along with propensity score matching to conclude that labor unions increase the probability of reporting higher health for its members, and that these results are strongest for men, for those less educated, and for those below the 75th percentile for income. Eisenberg-Guyot *et al.* [2021] take advantage of their longitudinal data and use a parametric g-formula approach to conclude that unions do not effect self-rated health and that these results do not change when studying different subgroups such as by sex or education. Using both an ordinal and nominal logit as well as using propensity score matching and coarsened exact matching, I find results which concur with the findings of Reynolds and Brady [2012] for the full labor force.

As previously discussed, there are several plausible mechanisms in which unions can affect worker health. Overall, these boil down to economic stability, the work environment, education, health and healthcare, and psychosocial determinants. Results for blue collar workers show that labor unions are most effective at increasing self-rated health among this subgroup, especially when compared to their white collar counterpart. This is likely because blue collar workers have the lowest average self-rated health of any subgroup studied likely due to the same five factors just listed. Another comparison which sees a dramatic difference is between public and private sector workers. Because of the incentive differences between public and private sector unions, public sector unions are shown to very slightly increase the probability of reporting higher health for its members where private sector unions show a moderate improvement. Overall, public sector employees already have a higher than average self-reported health making the need for a public sector union to focus on increased health less important. An interesting comparison is between low wage and high wage workers which show a very similar increase in the probability of reporting higher health due to union membership. However, the estimates for high wage workers are less significant and insignificant in some robustness checks. This does provide evidence that wage increases from labor unions has less impact for self-reported health than other mechanisms discussed.

When comparing union non-members to union members, blue collar workers have a lower probability of reporting better health when being a non-member. This is evidence that, for blue collar workers, it is potentially in their health's best interest to pay union dues to receive any extra benefits the union provides for their place of work. Right to work laws, which are shown to decrease union membership and increase non-member rates, are potentially most harmful to blue collar worker health than any other subgroup studied. White collar workers and low wage workers are more likely to report higher self-rated health being a non-member. Not paying union dues or paying lesser dues for non-members may have a positive influence on health for these two groups. However, nearly all results when comparing members to non-members are insignificant.

This paper provides additional evidence in favor of labor unions bettering self-reported health and shows that this primarily occurs for blue collar and private sector workers. These results are important for policy makers who should focus on reducing the power employers have at combating union formation for blue collar and private sector workers if overall worker health is of importance.

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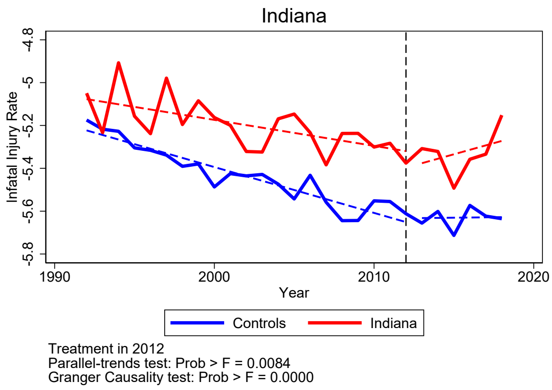
Appendix A

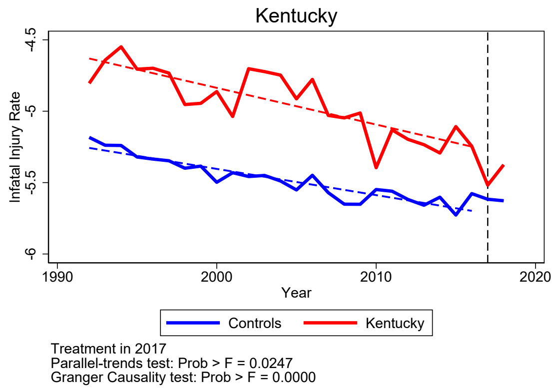
Additional Tables and Figures for Chapter 1

Figure A.1a: Trends for Fatal Injury rates

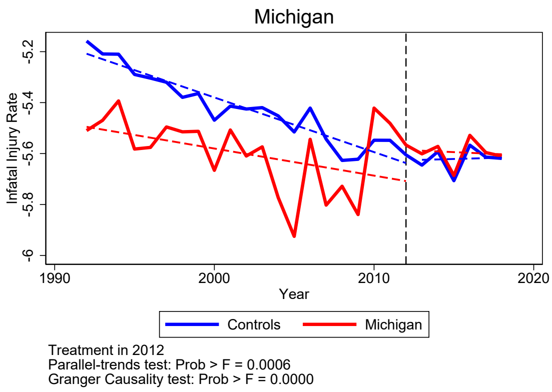
(a) Indiana



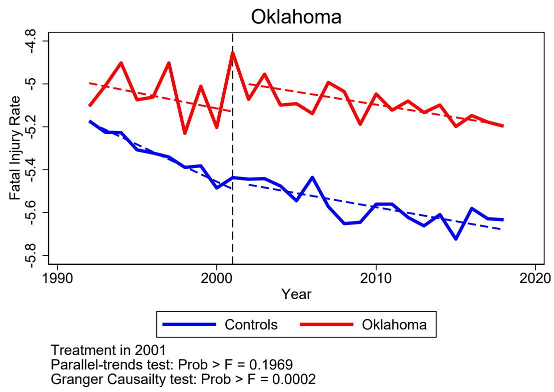
(b) Kentucky



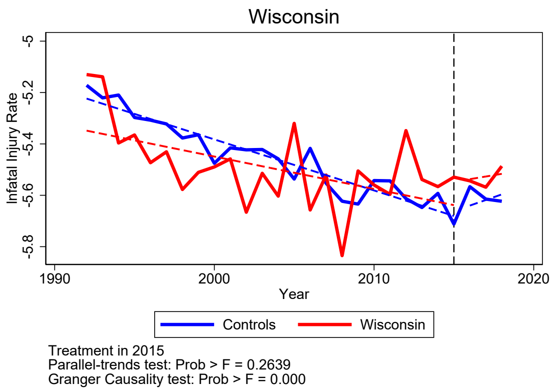
(c) Michigan



(d) Oklahoma



(e) Wisconsin



(f) West Virginia

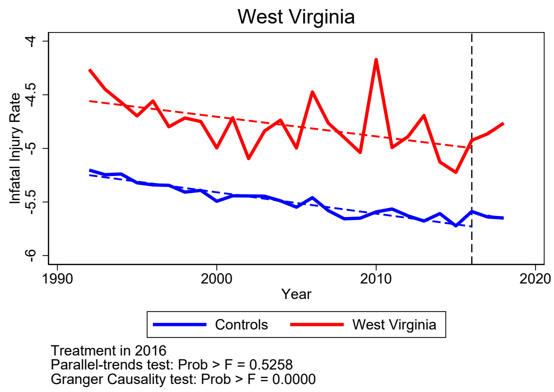
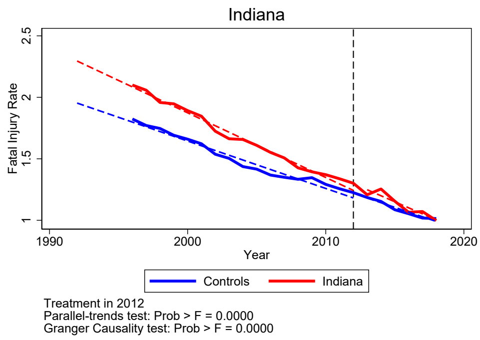
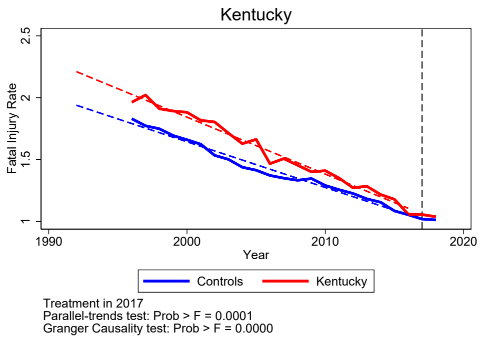


Figure A.1b: Trends for All Nonfatal Injury rates

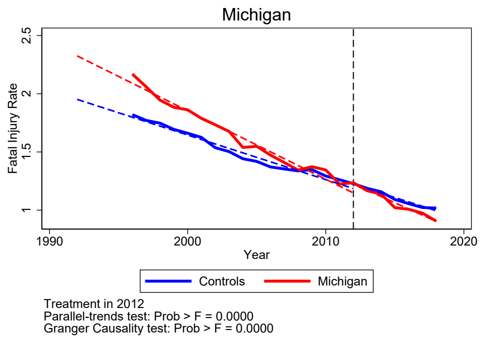
(g) Indiana



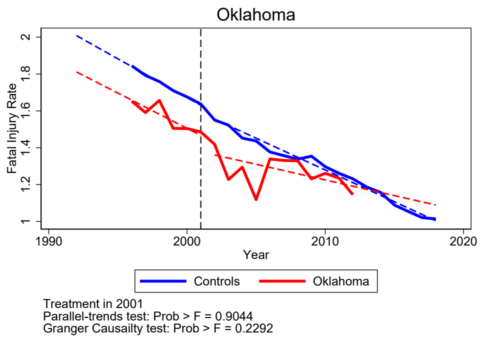
(h) Kentucky



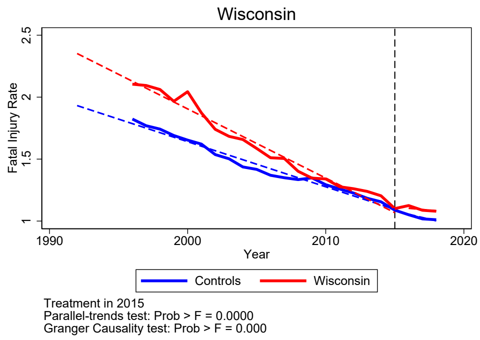
(i) Michigan



(j) Oklahoma



(k) Wisconsin



(l) West Virginia

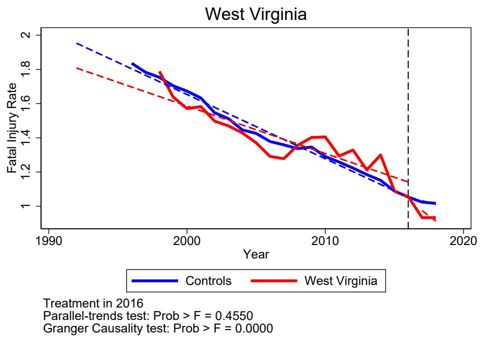
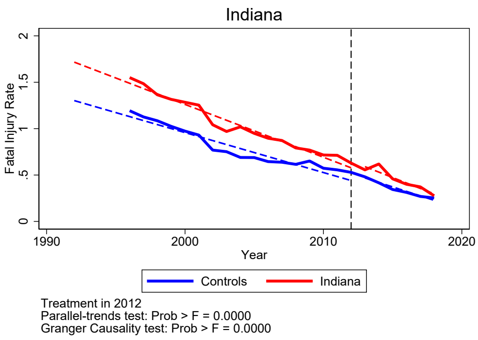
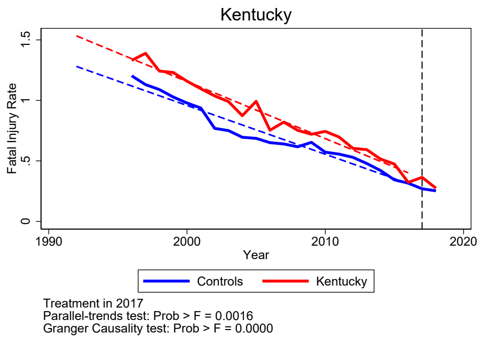


Figure A.1c: Trends for "Other" Nonfatal Injury Rates

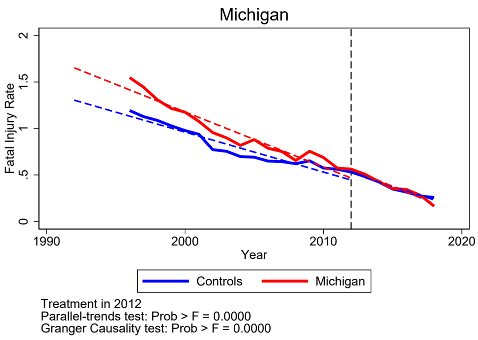
(m) Indiana



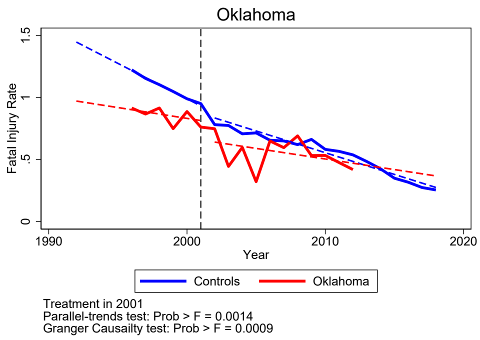
(n) Kentucky



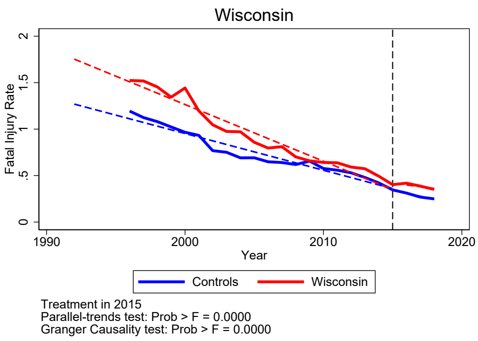
(o) Michigan



(p) Oklahoma



(q) Wisconsin



(r) West Virginia

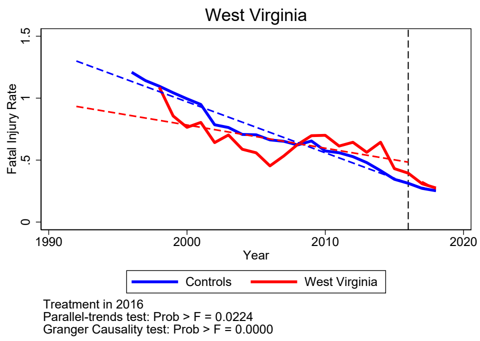
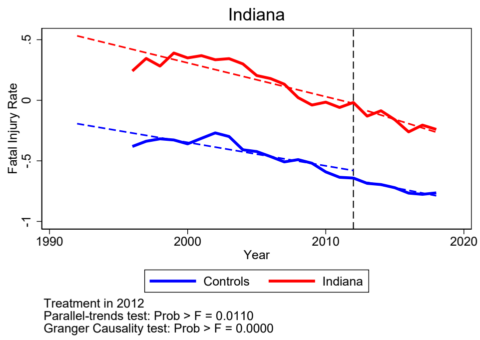
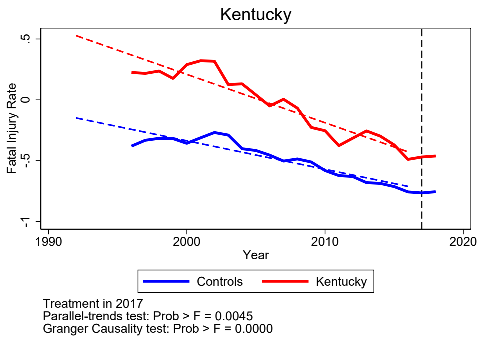


Figure A.1d: Trends for Job Restriction or Transfer Nonfatal Injury Rates

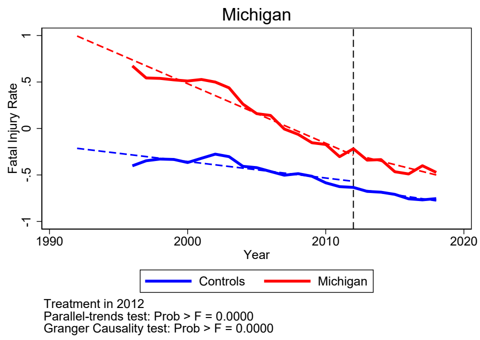
(s) Indiana



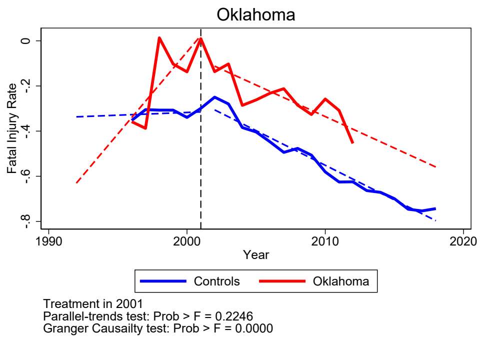
(t) Kentucky



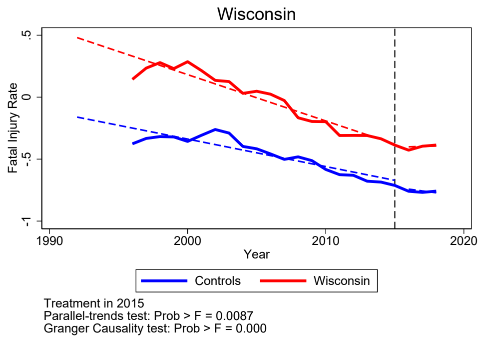
(u) Michigan



(v) Oklahoma



(w) Wisconsin



(x) West Virginia

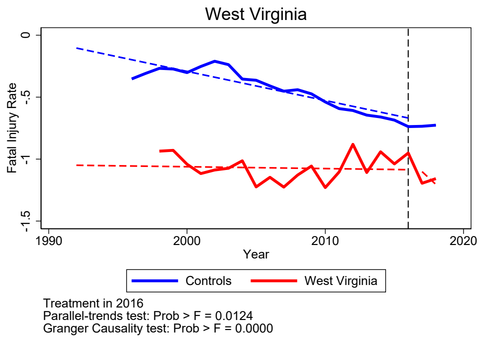
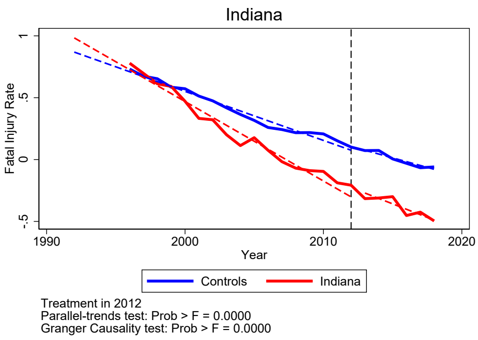
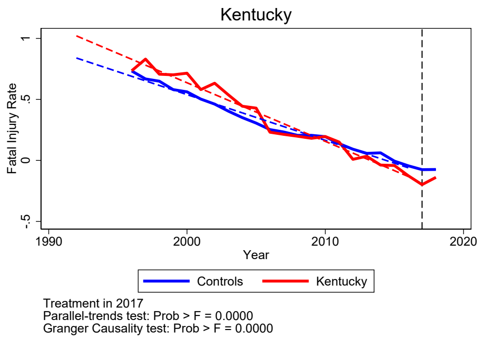


Figure A.1e: Trends for Lost Workday Nonfatal Injury Rates

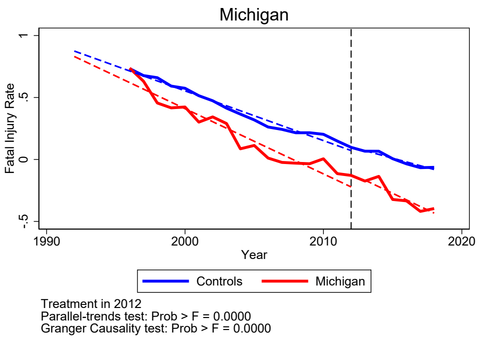
(y) Indiana



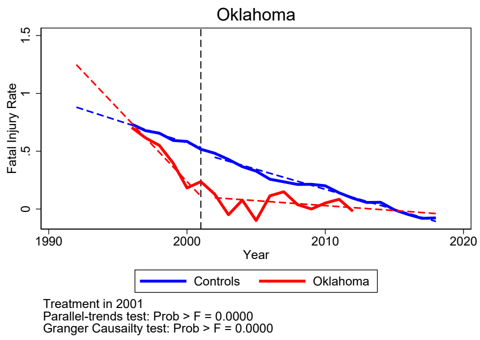
(z) Kentucky



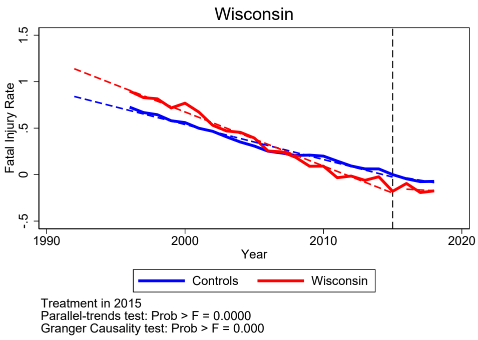
(aa) Michigan



(ab) Oklahoma



(ac) Wisconsin



(ad) West Virginia

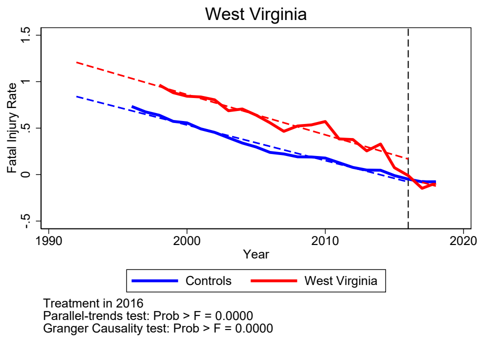


Figure A.2: OSHA State Mandates

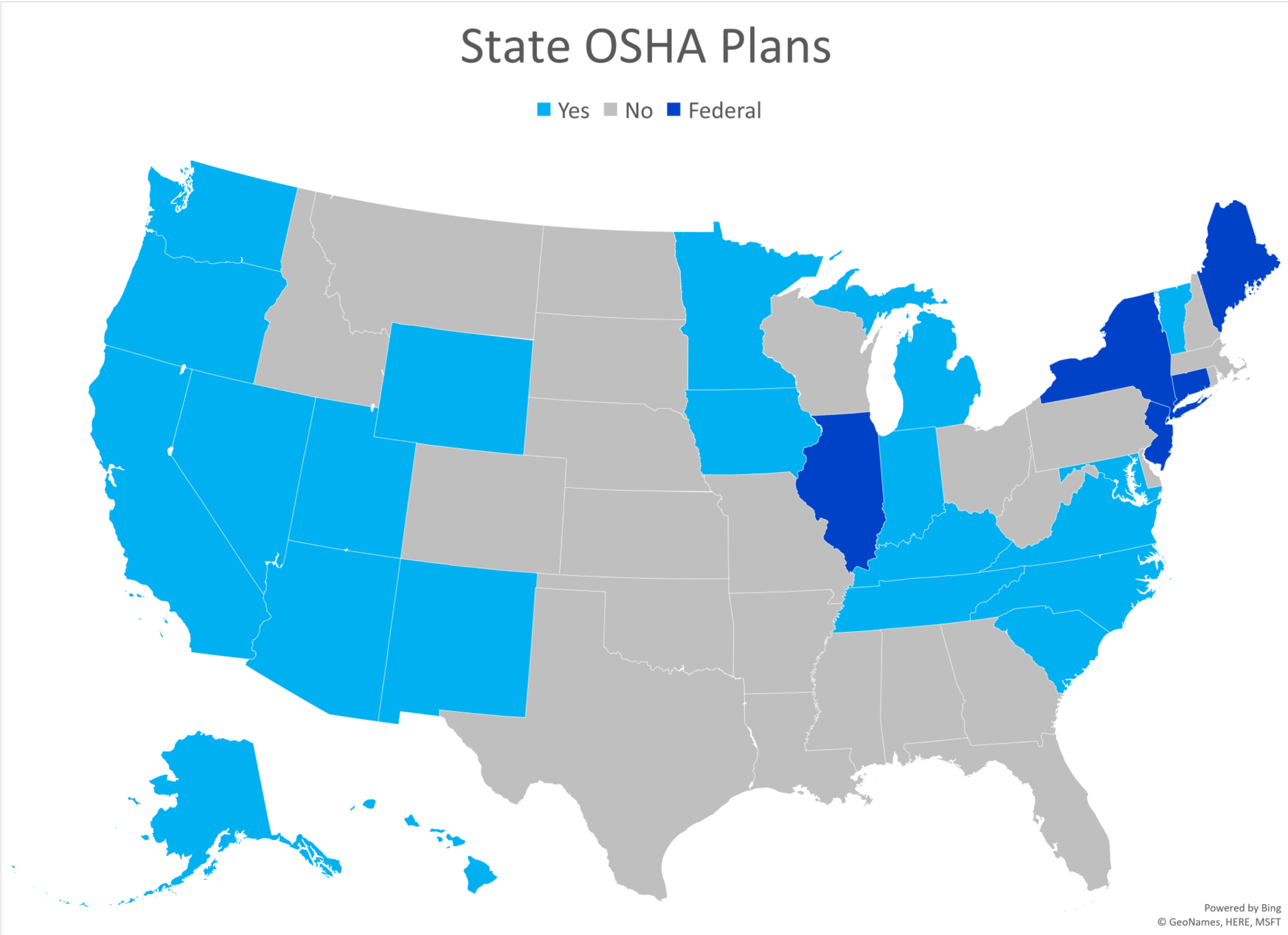


Table A.1: State OSHA Plans

State Name	Initial Approval Date	Public Sector Only
Alaska	1973	No
Arizona	1974	No
California	1973	No
Connecticut	1978	Yes
Hawaii	1974	No
Illinois	2009	Yes
Indiana	1974	No
Iowa	1973	No
Kentucky	1973	No
Maine	2015	Yes
Maryland	1973	No
Michigan	1973	No
Minnesota	1973	No
Nevada	1974	No
New Jersey	2001	Yes
New Mexico	1975	No
New York	1984	Yes
North Carolina	1973	No
Oregon	1972	No
South Carolina	1972	No
Tennessee	1973	No
Utah	1973	No
Vermont	1973	No
Virginia	1976	No
Washington	1973	No
Wyoming	1974	No

States not in table are covered by the OSHA federal plan as of 1970.
All state plans cover the public sector. Federal OSHA covers only the private sector.
Plans which cover the private sector are more strict than the federal plan.
Because only Illinois, Maine, and New Jersey enacted state plans within the data time frame and each of these cover the public sector only, the inclusion of a state plan control of little benefit.
Differences in strictness of state plans are controlled for by the state fixed effect.

Table A.2: Oklahoma (2001) Case Study - Parallel Trends Test

	Fatal	All Nonfatal	Lost Workday	Job Restriction/Transfer	Other Nonfatal
Treated_X_1992	-0.467***	0	0	0	0
	(0.126)	(.)	(.)	(.)	(.)
Treated_X_1993	-0.294***	0	0	0	0
	(0.0936)	(.)	(.)	(.)	(.)
Treated_X_1994	-0.234**	0	0	0	0
	(0.0992)	(.)	(.)	(.)	(.)
Treated_X_1995	-0.352***	0	0	0	0
	(0.0820)	(.)	(.)	(.)	(.)
Treated_X_1996	-0.362***	0.0278	0.314***	-0.129*	-0.0685*
	(0.0937)	(0.0352)	(0.0339)	(0.0677)	(0.0395)
Treated_X_1997	-0.232**	0.00483	0.249***	-0.202**	-0.0493
	(0.0985)	(0.0400)	(0.0299)	(0.0837)	(0.0452)
Treated_X_1998	-0.522***	0.0449	0.176***	0.250**	-0.0569
	(0.125)	(0.0528)	(0.0419)	(0.104)	(0.0719)
Treated_X_1999	-0.240**	-0.0504*	0.0828***	0.000306	-0.124***
	(0.0936)	(0.0291)	(0.0282)	(0.0765)	(0.0351)
Treated_X_2000	-0.224***	-0.0158	-0.119***	-0.125*	0.109***
	(0.0769)	(0.0253)	(0.0311)	(0.0686)	(0.0306)
Treated_X_2002	-0.275**	0.0437	-0.0512	-0.134*	0.171***
	(0.105)	(0.0371)	(0.0368)	(0.0667)	(0.0407)
Treated_X_2003	-0.0738	-0.104**	-0.199***	-0.0983	-0.0671
	(0.0938)	(0.0395)	(0.0309)	(0.0680)	(0.0510)
Treated_X_2004	-0.215**	0.0133	-0.0150	-0.165**	0.107***
	(0.0937)	(0.0365)	(0.0395)	(0.0718)	(0.0368)
Treated_X_2005	-0.113	-0.124***	-0.133***	-0.151**	-0.132**
	(0.128)	(0.0395)	(0.0453)	(0.0687)	(0.0498)
Treated_X_2006	-0.240**	0.178***	0.182***	0.00813	0.265***
	(0.0908)	(0.0377)	(0.0325)	(0.0599)	(0.0477)
Treated_X_2007	0.0613	0.177***	0.217***	0.0177	0.218***
	(0.111)	(0.0411)	(0.0457)	(0.0698)	(0.0542)
Treated_X_2008	-0.0211	0.170***	0.0855	-0.0887	0.329***
	(0.122)	(0.0476)	(0.0539)	(0.0717)	(0.0529)
Treated_X_2009	-0.0591	0.106*	0.0974	-0.0603	0.185***
	(0.115)	(0.0521)	(0.0577)	(0.0739)	(0.0623)
Treated_X_2010	0.0950	0.202***	0.168***	0.0415	0.291***
	(0.0834)	(0.0515)	(0.0507)	(0.0950)	(0.0667)
Treated_X_2011	-0.131	0.142**	0.176***	0.0720	0.168**
	(0.122)	(0.0597)	(0.0580)	(0.111)	(0.0673)
Treated_X_2012	-0.0567	0.0676	0.107	-0.111	0.116*
	(0.103)	(0.0550)	(0.0641)	(0.0865)	(0.0597)
Treated_X_2013	0.0154	0	0	0	0
	(0.0960)	(.)	(.)	(.)	(.)
Treated_X_2014	-0.117	0	0	0	0
	(0.115)	(.)	(.)	(.)	(.)
Treated_X_2015	-0.106	0	0	0	0
	(0.111)	(.)	(.)	(.)	(.)
Treated_X_2016	-0.0248	0	0	0	0
	(0.108)	(.)	(.)	(.)	(.)
Treated_X_2017	-0.0166	0	0	0	0
	(0.121)	(.)	(.)	(.)	(.)
Treated_X_2018	-0.0481	0	0	0	0
	(0.118)	(.)	(.)	(.)	(.)
N	648	453	453	453	453

If parallel trends hold, coefficients before treatment year should be zero or statistically insignificant. Results from this table indicate that for the Oklahoma case study, trends are close to parallel for All Nonfatal injuries. This can be verified using figure A.1b.

Indiana (2012) Case Study - Parallel Trends Test

	Fatal	All Nonfatal	Lost Workday	Job Restriction/Transfer	Other Nonfatal
Treated_X_1992	-0.215***	0	0	0	0
	(0.0736)	(.)	(.)	(.)	(.)
Treated_X_1993	-0.245***	0	0	0	0
	(0.0692)	(.)	(.)	(.)	(.)
Treated_X_1994	0.0698	0	0	0	0
	(0.0532)	(.)	(.)	(.)	(.)
Treated_X_1995	-0.180**	0	0	0	0
	(0.0789)	(.)	(.)	(.)	(.)
Treated_X_1996	-0.239***	0.219***	0.415***	-0.0896	0.255***
	(0.0467)	(0.0536)	(0.0582)	(0.0908)	(0.0631)
Treated_X_1997	0.0693	0.264***	0.394***	0.0152	0.321***
	(0.0556)	(0.0573)	(0.0553)	(0.117)	(0.0633)
Treated_X_1998	-0.0851	0.190***	0.312***	-0.0631	0.258***
	(0.0737)	(0.0543)	(0.0494)	(0.0924)	(0.0664)
Treated_X_1999	0.0497	0.215***	0.363***	0.0161	0.240***
	(0.0643)	(0.0551)	(0.0604)	(0.0892)	(0.0593)
Treated_X_2000	0.0624	0.202***	0.269***	-0.0556	0.280***
	(0.109)	(0.0605)	(0.0722)	(0.122)	(0.0608)
Treated_X_2001	-0.127	0.182**	0.162**	0.0605	0.252***
	(0.0911)	(0.0680)	(0.0677)	(0.0975)	(0.0787)
Treated_X_2002	-0.260***	0.143**	0.169**	-0.0321	0.223***
	(0.0456)	(0.0650)	(0.0628)	(0.0827)	(0.0752)
Treated_X_2003	-0.214***	0.117**	0.130***	0.0123	0.142**
	(0.0540)	(0.0418)	(0.0367)	(0.0438)	(0.0553)
Treated_X_2004	0.00213	0.179***	0.0956**	0.0775*	0.260***
	(0.0568)	(0.0308)	(0.0345)	(0.0439)	(0.0380)
Treated_X_2005	0.0942	0.152***	0.235***	-0.0390	0.180***
	(0.0896)	(0.0278)	(0.0369)	(0.0615)	(0.0425)
Treated_X_2006	-0.0379	0.150***	0.209***	-0.0350	0.175***
	(0.0623)	(0.0384)	(0.0392)	(0.0623)	(0.0497)
Treated_X_2007	-0.0660	0.0867***	0.0656*	-0.00382	0.137***
	(0.0950)	(0.0240)	(0.0372)	(0.0486)	(0.0297)
Treated_X_2008	0.189**	0.0333	0.0304	-0.166**	0.109***
	(0.0815)	(0.0330)	(0.0406)	(0.0597)	(0.0338)
Treated_X_2009	0.169**	0.00343	0.0286	-0.178***	0.0545
	(0.0735)	(0.0227)	(0.0295)	(0.0585)	(0.0320)
Treated_X_2010	0.00877	0.0534**	0.0607*	-0.0463	0.100***
	(0.0718)	(0.0223)	(0.0311)	(0.0478)	(0.0287)
Treated_X_2011	0.00307	0.00972	-0.0161	-0.101**	0.0635**
	(0.0572)	(0.0175)	(0.0209)	(0.0397)	(0.0238)
Treated_X_2013	0.0402	-0.00297	-0.0531*	-0.0334	0.0471
	(0.0570)	(0.0258)	(0.0296)	(0.0442)	(0.0345)
Treated_X_2014	-0.0492	0.0706***	-0.0506**	0.0379	0.160***
	(0.0485)	(0.0212)	(0.0242)	(0.0393)	(0.0254)
Treated_X_2015	-0.0695	0.0115	0.00534	-0.0533	0.0406
	(0.0799)	(0.0309)	(0.0352)	(0.0553)	(0.0414)
Treated_X_2016	-0.0461	-0.0485	-0.107***	-0.111*	0.00803
	(0.0656)	(0.0330)	(0.0296)	(0.0623)	(0.0513)
Treated_X_2017	-0.0326	-0.0143	-0.0516	-0.0509	0.00978
	(0.0856)	(0.0401)	(0.0331)	(0.0768)	(0.0552)
Treated_X_2018	0.194	-0.0690*	-0.0914**	-0.127	-0.0603
	(0.114)	(0.0360)	(0.0351)	(0.0891)	(0.0473)
N	648	459	459	459	459

If parallel trends hold, coefficients before treatment year should be zero or statistically insignificant. Results from this table indicate that for the Indiana case study, trends are close to parallel for Job Restriction/Transfer Nonfatal injuries. This can be verified using figure A.1d.

Table A.3: Michigan (2012) Case Study - Parallel Trends Test

	Fatal	All Nonfatal	Lost Workday	Job Restriction/Transfer	Other Nonfatal
Treated_X_1992	-0.523***	0	0	0	0
	(0.0693)	(.)	(.)	(.)	(.)
Treated_X_1993	-0.387***	0	0	0	0
	(0.0662)	(.)	(.)	(.)	(.)
Treated_X_1994	-0.326***	0	0	0	0
	(0.0487)	(.)	(.)	(.)	(.)
Treated_X_1995	-0.409***	0	0	0	0
	(0.0637)	(.)	(.)	(.)	(.)
Treated_X_1996	-0.343***	0.368***	0.298***	0.561***	0.346***
	(0.0464)	(0.0502)	(0.0583)	(0.0867)	(0.0528)
Treated_X_1997	-0.193***	0.315***	0.255***	0.372***	0.320***
	(0.0535)	(0.0434)	(0.0410)	(0.0982)	(0.0533)
Treated_X_1998	-0.234**	0.213***	0.0871*	0.334***	0.214***
	(0.0839)	(0.0496)	(0.0500)	(0.0894)	(0.0549)
Treated_X_1999	-0.222**	0.204***	0.137**	0.322***	0.166***
	(0.0842)	(0.0482)	(0.0537)	(0.0939)	(0.0469)
Treated_X_2000	-0.282***	0.218***	0.122**	0.351***	0.206***
	(0.0760)	(0.0412)	(0.0490)	(0.0935)	(0.0417)
Treated_X_2001	-0.108	0.165***	0.0361	0.303***	0.134***
	(0.0808)	(0.0358)	(0.0343)	(0.0613)	(0.0469)
Treated_X_2002	-0.168***	0.217***	0.153***	0.221***	0.203***
	(0.0561)	(0.0380)	(0.0327)	(0.0735)	(0.0479)
Treated_X_2003	-0.217**	0.180***	0.150***	0.266***	0.109**
	(0.0795)	(0.0351)	(0.0282)	(0.0662)	(0.0509)
Treated_X_2004	-0.368***	0.107***	-0.0126	0.200***	0.101**
	(0.0609)	(0.0289)	(0.0318)	(0.0477)	(0.0364)
Treated_X_2005	-0.399***	0.135***	0.0511	0.0416	0.187***
	(0.0839)	(0.0261)	(0.0312)	(0.0584)	(0.0331)
Treated_X_2006	-0.163**	0.106***	-0.00436	0.142**	0.126***
	(0.0654)	(0.0278)	(0.0217)	(0.0555)	(0.0360)
Treated_X_2007	-0.320***	0.0487**	-0.0363	0.0596	0.0730**
	(0.0622)	(0.0196)	(0.0275)	(0.0659)	(0.0329)
Treated_X_2008	-0.150**	0.0131	-0.0109	-0.0592	0.0340
	(0.0663)	(0.0232)	(0.0265)	(0.0470)	(0.0270)
Treated_X_2009	-0.312***	0.0548***	-0.00844	-0.0757	0.130***
	(0.0751)	(0.0192)	(0.0264)	(0.0475)	(0.0249)
Treated_X_2010	0.0105	0.0657**	0.0452*	-0.0192	0.113***
	(0.0615)	(0.0269)	(0.0254)	(0.0618)	(0.0339)
Treated_X_2011	-0.0213	-0.0301*	-0.0248	-0.116***	0.00409
	(0.0531)	(0.0155)	(0.0222)	(0.0287)	(0.0227)
Treated_X_2013	-0.0240	-0.0284	-0.0169	-0.0844**	-0.0132
	(0.0517)	(0.0209)	(0.0174)	(0.0395)	(0.0298)
Treated_X_2014	-0.127**	-0.00829	0.0238	-0.00181	-0.0131
	(0.0605)	(0.0141)	(0.0217)	(0.0516)	(0.0216)
Treated_X_2015	-0.123*	-0.0747**	-0.116***	-0.136**	-0.0220
	(0.0638)	(0.0296)	(0.0286)	(0.0633)	(0.0419)
Treated_X_2016	-0.0316	-0.0658**	-0.0713**	-0.180***	-0.0191
	(0.0561)	(0.0313)	(0.0309)	(0.0505)	(0.0440)
Treated_X_2017	-0.114	-0.0663*	-0.155***	-0.0728	-0.0224
	(0.0781)	(0.0378)	(0.0344)	(0.0706)	(0.0477)
Treated_X_2018	-0.194**	-0.126***	-0.139***	-0.0816	-0.125**
	(0.0843)	(0.0361)	(0.0291)	(0.0647)	(0.0561)
N	648	459	459	459	459

If parallel trends hold, coefficients before treatment year should be zero or statistically insignificant. Results from this table indicate no trends are parallel for the Michigan case study.

Table A.4: Wisconsin (2013) Case Study - Parallel Trends Test

	Fatal	All Nonfatal	Lost Workday	Job Restriction/Transfer	Other Nonfatal
Treated_X_1992	-0.0217	0	0	0	0
	(0.0744)	(.)	(.)	(.)	(.)
Treated_X_1993	0.0231	0	0	0	0
	(0.102)	(.)	(.)	(.)	(.)
Treated_X_1994	-0.379***	0	0	0	0
	(0.0728)	(.)	(.)	(.)	(.)
Treated_X_1995	-0.240**	0	0	0	0
	(0.0963)	(.)	(.)	(.)	(.)
Treated_X_1996	-0.234**	0.307***	0.397***	0.104	0.346***
	(0.105)	(0.0554)	(0.0649)	(0.0857)	(0.0635)
Treated_X_1997	-0.237***	0.346***	0.361***	0.162*	0.413***
	(0.0799)	(0.0420)	(0.0497)	(0.0849)	(0.0451)
Treated_X_1998	-0.328***	0.335***	0.367***	0.207**	0.384***
	(0.0855)	(0.0450)	(0.0475)	(0.0766)	(0.0490)
Treated_X_1999	-0.355***	0.237***	0.314***	0.162**	0.230***
	(0.0832)	(0.0437)	(0.0506)	(0.0770)	(0.0482)
Treated_X_2000	-0.147	0.374***	0.382***	0.148*	0.453***
	(0.0870)	(0.0479)	(0.0543)	(0.0861)	(0.0554)
Treated_X_2001	-0.145	0.240***	0.383***	0.0264	0.220***
	(0.107)	(0.0465)	(0.0530)	(0.0706)	(0.0510)
Treated_X_2002	-0.313***	0.193***	0.277***	-0.142*	0.249***
	(0.0802)	(0.0433)	(0.0487)	(0.0724)	(0.0507)
Treated_X_2003	-0.163**	0.174***	0.259***	-0.0239	0.187***
	(0.0782)	(0.0336)	(0.0379)	(0.0694)	(0.0339)
Treated_X_2004	-0.222***	0.216***	0.303***	-0.0321	0.251***
	(0.0707)	(0.0380)	(0.0407)	(0.0668)	(0.0414)
Treated_X_2005	0.156*	0.160***	0.288***	-0.00141	0.135***
	(0.0867)	(0.0421)	(0.0480)	(0.0713)	(0.0460)
Treated_X_2006	-0.299**	0.125***	0.211***	0.0928	0.0806*
	(0.108)	(0.0418)	(0.0453)	(0.0796)	(0.0468)
Treated_X_2007	-0.0925	0.139***	0.199***	0.122**	0.109***
	(0.0971)	(0.0270)	(0.0293)	(0.0576)	(0.0324)
Treated_X_2008	-0.315***	0.0555*	0.144***	-0.0858	0.0582
	(0.108)	(0.0291)	(0.0348)	(0.0516)	(0.0341)
Treated_X_2009	-0.0197	-0.00472	0.0435	-0.0601	-0.0147
	(0.0886)	(0.0341)	(0.0518)	(0.0628)	(0.0328)
Treated_X_2010	-0.204*	0.0122	0.0336	0.0134	0.00424
	(0.112)	(0.0290)	(0.0328)	(0.0522)	(0.0379)
Treated_X_2011	-0.251**	-0.0266	-0.0586	-0.0677	0.0133
	(0.104)	(0.0404)	(0.0459)	(0.0618)	(0.0514)
Treated_X_2012	0.102	-0.0307	0.00707	-0.0626	-0.0426
	(0.0866)	(0.0378)	(0.0441)	(0.0642)	(0.0479)
Treated_X_2013	0.0154	0.0411	0.0529	-0.0620	0.0577
	(0.0678)	(0.0253)	(0.0308)	(0.0418)	(0.0340)
Treated_X_2014	-0.127*	0.0385	0.0929***	-0.0484	0.0332
	(0.0618)	(0.0253)	(0.0302)	(0.0542)	(0.0283)
Treated_X_2016	-0.105*	0.0426**	0.121***	-0.0747**	0.0333
	(0.0510)	(0.0163)	(0.0253)	(0.0293)	(0.0204)
Treated_X_2017	-0.0888	0.0360	0.0525	-0.0738	0.0447
	(0.0639)	(0.0240)	(0.0333)	(0.0489)	(0.0303)
Treated_X_2018	0.0874	0.0366	0.0637	-0.0897*	0.0370
	(0.0697)	(0.0337)	(0.0445)	(0.0511)	(0.0380)
N	648	459	459	459	459

If parallel trends hold, coefficients before treatment year should be zero or statistically insignificant. Results from this table indicate that for the Wisconsin case study, trends are close to parallel for Job Restriction/Transfer Nonfatal injuries. This can be verified using figure A.1d.

Table A.5: West Virginia (2016) Case Study - Parallel Trends Test

	Fatal	All Nonfatal	Lost Workday	Job Restriction/Transfer	Other Nonfatal
Treated_X_1992	0.398**	0	0	0	0
	(0.184)	(.)	(.)	(.)	(.)
Treated_X_1993	0.326*	0	0	0	0
	(0.159)	(.)	(.)	(.)	(.)
Treated_X_1994	0.121	0	0	0	0
	(0.126)	(.)	(.)	(.)	(.)
Treated_X_1995	0.0406	0	0	0	0
	(0.106)	(.)	(.)	(.)	(.)
Treated_X_1996	0.212	0	0	0	0
	(0.126)	(.)	(.)	(.)	(.)
Treated_X_1997	-0.00936	0	0	0	0
	(0.119)	(.)	(.)	(.)	(.)
Treated_X_1998	0.0923	0.0783	0.329***	-0.420***	-0.0243
	(0.121)	(0.0839)	(0.0847)	(0.130)	(0.0861)
Treated_X_1999	0.154	-0.0177	0.326***	-0.441***	-0.191**
	(0.116)	(0.0932)	(0.101)	(0.153)	(0.0881)
Treated_X_2000	0.132	-0.0166	0.320***	-0.504***	-0.178**
	(0.134)	(0.0825)	(0.0860)	(0.161)	(0.0760)
Treated_X_2001	0.346**	0.0320	0.417***	-0.748***	-0.113
	(0.160)	(0.0624)	(0.0729)	(0.106)	(0.0701)
Treated_X_2002	-0.0852	0.0114	0.409***	-0.770***	-0.143*
	(0.155)	(0.0687)	(0.0781)	(0.103)	(0.0790)
Treated_X_2003	0.229*	0.0225	0.343***	-0.728***	-0.0511
	(0.126)	(0.0493)	(0.0490)	(0.100)	(0.0636)
Treated_X_2004	0.284**	0.0310	0.400***	-0.482***	-0.140***
	(0.113)	(0.0464)	(0.0489)	(0.101)	(0.0460)
Treated_X_2005	0.113	-0.0164	0.376***	-0.616***	-0.204***
	(0.107)	(0.0455)	(0.0460)	(0.128)	(0.0511)
Treated_X_2006	0.517***	-0.0518	0.359***	-0.516***	-0.277***
	(0.110)	(0.0377)	(0.0400)	(0.115)	(0.0452)
Treated_X_2007	0.375**	-0.0577*	0.266***	-0.591***	-0.184***
	(0.138)	(0.0293)	(0.0358)	(0.0928)	(0.0352)
Treated_X_2008	0.329**	0.0541	0.373***	-0.559***	-0.0460
	(0.138)	(0.0365)	(0.0534)	(0.0968)	(0.0381)
Treated_X_2009	0.0973	0.0488	0.322***	-0.532***	-0.0309
	(0.142)	(0.0416)	(0.0578)	(0.0681)	(0.0468)
Treated_X_2010	0.862***	0.0975*	0.325***	-0.608***	0.0637
	(0.112)	(0.0514)	(0.0590)	(0.0706)	(0.0667)
Treated_X_2011	-0.0935	-0.0286	0.164***	-0.378***	-0.110*
	(0.0888)	(0.0457)	(0.0491)	(0.0650)	(0.0554)
Treated_X_2012	0.114	0.0418	0.219***	-0.121*	-0.0552
	(0.0790)	(0.0336)	(0.0396)	(0.0659)	(0.0359)
Treated_X_2013	0.376***	-0.00350	0.113***	-0.334***	-0.00208
	(0.0753)	(0.0288)	(0.0395)	(0.0552)	(0.0365)
Treated_X_2014	-0.171***	0.171***	0.230***	-0.0228	0.198***
	(0.0534)	(0.0312)	(0.0399)	(0.0542)	(0.0312)
Treated_X_2015	-0.165**	0.00889	0.0580**	-0.124***	0.0101
	(0.0690)	(0.0215)	(0.0250)	(0.0403)	(0.0216)
Treated_X_2017	0.0981	-0.0605**	-0.0695**	-0.195***	-0.0271
	(0.0574)	(0.0233)	(0.0328)	(0.0545)	(0.0306)
Treated_X_2018	0.242***	-0.0455	0.0256	-0.172***	-0.0516
	(0.0787)	(0.0296)	(0.0322)	(0.0600)	(0.0366)
N	648	457	457	457	457

If parallel trends hold, coefficients before treatment year should be zero or statistically insignificant. Results from this table indicate that for the West Virginia case study, trends are close to parallel for All Nonfatal injuries. Figure A.1b indicates that this is primarily true except for the year 2014.

Table A.6: Kentucky (2017) Case Study - Parallel Trends Test

	Fatal	All Nonfatal	Lost Workday	Job Restriction/Transfer	Other Nonfatal
Treated_X_1992	0.339**	0	0	0	0
	(0.122)	(.)	(.)	(.)	(.)
Treated_X_1993	0.524***	0	0	0	0
	(0.129)	(.)	(.)	(.)	(.)
Treated_X_1994	0.750***	0	0	0	0
	(0.130)	(.)	(.)	(.)	(.)
Treated_X_1995	0.584***	0	0	0	0
	(0.0901)	(.)	(.)	(.)	(.)
Treated_X_1996	0.652***	0.170**	0.220**	0.214	0.137
	(0.0935)	(0.0736)	(0.0783)	(0.134)	(0.0873)
Treated_X_1997	0.655***	0.286***	0.374***	0.194	0.272***
	(0.107)	(0.0609)	(0.0536)	(0.124)	(0.0787)
Treated_X_1998	0.403***	0.171**	0.239***	0.0860	0.145*
	(0.116)	(0.0651)	(0.0678)	(0.109)	(0.0794)
Treated_X_1999	0.331***	0.152**	0.292***	0.0292	0.0870
	(0.118)	(0.0600)	(0.0697)	(0.119)	(0.0624)
Treated_X_2000	0.536***	0.226***	0.318***	0.312**	0.147**
	(0.0899)	(0.0638)	(0.0680)	(0.134)	(0.0699)
Treated_X_2001	0.343**	0.233***	0.270***	0.330***	0.173**
	(0.123)	(0.0566)	(0.0580)	(0.0902)	(0.0706)
Treated_X_2002	0.644***	0.261***	0.344***	0.268***	0.202***
	(0.0822)	(0.0468)	(0.0413)	(0.0772)	(0.0632)
Treated_X_2003	0.641***	0.219***	0.316***	0.0829	0.192***
	(0.0805)	(0.0458)	(0.0316)	(0.0796)	(0.0605)
Treated_X_2004	0.751***	0.210***	0.302***	0.130	0.161***
	(0.0920)	(0.0436)	(0.0321)	(0.0940)	(0.0539)
Treated_X_2005	0.610***	0.246***	0.305***	0.118	0.245***
	(0.0933)	(0.0495)	(0.0493)	(0.0928)	(0.0566)
Treated_X_2006	0.613***	0.0821*	0.150***	0.00908	0.0374
	(0.0802)	(0.0399)	(0.0443)	(0.0917)	(0.0431)
Treated_X_2007	0.585***	0.121***	0.139***	0.0297	0.109***
	(0.0965)	(0.0329)	(0.0433)	(0.0726)	(0.0353)
Treated_X_2008	0.578***	0.123***	0.168***	-0.0106	0.113***
	(0.0788)	(0.0283)	(0.0301)	(0.0639)	(0.0351)
Treated_X_2009	0.541***	0.0433	0.140***	-0.0849	0.00784
	(0.0886)	(0.0357)	(0.0330)	(0.0664)	(0.0411)
Treated_X_2010	0.160*	0.137***	0.189***	-0.000176	0.152***
	(0.0847)	(0.0295)	(0.0316)	(0.0785)	(0.0423)
Treated_X_2011	0.385***	0.0778**	0.168***	-0.101	0.0815**
	(0.0972)	(0.0311)	(0.0304)	(0.0832)	(0.0389)
Treated_X_2012	0.421***	0.0237	0.0717***	0.0378	-0.0120
	(0.0799)	(0.0234)	(0.0219)	(0.0672)	(0.0307)
Treated_X_2013	0.295***	0.0835***	0.139***	0.179***	0.0126
	(0.0700)	(0.0243)	(0.0250)	(0.0609)	(0.0353)
Treated_X_2014	0.125**	0.0187	0.0156	0.161**	-0.0266
	(0.0582)	(0.0206)	(0.0367)	(0.0671)	(0.0283)
Treated_X_2015	0.544***	0.0945***	0.117***	0.0996*	0.0888**
	(0.0574)	(0.0246)	(0.0342)	(0.0558)	(0.0355)
Treated_X_2016	0.270***	-0.00861	0.0577*	-0.00373	-0.0488*
	(0.0683)	(0.0210)	(0.0307)	(0.0629)	(0.0274)
Treated_X_2018	0.192***	-0.0124	0.0648***	-0.0293	-0.0716***
	(0.0502)	(0.0177)	(0.0170)	(0.0385)	(0.0251)
N	648	459	459	459	459

If parallel trends hold, coefficients before treatment year should be zero or statistically insignificant. Results from this table indicate no trends are parallel for the Kentucky case study.

Table A.7: Total Workforce Summary Statistics 1992 - 2018

	mean	sd	min	max
Fatal Injuries per 100,000	5.568	3.253	0.981	40.97
Nonfatal Injuries per 100	4.025	1.300	1.596	8.751
Lost Workdays Cases per 100	1.243	0.454	0.506	2.943
Job Restriction/Transfer Cases per 100	0.729	0.324	0.100	1.991
Other Cases per 100	2.054	0.762	0.687	4.990
Right to Work	0.450	0.498	0	1
OSHA Inspection Rate	0.0149	0.0114	0.00284	0.187
Aged 15-24	0.156	0.0221	0.101	0.265
Aged 25-34	0.223	0.0245	0.157	0.300
Aged 35-44	0.236	0.0313	0.164	0.331
Aged 45-54	0.214	0.0227	0.142	0.279
Aged 55-64	0.130	0.0335	0.0621	0.218
Fraction Male	0.532	0.0127	0.494	0.582
Fraction White	0.838	0.124	0.196	0.991
Fraction Black	0.0956	0.0896	0.000698	0.366
Fraction Asian	0.0401	0.0864	0.00164	0.735
Fraction Single	0.281	0.0330	0.188	0.384
Fraction Married	0.572	0.0326	0.478	0.668
Fraction Divorced	0.108	0.0161	0.0688	0.165
Obtained HS Degree Only	0.604	0.0478	0.435	0.708
Obtained Bachelor's Degree	0.282	0.0610	0.143	0.504
all_unionmemr	0.117	0.0571	0.0169	0.288
all_unioncovr	0.132	0.0575	0.0261	0.318
Fraction of Lower House Republican	0.539	0.317	0	1
Maximum Temperature	85.99	6.346	58.80	102.9
Monthly Precipitation	3.119	1.237	0.377	6.148

Fatal and nonfatal injury rates are calculated by dividing counts by total working hours. Therefore, Fatal injuries here represent the number of fatal injuries per 100,000 full-time employees.
OSHA Inspection Rate is calculated by taking the number of OSHA inspections performed divided by the number of firms within a state.
Control variable rates (excluding the political and weather variables) are calculated by dividing by the number of employees.
Fraction of Lower House Republican is calculated by taking the number of Republican representatives in the House of Representatives in the state and dividing by the total number of representatives in that state's house. Temperature is in Fahrenheit.
When using fatal injuries as an outcome, data is a balanced panel of 1,350 observations.
When using nonfatal injuries, data is an unbalanced panel of 943 observations.
Means are not national averages but rather the average of the states over the period 1992-2018.

Table A.8: Mutli-State Analysis Full Workforce Results

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	0.109*	0.102*	-0.0844**	-0.140***	-0.0634	-0.0577
	(0.0551)	(0.0511)	(0.0312)	(0.0280)	(0.0582)	(0.0462)
Inspection Rate	2.880**	2.558***	0.0267	-0.0709	-1.278	0.566
	(1.141)	(0.707)	(0.337)	(0.548)	(1.077)	(0.405)
Age 25-34	-2.471**	-2.616*	-1.292	-1.349	-0.970	-1.576
	(1.181)	(1.281)	(0.810)	(0.937)	(1.998)	(0.973)
Age 35-44	-1.654	-0.617	-2.078**	-1.554*	-3.020	-2.506**
	(1.652)	(1.612)	(0.783)	(0.901)	(2.104)	(1.156)
Age 45-54	-0.212	-0.557	-2.791***	-2.121*	-5.656***	-2.899**
	(1.503)	(1.711)	(0.974)	(1.042)	(1.740)	(1.137)
Age 55-64	-1.600	-2.387	-1.346	-1.065	-1.910	-1.177
	(1.460)	(1.900)	(0.974)	(1.039)	(2.207)	(1.425)
Male	2.986	3.445*	1.005	0.205	3.195***	1.101
	(1.887)	(1.738)	(0.687)	(0.813)	(1.086)	(1.039)
White	-0.234	-0.202	-0.333	-0.691	-0.549	-0.108
	(0.652)	(0.741)	(0.600)	(0.627)	(1.079)	(0.726)
Black	1.714	2.927	0.271	-0.393	-3.270	1.403
	(1.857)	(1.825)	(0.872)	(1.006)	(2.487)	(1.168)
Asian	-0.0951	0.565	0.104	-0.293**	0.176	0.398
	(0.716)	(0.505)	(0.225)	(0.136)	(0.446)	(0.472)
Single	-0.565	-1.150	-1.100*	-1.254**	-1.541	-1.046
	(1.043)	(1.341)	(0.560)	(0.605)	(1.257)	(0.774)
Divorced	5.280***	3.697***	1.412**	0.517	-0.443	2.943***
	(1.233)	(1.223)	(0.682)	(0.717)	(2.072)	(0.960)
HS Degree Only	-0.237	0.883	-0.133	-0.0719	-2.442	0.328
	(1.108)	(1.277)	(0.698)	(0.751)	(1.809)	(0.919)
Obtained Bachelor's Degree'	1.936	3.156**	0.334	1.260**	-2.463	0.164
	(1.477)	(1.524)	(0.553)	(0.550)	(1.639)	(0.844)
Frac. of Lower Rep.	0.0682	-0.0222	-0.0607*	-0.105**	0.0463	-0.0395
	(0.0581)	(0.0498)	(0.0346)	(0.0386)	(0.0959)	(0.0599)
Maximum Temperature	-0.00142	-0.00351	0.00393**	0.00143	0.00131	0.00553**
	(0.00340)	(0.00434)	(0.00181)	(0.00196)	(0.00351)	(0.00224)
Monthly Precipitation	0.00213	0.0191	0.00494	-0.00711	0.00304	0.0140
	(0.0153)	(0.0133)	(0.00691)	(0.00735)	(0.0135)	(0.00923)
Constant	-4.872**	-6.107**	3.230***	2.896**	2.955	1.956
	(2.174)	(2.517)	(1.102)	(1.224)	(2.559)	(1.470)
N	783	566	566	566	566	566
r2	0.856	0.861	0.945	0.944	0.942	0.931

Standard errors clustered as state level.
Equation 1 results for the private and public sectors combined.
Outcomes are log variables.
Results for the RTW variable should be interpretted as "a RTW passage leads to a x change in the outcome variable" where x is the point estimate.
Results for other variables should be interpretted as "a 1 percentage point increase leads to a x change in the outcome variable" where x is the point estimate.
Column (1) gives results for the log fatal workplace injury rate. Column (2) is the same outcome variable but using the sample in which nonfatal injuries are available.
Columns (3) - (6) represent All Nonfatal workplace injuries, nonfatal workplace injuries which resulted in days away from work, nonfatal workplace injuries which resulted in job restriction or job transfer, and nonfatal injuries which did not result in either lost workdays or job restriction or job transfer.
For a description of the control variables, see Table A.7.

Table A.9: Right to Work Coefficient Comparison From Multi-State Analyses: Robustness Check

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
All	0.109*	0.102*	-0.0844**	-0.140***	-0.0634	-0.0577
	(0.0551)	(0.0511)	(0.0312)	(0.0280)	(0.0582)	(0.0462)
N	783	566	566	566	566	566
r2	0.856	0.861	0.945	0.944	0.942	0.931
Private	0.106*	0.0996*	-0.0905***	-0.135***	-0.0780	-0.0641*
	(0.0566)	(0.0549)	(0.0227)	(0.0405)	(0.0537)	(0.0327)
N	783	566	566	566	566	566
r2	0.849	0.850	0.958	0.950	0.941	0.950
Public	0.119	0.0641	-0.0134	-0.204**	0.0604	0.0581
	(0.138)	(0.160)	(0.0503)	(0.0868)	(0.139)	(0.0583)
N	783	485	485	485	467	485
r2	0.406	0.420	0.869	0.885	0.866	0.812
Construction	-0.0453	-0.00648	-0.118	-0.168	-0.0330	-0.0997
	(0.140)	(0.0876)	(0.0870)	(0.136)	(0.236)	(0.0986)
N	783	564	564	564	564	564
r2	0.438	0.419	0.857	0.781	0.406	0.836
Manufacturing	0.273	0.261*	-0.124**	-0.136*	-0.0886	-0.0919**
	(0.162)	(0.152)	(0.0467)	(0.0771)	(0.100)	(0.0389)
N	783	566	566	566	566	566
r2	0.453	0.404	0.923	0.775	0.694	0.944
Wholesale Trade	0.0889	0.0570	-0.0259	-0.128	0.0814	0.105**
	(0.108)	(0.144)	(0.0343)	(0.0992)	(0.169)	(0.0484)
N	782	559	560	560	560	560
r2	0.445	0.428	0.676	0.573	0.623	0.578
Retail Trade	-0.131	-0.162	-0.0887*	-0.158***	-0.152	-0.0496
	(0.140)	(0.153)	(0.0489)	(0.0463)	(0.101)	(0.0576)
N	782	563	564	565	564	564
r2	0.393	0.338	0.763	0.770	0.816	0.856
Transportation and Warehousing	0.244	0.188	-0.0788	-0.0298	-0.258	-0.123
	(0.169)	(0.131)	(0.0814)	(0.0703)	(0.196)	(0.0850)
N	783	562	562	562	562	562
r2	0.569	0.539	0.737	0.683	0.408	0.736
Finance and Realestate	0.130	0.0892	-0.0263	0.0277	-0.205	-0.0921
	(0.118)	(0.123)	(0.0813)	(0.236)	(0.467)	(0.232)
N	783	550	550	548	544	549
r2	0.168	0.200	0.674	0.430	0.605	0.409
Services	0.0828	0.0652	-0.0150	-0.0985*	0.00587	0.0246
	(0.103)	(0.103)	(0.0246)	(0.0519)	(0.0648)	(0.0397)
N	783	550	550	545	547	547
r2	0.371	0.382	0.869	0.886	0.798	0.807

The always treated are dropped from the sample.
Standard errors clustered as state level.
Results for each sector and private industry are given in rows with columns representing log outcomes.
Controls along with state and year fixed effects are included.
Results for the RTW variable should be interpretted as "a RTW passage leads to a x change in the outcome variable" where x is the point estimate.
Results for other variables should be interpretted as "a 1 percentage point increase leads to a x change in the outcome variable" where x is the point estimate.
Column (1) gives results for the log fatal workplace injury rate. Column (2) is the same outcome variable but using the sample in which nonfatal injuries are available.
Columns (3) - (6) represent All Nonfatal workplace injuries, nonfatal workplace injuries which resulted in days away from work, nonfatal workplace injuries which resulted in job restriction or job transfer, and nonfatal injuries which did not result in either lost workdays or job restriction or job transfer.
For a description of the control variables, see Table A.7.

Table A.10: Mutli-State Analysis - Private Sector

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	0.107*	0.121**	-0.0655***	-0.119***	-0.0469	-0.0323
	(0.0560)	(0.0521)	(0.0183)	(0.0363)	(0.0623)	(0.0273)
Inspection Rate	-0.158	-0.549	-0.283	-0.248	-1.640	0.206
	(1.238)	(0.902)	(0.526)	(0.538)	(1.199)	(0.547)
Age 25-34	-0.735	-0.837	-2.232***	-2.326***	-2.207**	-2.495***
	(0.907)	(0.809)	(0.455)	(0.581)	(1.042)	(0.592)
Age 35-44	-2.457**	-1.758	-2.413***	-2.229***	-2.598*	-2.861***
	(1.170)	(1.267)	(0.533)	(0.693)	(1.389)	(0.688)
Age 45-54	-0.271	-0.382	-2.800***	-2.247***	-4.852***	-3.035***
	(1.141)	(1.453)	(0.524)	(0.805)	(1.366)	(0.595)
Age 55-64	-0.580	-1.472	-0.794	-0.377	-0.839	-0.855
	(1.393)	(1.720)	(0.532)	(0.708)	(1.431)	(0.784)
Male	2.727**	1.404	0.654	-0.164	2.853***	0.666
	(1.287)	(1.331)	(0.480)	(0.671)	(0.883)	(0.610)
White	-0.185	0.0628	-0.795**	-0.955**	-1.556*	-0.491
	(0.681)	(0.673)	(0.321)	(0.359)	(0.869)	(0.434)
Black	0.894	1.451	-0.396	-0.479	-1.389	-0.107
	(1.246)	(1.298)	(0.560)	(0.835)	(1.313)	(0.713)
Asian	-0.615	-0.309	-0.228*	-0.441**	-0.0890	-0.211
	(0.578)	(0.416)	(0.120)	(0.196)	(0.446)	(0.272)
Single	0.236	-0.0194	-0.777*	-0.634	-1.320	-0.898
	(0.788)	(1.106)	(0.433)	(0.432)	(0.972)	(0.567)
Divorced	5.757***	4.275***	0.537	0.113	-0.553	1.467*
	(0.851)	(0.882)	(0.536)	(0.717)	(1.305)	(0.744)
HS Degree Only	-0.661	-0.287	-0.607	-0.663	-0.886	-0.657
	(0.703)	(0.891)	(0.383)	(0.545)	(1.008)	(0.480)
Obtained Bachelor's Degree'	1.807*	2.607**	0.0111	0.635	-1.109	-0.434
	(1.077)	(1.223)	(0.361)	(0.525)	(0.896)	(0.552)
Frac. of Lower Rep.	0.0377	-0.0639	-0.0844*	-0.102*	-0.0167	-0.0741
	(0.0616)	(0.0598)	(0.0476)	(0.0575)	(0.0764)	(0.0509)
Maximum Temperature	0.00352	0.00332	0.00238	0.000614	0.00524**	0.00226
	(0.00258)	(0.00374)	(0.00143)	(0.00124)	(0.00220)	(0.00209)
Monthly Precipitation	0.0173	0.0340***	-0.00161	-0.00720	-0.00139	0.00277
	(0.0111)	(0.0118)	(0.00495)	(0.00506)	(0.0101)	(0.00610)
Constant	-6.552***	-6.568***	4.386***	3.634***	3.036*	3.721***
	(1.537)	(1.703)	(0.642)	(0.763)	(1.671)	(0.944)
N	1350	943	943	943	943	943
r2	0.855	0.847	0.966	0.956	0.940	0.957

Table A.11: Mutli-State Analysis - Public Sector

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	0.208	0.115	0.0140	-0.125	0.0347	0.0696
	(0.136)	(0.144)	(0.0580)	(0.0927)	(0.128)	(0.0621)
Inspection Rate	5.220**	6.719***	-0.817	-0.990	-0.480	-0.784
	(2.190)	(1.193)	(0.696)	(0.712)	(1.712)	(1.001)
Age 25-34	-0.782	0.0193	-0.679	-0.766**	-0.347	-0.633
	(0.829)	(1.219)	(0.494)	(0.337)	(0.695)	(0.604)
Age 35-44	0.719	1.286	-0.735	-0.596*	-0.0126	-0.788
	(0.772)	(1.280)	(0.498)	(0.301)	(0.775)	(0.631)
Age 45-54	0.270	2.051	-0.906*	-0.606*	0.524	-1.055*
	(0.981)	(1.482)	(0.466)	(0.303)	(0.809)	(0.586)
Age 55-64	1.285	3.143**	-0.362	-0.148	0.465	-0.513
	(1.034)	(1.415)	(0.586)	(0.402)	(0.919)	(0.712)
Male	-0.229	0.749	-0.0253	-0.320	0.113	0.0830
	(0.645)	(0.747)	(0.202)	(0.207)	(0.404)	(0.260)
White	1.177	1.381	0.452	0.402	0.784	0.565
	(0.759)	(1.076)	(0.359)	(0.287)	(0.655)	(0.489)
Black	0.615	1.374	0.205	-0.0646	-0.000889	0.438
	(0.927)	(1.321)	(0.408)	(0.437)	(0.808)	(0.521)
Asian	-0.0874	0.637	0.225	-1.006***	0.535	1.184
	(0.921)	(0.980)	(0.452)	(0.304)	(0.844)	(0.733)
Single	0.367	0.613	-0.351	-0.213	0.149	-0.473*
	(0.630)	(0.805)	(0.244)	(0.272)	(0.495)	(0.275)
Divorced	-1.178*	-1.797**	0.481*	0.220	0.352	0.554
	(0.661)	(0.887)	(0.268)	(0.267)	(0.508)	(0.341)
HS Degree Only	0.477	1.020	1.461***	1.269*	1.134	1.862**
	(1.607)	(1.387)	(0.524)	(0.691)	(1.315)	(0.738)
Obtained Bachelor's Degree'	0.267	0.190	1.530***	1.391**	0.916	1.845**
	(1.621)	(1.466)	(0.502)	(0.653)	(1.314)	(0.766)
Frac. of Lower Rep.	0.340***	0.239	0.0136	-0.0419	0.146	0.000535
	(0.126)	(0.191)	(0.0886)	(0.0905)	(0.165)	(0.0992)
Maximum Temperature	0.0141	0.00264	-0.00111	0.000746	-0.00408	-0.00136
	(0.0102)	(0.0125)	(0.00343)	(0.00322)	(0.00728)	(0.00457)
Monthly Precipitation	0.0301	0.0578	0.00573	-0.0163	0.0368	0.00976
	(0.0344)	(0.0487)	(0.0194)	(0.0172)	(0.0298)	(0.0245)
Constant	-7.336***	-8.896***	1.315	0.485	-2.143	0.353
	(1.804)	(2.204)	(0.835)	(0.740)	(1.426)	(1.128)
N	1350	762	762	762	744	762
r2	0.386	0.393	0.849	0.885	0.843	0.796

Table A.12: Mutli-State Analysis - Construction Industry

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	-0.0187	0.0347	-0.0680	-0.143	0.0723	-0.0292
	(0.110)	(0.0815)	(0.0812)	(0.145)	(0.214)	(0.0876)
Inspection Rate	3.275	3.569	-1.111	-1.012	-0.104	-0.408
	(3.006)	(3.186)	(0.950)	(1.179)	(3.211)	(0.861)
Age 25-34	-2.132**	-1.690**	-0.308	-0.788*	-1.783	0.0120
	(0.813)	(0.786)	(0.378)	(0.446)	(1.206)	(0.455)
Age 35-44	-2.584***	-2.673***	-0.503	-0.327	-2.566*	-0.641
	(0.853)	(0.924)	(0.364)	(0.425)	(1.483)	(0.433)
Age 45-54	-2.946**	-3.048**	-1.109**	-1.154**	-3.183**	-1.244**
	(1.108)	(1.429)	(0.413)	(0.510)	(1.342)	(0.506)
Age 55-64	-1.251	-2.178	0.165	0.0792	2.205	0.262
	(1.299)	(1.367)	(0.485)	(0.546)	(2.610)	(0.609)
Male	1.431	0.209	0.517	0.162	3.697	0.861**
	(1.169)	(1.116)	(0.366)	(0.487)	(3.500)	(0.413)
White	0.585	0.203	-0.193	0.0382	-2.221	-0.660
	(1.437)	(1.482)	(0.418)	(0.591)	(1.326)	(0.564)
Black	1.707	2.015	1.527***	1.285	2.032	1.313*
	(1.790)	(1.628)	(0.562)	(0.798)	(1.408)	(0.674)
Asian	-0.841	-0.919	0.0114	-0.117	-1.206	-0.0685
	(0.661)	(0.630)	(0.248)	(0.229)	(0.739)	(0.478)
Single	0.332	-0.369	0.0238	0.0686	-0.413	0.160
	(0.734)	(0.806)	(0.341)	(0.395)	(1.002)	(0.416)
Divorced	1.544	2.062	0.880*	0.275	1.055	1.524***
	(1.163)	(1.475)	(0.457)	(0.562)	(1.603)	(0.521)
HS Degree Only	0.786	0.457	-0.0867	0.260	-0.728	-0.0628
	(0.766)	(0.666)	(0.276)	(0.321)	(1.050)	(0.343)
Obtained Bachelor's Degree'	2.292*	2.262*	0.233	0.318	-2.854	0.377
	(1.201)	(1.189)	(0.416)	(0.521)	(1.913)	(0.470)
Frac. of Lower Rep.	0.302	0.113	-0.0196	-0.0767	-0.0702	-0.0126
	(0.201)	(0.133)	(0.0720)	(0.135)	(0.178)	(0.0662)
Maximum Temperature	0.0140	-0.00270	0.00437	0.00136	-0.0304	0.00757*
	(0.0136)	(0.0113)	(0.00348)	(0.00556)	(0.0388)	(0.00432)
Monthly Precipitation	0.0748*	0.0478	0.00463	-0.00538	-0.0276	0.0166
	(0.0442)	(0.0461)	(0.0139)	(0.0172)	(0.0619)	(0.0218)
Constant	-6.793***	-3.403*	1.211	0.612	2.907	0.193
	(2.455)	(1.688)	(0.838)	(0.969)	(5.559)	(1.085)
N	1350	941	941	941	941	941
r2	0.419	0.442	0.886	0.820	0.406	0.863

Table A.13: Mutli-State Analysis - Manufacturing Industry

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	0.160	0.115	-0.0771	-0.131**	0.0489	-0.0338
	(0.163)	(0.161)	(0.0474)	(0.0629)	(0.135)	(0.0373)
Inspection Rate	5.224	3.771	0.715	0.450	4.313	1.226
	(5.662)	(4.447)	(0.929)	(0.824)	(3.580)	(0.961)
Age 25-34	1.465	1.614	-1.270***	-1.418**	-2.373**	-1.217***
	(1.309)	(1.287)	(0.357)	(0.554)	(1.125)	(0.352)
Age 35-44	1.667	2.216	-1.520***	-1.757***	-3.323*	-1.560***
	(1.498)	(1.726)	(0.405)	(0.515)	(1.691)	(0.420)
Age 45-54	0.382	0.887	-1.798***	-2.046**	-5.207**	-1.693***
	(1.116)	(1.475)	(0.384)	(0.879)	(2.273)	(0.418)
Age 55-64	1.268	0.438	-0.254	0.00480	-0.498	-0.189
	(1.922)	(2.016)	(0.395)	(0.576)	(1.066)	(0.367)
Male	0.0965	-1.069	-0.0909	-0.0671	0.845	0.168
	(1.013)	(1.587)	(0.226)	(0.365)	(0.977)	(0.255)
White	0.585	1.583	-1.406***	-1.638***	0.0493	-1.260***
	(1.335)	(1.218)	(0.483)	(0.577)	(0.950)	(0.386)
Black	1.422	1.934	-1.038*	-1.458**	0.835	-0.781
	(1.596)	(1.831)	(0.526)	(0.641)	(1.342)	(0.540)
Asian	-3.332**	-1.862**	-1.021**	-0.902	0.823	-0.999***
	(1.312)	(0.896)	(0.416)	(0.579)	(1.432)	(0.280)
Single	0.659	1.066	-0.362	-0.0508	-0.979	-0.628**
	(1.243)	(1.385)	(0.251)	(0.363)	(0.972)	(0.272)
Divorced	2.557	2.483	-0.205	-0.514	-0.853	0.108
	(1.841)	(1.628)	(0.309)	(0.375)	(1.989)	(0.372)
HS Degree Only	-0.211	-1.018	1.003***	1.640***	1.099	1.118***
	(0.836)	(0.990)	(0.307)	(0.547)	(0.655)	(0.371)
Obtained Bachelor's Degree'	0.994	-0.211	1.228***	2.121***	1.705**	1.144***
	(1.220)	(1.086)	(0.282)	(0.530)	(0.830)	(0.306)
Frac. of Lower Rep.	-0.219	-0.362*	-0.0152	-0.000842	0.130	-0.0208
	(0.157)	(0.193)	(0.0875)	(0.0998)	(0.105)	(0.0714)
Maximum Temperature	0.00935	0.00790	0.00365	0.000529	-0.00446	0.00524**
	(0.00931)	(0.0119)	(0.00256)	(0.00595)	(0.00725)	(0.00207)
Monthly Precipitation	0.0303	0.0153	-0.00194	-0.0115	-0.0210	0.00315
	(0.0402)	(0.0409)	(0.00952)	(0.0161)	(0.0243)	(0.00984)
Constant	-8.370***	-7.881**	3.944***	2.584***	2.537*	2.687***
	(2.355)	(3.053)	(0.737)	(0.930)	(1.424)	(0.669)
N	1350	942	942	942	942	942
r2	0.429	0.405	0.928	0.811	0.641	0.944

Table A.14: Mutli-State Analysis - Wholesale Trade Industry

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	0.165	0.219*	-0.0319	-0.138	0.0803	0.0928**
	(0.112)	(0.111)	(0.0289)	(0.0882)	(0.164)	(0.0428)
Inspection Rate	-2.678	-3.624	-2.078**	-2.038**	-18.79***	1.344
	(3.494)	(3.838)	(0.883)	(0.985)	(6.643)	(2.566)
Age 25-34	-1.063	-0.935	0.0877	0.542*	-0.168	0.0420
	(1.185)	(1.321)	(0.239)	(0.315)	(1.314)	(0.501)
Age 35-44	-1.000	-0.372	-0.362	-0.0678	-0.867	-0.288
	(1.117)	(1.327)	(0.258)	(0.337)	(0.740)	(0.396)
Age 45-54	-0.828	-0.379	0.195	0.421	-0.346	0.380
	(1.063)	(1.442)	(0.213)	(0.340)	(0.494)	(0.434)
Age 55-64	-0.926	-0.100	0.476*	1.025**	-1.076	0.658*
	(0.984)	(1.242)	(0.261)	(0.466)	(1.144)	(0.384)
Male	-1.593***	-1.855***	-0.303	-0.221	-0.806	-0.828
	(0.579)	(0.631)	(0.188)	(0.266)	(0.814)	(0.550)
White	-0.929	-0.119	0.414	0.256	5.834*	0.556
	(1.337)	(1.682)	(0.364)	(0.560)	(3.131)	(0.776)
Black	-1.378	0.163	0.262	0.0642	5.501*	-0.368
	(1.108)	(1.456)	(0.477)	(0.570)	(2.781)	(0.877)
Asian	0.852	1.130	0.318	0.00613	4.651	-0.468
	(1.403)	(1.549)	(0.227)	(0.350)	(2.908)	(1.637)
Single	0.365	0.828	0.358*	0.471	-0.157	0.656
	(0.753)	(0.821)	(0.203)	(0.293)	(1.443)	(0.504)
Divorced	0.176	-0.849	1.001***	0.444	3.155**	0.0427
	(0.986)	(1.065)	(0.283)	(0.371)	(1.295)	(1.001)
HS Degree Only	1.909**	0.744	-0.114	-0.204	1.467	1.096
	(0.851)	(0.867)	(0.390)	(0.301)	(1.333)	(1.339)
Obtained Bachelor's Degree'	0.958	0.413	-0.0480	-0.0666	0.829	0.717
	(0.970)	(1.281)	(0.440)	(0.336)	(1.214)	(1.785)
Frac. of Lower Rep.	-0.0153	-0.275	-0.0869	-0.0734	-0.185	-0.0269
	(0.177)	(0.208)	(0.0777)	(0.0985)	(0.149)	(0.0586)
Maximum Temperature	-0.0168	-0.000638	0.00179	0.000546	-0.0374	-0.000723
	(0.0156)	(0.0165)	(0.00305)	(0.00425)	(0.0268)	(0.00518)
Monthly Precipitation	-0.0178	0.0363	0.0245	0.0334	-0.0103	0.0346
	(0.0481)	(0.0588)	(0.0176)	(0.0207)	(0.0652)	(0.0321)
Constant	-2.440	-3.951	1.718***	0.627	-2.318	0.387
	(2.157)	(2.759)	(0.596)	(0.764)	(4.417)	(1.480)
N	1349	932	933	933	933	933
r2	0.374	0.422	0.683	0.613	0.616	0.520

Table A.15: Mutli-State Analysis - Retail Trade Industry

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	-0.0856	-0.0373	-0.0412	-0.0964**	-0.0887	0.00414
	(0.129)	(0.149)	(0.0422)	(0.0475)	(0.0907)	(0.0512)
Inspection Rate	-2.079	-1.981	0.0871	0.404	-0.640	0.777
	(1.904)	(1.788)	(0.630)	(0.756)	(1.223)	(0.560)
Age 25-34	-2.462***	-2.285**	-0.753**	-0.615*	-1.547*	-0.879**
	(0.742)	(0.936)	(0.287)	(0.352)	(0.772)	(0.363)
Age 35-44	-2.194*	-1.059	-1.177***	-1.107**	-1.314	-1.176**
	(1.096)	(1.315)	(0.432)	(0.421)	(0.794)	(0.446)
Age 45-54	-2.187**	-2.672**	-1.067*	-0.921	-1.596*	-0.838*
	(1.016)	(1.075)	(0.596)	(0.645)	(0.845)	(0.446)
Age 55-64	-0.416	-1.612	0.0394	0.0442	-0.432	0.463
	(1.426)	(1.779)	(0.559)	(0.697)	(0.843)	(0.531)
Male	1.161*	0.325	-0.912***	-0.773**	-0.0332	-0.785**
	(0.608)	(0.673)	(0.299)	(0.377)	(0.523)	(0.328)
White	0.122	1.652	0.862*	0.701	-0.562	1.058***
	(1.336)	(1.778)	(0.456)	(0.492)	(0.652)	(0.380)
Black	-1.486	-0.155	1.289**	1.802***	-0.355	0.959*
	(1.478)	(1.982)	(0.562)	(0.628)	(0.831)	(0.482)
Asian	-2.000*	-0.741	-0.0742	-0.211	-0.924	-0.129
	(1.079)	(0.929)	(0.308)	(0.407)	(0.587)	(0.258)
Single	-1.208*	-0.666	-0.0942	-0.131	-0.466	-0.126
	(0.659)	(0.892)	(0.288)	(0.428)	(0.456)	(0.343)
Divorced	1.596	0.267	0.240	0.0738	0.457	-0.606
	(1.216)	(1.420)	(0.700)	(0.715)	(0.798)	(0.441)
HS Degree Only	-2.164**	-2.138*	-0.645*	-0.648	-1.032	-0.687*
	(0.826)	(1.081)	(0.324)	(0.418)	(0.645)	(0.378)
Obtained Bachelor's Degree'	-1.439	-0.396	-0.0305	0.0689	-0.945	-0.692
	(1.084)	(1.187)	(0.410)	(0.443)	(0.804)	(0.544)
Frac. of Lower Rep.	-0.00405	-0.197	-0.0243	-0.0842	-0.00893	-0.0521
	(0.120)	(0.149)	(0.0421)	(0.0663)	(0.114)	(0.0647)
Maximum Temperature	0.00802	0.00551	-0.0000760	-0.00263	0.00193	0.00472
	(0.00749)	(0.00925)	(0.00367)	(0.00385)	(0.00490)	(0.00361)
Monthly Precipitation	0.0266	0.0450	0.000480	-0.0114	0.00183	0.0211
	(0.0295)	(0.0373)	(0.0119)	(0.0149)	(0.0173)	(0.0128)
Constant	-3.017**	-4.426**	2.369***	1.208	1.912**	1.379*
	(1.424)	(1.996)	(0.599)	(0.775)	(0.943)	(0.701)
N	1349	939	940	941	940	940
r2	0.458	0.381	0.808	0.802	0.776	0.869

Table A.16: Mutli-State Analysis - Transportation and Warehousing Industry

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	0.122	0.148	-0.0398	-0.0103	-0.0759	-0.0392
	(0.191)	(0.125)	(0.0726)	(0.0730)	(0.154)	(0.0737)
Inspection Rate	-3.541	-5.366*	-0.543	0.136	-3.041	0.0556
	(3.001)	(3.185)	(0.653)	(0.784)	(3.817)	(0.998)
Age 25-34	-1.737	0.414	-0.849**	-0.691*	-4.197*	-1.080**
	(1.710)	(1.647)	(0.318)	(0.383)	(2.438)	(0.417)
Age 35-44	-1.014	0.113	-0.573*	-0.444	-4.399*	-1.010**
	(1.389)	(1.350)	(0.337)	(0.380)	(2.472)	(0.471)
Age 45-54	-1.806	0.264	-0.846**	-0.688	-3.630*	-1.212***
	(1.558)	(1.431)	(0.388)	(0.515)	(2.025)	(0.426)
Age 55-64	-1.155	-0.424	-0.647*	-0.275	-4.938*	-0.886*
	(1.574)	(1.636)	(0.383)	(0.450)	(2.752)	(0.501)
Male	0.512	0.380	0.103	0.176	-0.547	0.0226
	(0.572)	(0.620)	(0.205)	(0.275)	(0.725)	(0.267)
White	1.975	2.860**	0.379	0.0875	3.059	-0.251
	(1.239)	(1.087)	(0.339)	(0.373)	(2.505)	(0.447)
Black	0.953	2.297**	0.624	0.223	3.892	0.0740
	(1.201)	(1.039)	(0.448)	(0.454)	(2.651)	(0.578)
Asian	-1.183	0.523	-0.575***	-0.890***	-2.103	-0.911***
	(0.806)	(0.491)	(0.199)	(0.255)	(1.470)	(0.268)
Single	0.158	-0.360	-0.141	0.0240	-0.480	-0.446
	(0.864)	(0.512)	(0.262)	(0.293)	(1.072)	(0.343)
Divorced	0.383	-0.0924	-0.475*	-0.396	0.0220	-0.585
	(0.780)	(0.932)	(0.277)	(0.267)	(1.084)	(0.381)
HS Degree Only	-0.657	-0.345	0.637**	0.734**	0.395	0.698*
	(0.656)	(0.789)	(0.271)	(0.356)	(1.428)	(0.405)
Obtained Bachelor's Degree'	-0.106	0.201	0.275	0.247	1.724	0.690
	(1.081)	(1.112)	(0.349)	(0.375)	(1.932)	(0.494)
Frac. of Lower Rep.	-0.133	-0.488*	-0.0541	-0.122*	-0.108	0.0253
	(0.318)	(0.255)	(0.0429)	(0.0623)	(0.318)	(0.0620)
Maximum Temperature	0.0191	0.0122	-0.00544*	-0.00874**	0.00254	-0.00655*
	(0.0115)	(0.0131)	(0.00317)	(0.00421)	(0.0272)	(0.00383)
Monthly Precipitation	0.00297	0.0296	-0.00655	-0.0102	-0.0239	-0.00454
	(0.0401)	(0.0530)	(0.0171)	(0.0187)	(0.0525)	(0.0246)
Constant	-5.641**	-7.561***	2.315***	1.803**	0.352	2.380***
	(2.117)	(2.332)	(0.655)	(0.745)	(4.401)	(0.861)
N	1350	936	936	934	934	936
r2	0.523	0.554	0.764	0.698	0.385	0.758

Table A.17: Mutli-State Analysis - Finance and Real Estate Industry

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	0.132	0.134	-0.00841	0.129	0.0722	-0.0917
	(0.106)	(0.118)	(0.0839)	(0.196)	(0.339)	(0.251)
Inspection Rate	-0.244	-0.327	-2.657	-8.815	-17.27	0.278
	(1.240)	(1.392)	(4.194)	(6.022)	(11.99)	(3.105)
Age 25-34	0.362	0.340	-0.304	0.0297	2.585	0.352
	(0.495)	(0.609)	(0.635)	(2.054)	(2.246)	(0.889)
Age 35-44	0.00124	-0.0728	-0.340	0.113	-1.406	0.186
	(0.478)	(0.726)	(0.994)	(2.152)	(2.732)	(1.041)
Age 45-54	0.142	-0.0382	0.0393	2.825	3.435	1.337
	(0.548)	(0.721)	(0.828)	(2.741)	(2.801)	(1.200)
Age 55-64	0.379	0.341	0.813	2.096	3.310	1.189
	(0.692)	(0.791)	(0.845)	(3.401)	(3.987)	(1.452)
Male	0.170	0.522	-0.208	1.572	-3.409*	-0.310
	(0.481)	(0.712)	(0.524)	(1.534)	(2.015)	(0.850)
White	-0.478	-0.433	1.183	3.497	2.230	0.191
	(0.590)	(1.097)	(1.267)	(2.689)	(2.940)	(1.150)
Black	-0.00889	-0.0133	1.932	4.855*	6.307	0.155
	(0.802)	(1.124)	(1.527)	(2.651)	(4.518)	(1.380)
Asian	-1.566***	-1.277*	1.653**	4.435**	5.448*	1.532*
	(0.528)	(0.641)	(0.649)	(2.047)	(2.812)	(0.882)
Single	-0.154	0.295	0.563	1.870	-0.403	2.466**
	(0.537)	(0.759)	(0.431)	(1.476)	(2.052)	(1.209)
Divorced	0.423	0.432	-0.522	-1.072	0.175	-0.130
	(0.588)	(0.655)	(0.670)	(1.637)	(3.419)	(0.999)
HS Degree Only	-0.716	0.0479	-0.492	1.183	2.936	2.725*
	(0.893)	(1.196)	(1.425)	(2.635)	(3.431)	(1.522)
Obtained Bachelor's Degree'	-0.623	0.262	-0.0384	2.209	6.070*	2.993*
	(0.853)	(1.129)	(0.983)	(2.976)	(3.250)	(1.675)
Frac. of Lower Rep.	-0.0626	-0.139	-0.224	-0.393	0.493	-0.342**
	(0.0766)	(0.109)	(0.162)	(0.435)	(0.366)	(0.164)
Maximum Temperature	0.00765	0.00345	-0.00896	-0.00674	-0.00809	-0.0191
	(0.00510)	(0.00789)	(0.0106)	(0.0145)	(0.0328)	(0.0125)
Monthly Precipitation	0.0416*	0.0244	0.00282	-0.00707	0.0337	-0.00310
	(0.0248)	(0.0255)	(0.0213)	(0.0435)	(0.113)	(0.0359)
Constant	-6.889***	-7.215***	0.618	-7.172**	-9.464	-1.456
	(1.546)	(2.322)	(2.086)	(3.466)	(6.774)	(1.802)
N	1350	912	912	907	903	909
r2	0.131	0.152	0.505	0.433	0.551	0.393

Table A.18: Mutli-State Analysis - Service Industry

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	0.0698	0.129	0.00490	-0.0677	-0.00327	0.0544*
	(0.0981)	(0.0890)	(0.0202)	(0.0523)	(0.0686)	(0.0292)
Inspection Rate	0.862	0.954	-0.408	-0.546	-2.497*	0.113
	(2.450)	(2.054)	(0.489)	(0.584)	(1.435)	(0.474)
Age 25-34	-1.029	0.148	-1.650***	-1.583***	-2.299	-1.864***
	(1.577)	(1.937)	(0.419)	(0.545)	(1.427)	(0.443)
Age 35-44	-0.426	1.187	-1.593***	-1.148*	-2.815*	-1.889***
	(1.600)	(2.058)	(0.513)	(0.655)	(1.624)	(0.670)
Age 45-54	0.272	0.719	-1.911***	-1.197	-3.549*	-2.498***
	(1.468)	(1.926)	(0.569)	(0.916)	(2.031)	(0.749)
Age 55-64	-0.854	-3.359	-0.656	0.457	-0.931	-1.243
	(1.920)	(2.260)	(0.597)	(0.753)	(1.521)	(0.879)
Male	0.816	-0.113	-0.0132	0.339	0.923	-0.382
	(1.155)	(1.409)	(0.337)	(0.517)	(0.760)	(0.470)
White	1.140	0.336	-0.0462	-1.183***	-0.506	0.488
	(0.861)	(1.340)	(0.451)	(0.402)	(0.948)	(0.684)
Black	0.180	-0.706	0.0689	-0.829	-0.0647	0.558
	(1.285)	(1.866)	(0.566)	(0.640)	(1.349)	(0.842)
Asian	1.407	1.095	0.712***	0.368	-0.218	1.093***
	(0.935)	(1.083)	(0.236)	(0.237)	(0.645)	(0.362)
Single	0.684	0.305	-0.480	-0.626	-2.874*	-0.176
	(1.177)	(1.418)	(0.315)	(0.425)	(1.542)	(0.482)
Divorced	4.041***	4.100**	1.755***	0.452	0.0327	2.858***
	(1.443)	(2.008)	(0.513)	(0.605)	(1.237)	(0.710)
HS Degree Only	0.337	-0.511	-0.290	-0.589	1.033	-0.142
	(1.309)	(1.656)	(0.600)	(0.531)	(1.944)	(0.802)
Obtained Bachelor's Degree'	0.621	0.615	-0.221	-0.190	0.755	-0.307
	(1.443)	(1.781)	(0.642)	(0.641)	(1.270)	(0.890)
Frac. of Lower Rep.	0.0239	-0.0660	-0.0813***	-0.105	-0.0278	-0.0596*
	(0.0962)	(0.110)	(0.0292)	(0.0657)	(0.0877)	(0.0341)
Maximum Temperature	0.00923	0.00805	0.000505	-0.000159	-0.00304	-0.00107
	(0.00812)	(0.00841)	(0.00276)	(0.00214)	(0.0122)	(0.00379)
Monthly Precipitation	0.0595**	0.0502	-0.00296	-0.0109	-0.0146	0.000368
	(0.0264)	(0.0303)	(0.00923)	(0.00744)	(0.0226)	(0.0102)
Constant	-8.957***	-7.771**	2.724***	2.516***	1.570	1.921
	(2.160)	(3.492)	(0.795)	(0.740)	(2.136)	(1.213)
N	1350	913	913	907	909	910
r2	0.346	0.368	0.878	0.892	0.804	0.816

Table A.19: Synthetic Control Weights for Fatal Workplace Injury Analysis

	Indiana	Kentucky	Michigan	Oklahoma	West_Virginia	Wisconsin
Alaska	-1.77	-1.06	-1.82×10^{-4}	-1.14	-0.477	-0.979
Hawaii	-1.64	-0.985	-1.45×10^{-4}	-1.06	-0.442	-0.907
Washington	-0.497	-0.299	-1.05×10^{-4}	-0.32	-0.134	-0.275
Colorado	-0.478	-0.287	-9.44×10^{-5}	-0.308	-0.129	-0.264
California	-0.262	-0.157	-7.09×10^{-5}	-0.169	-0.0707	-0.145
Rhode Island	-0.249	-0.15	-5.56×10^{-5}	-0.16	-0.0672	-0.138
Pennsylvania	-0.191	-0.114	-4.93×10^{-5}	-0.123	-0.0514	-0.105
New Jersey	-0.189	-0.113	-4.16×10^{-5}	-0.122	-0.0509	-0.104
Delaware	-0.141	-0.0847	-3.57×10^{-5}	-0.0909	-0.038	-0.078
Montana	-0.0351	-0.0211	-1.46×10^{-5}	-0.0226	-0.00946	-0.0194
Illinois	-0.0239	-0.0143	-9.88×10^{-6}	-0.0154	-0.00643	-0.0132
New Mexico	-0.0109	-0.00651	1.59×10^{-6}	-0.00699	-0.00293	-0.006
Minnesota	0.0675	0.0405	3.49×10^{-6}	0.0434	0.0182	0.0373
Oregon	0.0994	0.0597	5.14×10^{-6}	0.064	0.0268	0.055
Maine	0.244	0.146	2.07×10^{-5}	0.157	0.0657	0.135
New York	0.284	0.17	2.77×10^{-5}	0.183	0.0765	0.157
Maryland	0.337	0.202	2.79×10^{-5}	0.217	0.0907	0.186
Ohio	0.38	0.228	3.65×10^{-5}	0.245	0.102	0.21
Missouri	0.485	0.291	3.84×10^{-5}	0.312	0.131	0.268
Massachusetts	0.645	0.387	7.00×10^{-5}	0.415	0.174	0.357
Connecticut	0.715	0.429	7.28×10^{-5}	0.46	0.193	0.395
New Hampshire	0.991	0.595	2.40×10^{-4}	0.638	0.267	0.548
Vermont	1.24	0.745	2.59×10^{-4}	0.8	0.335	0.687

Table A.20: Synthetic Control Weights for All Nonfatal Workplace Injuries Analysis

	Indiana	Kentucky	Michigan	West_Virginia	Wisconsin
Alaska	-1.77	-1.06	-1.82×10^{-4}	-1.14	-0.477
Hawaii	-1.64	-0.985	-1.45×10^{-4}	-1.06	-0.442
Washington	-0.497	-0.299	-1.05×10^{-4}	-0.32	-0.134
Colorado	-0.478	-0.287	-9.44×10^{-5}	-0.308	-0.129
California	-0.262	-0.157	-7.09×10^{-5}	-0.169	-0.0707
Rhode Island	-0.249	-0.15	-5.56×10^{-5}	-0.16	-0.0672
Pennsylvania	-0.191	-0.114	-4.93×10^{-5}	-0.123	-0.0514
New Jersey	-0.189	-0.113	-4.16×10^{-5}	-0.122	-0.0509
Delaware	-0.141	-0.0847	-3.57×10^{-5}	-0.0909	-0.038
Montana	-0.0351	-0.0211	-1.46×10^{-5}	-0.0226	-0.00946
Illinois	-0.0239	-0.0143	-9.88×10^{-6}	-0.0154	-0.00643
New Mexico	-0.0109	-0.00651	1.59×10^{-6}	-0.00699	-0.00293
Minnesota	0.0675	0.0405	3.49×10^{-6}	0.0434	0.0182
Oregon	0.0994	0.0597	5.14×10^{-6}	0.064	0.0268
Maine	0.244	0.146	2.07×10^{-5}	0.157	0.0657
New York	0.284	0.17	2.77×10^{-5}	0.183	0.0765
Maryland	0.337	0.202	2.79×10^{-5}	0.217	0.0907
Ohio	0.38	0.228	3.65×10^{-5}	0.245	0.102
Missouri	0.485	0.291	3.84×10^{-5}	0.312	0.131
Massachusetts	0.645	0.387	7.00×10^{-5}	0.415	0.174
Connecticut	0.715	0.429	7.28×10^{-5}	0.46	0.193
New Hampshire	0.991	0.595	2.40×10^{-4}	0.638	0.267
Vermont	1.24	0.745	2.59×10^{-4}	0.8	0.335

Table A.21: Synthetic Control Weights for Lost Workday Workplace Injury Analysis

	Indiana	Kentucky	Michigan	West_Virginia	Wisconsin
Alaska	-1.77	-1.06	-1.82×10^{-4}	-1.14	-0.477
Hawaii	-1.64	-0.985	-1.45×10^{-4}	-1.06	-0.442
Washington	-0.497	-0.299	-1.05×10^{-4}	-0.32	-0.134
Colorado	-0.478	-0.287	-9.44×10^{-5}	-0.308	-0.129
California	-0.262	-0.157	-7.09×10^{-5}	-0.169	-0.0707
Rhode Island	-0.249	-0.15	-5.56×10^{-5}	-0.16	-0.0672
Pennsylvania	-0.191	-0.114	-4.93×10^{-5}	-0.123	-0.0514
New Jersey	-0.189	-0.113	-4.16×10^{-5}	-0.122	-0.0509
Delaware	-0.141	-0.0847	-3.57×10^{-5}	-0.0909	-0.038
Montana	-0.0351	-0.0211	-1.46×10^{-5}	-0.0226	-0.00946
Illinois	-0.0239	-0.0143	-9.88×10^{-6}	-0.0154	-0.00643
New Mexico	-0.0109	-0.00651	1.59×10^{-6}	-0.00699	-0.00293
Minnesota	0.0675	0.0405	3.49×10^{-6}	0.0434	0.0182
Oregon	0.0994	0.0597	5.14×10^{-6}	0.064	0.0268
Maine	0.244	0.146	2.07×10^{-5}	0.157	0.0657
New York	0.284	0.17	2.77×10^{-5}	0.183	0.0765
Maryland	0.337	0.202	2.79×10^{-5}	0.217	0.0907
Ohio	0.38	0.228	3.65×10^{-5}	0.245	0.102
Missouri	0.485	0.291	3.84×10^{-5}	0.312	0.131
Massachusetts	0.645	0.387	7.00×10^{-5}	0.415	0.174
Connecticut	0.715	0.429	7.28×10^{-5}	0.46	0.193
New Hampshire	0.991	0.595	2.40×10^{-4}	0.638	0.267
Vermont	1.24	0.745	2.59×10^{-4}	0.8	0.335

Table A.22: Synthetic Control Weights for Job Restriction or Transfer Workplace Injury Analysis

	Indiana	Kentucky	Michigan	West_Virginia	Wisconsin
Alaska	-1.77	-1.06	-1.82×10^{-4}	-1.14	-0.477
Hawaii	-1.64	-0.985	-1.45×10^{-4}	-1.06	-0.442
Washington	-0.497	-0.299	-1.05×10^{-4}	-0.32	-0.134
Colorado	-0.478	-0.287	-9.44×10^{-5}	-0.308	-0.129
California	-0.262	-0.157	-7.09×10^{-5}	-0.169	-0.0707
Rhode Island	-0.249	-0.15	-5.56×10^{-5}	-0.16	-0.0672
Pennsylvania	-0.191	-0.114	-4.93×10^{-5}	-0.123	-0.0514
New Jersey	-0.189	-0.113	-4.16×10^{-5}	-0.122	-0.0509
Delaware	-0.141	-0.0847	-3.57×10^{-5}	-0.0909	-0.038
Montana	-0.0351	-0.0211	-1.46×10^{-5}	-0.0226	-0.00946
Illinois	-0.0239	-0.0143	-9.88×10^{-6}	-0.0154	-0.00643
New Mexico	-0.0109	-0.00651	1.59×10^{-6}	-0.00699	-0.00293
Minnesota	0.0675	0.0405	3.49×10^{-6}	0.0434	0.0182
Oregon	0.0994	0.0597	5.14×10^{-6}	0.064	0.0268
Maine	0.244	0.146	2.07×10^{-5}	0.157	0.0657
New York	0.284	0.17	2.77×10^{-5}	0.183	0.0765
Maryland	0.337	0.202	2.79×10^{-5}	0.217	0.0907
Ohio	0.38	0.228	3.65×10^{-5}	0.245	0.102
Missouri	0.485	0.291	3.84×10^{-5}	0.312	0.131
Massachusetts	0.645	0.387	7.00×10^{-5}	0.415	0.174
Connecticut	0.715	0.429	7.28×10^{-5}	0.46	0.193
New Hampshire	0.991	0.595	2.40×10^{-4}	0.638	0.267
Vermont	1.24	0.745	2.59×10^{-4}	0.8	0.335

Table A.23: Synthetic Control Weights for Other Nonfatal Workplace Injury Analysis

	Indiana	Kentucky	Michigan	West_Virginia	Wisconsin
Alaska	-1.77	-1.06	-1.82×10^{-4}	-1.14	-0.477
Hawaii	-1.64	-0.985	-1.45×10^{-4}	-1.06	-0.442
Washington	-0.497	-0.299	-1.05×10^{-4}	-0.32	-0.134
Colorado	-0.478	-0.287	-9.44×10^{-5}	-0.308	-0.129
California	-0.262	-0.157	-7.09×10^{-5}	-0.169	-0.0707
Rhode Island	-0.249	-0.15	-5.56×10^{-5}	-0.16	-0.0672
Pennsylvania	-0.191	-0.114	-4.93×10^{-5}	-0.123	-0.0514
New Jersey	-0.189	-0.113	-4.16×10^{-5}	-0.122	-0.0509
Delaware	-0.141	-0.0847	-3.57×10^{-5}	-0.0909	-0.038
Montana	-0.0351	-0.0211	-1.46×10^{-5}	-0.0226	-0.00946
Illinois	-0.0239	-0.0143	-9.88×10^{-6}	-0.0154	-0.00643
New Mexico	-0.0109	-0.00651	1.59×10^{-6}	-0.00699	-0.00293
Minnesota	0.0675	0.0405	3.49×10^{-6}	0.0434	0.0182
Oregon	0.0994	0.0597	5.14×10^{-6}	0.064	0.0268
Maine	0.244	0.146	2.07×10^{-5}	0.157	0.0657
New York	0.284	0.17	2.77×10^{-5}	0.183	0.0765
Maryland	0.337	0.202	2.79×10^{-5}	0.217	0.0907
Ohio	0.38	0.228	3.65×10^{-5}	0.245	0.102
Missouri	0.485	0.291	3.84×10^{-5}	0.312	0.131
Massachusetts	0.645	0.387	7.00×10^{-5}	0.415	0.174
Connecticut	0.715	0.429	7.28×10^{-5}	0.46	0.193
New Hampshire	0.991	0.595	2.40×10^{-4}	0.638	0.267
Vermont	1.24	0.745	2.59×10^{-4}	0.8	0.335

Table A.24: Oklahoma Case Study Results

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer
Right to Work	0.0906***	-0.0490*	0.0596	0.184***
	(0.0205)	(0.0258)	(0.0420)	(0.0325)
Inspection Rate	0.0905	0.0255	-1.596	0.728*
	(0.348)	(0.473)	(1.242)	(0.424)
Age 25-34	-1.587***	-2.310***	-2.040*	-1.179*
	(0.516)	(0.694)	(1.134)	(0.692)
Age 35-44	-1.938**	-2.410***	-2.472	-1.759*
	(0.739)	(0.860)	(1.517)	(1.018)
Age 45-54	-2.137**	-2.397**	-4.647***	-1.556
	(0.826)	(0.994)	(1.492)	(0.928)
Age 55-64	-0.444	-1.186	-0.574	0.344
	(0.741)	(0.803)	(1.466)	(1.082)
Male	-0.210	-0.730	1.810*	-0.308
	(0.621)	(0.913)	(0.938)	(0.809)
White	-0.123	-0.508	-1.040	0.354
	(0.482)	(0.490)	(0.981)	(0.689)
Black	0.967	0.674	-0.806	1.767*
	(0.706)	(0.779)	(1.523)	(0.989)
Asian	0.0346	-0.387**	0.167	0.286
	(0.176)	(0.174)	(0.485)	(0.366)
Single	-0.585	-0.753	-1.180	-0.403
	(0.527)	(0.641)	(1.182)	(0.698)
Divorced	1.189**	1.556***	-1.306	1.916**
	(0.559)	(0.525)	(0.999)	(0.827)
HS Degree Only	-0.718	-1.043	-0.890	-0.668
	(0.575)	(0.662)	(1.226)	(0.754)
Obtained Bachelor's Degree'	-0.200	0.251	-1.053	-0.643
	(0.450)	(0.650)	(1.037)	(0.673)
Frac. of Lower Rep.	-0.00906	-0.0166	-0.0119	0.00976
	(0.0305)	(0.0269)	(0.0647)	(0.0502)
Maximum Temperature	0.00362**	0.00206	0.00540**	0.00377*
	(0.00147)	(0.00166)	(0.00259)	(0.00200)
Monthly Precipitation	0.00484	-0.00207	0.00877	0.00924
	(0.00636)	(0.00574)	(0.0107)	(0.00950)
N	771	771	771	771

Table A.25: Indiana Case Study Results

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer
Right to Work	-0.134***	-0.222***	-0.0391	-0.142***
	(0.0187)	(0.0214)	(0.0336)	(0.0239)
Inspection Rate	0.0742	0.0227	-1.607	0.707
	(0.357)	(0.491)	(1.252)	(0.419)
Age 25-34	-1.573***	-2.319***	-2.088*	-1.125
	(0.512)	(0.691)	(1.118)	(0.688)
Age 35-44	-1.979**	-2.509***	-2.656*	-1.720
	(0.747)	(0.862)	(1.526)	(1.022)
Age 45-54	-2.083**	-2.401**	-4.743***	-1.406
	(0.814)	(0.990)	(1.490)	(0.908)
Age 55-64	-0.277	-0.973	-0.904	0.677
	(0.701)	(0.765)	(1.493)	(0.992)
Male	-0.103	-0.593	1.812*	-0.176
	(0.609)	(0.909)	(0.897)	(0.790)
White	-0.0294	-0.388	-1.005	0.445
	(0.475)	(0.467)	(1.029)	(0.703)
Black	1.039	0.611	-0.774	1.892*
	(0.693)	(0.786)	(1.533)	(0.980)
Asian	0.0850	-0.323*	0.168	0.344
	(0.148)	(0.182)	(0.495)	(0.307)
Single	-0.560	-0.682	-1.270	-0.358
	(0.515)	(0.625)	(1.173)	(0.686)
Divorced	1.210**	1.486***	-1.194	1.948**
	(0.547)	(0.519)	(1.006)	(0.813)
HS Degree Only	-0.745	-1.114*	-0.885	-0.684
	(0.571)	(0.655)	(1.236)	(0.748)
Obtained Bachelor's Degree'	-0.180	0.257	-1.029	-0.604
	(0.448)	(0.645)	(1.051)	(0.675)
Frac. of Lower Rep.	-0.00913	-0.0171	-0.0125	0.00943
	(0.0306)	(0.0263)	(0.0645)	(0.0501)
Maximum Temperature	0.00309**	0.00198	0.00441*	0.00307
	(0.00144)	(0.00174)	(0.00248)	(0.00195)
Monthly Precipitation	0.00202	-0.00512	0.00724	0.00548
	(0.00616)	(0.00605)	(0.0109)	(0.00906)
N	777	777	777	777

Table A.26: Kentucky Case Study Results

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer
Right to Work	-0.102***	-0.122***	-0.106**	-0.0901***
	(0.0234)	(0.0236)	(0.0436)	(0.0281)
Inspection Rate	0.123	0.0257	-1.533	0.762*
	(0.363)	(0.506)	(1.204)	(0.434)
Age 25-34	-1.528***	-2.276***	-2.067*	-1.060
	(0.517)	(0.696)	(1.128)	(0.693)
Age 35-44	-1.886**	-2.382***	-2.664*	-1.599
	(0.731)	(0.846)	(1.503)	(1.003)
Age 45-54	-2.035**	-2.343**	-4.673***	-1.360
	(0.807)	(0.971)	(1.495)	(0.903)
Age 55-64	-0.157	-0.880	-0.730	0.792
	(0.706)	(0.784)	(1.487)	(1.006)
Male	-0.239	-0.739	1.685*	-0.336
	(0.624)	(0.906)	(0.934)	(0.813)
White	-0.0217	-0.345	-1.063	0.472
	(0.478)	(0.459)	(1.027)	(0.704)
Black	1.122	0.827	-0.751	1.970*
	(0.714)	(0.784)	(1.541)	(1.006)
Asian	0.0845	-0.315*	0.144	0.348
	(0.147)	(0.181)	(0.492)	(0.307)
Single	-0.567	-0.719	-1.385	-0.319
	(0.519)	(0.627)	(1.170)	(0.674)
Divorced	0.976*	1.284**	-1.589	1.740**
	(0.562)	(0.553)	(0.998)	(0.811)
HS Degree Only	-0.775	-1.180*	-0.821	-0.726
	(0.534)	(0.609)	(1.162)	(0.702)
Obtained Bachelor's Degree'	-0.184	0.223	-0.925	-0.640
	(0.427)	(0.613)	(1.017)	(0.651)
Frac. of Lower Rep.	-0.00830	-0.0152	-0.0105	0.00972
	(0.0310)	(0.0274)	(0.0629)	(0.0504)
Maximum Temperature	0.00322**	0.00208	0.00399	0.00341*
	(0.00146)	(0.00174)	(0.00252)	(0.00196)
Monthly Precipitation	0.00305	-0.00256	0.00764	0.00627
	(0.00594)	(0.00552)	(0.0107)	(0.00877)
N	777	777	777	777

Table A.27: Michigan Case Study Results

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer
Right to Work	-0.168***	-0.107***	-0.260***	-0.151***
	(0.0205)	(0.0199)	(0.0321)	(0.0251)
Inspection Rate	0.0980	-0.0267	-1.485	0.743*
	(0.345)	(0.485)	(1.161)	(0.428)
Age 25-34	-1.563***	-2.322***	-2.088*	-1.115
	(0.521)	(0.697)	(1.115)	(0.698)
Age 35-44	-1.926**	-2.398***	-2.654*	-1.679
	(0.738)	(0.856)	(1.521)	(1.012)
Age 45-54	-2.156**	-2.428**	-4.905***	-1.459
	(0.816)	(0.983)	(1.490)	(0.905)
Age 55-64	-0.274	-0.929	-0.972	0.702
	(0.709)	(0.774)	(1.515)	(0.999)
Male	-0.0598	-0.692	2.139**	-0.157
	(0.620)	(0.900)	(0.953)	(0.810)
White	0.0290	-0.299	-0.979	0.507
	(0.479)	(0.460)	(1.039)	(0.708)
Black	1.086	0.762	-0.834	1.945*
	(0.707)	(0.781)	(1.549)	(1.004)
Asian	0.0876	-0.314	0.179	0.345
	(0.149)	(0.187)	(0.506)	(0.309)
Single	-0.479	-0.637	-1.076	-0.311
	(0.518)	(0.629)	(1.134)	(0.684)
Divorced	1.104*	1.468***	-1.359	1.817**
	(0.566)	(0.535)	(1.026)	(0.834)
HS Degree Only	-0.788	-1.137*	-1.031	-0.703
	(0.554)	(0.630)	(1.231)	(0.733)
Obtained Bachelor's Degree'	-0.263	0.166	-1.179	-0.672
	(0.443)	(0.636)	(1.032)	(0.667)
Frac. of Lower Rep.	-0.0180	-0.0220	-0.0305	0.00224
	(0.0306)	(0.0265)	(0.0684)	(0.0493)
Maximum Temperature	0.00316**	0.00211	0.00437*	0.00312
	(0.00144)	(0.00172)	(0.00248)	(0.00195)
Monthly Precipitation	0.00238	-0.00345	0.00701	0.00543
	(0.00613)	(0.00563)	(0.0109)	(0.00904)
N	777	777	777	777

Table A.28: West Virginia Case Study Results

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer
Right to Work	-0.0584***	-0.308***	0.303***	0.0496
	(0.0194)	(0.0243)	(0.0489)	(0.0324)
Inspection Rate	0.0364	-0.0838	-1.609	0.691
	(0.372)	(0.513)	(1.295)	(0.413)
Age 25-34	-1.587***	-2.058***	-2.412**	-1.271*
	(0.513)	(0.749)	(1.142)	(0.681)
Age 35-44	-1.933**	-2.225**	-2.900*	-1.774*
	(0.735)	(0.876)	(1.514)	(1.004)
Age 45-54	-2.097**	-2.058**	-5.141***	-1.610*
	(0.795)	(1.007)	(1.469)	(0.901)
Age 55-64	-0.139	-0.697	-0.937	0.732
	(0.704)	(0.809)	(1.545)	(1.005)
Male	-0.0477	-0.712	1.760*	0.0192
	(0.596)	(0.904)	(0.916)	(0.796)
White	0.0170	-0.290	-0.993	0.493
	(0.479)	(0.475)	(1.020)	(0.708)
Black	1.140	0.702	-0.672	2.096**
	(0.707)	(0.798)	(1.559)	(1.006)
Asian	0.103	-0.315	0.163	0.381
	(0.144)	(0.189)	(0.463)	(0.324)
Single	-0.550	-0.612	-1.258	-0.404
	(0.505)	(0.642)	(1.146)	(0.669)
Divorced	1.252**	1.153*	-0.457	2.165**
	(0.519)	(0.578)	(1.243)	(0.810)
HS Degree Only	-0.716	-1.055	-0.896	-0.662
	(0.552)	(0.633)	(1.195)	(0.732)
Obtained Bachelor's Degree'	-0.152	0.179	-0.911	-0.524
	(0.450)	(0.648)	(1.050)	(0.682)
Frac. of Lower Rep.	-0.00549	-0.0319	0.0163	0.0239
	(0.0289)	(0.0280)	(0.0648)	(0.0503)
Maximum Temperature	0.00309**	0.00201	0.00440*	0.00309
	(0.00143)	(0.00174)	(0.00245)	(0.00195)
Monthly Precipitation	0.00270	-0.00261	0.00649	0.00584
	(0.00602)	(0.00562)	(0.0108)	(0.00895)
N	775	775	775	775

Table A.29: Wisconsin Case Study Results

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer
Right to Work	-0.113***	-0.151***	-0.0664*	-0.123***
	(0.0185)	(0.0167)	(0.0371)	(0.0248)
Inspection Rate	-0.0399	-0.161	-1.643	0.594
	(0.387)	(0.514)	(1.268)	(0.430)
Age 25-34	-1.612***	-2.355***	-2.083*	-1.178
	(0.526)	(0.711)	(1.116)	(0.708)
Age 35-44	-1.897**	-2.405***	-2.610*	-1.629
	(0.744)	(0.862)	(1.511)	(1.018)
Age 45-54	-2.134**	-2.454**	-4.715***	-1.484
	(0.815)	(0.984)	(1.492)	(0.909)
Age 55-64	-0.376	-1.168	-0.849	0.568
	(0.716)	(0.816)	(1.474)	(1.006)
Male	0.0825	-0.445	1.920**	0.0599
	(0.668)	(0.960)	(0.904)	(0.860)
White	-0.00122	-0.288	-1.021	0.460
	(0.486)	(0.477)	(1.033)	(0.709)
Black	0.984	0.675	-0.833	1.816*
	(0.716)	(0.798)	(1.542)	(1.009)
Asian	0.105	-0.289	0.168	0.367
	(0.150)	(0.200)	(0.495)	(0.301)
Single	-0.540	-0.696	-1.236	-0.324
	(0.523)	(0.642)	(1.162)	(0.694)
Divorced	1.022*	1.321**	-1.357	1.740**
	(0.585)	(0.563)	(1.012)	(0.852)
HS Degree Only	-0.796	-1.170*	-0.834	-0.762
	(0.573)	(0.647)	(1.215)	(0.751)
Obtained Bachelor's Degree'	-0.242	0.133	-0.955	-0.674
	(0.447)	(0.644)	(1.029)	(0.676)
Frac. of Lower Rep.	-0.0200	-0.0292	-0.0204	-0.00197
	(0.0313)	(0.0285)	(0.0647)	(0.0505)
Maximum Temperature	0.00300**	0.00201	0.00406	0.00296
	(0.00145)	(0.00169)	(0.00247)	(0.00197)
Monthly Precipitation	0.00281	-0.00280	0.00718	0.00584
	(0.00608)	(0.00564)	(0.0107)	(0.00899)
N	777	777	777	777

Appendix B

Additional Tables and Figures for Chapter 2

Figure B.1: Fatal and Nonfatal Workplace Injury Trends

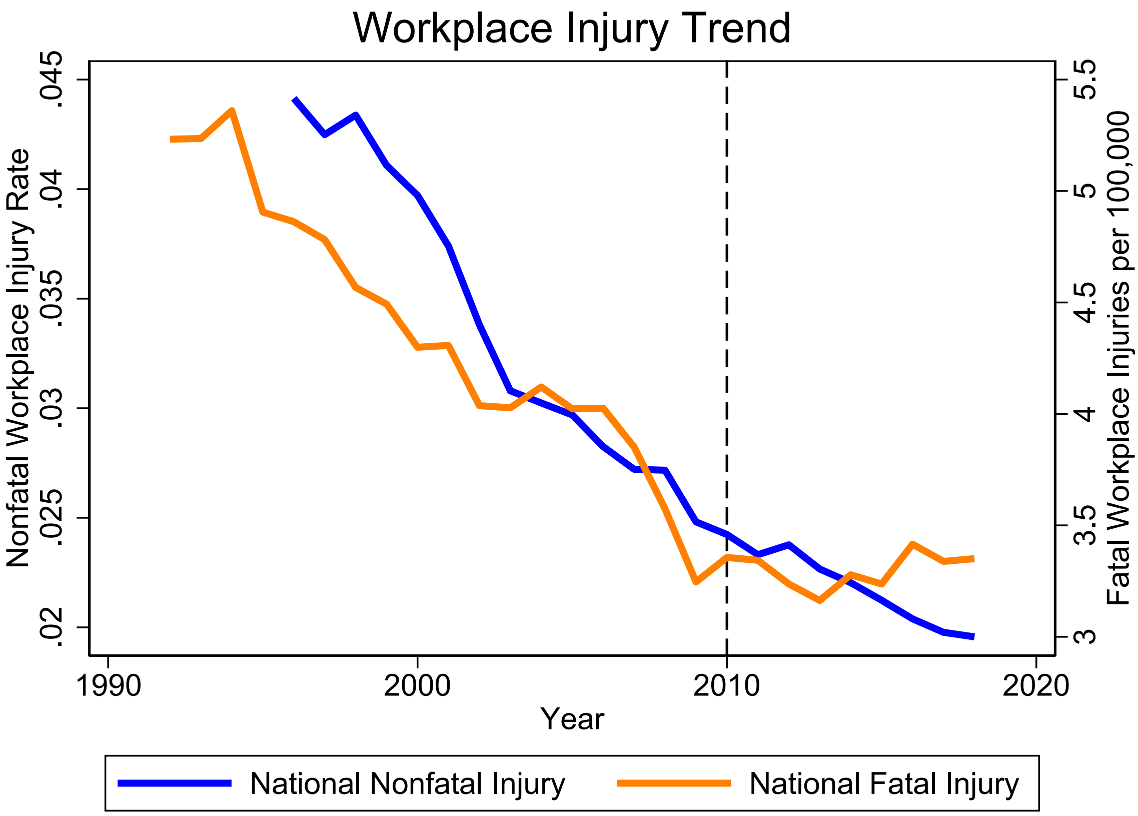


Table B.1: Full Workforce Summary Statistics for 50 U.S. States from 1992-2018

	mean	sd	min	max
Fatal Injuries per 100,000	5.568	3.253	0.981	40.97
Nonfatal Injuries per 100	4.025	1.300	1.596	8.751
Lost Workdays Cases per 100	1.243	0.454	0.506	2.943
Job Restriction/Transfer Cases per 100	0.729	0.324	0.100	1.991
Other Cases per 100	2.054	0.762	0.687	4.990
Right to Work	0.450	0.498	0	1
OSHA Inspection Rate	0.0149	0.0114	0.00284	0.187
Aged 15-24	0.156	0.0221	0.101	0.265
Aged 25-34	0.223	0.0245	0.157	0.300
Aged 35-44	0.236	0.0313	0.164	0.331
Aged 45-54	0.214	0.0227	0.142	0.279
Aged 55-64	0.130	0.0335	0.0621	0.218
Fraction Male	0.532	0.0127	0.494	0.582
Fraction White	0.838	0.124	0.196	0.991
Fraction Black	0.0956	0.0896	0.000698	0.366
Fraction Asian	0.0401	0.0864	0.00164	0.735
Fraction Single	0.281	0.0330	0.188	0.384
Fraction Married	0.572	0.0326	0.478	0.668
Fraction Divorced	0.108	0.0161	0.0688	0.165
Obtained HS Degree Only	0.604	0.0478	0.435	0.708
Obtained Bachelor's Degree	0.282	0.0610	0.143	0.504
all_unionmemr	0.117	0.0571	0.0169	0.288
all_unioncovr	0.132	0.0575	0.0261	0.318
Fraction of Lower House Republican	0.539	0.317	0	1
Maximum Temperature	85.99	6.346	58.80	102.9
Monthly Precipitation	3.119	1.237	0.377	6.148

See table 2.2 for a description of variables.

Table B.2: Private Industry Summary Statistics for 50 U.S. States from 1992-2018

	mean	sd	min	max
Fatal Injuries per 100,000	5.300	3.155	0.914	39.85
Nonfatal Injuries per 100	3.688	1.326	1.472	8.302
Lost Workdays Cases per 100	1.131	0.440	0.423	2.784
Job Restriction/Transfer Cases per 100	0.708	0.321	0.0983	2.001
Other Cases per 100	1.849	0.770	0.588	4.693
Right to Work	0.450	0.498	0	1
OSHA Inspection Rate	0.0149	0.0114	0.00284	0.187
Aged 15-24	0.161	0.0227	0.104	0.276
Aged 25-34	0.224	0.0246	0.158	0.302
Aged 35-44	0.234	0.0312	0.162	0.330
Aged 45-54	0.211	0.0227	0.142	0.268
Aged 55-64	0.129	0.0331	0.0596	0.217
Fraction Male	0.532	0.0132	0.493	0.585
Fraction White	0.840	0.124	0.197	0.992
Fraction Black	0.0942	0.0885	0.000732	0.363
Fraction Asian	0.0405	0.0863	0.00173	0.732
Fraction Single	0.286	0.0334	0.193	0.386
Fraction Married	0.568	0.0330	0.474	0.666
Fraction Divorced	0.107	0.0161	0.0688	0.164
Obtained HS Degree Only	0.606	0.0481	0.435	0.709
Obtained Bachelor's Degree	0.277	0.0608	0.139	0.503
priv_unionmemr	0.108	0.0519	0.0161	0.274
priv_unioncovr	0.121	0.0521	0.0244	0.303
Fraction of Lower House Republican	0.539	0.317	0	1
Maximum Temperature	85.99	6.346	58.80	102.9
Monthly Precipitation	3.119	1.237	0.377	6.148

See table 2.2 for a description of variables.

Table B.3: Public Industry Summary Statistics for 50 U.S. States from 1992-2018

	mean	sd	min	max
Fatal Injuries per 100,000	10.65	8.376	0	106.0
Nonfatal Injuries per 100	13.10	5.229	2.587	32.19
Lost Workdays Cases per 100	4.215	2.282	0.843	17.37
Job Restriction/Transfer Cases per 100	1.473	0.911	0.0658	5.735
Other Cases per 100	7.448	3.236	1.030	27.21
Right to Work	0.450	0.498	0	1
OSHA Inspection Rate	0.0149	0.0114	0.00284	0.187
Aged 15-24	0.0545	0.0215	0.00273	0.173
Aged 25-34	0.205	0.0430	0.0892	0.377
Aged 35-44	0.270	0.0506	0.121	0.468
Aged 45-54	0.276	0.0451	0.121	0.488
Aged 55-64	0.157	0.0521	0.0257	0.301
Fraction Male	0.544	0.0458	0.351	0.709
Fraction White	0.812	0.137	0.132	1
Fraction Black	0.122	0.112	1.00e-08	0.475
Fraction Asian	0.0301	0.0892	1.00e-08	0.782
Fraction Single	0.184	0.0454	0.0647	0.352
Fraction Married	0.649	0.0514	0.484	0.801
Fraction Divorced	0.129	0.0322	0.0340	0.253
Obtained HS Degree Only	0.583	0.0712	0.312	0.777
Obtained Bachelor's Degree	0.391	0.0766	0.208	0.683
pub_unionmemr	0.287	0.175	0.0159	0.754
pub_unioncovr	0.327	0.179	0.0159	0.758
Fraction of Lower House Republican	0.539	0.317	0	1
Maximum Temperature	85.99	6.346	58.80	102.9
Monthly Precipitation	3.119	1.237	0.377	6.148

See table 2.2 for a description of variables.

Table B.4: Construction Industry Summary Statistics for 50 U.S. States from 1992-2018

	mean	sd	min	max
Fatal Injuries per 100,000	12.73	7.776	0	92.07
Nonfatal Injuries per 100	4.145	2.040	0.526	14.82
Lost Workdays Cases per 100	1.593	0.795	0.132	4.841
Job Restriction/Transfer Cases per 100	0.514	0.308	0	2.711
Other Cases per 100	2.039	1.195	0.230	8.706
Right to Work	0.450	0.498	0	1
OSHA Inspection Rate	0.0149	0.0114	0.00284	0.187
Aged 15-24	0.125	0.0383	0.0428	0.303
Aged 25-34	0.250	0.0421	0.102	0.401
Aged 35-44	0.266	0.0440	0.143	0.445
Aged 45-54	0.215	0.0414	0.0927	0.339
Aged 55-64	0.116	0.0402	0.0278	0.288
Fraction Male	0.907	0.0197	0.832	0.973
Fraction White	0.898	0.107	0.214	1
Fraction Black	0.0542	0.0599	1.00e-08	0.304
Fraction Asian	0.0196	0.0787	1.00e-08	0.728
Fraction Single	0.257	0.0413	0.105	0.423
Fraction Married	0.601	0.0426	0.468	0.767
Fraction Divorced	0.112	0.0266	0.0449	0.217
Obtained HS Degree Only	0.710	0.0680	0.488	0.855
Obtained Bachelor's Degree	0.109	0.0343	0.0151	0.229
con_unionmemr	0.166	0.114	0	0.561
con_unioncovr	0.175	0.115	0	0.566
Fraction of Lower House Republican	0.539	0.317	0	1
Maximum Temperature	85.99	6.346	58.80	102.9
Monthly Precipitation	3.119	1.237	0.377	6.148

See table 2.2 for a description of variables.

Table B.5: Manufacturing Industry Summary Statistics for 50 U.S. States from 1992-2018

	mean	sd	min	max
Fatal Injuries per 100,000	3.767	8.992	0	201.0
Nonfatal Injuries per 100	6.050	3.670	0.251	29.87
Lost Workdays Cases per 100	1.619	1.367	0	12.97
Job Restriction/Transfer Cases per 100	1.592	0.896	0	5.591
Other Cases per 100	2.844	1.868	0.251	13.63
Right to Work	0.450	0.498	0	1
OSHA Inspection Rate	0.0149	0.0114	0.00284	0.187
Aged 15-24	0.0987	0.0299	0.0289	0.239
Aged 25-34	0.222	0.0436	0.0835	0.369
Aged 35-44	0.263	0.0450	0.128	0.395
Aged 45-54	0.246	0.0425	0.117	0.377
Aged 55-64	0.142	0.0477	0.0346	0.295
Fraction Male	0.697	0.0425	0.510	0.850
Fraction White	0.832	0.131	0.148	0.998
Fraction Black	0.0929	0.102	1.00e-08	0.524
Fraction Asian	0.0506	0.0936	1.00e-08	0.797
Fraction Single	0.225	0.0409	0.115	0.453
Fraction Married	0.621	0.0437	0.431	0.736
Fraction Divorced	0.116	0.0234	0.0171	0.200
Obtained HS Degree Only	0.657	0.0739	0.399	0.849
Obtained Bachelor's Degree	0.217	0.0765	0.0627	0.544
man_unionmemr	0.122	0.0724	0	0.411
man_unioncovr	0.133	0.0741	0	0.428
Fraction of Lower House Republican	0.539	0.317	0	1
Maximum Temperature	85.99	6.346	58.80	102.9
Monthly Precipitation	3.119	1.237	0.377	6.148

See Table 2.2 for a description of variables.

Table B.6: Wholesale Industry Summary Statistics for 50 U.S. States from 1992-2018

	mean	sd	min	max
Fatal Injuries per 100,000	4.472	6.165	0	101.5
Nonfatal Injuries per 100	6.220	2.136	1.768	15.76
Lost Workdays Cases per 100	2.152	0.882	0.506	6.062
Job Restriction/Transfer Cases per 100	1.425	0.680	0	5.112
Other Cases per 100	2.653	1.294	0	8.487
Right to Work	0.450	0.498	0	1
OSHA Inspection Rate	0.0149	0.0114	0.00284	0.187
Aged 15-24	0.0960	0.0356	0	0.246
Aged 25-34	0.233	0.0542	0.0863	0.460
Aged 35-44	0.260	0.0557	0.0645	0.460
Aged 45-54	0.229	0.0536	0.0679	0.408
Aged 55-64	0.141	0.0521	0.00321	0.402
Fraction Male	0.720	0.0490	0.553	0.904
Fraction White	0.882	0.124	0.133	1
Fraction Black	0.0655	0.0692	1.00e-08	0.380
Fraction Asian	0.0346	0.0933	1.00e-08	0.784
Fraction Single	0.218	0.0510	0.0822	0.434
Fraction Married	0.643	0.0590	0.360	0.835
Fraction Divorced	0.107	0.0340	0.0235	0.290
Obtained HS Degree Only	0.658	0.0743	0.427	0.894
Obtained Bachelor's Degree	0.254	0.0728	0.0427	0.517
whole_unionmemr	0.0464	0.0374	0	0.210
whole_unioncovr	0.0518	0.0394	0	0.243
Fraction of Lower House Republican	0.539	0.317	0	1
Maximum Temperature	85.99	6.346	58.80	102.9
Monthly Precipitation	3.119	1.237	0.377	6.148

See Table 2.2 for a description of variables.

Table B.7: Retail Industry Summary Statistics for 50 U.S. States from 1992-2018

	mean	sd	min	max
Fatal Injuries per 100,000	2.339	2.116	0	15.06
Nonfatal Injuries per 100	4.392	1.379	0.230	9.438
Lost Workdays Cases per 100	1.311	0.499	0.115	3.282
Job Restriction/Transfer Cases per 100	0.829	0.341	0.0924	2.299
Other Cases per 100	2.256	0.996	0.698	6.589
Right to Work	0.450	0.498	0	1
OSHA Inspection Rate	0.0149	0.0114	0.00284	0.187
Aged 15-24	0.289	0.0585	0.132	0.478
Aged 25-34	0.215	0.0313	0.128	0.337
Aged 35-44	0.184	0.0263	0.108	0.263
Aged 45-54	0.160	0.0316	0.0731	0.249
Aged 55-64	0.107	0.0347	0.0311	0.218
Fraction Male	0.493	0.0360	0.377	0.594
Fraction White	0.839	0.132	0.145	0.995
Fraction Black	0.0926	0.0904	1.00e-08	0.405
Fraction Asian	0.0420	0.0908	1.00e-08	0.747
Fraction Single	0.404	0.0503	0.217	0.533
Fraction Married	0.457	0.0415	0.341	0.606
Fraction Divorced	0.0979	0.0220	0.0428	0.177
Obtained HS Degree Only	0.693	0.0423	0.573	0.819
Obtained Bachelor's Degree	0.151	0.0465	0.0486	0.331
retail_unionmemr	0.0429	0.0352	0	0.176
retail_unioncovr	0.0480	0.0366	0	0.181
Fraction of Lower House Republican	0.539	0.317	0	1
Maximum Temperature	85.99	6.346	58.80	102.9
Monthly Precipitation	3.119	1.237	0.377	6.148

See Table 2.2 for a description of variables.

Table B.8: Transportation and Warehousing Industry Summary Statistics for 50 U.S. States from 1992-2018

	mean	sd	min	max
Fatal Injuries per 100,000	17.29	13.56	0	105.4
Nonfatal Injuries per 100	4.892	1.946	0.517	12.72
Lost Workdays Cases per 100	2.192	0.963	0.310	6.739
Job Restriction/Transfer Cases per 100	0.979	0.475	0	2.805
Other Cases per 100	1.727	0.963	0.103	7.167
Right to Work	0.450	0.498	0	1
OSHA Inspection Rate	0.0149	0.0114	0.00284	0.187
Aged 15-24	0.0810	0.0293	0	0.234
Aged 25-34	0.204	0.0511	0.0938	0.395
Aged 35-44	0.259	0.0563	0.0820	0.554
Aged 45-54	0.261	0.0459	0.133	0.407
Aged 55-64	0.155	0.0542	0.0366	0.338
Fraction Male	0.753	0.0450	0.593	0.915
Fraction White	0.810	0.155	0.122	1
Fraction Black	0.133	0.124	1.00e-08	0.565
Fraction Asian	0.0333	0.0919	1.00e-08	0.823
Fraction Single	0.211	0.0579	0.0624	0.435
Fraction Married	0.626	0.0648	0.424	0.824
Fraction Divorced	0.126	0.0334	0.0239	0.324
Obtained HS Degree Only	0.752	0.0473	0.580	0.876
Obtained Bachelor's Degree	0.152	0.0470	0.0351	0.358
tran_unionmemr	0.305	0.0934	0.0256	0.638
tran_unioncovr	0.325	0.0943	0.0256	0.638
Fraction of Lower House Republican	0.539	0.317	0	1
Maximum Temperature	85.99	6.346	58.80	102.9
Monthly Precipitation	3.119	1.237	0.377	6.148

See Table 2.2 for a description of variables.

Table B.9: Financial Activity Industry Summary Statistics for 50 U.S. States from 1992-2018

	mean	sd	min	max
Fatal Injuries per 100,000	0.687	1.530	0	22.35
Nonfatal Injuries per 100	1.232	0.593	0	4.506
Lost Workdays Cases per 100	0.382	0.241	0	2.406
Job Restriction/Transfer Cases per 100	0.124	0.129	0	1.000
Other Cases per 100	0.708	0.391	0	3.044
Right to Work	0.450	0.498	0	1
OSHA Inspection Rate	0.0149	0.0114	0.00284	0.187
Aged 15-24	0.0967	0.0334	0.0197	0.269
Aged 25-34	0.237	0.0422	0.125	0.395
Aged 35-44	0.246	0.0409	0.109	0.386
Aged 45-54	0.226	0.0367	0.115	0.348
Aged 55-64	0.144	0.0438	0.0295	0.296
Fraction Male	0.418	0.0532	0.259	0.596
Fraction White	0.863	0.118	0.181	1
Fraction Black	0.0792	0.0722	1.00e-08	0.322
Fraction Asian	0.0391	0.0879	1.00e-08	0.775
Fraction Single	0.215	0.0482	0.0654	0.416
Fraction Married	0.633	0.0529	0.431	0.813
Fraction Divorced	0.115	0.0296	0.0192	0.250
Obtained HS Degree Only	0.578	0.0879	0.270	0.826
Obtained Bachelor's Degree	0.390	0.0944	0.152	0.725
fin_unionmemr	0.0189	0.0191	0	0.138
fin_unioncovr	0.0249	0.0220	0	0.147
Fraction of Lower House Republican	0.539	0.317	0	1
Maximum Temperature	85.99	6.346	58.80	102.9
Monthly Precipitation	3.119	1.237	0.377	6.148

See Table 2.2 for a description of variables.

Table B.10: Service Industry Summary Statistics for 50 U.S. States from 1992-2018

	mean	sd	min	max
Fatal Injuries per 100,000	1.700	1.264	0	13.07
Nonfatal Injuries per 100	2.866	0.815	0.817	6.971
Lost Workdays Cases per 100	0.831	0.325	0.237	2.508
Job Restriction/Transfer Cases per 100	0.459	0.230	0	1.643
Other Cases per 100	1.575	0.481	0.474	4.436
Right to Work	0.450	0.498	0	1
OSHA Inspection Rate	0.0149	0.0114	0.00284	0.187
Aged 15-24	0.157	0.0266	0.0915	0.279
Aged 25-34	0.225	0.0237	0.153	0.308
Aged 35-44	0.233	0.0360	0.135	0.344
Aged 45-54	0.212	0.0225	0.140	0.290
Aged 55-64	0.130	0.0298	0.0578	0.218
Fraction Male	0.381	0.0324	0.282	0.484
Fraction White	0.827	0.124	0.207	0.994
Fraction Black	0.103	0.0930	1.00e-08	0.382
Fraction Asian	0.0435	0.0855	0.00155	0.730
Fraction Single	0.287	0.0439	0.163	0.394
Fraction Married	0.562	0.0422	0.445	0.678
Fraction Divorced	0.107	0.0178	0.0703	0.181
Obtained HS Degree Only	0.532	0.0443	0.378	0.662
Obtained Bachelor's Degree	0.374	0.0536	0.203	0.566
serv_unionmemr	0.109	0.0619	0.0114	0.322
serv_unioncovr	0.128	0.0619	0.0148	0.360
Fraction of Lower House Republican	0.539	0.317	0	1
Maximum Temperature	85.99	6.346	58.80	102.9
Monthly Precipitation	3.119	1.237	0.377	6.148

See Table 2.2 for a description of variables.

Table B.11: Full Workforce Results: Model 1

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	0.119**	0.127**	-0.0795**	-0.139***	-0.0480	-0.0514
	(0.0549)	(0.0500)	(0.0356)	(0.0311)	(0.0686)	(0.0503)
Inspection Rate	1.785	1.859**	0.209	0.172	-1.399	0.822*
	(1.102)	(0.837)	(0.340)	(0.495)	(1.101)	(0.460)
Age 25-34	-0.959	-1.262	-1.608***	-2.065***	-2.119*	-1.405**
	(0.989)	(0.942)	(0.498)	(0.695)	(1.115)	(0.696)
Age 35-44	-2.033*	-1.565	-1.893**	-2.059**	-2.807*	-1.834*
	(1.189)	(1.302)	(0.720)	(0.832)	(1.463)	(0.985)
Age 45-54	0.00343	-0.151	-2.459***	-2.255**	-5.032***	-2.156**
	(1.167)	(1.484)	(0.801)	(0.926)	(1.442)	(0.949)
Age 55-64	0.154	-0.458	-1.036	-1.142	-1.483	-0.613
	(1.349)	(1.734)	(0.753)	(0.776)	(1.456)	(1.105)
Male	2.537**	1.617	0.255	-0.360	1.923**	0.301
	(1.223)	(1.215)	(0.588)	(0.806)	(0.847)	(0.771)
White	-0.242	0.0271	-0.443	-0.769	-1.288	-0.0463
	(0.697)	(0.671)	(0.508)	(0.531)	(0.907)	(0.688)
Black	0.954	1.194	0.459	0.105	-1.056	1.084
	(1.278)	(1.222)	(0.680)	(0.780)	(1.373)	(0.953)
Asian	-0.245	0.120	0.00834	-0.371**	0.0391	0.247
	(0.647)	(0.499)	(0.206)	(0.172)	(0.439)	(0.448)
Single	0.350	-0.0869	-0.767	-0.741	-1.313	-0.748
	(0.829)	(1.126)	(0.497)	(0.601)	(1.013)	(0.649)
Divorced	4.643***	2.866***	0.986*	0.625	-0.344	1.971**
	(0.780)	(0.879)	(0.500)	(0.542)	(1.267)	(0.775)
HS Degree Only	-0.640	-0.384	-0.378	-0.642	-0.846	-0.272
	(0.632)	(0.780)	(0.546)	(0.609)	(1.119)	(0.700)
Obtained Bachelor's Degree'	1.309	1.753	0.113	0.540	-0.881	-0.257
	(0.989)	(1.098)	(0.456)	(0.599)	(0.973)	(0.640)
Frac. of Lower Rep.	0.0719	-0.0293	-0.0219	-0.0537*	0.0215	0.00622
	(0.0617)	(0.0533)	(0.0305)	(0.0314)	(0.0709)	(0.0530)
Maximum Temperature	0.00360	0.00322	0.00280**	0.00167	0.00469**	0.00279
	(0.00254)	(0.00379)	(0.00132)	(0.00148)	(0.00224)	(0.00181)
Monthly Precipitation	0.0144	0.0308***	0.00290	-0.00353	0.00501	0.00733
	(0.0109)	(0.00949)	(0.00516)	(0.00514)	(0.00944)	(0.00759)
Constant	-6.404***	-6.266***	3.425***	3.216***	3.228*	2.014
	(1.633)	(1.759)	(0.851)	(0.937)	(1.723)	(1.253)
N	1350	943	943	943	943	943
r2	0.861	0.854	0.944	0.948	0.939	0.923

Robust standard errors are clustered at the state level.
Independent variable of interest in the unemployment rate.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.12: Full Workforce Results: Model 2

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
all_recession	-0.106*	-0.199***	-0.201***	-0.250***	-0.185***
	(0.0627)	(0.0439)	(0.0429)	(0.0607)	(0.0588)
all_expansion	-0.107*	-0.191***	-0.196***	-0.243***	-0.175***
	(0.0610)	(0.0422)	(0.0417)	(0.0595)	(0.0564)
Fraction Construction	-0.331	0.610	1.475	1.026	0.0245
	(1.754)	(0.781)	(0.961)	(1.403)	(1.021)
Fraction Manufacturing	-0.903	-0.258	-0.521	1.659	-0.243
	(1.448)	(0.485)	(0.601)	(1.149)	(0.693)
Fraction Transportation/Warehouse	-2.111	-1.323	-1.286	0.514	-1.562
	(1.775)	(1.038)	(1.099)	(1.826)	(1.232)
Fraction Wholesale	-2.094	0.931	-0.217	0.699	1.787
	(2.838)	(1.131)	(1.223)	(2.087)	(1.720)
Fraction Retail	-0.432	-0.927	0.500	-1.012	-1.724*
	(1.468)	(0.637)	(0.642)	(1.449)	(0.946)
Fraction Services	-0.356	-0.300	0.373	0.346	-0.773
	(1.218)	(0.540)	(0.543)	(0.918)	(0.782)
Inspection Rate	1.706	0.145	0.0727	-1.418	0.785
	(1.097)	(0.337)	(0.527)	(0.955)	(0.533)
Age 25-34	-1.075	-1.613***	-1.946***	-2.634***	-1.385*
	(0.914)	(0.472)	(0.639)	(0.970)	(0.691)
Age 35-44	-2.019*	-1.709**	-1.695**	-3.164**	-1.663*
	(1.191)	(0.663)	(0.827)	(1.270)	(0.892)
Age 45-54	0.426	-2.044***	-1.861**	-5.245***	-1.632*
	(1.237)	(0.745)	(0.914)	(1.261)	(0.878)
Age 55-64	0.558	-0.886	-0.642	-2.412**	-0.461
	(1.370)	(0.683)	(0.749)	(1.157)	(1.048)
Male	0.847	0.0651	-0.454	1.795*	0.0232
	(1.114)	(0.502)	(0.706)	(0.901)	(0.763)
White	0.273	-0.256	-0.843*	-1.045	0.364
	(0.802)	(0.448)	(0.468)	(0.927)	(0.674)
Black	1.399	0.918	0.385	-0.620	1.747*
	(1.294)	(0.640)	(0.782)	(1.343)	(0.991)
Asian	-0.371	0.610**	0.114	0.999*	0.859*
	(0.879)	(0.261)	(0.245)	(0.538)	(0.476)
Single	0.302	-0.786	-0.826	-1.420	-0.735
	(0.895)	(0.469)	(0.585)	(0.982)	(0.636)
HS Degree Only	-1.267**	-0.247	-0.768*	0.00151	0.116
	(0.613)	(0.366)	(0.448)	(0.821)	(0.417)
Frac. of Lower Rep.	0.0796	-0.0373	-0.0746**	0.00156	-0.00526
	(0.0542)	(0.0295)	(0.0312)	(0.0688)	(0.0563)
Maximum Temperature	0.00235	0.00350***	0.00240	0.00539**	0.00347*
	(0.00274)	(0.00128)	(0.00153)	(0.00212)	(0.00180)
Monthly Precipitation	0.0159	0.00485	-0.00177	0.00677	0.00927
	(0.0108)	(0.00533)	(0.00539)	(0.00928)	(0.00758)
Constant	-9.136***	-8.816***	-9.212***	-10.17***	-10.18***
	(1.765)	(0.724)	(0.926)	(1.631)	(1.186)
N	1350	943	943	943	943
r2	0.866	0.949	0.950	0.944	0.928
F_diff	0.0325	6.231	2.524	2.284	5.428
p_diff	0.858	0.0165	0.119	0.138	0.0246

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.2.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.13: Full Workforce Results: Model 3

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
Unemployment Increased	-0.114*	-0.178***	-0.187***	-0.229***	-0.160***
	(0.0622)	(0.0410)	(0.0419)	(0.0575)	(0.0544)
Unemployment Decreased	-0.129**	-0.178***	-0.191***	-0.227***	-0.159***
	(0.0595)	(0.0406)	(0.0406)	(0.0558)	(0.0547)
Inspection Rate	1.765	0.171	0.0705	-1.378	0.820
	(1.206)	(0.346)	(0.527)	(0.934)	(0.561)
Age 25-34	-0.549	-1.519***	-1.828***	-2.652**	-1.279*
	(1.001)	(0.461)	(0.644)	(0.992)	(0.690)
Age 35-44	-1.896	-1.626**	-1.611*	-3.139**	-1.568*
	(1.261)	(0.670)	(0.830)	(1.256)	(0.898)
Age 45-54	0.502	-2.121***	-1.894**	-5.312***	-1.735*
	(1.265)	(0.764)	(0.911)	(1.281)	(0.889)
Age 55-64	0.573	-0.968	-0.698	-2.462**	-0.561
	(1.388)	(0.698)	(0.747)	(1.169)	(1.054)
Male	1.739	0.00515	-0.477	1.659*	-0.0352
	(1.123)	(0.539)	(0.733)	(0.932)	(0.760)
White	0.415	-0.274	-0.864*	-1.051	0.345
	(0.885)	(0.491)	(0.497)	(0.926)	(0.723)
Black	1.790	0.885	0.353	-0.648	1.713*
	(1.397)	(0.656)	(0.786)	(1.316)	(1.019)
Asian	-0.454	0.503*	0.0338	0.926*	0.733
	(0.942)	(0.268)	(0.232)	(0.523)	(0.495)
Single	0.184	-0.785	-0.837	-1.399	-0.732
	(0.909)	(0.481)	(0.580)	(0.976)	(0.660)
HS Degree Only	-1.118*	-0.286	-0.786*	-0.0368	0.0668
	(0.608)	(0.367)	(0.440)	(0.805)	(0.428)
Frac. of Lower Rep.	0.100	-0.0345	-0.0718**	0.00353	-0.00225
	(0.0636)	(0.0289)	(0.0327)	(0.0680)	(0.0548)
Maximum Temperature	0.00251	0.00322**	0.00223	0.00525**	0.00311*
	(0.00276)	(0.00129)	(0.00153)	(0.00215)	(0.00182)
Monthly Precipitation	0.0128	0.00485	-0.00203	0.00702	0.00934
	(0.0109)	(0.00535)	(0.00525)	(0.00929)	(0.00766)
Constant	-9.871***	-8.958***	-9.366***	-10.21***	-10.33***
	(1.813)	(0.811)	(0.940)	(1.747)	(1.251)
N	1350	943	943	943	943
r2	0.863	0.947	0.949	0.944	0.926
F_diff	3.053	0.00205	0.904	0.0866	0.102
p_diff	0.0869	0.964	0.347	0.770	0.750

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.3.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.14: Full Workforce Results: Model 4

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
all_recession	-0.213***	-0.0927	-0.126**	-0.0446	-0.0686
	(0.0761)	(0.0569)	(0.0544)	(0.0653)	(0.0737)
all_expansion	-0.217***	-0.0871	-0.124**	-0.0313	-0.0619
	(0.0726)	(0.0554)	(0.0534)	(0.0652)	(0.0730)
Fraction Construction	2.332	0.293	1.302	0.244	-0.114
	(2.021)	(0.917)	(1.096)	(0.958)	(1.145)
Fraction Manufacturing	1.215	-0.113	-0.317	0.836	0.147
	(1.566)	(0.616)	(1.041)	(0.991)	(0.777)
Fraction Transportation/Warehouse	-2.587	0.733	0.434	1.107	0.894
	(2.343)	(1.047)	(1.366)	(1.377)	(1.245)
Fraction Wholesale	5.032	1.421	0.338	2.033	1.945
	(3.997)	(1.006)	(1.490)	(2.235)	(1.537)
Fraction Retail	1.384	0.419	1.281	-0.0144	0.0858
	(1.695)	(0.741)	(0.854)	(1.139)	(1.052)
Fraction Services	0.536	-0.0348	0.391	0.704	-0.404
	(1.398)	(0.569)	(0.652)	(0.584)	(0.714)
Inspection Rate	1.275*	0.0924	-0.0527	-0.614	0.700
	(0.663)	(0.302)	(0.426)	(0.578)	(0.444)
Age 25-34	-2.548	-0.407	0.00280	-1.654*	-0.418
	(1.551)	(0.689)	(0.754)	(0.844)	(0.996)
Age 35-44	-3.348**	-0.289	0.308	-1.680	-0.308
	(1.431)	(0.761)	(0.966)	(1.272)	(0.985)
Age 45-54	-2.011	-1.609**	-0.666	-3.631***	-1.533*
	(1.875)	(0.733)	(0.757)	(0.888)	(0.906)
Age 55-64	-0.341	-1.861**	-1.296	-3.647***	-1.727*
	(2.343)	(0.710)	(0.874)	(0.877)	(0.941)
Male	3.347**	0.456	0.602	1.241	0.426
	(1.579)	(0.716)	(0.945)	(1.167)	(0.886)
White	-0.688	-0.233	-0.420	0.656	-0.356
	(0.795)	(0.384)	(0.479)	(0.627)	(0.618)
Black	1.171	1.433**	1.801**	-0.226	1.692*
	(1.422)	(0.607)	(0.749)	(1.066)	(0.973)
Asian	-0.436	0.536	0.696	2.309**	-0.352
	(1.561)	(0.640)	(0.707)	(0.960)	(1.064)
Single	-0.00535	-0.414	-0.253	-0.845	-0.416
	(1.178)	(0.394)	(0.420)	(0.644)	(0.509)
HS Degree Only	-0.197	-0.824**	-0.952***	-1.145**	-0.601
	(0.654)	(0.316)	(0.314)	(0.544)	(0.457)
Frac. of Lower Rep.	0.00324	-0.0334	-0.0772**	0.0349	-0.00756
	(0.0728)	(0.0241)	(0.0373)	(0.0574)	(0.0449)
Maximum Temperature	-0.00128	0.00393**	0.00129	0.00756***	0.00474**
	(0.00488)	(0.00164)	(0.00215)	(0.00261)	(0.00204)
Monthly Precipitation	-0.00938	0.00573	-0.00610	0.0195*	0.0106
	(0.0165)	(0.00699)	(0.00851)	(0.0112)	(0.00963)
Constant	-10.82***	-10.13***	-12.04***	-11.35***	-10.83***
	(2.763)	(0.880)	(0.994)	(1.333)	(1.123)
N	700	577	577	577	577
r2	0.868	0.909	0.938	0.963	0.879
F_diff	0.147	2.193	0.156	4.865	2.101
p_diff	0.703	0.146	0.695	0.0328	0.154

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.4.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.15: Private Sector Results: Model 1

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	0.107*	0.121**	-0.0655***	-0.119***	-0.0469	-0.0323
	(0.0560)	(0.0521)	(0.0183)	(0.0363)	(0.0623)	(0.0273)
Inspection Rate	-0.158	-0.549	-0.283	-0.248	-1.640	0.206
	(1.238)	(0.902)	(0.526)	(0.538)	(1.199)	(0.547)
Age 25-34	-0.735	-0.837	-2.232***	-2.326***	-2.207**	-2.495***
	(0.907)	(0.809)	(0.455)	(0.581)	(1.042)	(0.592)
Age 35-44	-2.457**	-1.758	-2.413***	-2.229***	-2.598*	-2.861***
	(1.170)	(1.267)	(0.533)	(0.693)	(1.389)	(0.688)
Age 45-54	-0.271	-0.382	-2.800***	-2.247***	-4.852***	-3.035***
	(1.141)	(1.453)	(0.524)	(0.805)	(1.366)	(0.595)
Age 55-64	-0.580	-1.472	-0.794	-0.377	-0.839	-0.855
	(1.393)	(1.720)	(0.532)	(0.708)	(1.431)	(0.784)
Male	2.727**	1.404	0.654	-0.164	2.853***	0.666
	(1.287)	(1.331)	(0.480)	(0.671)	(0.883)	(0.610)
White	-0.185	0.0628	-0.795**	-0.955**	-1.556*	-0.491
	(0.681)	(0.673)	(0.321)	(0.359)	(0.869)	(0.434)
Black	0.894	1.451	-0.396	-0.479	-1.389	-0.107
	(1.246)	(1.298)	(0.560)	(0.835)	(1.313)	(0.713)
Asian	-0.615	-0.309	-0.228*	-0.441**	-0.0890	-0.211
	(0.578)	(0.416)	(0.120)	(0.196)	(0.446)	(0.272)
Single	0.236	-0.0194	-0.777*	-0.634	-1.320	-0.898
	(0.788)	(1.106)	(0.433)	(0.432)	(0.972)	(0.567)
Divorced	5.757***	4.275***	0.537	0.113	-0.553	1.467*
	(0.851)	(0.882)	(0.536)	(0.717)	(1.305)	(0.744)
HS Degree Only	-0.661	-0.287	-0.607	-0.663	-0.886	-0.657
	(0.703)	(0.891)	(0.383)	(0.545)	(1.008)	(0.480)
Obtained Bachelor's Degree'	1.807*	2.607**	0.0111	0.635	-1.109	-0.434
	(1.077)	(1.223)	(0.361)	(0.525)	(0.896)	(0.552)
Frac. of Lower Rep.	0.0377	-0.0639	-0.0844*	-0.102*	-0.0167	-0.0741
	(0.0616)	(0.0598)	(0.0476)	(0.0575)	(0.0764)	(0.0509)
Maximum Temperature	0.00352	0.00332	0.00238	0.000614	0.00524**	0.00226
	(0.00258)	(0.00374)	(0.00143)	(0.00124)	(0.00220)	(0.00209)
Monthly Precipitation	0.0173	0.0340***	-0.00161	-0.00720	-0.00139	0.00277
	(0.0111)	(0.0118)	(0.00495)	(0.00506)	(0.0101)	(0.00610)
Constant	-6.552***	-6.568***	4.386***	3.634***	3.036*	3.721***
	(1.537)	(1.703)	(0.642)	(0.763)	(1.671)	(0.944)
N	1350	943	943	943	943	943
r2	0.855	0.847	0.966	0.956	0.940	0.957

Robust standard errors are clustered at the state level.
Independent variable of interest in the unemployment rate.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.16: Private Sector Results: Model 2

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
priv_recession	-0.142**	-0.195***	-0.204***	-0.281***	-0.162***
	(0.0654)	(0.0301)	(0.0439)	(0.0599)	(0.0328)
priv_expansion	-0.140**	-0.189***	-0.200***	-0.271***	-0.157***
	(0.0640)	(0.0293)	(0.0427)	(0.0586)	(0.0318)
Fraction Construction	-1.691	-0.439	0.379	0.203	-1.140
	(1.683)	(0.755)	(1.032)	(1.381)	(0.938)
Fraction Manufacturing	-1.502	-0.929*	-1.222*	1.325	-1.008
	(1.334)	(0.527)	(0.609)	(1.129)	(0.720)
Fraction Transportation/Warehouse	-3.024	-2.546**	-1.861	-0.313	-3.366***
	(1.897)	(1.012)	(1.144)	(1.828)	(1.232)
Fraction Wholesale	-3.109	-2.164**	-3.132**	0.0177	-2.068
	(2.869)	(0.976)	(1.197)	(2.051)	(1.297)
Fraction Retail	-0.979	-2.060***	-0.516	-1.671	-3.185***
	(1.434)	(0.628)	(0.642)	(1.415)	(0.836)
Fraction Services	-0.596	-1.051**	-0.314	-0.271	-1.637**
	(1.149)	(0.496)	(0.541)	(0.921)	(0.696)
Inspection Rate	-0.225	-0.319	-0.330	-1.655	0.217
	(1.408)	(0.408)	(0.521)	(1.037)	(0.409)
Age 25-34	-0.727	-2.147***	-2.123***	-2.636***	-2.380***
	(0.852)	(0.423)	(0.548)	(0.884)	(0.565)
Age 35-44	-2.406*	-2.351***	-1.999***	-3.030**	-2.839***
	(1.248)	(0.447)	(0.684)	(1.200)	(0.551)
Age 45-54	0.369	-2.547***	-2.019**	-5.138***	-2.699***
	(1.269)	(0.506)	(0.795)	(1.194)	(0.594)
Age 55-64	0.112	-0.844	-0.107	-1.986*	-0.897
	(1.415)	(0.506)	(0.790)	(1.168)	(0.722)
Male	1.238	0.720	0.0327	2.803***	0.704
	(1.272)	(0.441)	(0.593)	(0.926)	(0.684)
White	0.581	-0.618**	-1.054***	-1.219	-0.0964
	(0.797)	(0.294)	(0.369)	(0.900)	(0.420)
Black	1.467	0.0705	-0.246	-0.842	0.570
	(1.267)	(0.483)	(0.842)	(1.291)	(0.668)
Asian	-0.638	0.316*	-0.0329	0.912*	0.332
	(0.790)	(0.187)	(0.267)	(0.521)	(0.334)
Single	0.209	-0.746*	-0.717*	-1.388	-0.793
	(0.878)	(0.390)	(0.425)	(0.915)	(0.530)
HS Degree Only	-1.446**	-0.337	-0.801*	0.124	-0.0561
	(0.583)	(0.340)	(0.442)	(0.814)	(0.381)
Frac. of Lower Rep.	0.0450	-0.0991***	-0.122**	-0.0405	-0.0829**
	(0.0546)	(0.0360)	(0.0557)	(0.0703)	(0.0358)
Maximum Temperature	0.00223	0.00282**	0.00105	0.00597***	0.00259
	(0.00280)	(0.00140)	(0.00129)	(0.00214)	(0.00212)
Monthly Precipitation	0.0183	0.0000562	-0.00600	0.000472	0.00445
	(0.0112)	(0.00487)	(0.00516)	(0.00962)	(0.00594)
Constant	-9.041***	-7.245***	-8.099***	-10.24***	-7.731***
	(1.731)	(0.588)	(0.854)	(1.736)	(0.852)
N	1350	943	943	943	943
r2	0.859	0.971	0.959	0.946	0.961
F_diff	0.283	7.037	2.767	7.052	2.028
p_diff	0.597	0.0111	0.104	0.0111	0.162

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.2.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.17: Private Sector Results: Model 4

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
priv_recession	-0.212**	-0.0993***	-0.142***	-0.0527	-0.0664
	(0.0852)	(0.0364)	(0.0506)	(0.0635)	(0.0459)
priv_expansion	-0.222***	-0.0982***	-0.145***	-0.0455	-0.0647
	(0.0807)	(0.0353)	(0.0511)	(0.0631)	(0.0450)
Fraction Construction	1.233	-0.271	0.695	-0.329	-0.777
	(1.949)	(0.575)	(1.014)	(0.940)	(0.744)
Fraction Manufacturing	0.921	-0.557	-1.019	0.449	-0.135
	(1.630)	(0.546)	(1.033)	(0.929)	(0.690)
Fraction Transportation/Warehouse	-3.481	-0.874	-0.459	0.819	-1.628
	(2.757)	(1.095)	(1.388)	(1.402)	(1.309)
Fraction Wholesale	2.627	-0.877	-1.848	1.203	-0.813
	(3.925)	(0.879)	(1.349)	(2.312)	(1.194)
Fraction Retail	0.699	-0.854*	0.0137	-0.654	-1.442**
	(1.760)	(0.460)	(0.657)	(1.126)	(0.654)
Fraction Services	0.520	-0.652	-0.311	0.223	-1.116**
	(1.345)	(0.410)	(0.519)	(0.592)	(0.513)
Inspection Rate	-1.578***	-0.0892	-0.191	-0.730	0.418
	(0.579)	(0.221)	(0.376)	(0.551)	(0.300)
Age 25-34	-1.429	-0.966**	-0.299	-1.925**	-1.390**
	(1.429)	(0.460)	(0.656)	(0.745)	(0.649)
Age 35-44	-3.132**	-0.643	0.196	-1.940	-1.033
	(1.404)	(0.568)	(0.924)	(1.162)	(0.672)
Age 45-54	-1.609	-1.595**	-0.548	-3.872***	-1.745**
	(1.883)	(0.629)	(0.682)	(0.885)	(0.775)
Age 55-64	-0.0982	-1.628**	-0.839	-3.683***	-1.696*
	(2.248)	(0.619)	(0.737)	(0.848)	(0.943)
Male	3.388	0.337	0.248	1.664	0.257
	(2.132)	(0.466)	(0.674)	(1.060)	(0.698)
White	-0.870	-0.194	-0.684	0.474	0.0250
	(1.064)	(0.332)	(0.453)	(0.599)	(0.539)
Black	1.205	-0.506	-0.456	-0.656	-0.627
	(1.653)	(0.578)	(0.912)	(1.036)	(0.846)
Asian	-2.008	0.887*	0.713	2.194***	0.389
	(1.705)	(0.499)	(0.650)	(0.808)	(0.976)
Single	-0.0934	-0.221	0.0245	-0.985	-0.309
	(1.171)	(0.422)	(0.426)	(0.645)	(0.550)
HS Degree Only	-0.755	-0.416	-0.676*	-0.913*	-0.0184
	(0.771)	(0.261)	(0.350)	(0.526)	(0.330)
Frac. of Lower Rep.	-0.0379	-0.0787*	-0.0953	0.0148	-0.0738*
	(0.0786)	(0.0430)	(0.0633)	(0.0614)	(0.0420)
Maximum Temperature	-0.00183	0.00287**	-0.00112	0.00756***	0.00366**
	(0.00501)	(0.00124)	(0.00190)	(0.00267)	(0.00158)
Monthly Precipitation	-0.00658	-0.00533	-0.0168**	0.00849	-0.00192
	(0.0161)	(0.00635)	(0.00818)	(0.0124)	(0.00754)
Constant	-10.35***	-8.972***	-10.43***	-10.82***	-9.512***
	(2.855)	(0.568)	(0.742)	(1.220)	(0.659)
N	700	577	577	577	577
r2	0.861	0.958	0.947	0.961	0.947
F_diff	1.007	0.0931	0.267	1.189	0.136
p_diff	0.321	0.762	0.608	0.282	0.714

Robust standard errors are clustered at the state level.

Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.4.

For a description of each control variable, see Table 2.2.

Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.

F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.

Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.18: Public Sector Results: Model 1

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	0.208	0.115	0.0140	-0.125	0.0347	0.0696
	(0.136)	(0.144)	(0.0580)	(0.0927)	(0.128)	(0.0621)
Inspection Rate	5.220**	6.719***	-0.817	-0.990	-0.480	-0.784
	(2.190)	(1.193)	(0.696)	(0.712)	(1.712)	(1.001)
Age 25-34	-0.782	0.0193	-0.679	-0.766**	-0.347	-0.633
	(0.829)	(1.219)	(0.494)	(0.337)	(0.695)	(0.604)
Age 35-44	0.719	1.286	-0.735	-0.596*	-0.0126	-0.788
	(0.772)	(1.280)	(0.498)	(0.301)	(0.775)	(0.631)
Age 45-54	0.270	2.051	-0.906*	-0.606*	0.524	-1.055*
	(0.981)	(1.482)	(0.466)	(0.303)	(0.809)	(0.586)
Age 55-64	1.285	3.143**	-0.362	-0.148	0.465	-0.513
	(1.034)	(1.415)	(0.586)	(0.402)	(0.919)	(0.712)
Male	-0.229	0.749	-0.0253	-0.320	0.113	0.0830
	(0.645)	(0.747)	(0.202)	(0.207)	(0.404)	(0.260)
White	1.177	1.381	0.452	0.402	0.784	0.565
	(0.759)	(1.076)	(0.359)	(0.287)	(0.655)	(0.489)
Black	0.615	1.374	0.205	-0.0646	-0.000889	0.438
	(0.927)	(1.321)	(0.408)	(0.437)	(0.808)	(0.521)
Asian	-0.0874	0.637	0.225	-1.006***	0.535	1.184
	(0.921)	(0.980)	(0.452)	(0.304)	(0.844)	(0.733)
Single	0.367	0.613	-0.351	-0.213	0.149	-0.473*
	(0.630)	(0.805)	(0.244)	(0.272)	(0.495)	(0.275)
Divorced	-1.178*	-1.797**	0.481*	0.220	0.352	0.554
	(0.661)	(0.887)	(0.268)	(0.267)	(0.508)	(0.341)
HS Degree Only	0.477	1.020	1.461***	1.269*	1.134	1.862**
	(1.607)	(1.387)	(0.524)	(0.691)	(1.315)	(0.738)
Obtained Bachelor's Degree'	0.267	0.190	1.530***	1.391**	0.916	1.845**
	(1.621)	(1.466)	(0.502)	(0.653)	(1.314)	(0.766)
Frac. of Lower Rep.	0.340***	0.239	0.0136	-0.0419	0.146	0.000535
	(0.126)	(0.191)	(0.0886)	(0.0905)	(0.165)	(0.0992)
Maximum Temperature	0.0141	0.00264	-0.00111	0.000746	-0.00408	-0.00136
	(0.0102)	(0.0125)	(0.00343)	(0.00322)	(0.00728)	(0.00457)
Monthly Precipitation	0.0301	0.0578	0.00573	-0.0163	0.0368	0.00976
	(0.0344)	(0.0487)	(0.0194)	(0.0172)	(0.0298)	(0.0245)
Constant	-7.336***	-8.896***	1.315	0.485	-2.143	0.353
	(1.804)	(2.204)	(0.835)	(0.740)	(1.426)	(1.128)
N	1350	762	762	762	744	762
r2	0.386	0.393	0.849	0.885	0.843	0.796

Robust standard errors are clustered at the state level.
Independent variable of interest in the unemployment rate.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.19: Public Sector Results: Model 2

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
pub_recession	-0.0464	-0.00831	-0.0130	-0.00761	-0.00636
	(0.0561)	(0.00856)	(0.00854)	(0.0148)	(0.0121)
pub_expansion	-0.0262	-0.0104	-0.0136*	-0.00208	-0.00916
	(0.0530)	(0.00699)	(0.00729)	(0.0101)	(0.00939)
Inspection Rate	2.609	-0.795	-0.827	-0.324	-0.810
	(4.590)	(0.831)	(0.804)	(1.746)	(1.147)
Age 25-34	-1.761	-0.585	-0.605*	-0.220	-0.554
	(2.329)	(0.524)	(0.352)	(0.684)	(0.641)
Age 35-44	3.056	-0.594	-0.380	0.118	-0.666
	(2.013)	(0.498)	(0.314)	(0.755)	(0.633)
Age 45-54	1.223	-0.731	-0.372	0.706	-0.890
	(2.882)	(0.488)	(0.322)	(0.794)	(0.613)
Age 55-64	3.514	-0.343	-0.0639	0.509	-0.512
	(3.539)	(0.624)	(0.450)	(0.907)	(0.758)
Male	0.587	0.0942	-0.158	0.204	0.192
	(1.889)	(0.220)	(0.205)	(0.403)	(0.283)
White	3.900*	0.686*	0.481	0.902	0.885*
	(2.135)	(0.360)	(0.323)	(0.651)	(0.486)
Black	3.808	0.443	0.0766	0.111	0.736
	(2.326)	(0.392)	(0.430)	(0.786)	(0.502)
Asian	0.877	0.256	-0.992***	0.468	1.227
	(1.609)	(0.462)	(0.314)	(0.849)	(0.730)
Single	0.763	-0.465*	-0.302	0.0306	-0.595**
	(1.829)	(0.258)	(0.292)	(0.502)	(0.289)
HS Degree Only	0.0636	-0.0110	-0.0998	0.271	0.0973
	(1.748)	(0.171)	(0.223)	(0.382)	(0.227)
Frac. of Lower Rep.	1.184**	0.00578	-0.0772	0.144	0.00363
	(0.460)	(0.0901)	(0.0928)	(0.173)	(0.0999)
Maximum Temperature	0.0227	0.000243	0.00209	-0.00339	0.0000805
	(0.0281)	(0.00342)	(0.00308)	(0.00723)	(0.00473)
Monthly Precipitation	0.0308	0.0105	-0.0143	0.0402	0.0158
	(0.0971)	(0.0195)	(0.0179)	(0.0290)	(0.0243)
Constant	-17.09***	-9.279***	-10.32***	-13.13***	-9.963***
	(4.021)	(0.648)	(0.556)	(0.866)	(0.865)
N	1350	762	762	744	762
r2	0.330	0.842	0.880	0.845	0.789
F_diff	0.436	0.257	0.0304	0.640	0.208
p_diff	0.512	0.615	0.862	0.428	0.651

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.2.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.20: Public Sector Results: Model 4

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
GDP Decrease for 2 quarters	0.171	-0.0145	-0.0164	-0.0226	-0.0133
	(0.150)	(0.0101)	(0.0154)	(0.0220)	(0.00966)
Not Recession	0.0829	-0.0134	-0.0203*	-0.000509	-0.0105
	(0.118)	(0.00896)	(0.0114)	(0.0115)	(0.0101)
Inspection Rate	7.381	-0.924**	-1.034	-1.754*	-0.518
	(4.461)	(0.443)	(0.656)	(0.898)	(0.554)
Age 25-34	-1.287	-1.011	-0.690	-0.759	-1.216
	(2.901)	(0.747)	(0.521)	(0.739)	(0.897)
Age 35-44	2.418	-0.936	-0.269	-0.0888	-1.298
	(3.275)	(0.713)	(0.478)	(1.002)	(0.872)
Age 45-54	0.424	-0.988	-0.325	0.641	-1.364
	(4.183)	(0.688)	(0.456)	(1.030)	(0.855)
Age 55-64	5.447	-0.701	-0.141	0.441	-1.113
	(4.636)	(0.873)	(0.633)	(1.175)	(1.047)
Male	0.351	0.0123	-0.151	0.220	0.0548
	(2.425)	(0.240)	(0.277)	(0.402)	(0.307)
White	6.047	-0.144	0.0578	0.109	-0.458
	(4.550)	(0.343)	(0.332)	(0.703)	(0.576)
Black	6.416	-0.122	-0.363	-0.350	-0.237
	(4.568)	(0.465)	(0.540)	(1.047)	(0.656)
Asian	0.196	-1.019	-1.254	-0.545	-1.233*
	(5.509)	(0.637)	(1.005)	(1.212)	(0.698)
Single	-0.0619	-0.289	-0.118	0.406	-0.455*
	(3.215)	(0.218)	(0.311)	(0.521)	(0.248)
HS Degree Only	0.433	-0.104	-0.0910	0.133	-0.0535
	(2.077)	(0.207)	(0.276)	(0.448)	(0.240)
Frac. of Lower Rep.	1.588**	0.0211	-0.136	0.259	0.0579
	(0.702)	(0.107)	(0.0947)	(0.163)	(0.122)
Maximum Temperature	0.00428	0.000587	0.00398	0.00406	-0.000938
	(0.0458)	(0.00471)	(0.00482)	(0.00797)	(0.00621)
Monthly Precipitation	0.0476	0.0102	-0.0161	0.0684*	0.0157
	(0.171)	(0.0267)	(0.0248)	(0.0359)	(0.0337)
Constant	-18.93***	-8.399***	-10.42***	-12.60***	-8.240***
	(6.175)	(1.017)	(0.843)	(1.072)	(1.345)
N	700	529	529	517	529
r2	0.374	0.804	0.851	0.852	0.769
F_diff	1.298	0.0369	0.234	1.886	0.203
p_diff	0.260	0.849	0.631	0.177	0.654

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.4.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.21: Construction Industry Results: Model 1

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	-0.0187	0.0347	-0.0680	-0.143	0.0723	-0.0292
	(0.110)	(0.0815)	(0.0812)	(0.145)	(0.214)	(0.0876)
Inspection Rate	3.275	3.569	-1.111	-1.012	-0.104	-0.408
	(3.006)	(3.186)	(0.950)	(1.179)	(3.211)	(0.861)
Age 25-34	-2.132**	-1.690**	-0.308	-0.788*	-1.783	0.0120
	(0.813)	(0.786)	(0.378)	(0.446)	(1.206)	(0.455)
Age 35-44	-2.584***	-2.673***	-0.503	-0.327	-2.566*	-0.641
	(0.853)	(0.924)	(0.364)	(0.425)	(1.483)	(0.433)
Age 45-54	-2.946**	-3.048**	-1.109**	-1.154**	-3.183**	-1.244**
	(1.108)	(1.429)	(0.413)	(0.510)	(1.342)	(0.506)
Age 55-64	-1.251	-2.178	0.165	0.0792	2.205	0.262
	(1.299)	(1.367)	(0.485)	(0.546)	(2.610)	(0.609)
Male	1.431	0.209	0.517	0.162	3.697	0.861**
	(1.169)	(1.116)	(0.366)	(0.487)	(3.500)	(0.413)
White	0.585	0.203	-0.193	0.0382	-2.221	-0.660
	(1.437)	(1.482)	(0.418)	(0.591)	(1.326)	(0.564)
Black	1.707	2.015	1.527***	1.285	2.032	1.313*
	(1.790)	(1.628)	(0.562)	(0.798)	(1.408)	(0.674)
Asian	-0.841	-0.919	0.0114	-0.117	-1.206	-0.0685
	(0.661)	(0.630)	(0.248)	(0.229)	(0.739)	(0.478)
Single	0.332	-0.369	0.0238	0.0686	-0.413	0.160
	(0.734)	(0.806)	(0.341)	(0.395)	(1.002)	(0.416)
Divorced	1.544	2.062	0.880*	0.275	1.055	1.524***
	(1.163)	(1.475)	(0.457)	(0.562)	(1.603)	(0.521)
HS Degree Only	0.786	0.457	-0.0867	0.260	-0.728	-0.0628
	(0.766)	(0.666)	(0.276)	(0.321)	(1.050)	(0.343)
Obtained Bachelor's Degree'	2.292*	2.262*	0.233	0.318	-2.854	0.377
	(1.201)	(1.189)	(0.416)	(0.521)	(1.913)	(0.470)
Frac. of Lower Rep.	0.302	0.113	-0.0196	-0.0767	-0.0702	-0.0126
	(0.201)	(0.133)	(0.0720)	(0.135)	(0.178)	(0.0662)
Maximum Temperature	0.0140	-0.00270	0.00437	0.00136	-0.0304	0.00757*
	(0.0136)	(0.0113)	(0.00348)	(0.00556)	(0.0388)	(0.00432)
Monthly Precipitation	0.0748*	0.0478	0.00463	-0.00538	-0.0276	0.0166
	(0.0442)	(0.0461)	(0.0139)	(0.0172)	(0.0619)	(0.0218)
Constant	-6.793***	-3.403*	1.211	0.612	2.907	0.193
	(2.455)	(1.688)	(0.838)	(0.969)	(5.559)	(1.085)
N	1350	941	941	941	941	941
r2	0.419	0.442	0.886	0.820	0.406	0.863

Robust standard errors are clustered at the state level.
Independent variable of interest in the unemployment rate.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.22: Construction Industry Results: Model 2

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
con_recession	-0.768**	-0.158***	-0.137**	-0.156	-0.143***
	(0.334)	(0.0399)	(0.0577)	(0.122)	(0.0468)
con_expansion	-0.701**	-0.135***	-0.114**	-0.145	-0.124***
	(0.282)	(0.0358)	(0.0536)	(0.119)	(0.0417)
Inspection Rate	14.03	-0.829	-0.672	-0.324	-0.110
	(10.11)	(0.956)	(1.185)	(3.245)	(0.923)
Age 25-34	-5.193**	-0.152	-0.659	-1.572	0.179
	(2.529)	(0.376)	(0.461)	(1.125)	(0.450)
Age 35-44	-6.130**	-0.320	-0.229	-2.364	-0.391
	(2.531)	(0.319)	(0.415)	(1.420)	(0.379)
Age 45-54	-6.679**	-0.973**	-1.092**	-3.187**	-1.071**
	(3.121)	(0.393)	(0.490)	(1.376)	(0.494)
Age 55-64	-4.786	0.351	0.197	2.108	0.521
	(4.069)	(0.472)	(0.518)	(2.399)	(0.621)
Male	1.531	0.561	0.140	4.225	0.921**
	(3.272)	(0.380)	(0.488)	(3.436)	(0.426)
White	2.185	-0.120	0.00474	-1.987	-0.497
	(4.097)	(0.419)	(0.563)	(1.280)	(0.576)
Black	4.144	1.538**	1.139	2.340*	1.441**
	(5.179)	(0.579)	(0.796)	(1.313)	(0.696)
Asian	-3.501*	-0.0266	-0.151	-1.135	-0.192
	(2.067)	(0.293)	(0.288)	(0.717)	(0.531)
Single	0.508	-0.0222	0.0410	-0.395	0.0818
	(2.139)	(0.340)	(0.417)	(1.021)	(0.415)
HS Degree Only	2.437	-0.0487	0.250	0.221	-0.0616
	(2.290)	(0.242)	(0.284)	(1.181)	(0.285)
Frac. of Lower Rep.	0.937	-0.0115	-0.0774	-0.0676	0.00521
	(0.637)	(0.0736)	(0.148)	(0.192)	(0.0674)
Maximum Temperature	0.0706	0.00562	0.00265	-0.0300	0.00899**
	(0.0444)	(0.00360)	(0.00535)	(0.0384)	(0.00444)
Monthly Precipitation	0.219	0.00243	-0.00836	-0.0308	0.0152
	(0.149)	(0.0126)	(0.0159)	(0.0611)	(0.0207)
Constant	-19.28**	-11.07***	-11.50***	-10.60*	-12.07***
	(7.389)	(0.803)	(0.934)	(5.637)	(1.031)
N	1350	941	941	941	941
r2	0.434	0.890	0.826	0.410	0.867
F_diff	0.754	11.26	8.157	0.167	4.303
p_diff	0.389	0.00166	0.00658	0.685	0.0441

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.2.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.23: Construction Industry Results: Model 4

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
GDP Decrease for 2 quarters	-0.985**	-0.0823*	-0.0912	0.0732	-0.0467
	(0.413)	(0.0434)	(0.0728)	(0.139)	(0.0570)
Not Recession	-1.077**	-0.0869**	-0.0935	-0.0166	-0.0465
	(0.423)	(0.0423)	(0.0747)	(0.132)	(0.0554)
Inspection Rate	4.494	-0.301	0.240	-1.125	0.0621
	(8.324)	(0.870)	(1.090)	(1.591)	(0.935)
Age 25-34	-5.495	-0.167	-0.502	1.215	0.0422
	(4.539)	(0.507)	(0.628)	(1.599)	(0.625)
Age 35-44	-9.831**	-0.0454	0.388	0.893	-0.419
	(3.979)	(0.380)	(0.582)	(1.914)	(0.492)
Age 45-54	-11.76**	-0.662	-0.567	0.286	-1.125
	(5.082)	(0.508)	(0.634)	(2.095)	(0.717)
Age 55-64	-9.067	-0.177	-0.156	4.157	-0.561
	(7.135)	(0.702)	(0.783)	(3.825)	(0.942)
Male	-0.0839	0.337	0.145	-0.394	0.824
	(5.445)	(0.566)	(0.689)	(2.692)	(0.702)
White	3.975	0.486	1.117	1.484	-0.818
	(6.888)	(0.509)	(0.856)	(1.099)	(0.741)
Black	3.036	0.717	1.167	2.215	-0.646
	(6.985)	(0.916)	(1.254)	(1.766)	(1.272)
Asian	14.06	0.186	0.540	4.048**	-1.303
	(10.15)	(0.694)	(0.845)	(1.816)	(1.252)
Single	0.200	0.00590	0.180	0.810	-0.206
	(3.233)	(0.436)	(0.554)	(1.457)	(0.575)
HS Degree Only	3.396	-0.171	0.304	-0.104	-0.248
	(2.933)	(0.410)	(0.517)	(1.345)	(0.447)
Frac. of Lower Rep.	0.511	-0.0660	-0.0984	-0.129	-0.0895
	(0.460)	(0.0689)	(0.167)	(0.109)	(0.0908)
Maximum Temperature	0.0373	0.00610	0.00250	-0.0192	0.0108*
	(0.0845)	(0.00434)	(0.00715)	(0.0362)	(0.00565)
Monthly Precipitation	-0.100	-0.0150	-0.0309	-0.0478	-0.000261
	(0.192)	(0.0186)	(0.0255)	(0.0726)	(0.0295)
Constant	-13.91	-11.66***	-13.14***	-12.59***	-11.66***
	(10.49)	(1.093)	(1.324)	(3.889)	(1.398)
N	700	577	577	577	577
r2	0.461	0.848	0.735	0.459	0.820
F_diff	1.119	0.280	0.0409	1.937	0.000227
p_diff	0.295	0.599	0.841	0.171	0.988

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.4.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.24: Manufacturing Industry Results: Model 1

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	0.160	0.115	-0.0771	-0.131**	0.0489	-0.0338
	(0.163)	(0.161)	(0.0474)	(0.0629)	(0.135)	(0.0373)
Inspection Rate	5.224	3.771	0.715	0.450	4.313	1.226
	(5.662)	(4.447)	(0.929)	(0.824)	(3.580)	(0.961)
Age 25-34	1.465	1.614	-1.270***	-1.418**	-2.373**	-1.217***
	(1.309)	(1.287)	(0.357)	(0.554)	(1.125)	(0.352)
Age 35-44	1.667	2.216	-1.520***	-1.757***	-3.323*	-1.560***
	(1.498)	(1.726)	(0.405)	(0.515)	(1.691)	(0.420)
Age 45-54	0.382	0.887	-1.798***	-2.046**	-5.207**	-1.693***
	(1.116)	(1.475)	(0.384)	(0.879)	(2.273)	(0.418)
Age 55-64	1.268	0.438	-0.254	0.00480	-0.498	-0.189
	(1.922)	(2.016)	(0.395)	(0.576)	(1.066)	(0.367)
Male	0.0965	-1.069	-0.0909	-0.0671	0.845	0.168
	(1.013)	(1.587)	(0.226)	(0.365)	(0.977)	(0.255)
White	0.585	1.583	-1.406***	-1.638***	0.0493	-1.260***
	(1.335)	(1.218)	(0.483)	(0.577)	(0.950)	(0.386)
Black	1.422	1.934	-1.038*	-1.458**	0.835	-0.781
	(1.596)	(1.831)	(0.526)	(0.641)	(1.342)	(0.540)
Asian	-3.332**	-1.862**	-1.021**	-0.902	0.823	-0.999***
	(1.312)	(0.896)	(0.416)	(0.579)	(1.432)	(0.280)
Single	0.659	1.066	-0.362	-0.0508	-0.979	-0.628**
	(1.243)	(1.385)	(0.251)	(0.363)	(0.972)	(0.272)
Divorced	2.557	2.483	-0.205	-0.514	-0.853	0.108
	(1.841)	(1.628)	(0.309)	(0.375)	(1.989)	(0.372)
HS Degree Only	-0.211	-1.018	1.003***	1.640***	1.099	1.118***
	(0.836)	(0.990)	(0.307)	(0.547)	(0.655)	(0.371)
Obtained Bachelor's Degree'	0.994	-0.211	1.228***	2.121***	1.705**	1.144***
	(1.220)	(1.086)	(0.282)	(0.530)	(0.830)	(0.306)
Frac. of Lower Rep.	-0.219	-0.362*	-0.0152	-0.000842	0.130	-0.0208
	(0.157)	(0.193)	(0.0875)	(0.0998)	(0.105)	(0.0714)
Maximum Temperature	0.00935	0.00790	0.00365	0.000529	-0.00446	0.00524**
	(0.00931)	(0.0119)	(0.00256)	(0.00595)	(0.00725)	(0.00207)
Monthly Precipitation	0.0303	0.0153	-0.00194	-0.0115	-0.0210	0.00315
	(0.0402)	(0.0409)	(0.00952)	(0.0161)	(0.0243)	(0.00984)
Constant	-8.370***	-7.881**	3.944***	2.584***	2.537*	2.687***
	(2.355)	(3.053)	(0.737)	(0.930)	(1.424)	(0.669)
N	1350	942	942	942	942	942
r2	0.429	0.405	0.928	0.811	0.641	0.944

Robust standard errors are clustered at the state level.
Independent variable of interest in the unemployment rate.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.25: Manufacturing Industry Results: Model 2

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
man_recession	-0.226	-0.0631	-0.0757	-0.179*	-0.0552
	(0.380)	(0.0475)	(0.0879)	(0.103)	(0.0424)
man_expansion	-0.205	-0.0533	-0.0563	-0.176*	-0.0487
	(0.349)	(0.0432)	(0.0760)	(0.0934)	(0.0394)
Inspection Rate	9.119	0.939	0.843	4.468	1.405
	(14.13)	(1.142)	(1.149)	(3.409)	(1.174)
Age 25-34	5.955	-1.043***	-1.088*	-2.163*	-1.030***
	(5.261)	(0.364)	(0.544)	(1.111)	(0.366)
Age 35-44	6.687	-1.318***	-1.435***	-3.193*	-1.385***
	(5.644)	(0.407)	(0.531)	(1.716)	(0.443)
Age 45-54	2.620	-1.568***	-1.708*	-4.988**	-1.467***
	(4.391)	(0.398)	(0.875)	(2.267)	(0.444)
Age 55-64	3.640	-0.0450	0.369	-0.404	-0.0281
	(6.998)	(0.403)	(0.586)	(1.051)	(0.374)
Male	2.114	0.246	0.406	1.222	0.458*
	(3.978)	(0.219)	(0.387)	(0.987)	(0.232)
White	4.699	-1.342**	-1.540**	0.210	-1.189***
	(5.475)	(0.531)	(0.739)	(0.964)	(0.386)
Black	5.587	-1.065**	-1.516**	0.801	-0.775
	(6.809)	(0.526)	(0.751)	(1.428)	(0.502)
Asian	-5.617	-1.066**	-0.943	0.982	-1.063***
	(5.273)	(0.523)	(0.813)	(1.624)	(0.380)
Single	-0.390	-0.469*	-0.242	-1.042	-0.739***
	(4.779)	(0.240)	(0.421)	(0.994)	(0.259)
HS Degree Only	-1.382	0.239	0.315	0.147	0.407
	(3.399)	(0.265)	(0.345)	(0.662)	(0.333)
Frac. of Lower Rep.	-0.577	-0.0254	-0.0241	0.114	-0.0229
	(0.654)	(0.0894)	(0.113)	(0.101)	(0.0717)
Maximum Temperature	0.0137	0.00325	-0.0000424	-0.00385	0.00482**
	(0.0380)	(0.00281)	(0.00617)	(0.00714)	(0.00218)
Monthly Precipitation	0.0409	-0.00454	-0.0161	-0.0200	0.000726
	(0.148)	(0.00975)	(0.0174)	(0.0268)	(0.00954)
Constant	-20.31*	-7.571***	-8.702***	-9.272***	-8.742***
	(10.39)	(0.758)	(1.071)	(1.616)	(0.711)
N	1350	942	942	942	942
r2	0.509	0.926	0.804	0.647	0.943
F_diff	0.114	3.054	2.340	0.0273	1.698
p_diff	0.737	0.0877	0.133	0.870	0.199

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.2.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.26: Manufacturing Industry Results: Model 4

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
GDP Decrease for 2 quarters	-0.318	-0.0324	-0.0645	-0.175*	-0.0335
	(0.413)	(0.0504)	(0.118)	(0.0988)	(0.0377)
Not Recession	-0.309	-0.0332	-0.0681	-0.215*	-0.0333
	(0.420)	(0.0503)	(0.120)	(0.107)	(0.0379)
Inspection Rate	6.451	1.231	0.531	6.531*	1.745*
	(6.868)	(1.076)	(1.132)	(3.358)	(1.015)
Age 25-34	2.954	-0.502	-0.586	-2.519	-0.697
	(6.936)	(0.496)	(0.878)	(1.888)	(0.554)
Age 35-44	3.025	-0.688	-0.576	-3.911	-1.054
	(6.640)	(0.544)	(0.581)	(3.079)	(0.640)
Age 45-54	-0.928	-1.268***	-1.369	-6.064	-1.519***
	(7.632)	(0.444)	(0.845)	(3.608)	(0.540)
Age 55-64	3.710	-0.116	0.715	0.142	-0.397
	(9.390)	(0.480)	(0.855)	(1.388)	(0.393)
Male	-1.507	0.446	0.950*	2.339	0.533
	(4.867)	(0.278)	(0.515)	(1.667)	(0.360)
White	20.47*	-0.0799	-1.217**	0.972	-0.378
	(10.81)	(0.517)	(0.480)	(1.403)	(0.389)
Black	28.20**	0.320	-1.042	1.370	0.0604
	(10.63)	(0.676)	(0.950)	(2.421)	(0.728)
Asian	16.28	0.880	-0.445	2.974	0.386
	(13.53)	(0.633)	(0.537)	(2.378)	(0.491)
Single	-7.272	-0.483	-0.458	-1.304	-0.653*
	(5.616)	(0.317)	(0.470)	(1.438)	(0.351)
HS Degree Only	2.135	0.154	0.500	0.395	0.269
	(4.499)	(0.316)	(0.605)	(0.895)	(0.373)
Frac. of Lower Rep.	-0.490	-0.0425	-0.100	0.136	-0.0587
	(1.112)	(0.0929)	(0.109)	(0.109)	(0.0724)
Maximum Temperature	0.0995*	0.00394	-0.00110	-0.00423	0.00594*
	(0.0549)	(0.00408)	(0.00770)	(0.0112)	(0.00351)
Monthly Precipitation	0.127	-0.00499	-0.00823	-0.0113	-0.000983
	(0.228)	(0.0147)	(0.0277)	(0.0412)	(0.0134)
Constant	-44.07**	-9.825***	-10.45***	-10.64***	-10.38***
	(18.87)	(0.779)	(0.725)	(2.639)	(0.725)
N	700	577	577	577	577
r2	0.544	0.885	0.711	0.550	0.917
F_diff	0.0188	0.0449	0.212	1.876	0.00326
p_diff	0.892	0.833	0.648	0.178	0.955

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.4.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.27: Wholesale Trade Industry Results: Model 1

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	0.165	0.219*	-0.0319	-0.138	0.0803	0.0928**
	(0.112)	(0.111)	(0.0289)	(0.0882)	(0.164)	(0.0428)
Inspection Rate	-2.678	-3.624	-2.078**	-2.038**	-18.79***	1.344
	(3.494)	(3.838)	(0.883)	(0.985)	(6.643)	(2.566)
Age 25-34	-1.063	-0.935	0.0877	0.542*	-0.168	0.0420
	(1.185)	(1.321)	(0.239)	(0.315)	(1.314)	(0.501)
Age 35-44	-1.000	-0.372	-0.362	-0.0678	-0.867	-0.288
	(1.117)	(1.327)	(0.258)	(0.337)	(0.740)	(0.396)
Age 45-54	-0.828	-0.379	0.195	0.421	-0.346	0.380
	(1.063)	(1.442)	(0.213)	(0.340)	(0.494)	(0.434)
Age 55-64	-0.926	-0.100	0.476*	1.025**	-1.076	0.658*
	(0.984)	(1.242)	(0.261)	(0.466)	(1.144)	(0.384)
Male	-1.593***	-1.855***	-0.303	-0.221	-0.806	-0.828
	(0.579)	(0.631)	(0.188)	(0.266)	(0.814)	(0.550)
White	-0.929	-0.119	0.414	0.256	5.834*	0.556
	(1.337)	(1.682)	(0.364)	(0.560)	(3.131)	(0.776)
Black	-1.378	0.163	0.262	0.0642	5.501*	-0.368
	(1.108)	(1.456)	(0.477)	(0.570)	(2.781)	(0.877)
Asian	0.852	1.130	0.318	0.00613	4.651	-0.468
	(1.403)	(1.549)	(0.227)	(0.350)	(2.908)	(1.637)
Single	0.365	0.828	0.358*	0.471	-0.157	0.656
	(0.753)	(0.821)	(0.203)	(0.293)	(1.443)	(0.504)
Divorced	0.176	-0.849	1.001***	0.444	3.155**	0.0427
	(0.986)	(1.065)	(0.283)	(0.371)	(1.295)	(1.001)
HS Degree Only	1.909**	0.744	-0.114	-0.204	1.467	1.096
	(0.851)	(0.867)	(0.390)	(0.301)	(1.333)	(1.339)
Obtained Bachelor's Degree'	0.958	0.413	-0.0480	-0.0666	0.829	0.717
	(0.970)	(1.281)	(0.440)	(0.336)	(1.214)	(1.785)
Frac. of Lower Rep.	-0.0153	-0.275	-0.0869	-0.0734	-0.185	-0.0269
	(0.177)	(0.208)	(0.0777)	(0.0985)	(0.149)	(0.0586)
Maximum Temperature	-0.0168	-0.000638	0.00179	0.000546	-0.0374	-0.000723
	(0.0156)	(0.0165)	(0.00305)	(0.00425)	(0.0268)	(0.00518)
Monthly Precipitation	-0.0178	0.0363	0.0245	0.0334	-0.0103	0.0346
	(0.0481)	(0.0588)	(0.0176)	(0.0207)	(0.0652)	(0.0321)
Constant	-2.440	-3.951	1.718***	0.627	-2.318	0.387
	(2.157)	(2.759)	(0.596)	(0.764)	(4.417)	(1.480)
N	1349	932	933	933	933	933
r2	0.374	0.422	0.683	0.613	0.616	0.520

Robust standard errors are clustered at the state level.
Independent variable of interest in the unemployment rate.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.28: Wholesale Trade Industry Results: Model 2

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
whole_recession	-0.113	-0.00273	0.00148	0.0894	-0.0153
	(0.120)	(0.00730)	(0.00902)	(0.0535)	(0.0118)
whole_expansion	-0.0461	0.00367	0.00932	0.0440	-0.00396
	(0.0986)	(0.00435)	(0.00588)	(0.0435)	(0.00844)
Inspection Rate	-17.59	-1.885*	-1.756*	-19.09**	1.231
	(15.53)	(0.986)	(0.922)	(7.124)	(2.633)
Age 25-34	-3.104	0.283	0.689**	0.190	0.228
	(4.352)	(0.239)	(0.315)	(1.245)	(0.447)
Age 35-44	-3.925	-0.188	0.116	-0.702	-0.0541
	(4.143)	(0.247)	(0.332)	(0.739)	(0.389)
Age 45-54	-2.739	0.365	0.542	-0.202	0.605
	(4.252)	(0.219)	(0.335)	(0.492)	(0.501)
Age 55-64	-3.461	0.534**	1.030**	-1.015	0.765**
	(3.776)	(0.249)	(0.456)	(1.139)	(0.375)
Male	-4.961**	-0.283	-0.142	-0.998	-0.771
	(2.141)	(0.188)	(0.261)	(0.841)	(0.515)
White	-3.200	0.520	0.366	6.108*	0.694
	(4.604)	(0.395)	(0.628)	(3.105)	(0.784)
Black	-4.189	0.310	0.122	5.399*	-0.318
	(3.899)	(0.476)	(0.623)	(2.687)	(0.836)
Asian	0.343	0.244	-0.000902	4.261	-0.467
	(5.610)	(0.275)	(0.369)	(2.711)	(1.634)
Single	1.283	0.217	0.360	-0.495	0.590
	(2.881)	(0.203)	(0.285)	(1.386)	(0.508)
HS Degree Only	4.343*	-0.0000479	-0.0696	1.042	0.614
	(2.238)	(0.156)	(0.236)	(0.958)	(0.620)
Frac. of Lower Rep.	-0.0194	-0.0778	-0.0761	-0.153	-0.000493
	(0.635)	(0.0640)	(0.0900)	(0.155)	(0.0453)
Maximum Temperature	-0.0354	0.00280	0.00166	-0.0367	-0.0000107
	(0.0544)	(0.00299)	(0.00372)	(0.0275)	(0.00499)
Monthly Precipitation	0.00934	0.0290	0.0366*	-0.00546	0.0398
	(0.186)	(0.0178)	(0.0198)	(0.0674)	(0.0330)
Constant	-1.583	-10.14***	-11.41***	-12.99***	-11.01***
	(7.363)	(0.565)	(0.739)	(4.161)	(1.084)
N	1349	933	933	933	933
r2	0.504	0.698	0.621	0.616	0.531
F_diff	1.663	2.039	2.360	2.915	2.126
p_diff	0.203	0.161	0.132	0.0950	0.152

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.2.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.29: Wholesale Trade Industry Results: Model 4

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
GDP Decrease for 2 quarters	-0.100	0.00387	0.00324	-0.0677	-0.0129
	(0.159)	(0.0127)	(0.0192)	(0.0945)	(0.0198)
Not Recession	-0.0101	0.00545	0.0115**	0.0278	-0.00264
	(0.0883)	(0.00442)	(0.00540)	(0.0438)	(0.00973)
Inspection Rate	-23.32	-3.363***	-3.018***	-24.49***	-0.118
	(15.32)	(0.492)	(1.014)	(3.662)	(2.728)
Age 25-34	0.157	0.164	0.656	1.251	-0.144
	(4.554)	(0.320)	(0.502)	(1.804)	(0.608)
Age 35-44	-1.189	-0.00656	0.534	-0.0407	-0.185
	(4.740)	(0.303)	(0.504)	(0.705)	(0.461)
Age 45-54	-1.465	0.496	0.887	0.0627	0.313
	(4.457)	(0.329)	(0.571)	(0.846)	(0.747)
Age 55-64	-1.132	0.538	1.078*	-0.551	0.433
	(4.468)	(0.331)	(0.625)	(1.018)	(0.513)
Male	-10.33***	0.0280	0.274	-1.194	-0.662
	(2.838)	(0.229)	(0.372)	(1.506)	(0.607)
White	1.458	0.173	0.304	3.721	-0.428
	(7.760)	(0.565)	(0.897)	(6.644)	(1.429)
Black	3.553	-0.0933	0.0976	2.184	-1.734
	(7.814)	(0.599)	(0.905)	(6.265)	(1.619)
Asian	7.108	-0.0531	-0.140	-2.700	-1.766
	(11.15)	(0.695)	(0.803)	(8.422)	(3.342)
Single	-0.902	0.307	0.556	-0.229	0.815
	(3.584)	(0.204)	(0.387)	(1.884)	(0.758)
HS Degree Only	6.332**	-0.0675	-0.368*	0.928	0.942
	(2.868)	(0.159)	(0.215)	(1.167)	(0.872)
Frac. of Lower Rep.	-0.488	-0.0944	-0.0285	-0.156	-0.0500
	(0.857)	(0.0608)	(0.0887)	(0.200)	(0.0665)
Maximum Temperature	-0.106	0.00146	0.00156	-0.0170	-0.00647
	(0.0845)	(0.00368)	(0.00566)	(0.0201)	(0.00773)
Monthly Precipitation	-0.162	0.0117	0.0191	0.114	0.0307
	(0.269)	(0.0184)	(0.0229)	(0.0701)	(0.0505)
Constant	1.545	-10.24***	-12.12***	-12.86	-9.825***
	(12.15)	(0.794)	(1.316)	(7.926)	(1.508)
N	699	571	571	571	571
r2	0.505	0.608	0.534	0.623	0.364
F_diff	0.563	0.0215	0.224	1.830	0.298
p_diff	0.457	0.884	0.638	0.183	0.588

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.4.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.30: Retail Trade Industry Results: Model 1

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	-0.0187	0.0347	-0.0680	-0.143	0.0723	-0.0292
	(0.110)	(0.0815)	(0.0812)	(0.145)	(0.214)	(0.0876)
Inspection Rate	3.275	3.569	-1.111	-1.012	-0.104	-0.408
	(3.006)	(3.186)	(0.950)	(1.179)	(3.211)	(0.861)
Age 25-34	-2.132**	-1.690**	-0.308	-0.788*	-1.783	0.0120
	(0.813)	(0.786)	(0.378)	(0.446)	(1.206)	(0.455)
Age 35-44	-2.584***	-2.673***	-0.503	-0.327	-2.566*	-0.641
	(0.853)	(0.924)	(0.364)	(0.425)	(1.483)	(0.433)
Age 45-54	-2.946**	-3.048**	-1.109**	-1.154**	-3.183**	-1.244**
	(1.108)	(1.429)	(0.413)	(0.510)	(1.342)	(0.506)
Age 55-64	-1.251	-2.178	0.165	0.0792	2.205	0.262
	(1.299)	(1.367)	(0.485)	(0.546)	(2.610)	(0.609)
Male	1.431	0.209	0.517	0.162	3.697	0.861**
	(1.169)	(1.116)	(0.366)	(0.487)	(3.500)	(0.413)
White	0.585	0.203	-0.193	0.0382	-2.221	-0.660
	(1.437)	(1.482)	(0.418)	(0.591)	(1.326)	(0.564)
Black	1.707	2.015	1.527***	1.285	2.032	1.313*
	(1.790)	(1.628)	(0.562)	(0.798)	(1.408)	(0.674)
Asian	-0.841	-0.919	0.0114	-0.117	-1.206	-0.0685
	(0.661)	(0.630)	(0.248)	(0.229)	(0.739)	(0.478)
Single	0.332	-0.369	0.0238	0.0686	-0.413	0.160
	(0.734)	(0.806)	(0.341)	(0.395)	(1.002)	(0.416)
Divorced	1.544	2.062	0.880*	0.275	1.055	1.524***
	(1.163)	(1.475)	(0.457)	(0.562)	(1.603)	(0.521)
HS Degree Only	0.786	0.457	-0.0867	0.260	-0.728	-0.0628
	(0.766)	(0.666)	(0.276)	(0.321)	(1.050)	(0.343)
Obtained Bachelor's Degree'	2.292*	2.262*	0.233	0.318	-2.854	0.377
	(1.201)	(1.189)	(0.416)	(0.521)	(1.913)	(0.470)
Frac. of Lower Rep.	0.302	0.113	-0.0196	-0.0767	-0.0702	-0.0126
	(0.201)	(0.133)	(0.0720)	(0.135)	(0.178)	(0.0662)
Maximum Temperature	0.0140	-0.00270	0.00437	0.00136	-0.0304	0.00757*
	(0.0136)	(0.0113)	(0.00348)	(0.00556)	(0.0388)	(0.00432)
Monthly Precipitation	0.0748*	0.0478	0.00463	-0.00538	-0.0276	0.0166
	(0.0442)	(0.0461)	(0.0139)	(0.0172)	(0.0619)	(0.0218)
Constant	-6.793***	-3.403*	1.211	0.612	2.907	0.193
	(2.455)	(1.688)	(0.838)	(0.969)	(5.559)	(1.085)
N	1350	941	941	941	941	941
r2	0.419	0.442	0.886	0.820	0.406	0.863

Robust standard errors are clustered at the state level.
Independent variable of interest in the unemployment rate.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.31: Retail Trade Industry Results: Model 2

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
con_recession	-0.768**	-0.158***	-0.137**	-0.156	-0.143***
	(0.334)	(0.0399)	(0.0577)	(0.122)	(0.0468)
con_expansion	-0.701**	-0.135***	-0.114**	-0.145	-0.124***
	(0.282)	(0.0358)	(0.0536)	(0.119)	(0.0417)
Inspection Rate	14.03	-0.829	-0.672	-0.324	-0.110
	(10.11)	(0.956)	(1.185)	(3.245)	(0.923)
Age 25-34	-5.193**	-0.152	-0.659	-1.572	0.179
	(2.529)	(0.376)	(0.461)	(1.125)	(0.450)
Age 35-44	-6.130**	-0.320	-0.229	-2.364	-0.391
	(2.531)	(0.319)	(0.415)	(1.420)	(0.379)
Age 45-54	-6.679**	-0.973**	-1.092**	-3.187**	-1.071**
	(3.121)	(0.393)	(0.490)	(1.376)	(0.494)
Age 55-64	-4.786	0.351	0.197	2.108	0.521
	(4.069)	(0.472)	(0.518)	(2.399)	(0.621)
Male	1.531	0.561	0.140	4.225	0.921**
	(3.272)	(0.380)	(0.488)	(3.436)	(0.426)
White	2.185	-0.120	0.00474	-1.987	-0.497
	(4.097)	(0.419)	(0.563)	(1.280)	(0.576)
Black	4.144	1.538**	1.139	2.340*	1.441**
	(5.179)	(0.579)	(0.796)	(1.313)	(0.696)
Asian	-3.501*	-0.0266	-0.151	-1.135	-0.192
	(2.067)	(0.293)	(0.288)	(0.717)	(0.531)
Single	0.508	-0.0222	0.0410	-0.395	0.0818
	(2.139)	(0.340)	(0.417)	(1.021)	(0.415)
HS Degree Only	2.437	-0.0487	0.250	0.221	-0.0616
	(2.290)	(0.242)	(0.284)	(1.181)	(0.285)
Frac. of Lower Rep.	0.937	-0.0115	-0.0774	-0.0676	0.00521
	(0.637)	(0.0736)	(0.148)	(0.192)	(0.0674)
Maximum Temperature	0.0706	0.00562	0.00265	-0.0300	0.00899**
	(0.0444)	(0.00360)	(0.00535)	(0.0384)	(0.00444)
Monthly Precipitation	0.219	0.00243	-0.00836	-0.0308	0.0152
	(0.149)	(0.0126)	(0.0159)	(0.0611)	(0.0207)
Constant	-19.28**	-11.07***	-11.50***	-10.60*	-12.07***
	(7.389)	(0.803)	(0.934)	(5.637)	(1.031)
N	1350	941	941	941	941
r2	0.434	0.890	0.826	0.410	0.867
F_diff	0.754	11.26	8.157	0.167	4.303
p_diff	0.389	0.00166	0.00658	0.685	0.0441

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.2.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.32: Retail Trade Industry Results: Model 4

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
GDP Decrease for 2 quarters	-0.985**	-0.0823*	-0.0912	0.0732	-0.0467
	(0.413)	(0.0434)	(0.0728)	(0.139)	(0.0570)
Not Recession	-1.077**	-0.0869**	-0.0935	-0.0166	-0.0465
	(0.423)	(0.0423)	(0.0747)	(0.132)	(0.0554)
Inspection Rate	4.494	-0.301	0.240	-1.125	0.0621
	(8.324)	(0.870)	(1.090)	(1.591)	(0.935)
Age 25-34	-5.495	-0.167	-0.502	1.215	0.0422
	(4.539)	(0.507)	(0.628)	(1.599)	(0.625)
Age 35-44	-9.831**	-0.0454	0.388	0.893	-0.419
	(3.979)	(0.380)	(0.582)	(1.914)	(0.492)
Age 45-54	-11.76**	-0.662	-0.567	0.286	-1.125
	(5.082)	(0.508)	(0.634)	(2.095)	(0.717)
Age 55-64	-9.067	-0.177	-0.156	4.157	-0.561
	(7.135)	(0.702)	(0.783)	(3.825)	(0.942)
Male	-0.0839	0.337	0.145	-0.394	0.824
	(5.445)	(0.566)	(0.689)	(2.692)	(0.702)
White	3.975	0.486	1.117	1.484	-0.818
	(6.888)	(0.509)	(0.856)	(1.099)	(0.741)
Black	3.036	0.717	1.167	2.215	-0.646
	(6.985)	(0.916)	(1.254)	(1.766)	(1.272)
Asian	14.06	0.186	0.540	4.048**	-1.303
	(10.15)	(0.694)	(0.845)	(1.816)	(1.252)
Single	0.200	0.00590	0.180	0.810	-0.206
	(3.233)	(0.436)	(0.554)	(1.457)	(0.575)
HS Degree Only	3.396	-0.171	0.304	-0.104	-0.248
	(2.933)	(0.410)	(0.517)	(1.345)	(0.447)
Frac. of Lower Rep.	0.511	-0.0660	-0.0984	-0.129	-0.0895
	(0.460)	(0.0689)	(0.167)	(0.109)	(0.0908)
Maximum Temperature	0.0373	0.00610	0.00250	-0.0192	0.0108*
	(0.0845)	(0.00434)	(0.00715)	(0.0362)	(0.00565)
Monthly Precipitation	-0.100	-0.0150	-0.0309	-0.0478	-0.000261
	(0.192)	(0.0186)	(0.0255)	(0.0726)	(0.0295)
Constant	-13.91	-11.66***	-13.14***	-12.59***	-11.66***
	(10.49)	(1.093)	(1.324)	(3.889)	(1.398)
N	700	577	577	577	577
r2	0.461	0.848	0.735	0.459	0.820
F_diff	1.119	0.280	0.0409	1.937	0.000227
p_diff	0.295	0.599	0.841	0.171	0.988

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.4.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.33: Transportation and Warehousing Industry Results: Model 1

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	0.122	0.148	-0.0398	-0.0103	-0.0759	-0.0392
	(0.191)	(0.125)	(0.0726)	(0.0730)	(0.154)	(0.0737)
Inspection Rate	-3.541	-5.366*	-0.543	0.136	-3.041	0.0556
	(3.001)	(3.185)	(0.653)	(0.784)	(3.817)	(0.998)
Age 25-34	-1.737	0.414	-0.849**	-0.691*	-4.197*	-1.080**
	(1.710)	(1.647)	(0.318)	(0.383)	(2.438)	(0.417)
Age 35-44	-1.014	0.113	-0.573*	-0.444	-4.399*	-1.010**
	(1.389)	(1.350)	(0.337)	(0.380)	(2.472)	(0.471)
Age 45-54	-1.806	0.264	-0.846**	-0.688	-3.630*	-1.212***
	(1.558)	(1.431)	(0.388)	(0.515)	(2.025)	(0.426)
Age 55-64	-1.155	-0.424	-0.647*	-0.275	-4.938*	-0.886*
	(1.574)	(1.636)	(0.383)	(0.450)	(2.752)	(0.501)
Male	0.512	0.380	0.103	0.176	-0.547	0.0226
	(0.572)	(0.620)	(0.205)	(0.275)	(0.725)	(0.267)
White	1.975	2.860**	0.379	0.0875	3.059	-0.251
	(1.239)	(1.087)	(0.339)	(0.373)	(2.505)	(0.447)
Black	0.953	2.297**	0.624	0.223	3.892	0.0740
	(1.201)	(1.039)	(0.448)	(0.454)	(2.651)	(0.578)
Asian	-1.183	0.523	-0.575***	-0.890***	-2.103	-0.911***
	(0.806)	(0.491)	(0.199)	(0.255)	(1.470)	(0.268)
Single	0.158	-0.360	-0.141	0.0240	-0.480	-0.446
	(0.864)	(0.512)	(0.262)	(0.293)	(1.072)	(0.343)
Divorced	0.383	-0.0924	-0.475*	-0.396	0.0220	-0.585
	(0.780)	(0.932)	(0.277)	(0.267)	(1.084)	(0.381)
HS Degree Only	-0.657	-0.345	0.637**	0.734**	0.395	0.698*
	(0.656)	(0.789)	(0.271)	(0.356)	(1.428)	(0.405)
Obtained Bachelor's Degree'	-0.106	0.201	0.275	0.247	1.724	0.690
	(1.081)	(1.112)	(0.349)	(0.375)	(1.932)	(0.494)
Frac. of Lower Rep.	-0.133	-0.488*	-0.0541	-0.122*	-0.108	0.0253
	(0.318)	(0.255)	(0.0429)	(0.0623)	(0.318)	(0.0620)
Maximum Temperature	0.0191	0.0122	-0.00544*	-0.00874**	0.00254	-0.00655*
	(0.0115)	(0.0131)	(0.00317)	(0.00421)	(0.0272)	(0.00383)
Monthly Precipitation	0.00297	0.0296	-0.00655	-0.0102	-0.0239	-0.00454
	(0.0401)	(0.0530)	(0.0171)	(0.0187)	(0.0525)	(0.0246)
Constant	-5.641**	-7.561***	2.315***	1.803**	0.352	2.380***
	(2.117)	(2.332)	(0.655)	(0.745)	(4.401)	(0.861)
N	1350	936	936	934	934	936
r2	0.523	0.554	0.764	0.698	0.385	0.758

Robust standard errors are clustered at the state level.
Independent variable of interest in the unemployment rate.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.34: Transportation and Warehousing Industry Results: Model 2

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
tran_recession	0.0965	0.0126	-0.00253	0.319	0.00841
	(0.213)	(0.0224)	(0.0321)	(0.253)	(0.0309)
tran_expansion	0.0412	0.0150	-0.00827	0.318	0.0139
	(0.186)	(0.0213)	(0.0304)	(0.232)	(0.0268)
Inspection Rate	-20.81**	-0.318	0.295	-2.067	0.288
	(7.912)	(0.692)	(0.804)	(3.469)	(1.110)
Age 25-34	-4.914	-0.718**	-0.583	-3.979*	-0.931**
	(5.297)	(0.317)	(0.377)	(2.344)	(0.420)
Age 35-44	-2.331	-0.503	-0.383	-4.257*	-0.916*
	(4.035)	(0.344)	(0.371)	(2.424)	(0.486)
Age 45-54	-4.258	-0.779**	-0.602	-3.537*	-1.109**
	(4.970)	(0.385)	(0.496)	(1.976)	(0.431)
Age 55-64	-2.931	-0.591	-0.224	-4.555*	-0.803
	(4.615)	(0.408)	(0.445)	(2.454)	(0.516)
Male	1.704	0.221	0.302	-0.536	0.139
	(1.435)	(0.205)	(0.278)	(0.642)	(0.274)
White	6.050*	0.320	0.0851	2.856	-0.299
	(3.177)	(0.334)	(0.370)	(2.444)	(0.419)
Black	2.964	0.452	0.162	3.221	-0.0860
	(2.731)	(0.460)	(0.474)	(2.663)	(0.572)
Asian	-3.550**	-0.618***	-0.915***	-2.205	-0.935***
	(1.504)	(0.202)	(0.257)	(1.637)	(0.234)
Single	-0.273	-0.151	0.0227	-0.809	-0.443
	(2.388)	(0.267)	(0.304)	(1.029)	(0.357)
HS Degree Only	-2.201	0.385*	0.521**	-0.966	0.184
	(1.463)	(0.196)	(0.239)	(0.754)	(0.343)
Frac. of Lower Rep.	-0.599	-0.0393	-0.108	-0.00574	0.0459
	(0.935)	(0.0446)	(0.0682)	(0.291)	(0.0638)
Maximum Temperature	0.0409	-0.00529	-0.00894**	0.00529	-0.00646
	(0.0327)	(0.00336)	(0.00441)	(0.0258)	(0.00392)
Monthly Precipitation	-0.0489	-0.00472	-0.0110	-0.00820	-0.000875
	(0.117)	(0.0181)	(0.0195)	(0.0490)	(0.0259)
Constant	-12.38*	-9.115***	-9.717***	-9.139*	-8.864***
	(6.692)	(0.632)	(0.737)	(4.876)	(0.869)
N	1350	936	934	934	936
r2	0.546	0.777	0.705	0.394	0.771
F_diff	1.615	0.375	1.670	0.00127	0.606
p_diff	0.210	0.543	0.203	0.972	0.440

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.2.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.35: Transportation and Warehousing Industry Results: Model 4

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
GDP Decrease for 2 quarters	-0.0153	0.0290	-0.0149	0.435*	0.0727**
	(0.277)	(0.0296)	(0.0359)	(0.251)	(0.0321)
Not Recession	-0.0711	0.0286	-0.0144	0.428*	0.0672*
	(0.288)	(0.0282)	(0.0351)	(0.238)	(0.0335)
Inspection Rate	-32.21***	-0.0896	0.604	-3.118	0.653
	(10.73)	(0.703)	(0.868)	(2.854)	(1.296)
Age 25-34	-6.940	-0.385	-0.157	-2.649	-0.467
	(4.911)	(0.320)	(0.358)	(2.100)	(0.396)
Age 35-44	-2.033	-0.216	0.0492	-2.773	-0.917*
	(4.392)	(0.339)	(0.540)	(1.982)	(0.461)
Age 45-54	-2.847	-0.442	-0.279	-0.347	-0.512
	(4.462)	(0.305)	(0.487)	(1.368)	(0.419)
Age 55-64	-3.525	-0.325	0.205	-3.147*	-0.556
	(6.122)	(0.418)	(0.484)	(1.871)	(0.564)
Male	1.571	0.265	0.309	-0.755	0.191
	(3.098)	(0.195)	(0.271)	(0.920)	(0.272)
White	2.786	0.278	-0.0781	4.637	-0.407
	(3.908)	(0.443)	(0.473)	(3.664)	(0.516)
Black	0.744	0.257	-0.272	4.452	-0.303
	(4.098)	(0.538)	(0.607)	(3.666)	(0.576)
Asian	-3.006	-0.991	-1.770**	2.807	-1.604**
	(5.725)	(0.722)	(0.699)	(2.999)	(0.791)
Single	-0.0592	-0.0490	0.101	0.0195	-0.459
	(2.791)	(0.266)	(0.315)	(1.528)	(0.349)
HS Degree Only	-3.695*	0.308	0.482	-0.604	-0.00589
	(1.990)	(0.283)	(0.303)	(1.181)	(0.423)
Frac. of Lower Rep.	-0.204	-0.0752	-0.195**	0.190	-0.0163
	(1.471)	(0.0498)	(0.0845)	(0.243)	(0.0555)
Maximum Temperature	0.0328	-0.00107	-0.00552	0.0102	-0.00291
	(0.0508)	(0.00391)	(0.00464)	(0.0191)	(0.00524)
Monthly Precipitation	-0.0867	-0.00947	-0.0161	-0.0519	-0.00718
	(0.224)	(0.0249)	(0.0277)	(0.0634)	(0.0345)
Constant	-8.344	-10.12***	-10.66***	-12.65*	-9.674***
	(7.234)	(0.676)	(0.765)	(6.331)	(0.955)
N	700	575	573	573	575
r2	0.538	0.713	0.590	0.404	0.726
F_diff	1.005	0.00244	0.00228	0.102	0.243
p_diff	0.321	0.961	0.962	0.751	0.625

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.4.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.36: Financial Activities Industry Results: Model 1

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	0.132	0.134	-0.00841	0.129	0.0722	-0.0917
	(0.106)	(0.118)	(0.0839)	(0.196)	(0.339)	(0.251)
Inspection Rate	-0.244	-0.327	-2.657	-8.815	-17.27	0.278
	(1.240)	(1.392)	(4.194)	(6.022)	(11.99)	(3.105)
Age 25-34	0.362	0.340	-0.304	0.0297	2.585	0.352
	(0.495)	(0.609)	(0.635)	(2.054)	(2.246)	(0.889)
Age 35-44	0.00124	-0.0728	-0.340	0.113	-1.406	0.186
	(0.478)	(0.726)	(0.994)	(2.152)	(2.732)	(1.041)
Age 45-54	0.142	-0.0382	0.0393	2.825	3.435	1.337
	(0.548)	(0.721)	(0.828)	(2.741)	(2.801)	(1.200)
Age 55-64	0.379	0.341	0.813	2.096	3.310	1.189
	(0.692)	(0.791)	(0.845)	(3.401)	(3.987)	(1.452)
Male	0.170	0.522	-0.208	1.572	-3.409*	-0.310
	(0.481)	(0.712)	(0.524)	(1.534)	(2.015)	(0.850)
White	-0.478	-0.433	1.183	3.497	2.230	0.191
	(0.590)	(1.097)	(1.267)	(2.689)	(2.940)	(1.150)
Black	-0.00889	-0.0133	1.932	4.855*	6.307	0.155
	(0.802)	(1.124)	(1.527)	(2.651)	(4.518)	(1.380)
Asian	-1.566***	-1.277*	1.653**	4.435**	5.448*	1.532*
	(0.528)	(0.641)	(0.649)	(2.047)	(2.812)	(0.882)
Single	-0.154	0.295	0.563	1.870	-0.403	2.466**
	(0.537)	(0.759)	(0.431)	(1.476)	(2.052)	(1.209)
Divorced	0.423	0.432	-0.522	-1.072	0.175	-0.130
	(0.588)	(0.655)	(0.670)	(1.637)	(3.419)	(0.999)
HS Degree Only	-0.716	0.0479	-0.492	1.183	2.936	2.725*
	(0.893)	(1.196)	(1.425)	(2.635)	(3.431)	(1.522)
Obtained Bachelor's Degree'	-0.623	0.262	-0.0384	2.209	6.070*	2.993*
	(0.853)	(1.129)	(0.983)	(2.976)	(3.250)	(1.675)
Frac. of Lower Rep.	-0.0626	-0.139	-0.224	-0.393	0.493	-0.342**
	(0.0766)	(0.109)	(0.162)	(0.435)	(0.366)	(0.164)
Maximum Temperature	0.00765	0.00345	-0.00896	-0.00674	-0.00809	-0.0191
	(0.00510)	(0.00789)	(0.0106)	(0.0145)	(0.0328)	(0.0125)
Monthly Precipitation	0.0416*	0.0244	0.00282	-0.00707	0.0337	-0.00310
	(0.0248)	(0.0255)	(0.0213)	(0.0435)	(0.113)	(0.0359)
Constant	-6.889***	-7.215***	0.618	-7.172**	-9.464	-1.456
	(1.546)	(2.322)	(2.086)	(3.466)	(6.774)	(1.802)
N	1350	912	912	907	903	909
r2	0.131	0.152	0.505	0.433	0.551	0.393

Robust standard errors are clustered at the state level.
Independent variable of interest in the unemployment rate.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.37: Financial Activities Industry Results: Model 2

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
fin_recession	-0.0312	0.00447	-0.0539	-0.0772	0.0223
	(0.134)	(0.0137)	(0.0598)	(0.0943)	(0.0362)
fin_expansion	0.0194	0.0113	-0.0592	-0.0935	0.0216
	(0.112)	(0.0145)	(0.0470)	(0.0667)	(0.0273)
Inspection Rate	-8.852	-2.536	-8.430	-16.92	0.443
	(8.703)	(4.133)	(6.047)	(11.72)	(3.092)
Age 25-34	-2.208	-0.220	0.276	3.034	0.623
	(3.707)	(0.648)	(2.019)	(2.290)	(0.886)
Age 35-44	-1.852	-0.229	0.327	-0.902	0.501
	(3.938)	(0.997)	(2.082)	(2.680)	(1.021)
Age 45-54	-1.784	0.198	2.990	3.753	1.649
	(4.401)	(0.847)	(2.634)	(2.816)	(1.156)
Age 55-64	-1.386	0.831	2.158	3.564	1.320
	(4.742)	(0.821)	(3.397)	(3.834)	(1.396)
Male	0.104	-0.129	1.648	-3.210*	-0.114
	(3.311)	(0.523)	(1.545)	(1.907)	(0.815)
White	2.671	1.087	3.285	2.021	0.0969
	(4.056)	(1.290)	(2.725)	(3.079)	(1.162)
Black	8.072	1.810	4.620*	6.139	0.0169
	(5.055)	(1.532)	(2.606)	(4.579)	(1.381)
Asian	-1.164	1.579**	4.265**	5.298*	1.493*
	(4.436)	(0.647)	(1.978)	(2.864)	(0.797)
Single	-1.316	0.601	1.940	-0.547	2.302*
	(3.509)	(0.408)	(1.588)	(2.130)	(1.194)
HS Degree Only	-3.120	-0.440	-1.065	-2.930	-0.0302
	(2.625)	(0.632)	(1.041)	(1.767)	(0.781)
Frac. of Lower Rep.	-0.312	-0.224	-0.369	0.500	-0.345*
	(0.389)	(0.159)	(0.420)	(0.341)	(0.182)
Maximum Temperature	0.0385	-0.00811	-0.00654	-0.00968	-0.0181
	(0.0309)	(0.00996)	(0.0143)	(0.0330)	(0.0119)
Monthly Precipitation	0.315*	0.00355	-0.00501	0.0378	-0.00110
	(0.170)	(0.0216)	(0.0439)	(0.114)	(0.0346)
Constant	-21.36***	-11.13***	-16.85***	-15.65***	-10.59***
	(7.234)	(1.478)	(3.476)	(5.207)	(1.848)
N	1350	912	907	903	909
r2	0.376	0.499	0.434	0.551	0.390
F_diff	0.858	0.558	0.0395	0.174	0.00205
p_diff	0.359	0.459	0.843	0.679	0.964

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.2.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.38: Financial Activities Industry Results: Model 4

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
GDP Decrease for 2 quarters	0.143	0.0133	-0.0983	-0.120**	0.0243
	(0.119)	(0.0256)	(0.0995)	(0.0501)	(0.0335)
Not Recession	0.227	0.00730	-0.0959	-0.0595	-0.00218
	(0.151)	(0.0275)	(0.0980)	(0.0763)	(0.0385)
Inspection Rate	-26.41*	0.189	-8.074	-13.03	5.448*
	(13.29)	(2.958)	(7.243)	(15.16)	(2.794)
Age 25-34	-7.580	-0.230	1.844	3.632	1.129
	(6.231)	(1.071)	(3.714)	(2.973)	(1.610)
Age 35-44	-9.383	-0.640	2.334	0.101	0.0969
	(7.135)	(1.816)	(3.266)	(3.768)	(1.964)
Age 45-54	-5.850	0.204	4.960	8.368*	1.170
	(7.051)	(1.386)	(3.749)	(4.291)	(2.004)
Age 55-64	-11.85*	0.550	5.532	8.466*	1.448
	(6.140)	(1.433)	(4.989)	(4.963)	(2.232)
Male	1.395	0.391	2.939	-2.135	-0.669
	(5.482)	(0.576)	(1.976)	(2.435)	(1.282)
White	14.52*	-0.555	3.765	6.183	-3.025
	(8.425)	(1.679)	(5.799)	(6.588)	(2.907)
Black	18.41*	0.552	6.392	8.416	-1.777
	(9.755)	(2.021)	(5.583)	(7.490)	(3.133)
Asian	13.19	0.534	7.005	4.618	-1.612
	(11.07)	(1.612)	(7.131)	(8.223)	(2.819)
Single	4.158	0.607	1.952*	-1.932	2.216
	(4.377)	(0.506)	(1.146)	(2.726)	(1.530)
HS Degree Only	-3.192	-0.0872	-0.545	-3.716	-0.112
	(4.474)	(0.645)	(1.899)	(2.328)	(1.285)
Frac. of Lower Rep.	-0.505	-0.229	-0.519	0.706	-0.480
	(0.605)	(0.192)	(0.513)	(0.505)	(0.297)
Maximum Temperature	0.107*	-0.00471	-0.00796	0.0238	-0.0357
	(0.0635)	(0.00834)	(0.0250)	(0.0469)	(0.0215)
Monthly Precipitation	0.494**	-0.00147	0.0244	0.194	-0.0781*
	(0.237)	(0.0238)	(0.0898)	(0.147)	(0.0463)
Constant	-35.52***	-10.74***	-20.79**	-26.00***	-6.040*
	(11.13)	(2.463)	(8.520)	(9.020)	(3.433)
N	700	552	547	543	549
r2	0.367	0.438	0.463	0.578	0.292
F_diff	0.758	0.215	0.00244	1.191	1.456
p_diff	0.388	0.645	0.961	0.281	0.234

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.4.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.39: Service Industry Results: Model 1

	(1) Fatal	(2) Fatal (Reduced n)	(3) All Nonfatal	(4) Lost Workday	(5) Job Restriction/Transfer	(6) Other Nonfatal
Right to Work	0.0698	0.129	0.00490	-0.0677	-0.00327	0.0544*
	(0.0981)	(0.0890)	(0.0202)	(0.0523)	(0.0686)	(0.0292)
Inspection Rate	0.862	0.954	-0.408	-0.546	-2.497*	0.113
	(2.450)	(2.054)	(0.489)	(0.584)	(1.435)	(0.474)
Age 25-34	-1.029	0.148	-1.650***	-1.583***	-2.299	-1.864***
	(1.577)	(1.937)	(0.419)	(0.545)	(1.427)	(0.443)
Age 35-44	-0.426	1.187	-1.593***	-1.148*	-2.815*	-1.889***
	(1.600)	(2.058)	(0.513)	(0.655)	(1.624)	(0.670)
Age 45-54	0.272	0.719	-1.911***	-1.197	-3.549*	-2.498***
	(1.468)	(1.926)	(0.569)	(0.916)	(2.031)	(0.749)
Age 55-64	-0.854	-3.359	-0.656	0.457	-0.931	-1.243
	(1.920)	(2.260)	(0.597)	(0.753)	(1.521)	(0.879)
Male	0.816	-0.113	-0.0132	0.339	0.923	-0.382
	(1.155)	(1.409)	(0.337)	(0.517)	(0.760)	(0.470)
White	1.140	0.336	-0.0462	-1.183***	-0.506	0.488
	(0.861)	(1.340)	(0.451)	(0.402)	(0.948)	(0.684)
Black	0.180	-0.706	0.0689	-0.829	-0.0647	0.558
	(1.285)	(1.866)	(0.566)	(0.640)	(1.349)	(0.842)
Asian	1.407	1.095	0.712***	0.368	-0.218	1.093***
	(0.935)	(1.083)	(0.236)	(0.237)	(0.645)	(0.362)
Single	0.684	0.305	-0.480	-0.626	-2.874*	-0.176
	(1.177)	(1.418)	(0.315)	(0.425)	(1.542)	(0.482)
Divorced	4.041***	4.100**	1.755***	0.452	0.0327	2.858***
	(1.443)	(2.008)	(0.513)	(0.605)	(1.237)	(0.710)
HS Degree Only	0.337	-0.511	-0.290	-0.589	1.033	-0.142
	(1.309)	(1.656)	(0.600)	(0.531)	(1.944)	(0.802)
Obtained Bachelor's Degree'	0.621	0.615	-0.221	-0.190	0.755	-0.307
	(1.443)	(1.781)	(0.642)	(0.641)	(1.270)	(0.890)
Frac. of Lower Rep.	0.0239	-0.0660	-0.0813***	-0.105	-0.0278	-0.0596*
	(0.0962)	(0.110)	(0.0292)	(0.0657)	(0.0877)	(0.0341)
Maximum Temperature	0.00923	0.00805	0.000505	-0.000159	-0.00304	-0.00107
	(0.00812)	(0.00841)	(0.00276)	(0.00214)	(0.0122)	(0.00379)
Monthly Precipitation	0.0595**	0.0502	-0.00296	-0.0109	-0.0146	0.000368
	(0.0264)	(0.0303)	(0.00923)	(0.00744)	(0.0226)	(0.0102)
Constant	-8.957***	-7.771**	2.724***	2.516***	1.570	1.921
	(2.160)	(3.492)	(0.795)	(0.740)	(2.136)	(1.213)
N	1350	913	913	907	909	910
r2	0.346	0.368	0.878	0.892	0.804	0.816

Robust standard errors are clustered at the state level.
Independent variable of interest in the unemployment rate.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.40: Service Industry Results: Model 2

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
serv_recession	0.310	-0.0460	-0.0451	-0.142	-0.0410
	(0.536)	(0.0356)	(0.0421)	(0.0850)	(0.0461)
serv_expansion	0.342	-0.0428	-0.0374	-0.137	-0.0420
	(0.516)	(0.0336)	(0.0399)	(0.0837)	(0.0437)
Inspection Rate	6.066	-0.266	-0.349	-2.520*	0.230
	(8.032)	(0.411)	(0.529)	(1.382)	(0.526)
Age 25-34	-2.594	-1.317***	-1.234**	-2.085	-1.552***
	(8.974)	(0.394)	(0.510)	(1.383)	(0.418)
Age 35-44	-3.752	-1.489***	-0.966	-2.737*	-1.849***
	(9.313)	(0.491)	(0.618)	(1.533)	(0.643)
Age 45-54	3.365	-1.712***	-0.968	-3.274	-2.332***
	(9.518)	(0.571)	(0.886)	(1.969)	(0.786)
Age 55-64	4.426	-0.258	0.813	-0.776	-0.812
	(9.799)	(0.603)	(0.712)	(1.393)	(0.883)
Male	4.300	0.0904	0.481	1.183	-0.310
	(4.889)	(0.330)	(0.493)	(0.744)	(0.486)
White	1.401	0.173	-1.183***	-0.422	0.877
	(4.368)	(0.500)	(0.401)	(0.998)	(0.775)
Black	0.380	0.319	-0.836	-0.0545	1.010
	(6.198)	(0.587)	(0.644)	(1.391)	(0.860)
Asian	-2.154	0.589**	0.305	-0.142	0.912**
	(4.877)	(0.258)	(0.253)	(0.695)	(0.427)
Single	-2.135	-0.727**	-0.778*	-2.834*	-0.506
	(5.549)	(0.342)	(0.439)	(1.441)	(0.509)
HS Degree Only	-3.536	-0.00817	-0.479	0.412	0.328
	(3.233)	(0.351)	(0.393)	(1.181)	(0.430)
Frac. of Lower Rep.	-0.0893	-0.0662**	-0.104	-0.0265	-0.0338
	(0.917)	(0.0265)	(0.0683)	(0.100)	(0.0369)
Maximum Temperature	0.0560	-0.000000713	-0.000380	-0.00261	-0.00180
	(0.0377)	(0.00294)	(0.00234)	(0.0115)	(0.00395)
Monthly Precipitation	0.151	-0.000440	-0.00877	-0.0124	0.00329
	(0.115)	(0.00928)	(0.00741)	(0.0225)	(0.0103)
Constant	-14.99	-9.493***	-9.652***	-10.29***	-10.36***
	(9.760)	(0.730)	(0.771)	(2.627)	(1.085)
N	1350	913	907	909	910
r2	0.486	0.876	0.894	0.808	0.808
F_diff	0.444	0.905	4.058	0.742	0.0398
p_diff	0.509	0.347	0.0502	0.394	0.843

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.2.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.41: Service Industry Results: Model 4

	(1) Fatal	(2) All Nonfatal	(3) Lost Workday	(4) Job Restriction/Transfer	(5) Other Nonfatal
GDP Decrease for 2 quarters	0.909	0.0216	0.0182	0.183**	-0.0101
	(0.580)	(0.0369)	(0.0572)	(0.0683)	(0.0543)
Not Recession	0.915	0.0232	0.0163	0.194***	-0.00582
	(0.597)	(0.0368)	(0.0560)	(0.0681)	(0.0552)
Inspection Rate	8.427	0.125	0.272	-0.174	0.302
	(7.759)	(0.272)	(0.341)	(0.451)	(0.389)
Age 25-34	-4.641	-0.776	0.139	-1.431	-1.152**
	(12.47)	(0.503)	(0.672)	(1.051)	(0.540)
Age 35-44	-11.91	-0.0927	0.899	-1.544	-0.375
	(12.99)	(0.558)	(0.783)	(1.409)	(0.704)
Age 45-54	-22.75*	-0.224	1.392	-1.340	-0.855
	(11.81)	(0.780)	(1.027)	(1.456)	(0.964)
Age 55-64	-14.53	-0.0960	1.615*	-2.558**	-0.721
	(17.00)	(0.759)	(0.897)	(1.184)	(1.075)
Male	4.675	-0.264	0.0438	1.508	-0.761
	(7.687)	(0.499)	(0.483)	(1.056)	(0.644)
White	-8.311	-0.0534	-0.987	-0.379	0.160
	(16.96)	(0.400)	(0.647)	(1.557)	(0.703)
Black	1.533	-0.141	-0.859	-0.288	-0.0141
	(21.74)	(0.703)	(0.992)	(1.803)	(1.020)
Asian	-24.37	1.314**	1.276	0.784	1.203
	(18.79)	(0.508)	(0.804)	(2.291)	(0.723)
Single	-27.46***	-0.394	-0.392	-1.731**	-0.352
	(9.176)	(0.390)	(0.494)	(0.822)	(0.537)
HS Degree Only	-0.110	-0.683**	-0.664	-1.927**	-0.507
	(6.105)	(0.307)	(0.496)	(0.739)	(0.360)
Frac. of Lower Rep.	0.514	-0.0586*	-0.0961	0.0259	-0.0333
	(1.524)	(0.0330)	(0.0849)	(0.0881)	(0.0424)
Maximum Temperature	-0.0269	0.00412*	0.000457	0.0176***	0.00311
	(0.0481)	(0.00214)	(0.00272)	(0.00443)	(0.00288)
Monthly Precipitation	-0.208	-0.00614	-0.0257**	0.0341	-0.00432
	(0.177)	(0.0105)	(0.0102)	(0.0254)	(0.0117)
Constant	16.03	-10.06***	-11.32***	-10.97***	-10.40***
	(23.09)	(0.637)	(1.072)	(1.935)	(0.949)
N	700	554	548	550	551
r2	0.503	0.876	0.897	0.901	0.828
F_diff	0.00248	0.168	0.0618	0.670	0.858
p_diff	0.960	0.684	0.805	0.418	0.359

Robust standard errors are clustered at the state level.
Independent variable of interest is the unemployment rate split into two separate variables as in equation 2.4.
For a description of each control variable, see Table 2.2.
Column (1) represents all fatal workplace injuries. Column (2) represents all nonfatal workplace injuries. Column (3) represents nonfatal workplace injuries which resulted in days away from work. Column (4) represents nonfatal injuries which did not result in days away from work but did result in job restriction or job transfer. Column (5) represents all nonfatal injuries which did not result in days away from work, job restriction, or job transfer.
F_diff and p_diff are the F statistic and p-value for the null hypothesis of if the two estimate outcomes of interest are equal.
Differences in n's between column (1) and the remaining occurs because there is not full participation from states for reporting nonfatal injury counts. See Table 2.3 for a list of excluded states-years.

Table B.42: Fatal Injury Results

	(1) All	(2) Private	(3) Public	(4) Construction	(5) Manufacturing	(6) Whole Sale	(7) Retail	(8) Transportation	(9) Finance	(10) Service
Unemployment	-0.132**	-0.157**	-1.337	-0.899**	-1.656	1.088	0.250	0.479	1.315	3.059
	(0.0593)	(0.0629)	(1.483)	(0.417)	(1.307)	(1.205)	(1.241)	(0.743)	(2.393)	(2.439)
N	1350	1350	1282	1226	1025	805	959	1195	434	1144
r2	0.863	0.855	0.466	0.566	0.744	0.600	0.519	0.672	0.663	0.444
Recession (UNEMP+)	-0.134**	-0.168**	-1.305	-0.954**	-1.758	1.229	0.208	0.512	1.905	2.938
	(0.0655)	(0.0683)	(1.512)	(0.432)	(1.320)	(1.221)	(1.196)	(0.748)	(2.453)	(2.420)
Expansion (UNEMP-)	-0.133**	-0.164**	-1.110	-1.436**	-2.416	1.961	0.126	0.672	3.851	2.463
	(0.0631)	(0.0662)	(2.049)	(0.614)	(1.566)	(1.596)	(1.228)	(0.983)	(3.386)	(2.481)
N	1350	1350	1282	1226	1025	805	959	1195	434	1144
r2	0.863	0.855	0.466	0.568	0.744	0.600	0.519	0.672	0.664	0.444
F_diff	0.0153	0.453	0.0315	3.174	0.834	0.810	0.0337	0.0805	1.388	0.591
p_diff	0.902	0.504	0.860	0.0810	0.366	0.373	0.855	0.778	0.245	0.446
Recession (Julius Shiskin)	-0.213***	-0.212**	1.293	-1.558**	-2.518*	0.815	-1.216	0.585	0.712	3.996
	(0.0761)	(0.0852)	(2.052)	(0.628)	(1.479)	(2.103)	(1.801)	(1.261)	(3.569)	(3.375)
Expansion	-0.217***	-0.222***	-1.396	-1.219**	-2.863*	1.107	-0.739	1.037	2.556	2.733
	(0.0726)	(0.0807)	(2.177)	(0.568)	(1.545)	(1.666)	(1.934)	(0.887)	(3.689)	(3.337)
N	700	700	661	633	502	419	471	628	254	600
r2	0.868	0.861	0.407	0.578	0.664	0.613	0.436	0.690	0.634	0.401
F_diff	0.147	1.007	2.313	0.849	0.310	0.0272	0.438	0.359	2.498	1.236
p_diff	0.703	0.321	0.135	0.361	0.580	0.870	0.511	0.552	0.121	0.272

Robustness Check. Using missing values instead of zeros.

Table B.43: eq3 Comparison Robustness

	(1) all_lnfatalr	(2) all_lnnon_totr	(3) all_lnnon_awayr	(4) all_lnnon_tranr	(5) all_lnnon_othr
Recession (SCI Decreased, quarterly)	-0.114*	-0.178***	-0.187***	-0.229***	-0.160***
	(0.0622)	(0.0410)	(0.0419)	(0.0575)	(0.0544)
Expansion (SCI Increased, quarterly)	-0.129**	-0.178***	-0.191***	-0.227***	-0.159***
	(0.0595)	(0.0406)	(0.0406)	(0.0558)	(0.0547)
N	1350	943	943	943	943
r2	0.863	0.947	0.949	0.944	0.926
F_diff	3.053	0.00205	0.904	0.0866	0.102
p_diff	0.0869	0.964	0.347	0.770	0.750
Recession (SCI Decreased, yearly)	-0.125*	-0.189***	-0.193***	-0.240***	-0.170***
	(0.0639)	(0.0437)	(0.0451)	(0.0651)	(0.0579)
Expansion (SCI Increased, yearly)	-0.130**	-0.182***	-0.193***	-0.231***	-0.163***
	(0.0604)	(0.0414)	(0.0418)	(0.0587)	(0.0558)
N	1350	943	943	943	943
r2	0.863	0.948	0.949	0.944	0.926
F_diff	0.206	1.663	0.00132	1.084	1.515
p_diff	0.652	0.204	0.971	0.304	0.225

Robustness Check. Using yearly SCI changes instead of quarterly

Table B.44: Model 3 Robustness Check

	(1) all_lnfatalr	(2) all_lnnon_totr	(3) all_lnnon_awayr	(4) all_lnnon_tranr	(5) all_lnnon_othr
Recession (SCI Decreased, quarterly)	-0.114*	-0.178***	-0.187***	-0.229***	-0.160***
	(0.0622)	(0.0410)	(0.0419)	(0.0575)	(0.0544)
Expansion (SCI Increased, quarterly)	-0.129**	-0.178***	-0.191***	-0.227***	-0.159***
	(0.0595)	(0.0406)	(0.0406)	(0.0558)	(0.0547)
N	1350	943	943	943	943
r2	0.863	0.947	0.949	0.944	0.926
F_diff	3.053	0.00205	0.904	0.0866	0.102
p_diff	0.0869	0.964	0.347	0.770	0.750
Recession (SCI Decreased, yearly)	-0.125*	-0.189***	-0.193***	-0.240***	-0.170***
	(0.0639)	(0.0437)	(0.0451)	(0.0651)	(0.0579)
Expansion (SCI Increased, yearly)	-0.130**	-0.182***	-0.193***	-0.231***	-0.163***
	(0.0604)	(0.0414)	(0.0418)	(0.0587)	(0.0558)
N	1350	943	943	943	943
r2	0.863	0.948	0.949	0.944	0.926
F_diff	0.206	1.663	0.00132	1.084	1.515
p_diff	0.652	0.204	0.971	0.304	0.225

Results study the full workforce.
Results for the quarterly definition of a recession are identical to those found in Table 2.4.
The yearly definition means that a state's average SCI index decreased from the previous year. This definition is similar to equation 2 but using the SCI index.

Appendix C

Additional Tables and Figures for Chapter 3

Table C.1: Propensity Score and Coarsened Exact Matching - Number of Matches

	All	Public	Private	Blue Collar	White Collar	Low Wage	Middle Wage	High Wage
Members	149,858	73,170	76,370	55,374	94,492	44,111	92,435	13,305
Off Support	9	9	0	0	1	6	0	10
Members - Robustness	61,596	30,988	30,491	22,723	38,873	16,780	39,215	5,582
Off Support	4	5	2	0	4	1	1	21
Non-members	16,109	8,697	7,376	3,471	12,637	5,440	9,153	1,514
Off Support	0	1	0	0	1	1	0	1
Non-members - Robustness	6,444	3,625	2,812	1,367	5,075	1,990	3,841	612
Off Support	1	1	0	0	3	1	1	0

Number of matches and off support for propensity score matching
Coarsened exact matching results in all treated being matched meaning number of matches is sum of matches and off support in table

Table C.2: Ordinal and Nominal Logistic Regression Results - Robustness Check

	Full Workforce	Public	Private	Blue Collar	White Collar	Low Wage	Middle Wage	High Wage
Ordinal Logistic Results								
Member	1.069***	1.022	1.088***	1.216***	0.992	1.078***	1.033**	1.058
	(0.0113)	(0.0185)	(0.0148)	(0.0205)	(0.0135)	(0.0203)	(0.0142)	(0.0388)
Member - Income Control	1.063***	1.020	1.076***	1.157***	0.997	1.016	1.015	1.063*
	(0.0112)	(0.0185)	(0.0146)	(0.0201)	(0.0136)	(0.0193)	(0.0140)	(0.0391)
Non-Member	1.011	1.009	1.020	0.916	1.045	1.098*	0.993	0.929
	(0.0307)	(0.0426)	(0.0449)	(0.0582)	(0.0363)	(0.0616)	(0.0385)	(0.0963)
Non-Member - Income Control	1.015	1.011	1.025	0.940	1.045	1.126**	1.005	0.929
	(0.0308)	(0.0428)	(0.0452)	(0.0597)	(0.0364)	(0.0628)	(0.0389)	(0.0964)
Nominal Logistic Results								
Member	1.094***	1.041*	1.114***	1.241***	1.008	1.108***	1.044**	1.080
	(0.0142)	(0.0235)	(0.0184)	(0.0250)	(0.0171)	(0.0247)	(0.0177)	(0.0541)
Member - Income Control	1.079***	1.036	1.092***	1.152***	1.011	1.029	1.020	1.085
	(0.0140)	(0.0234)	(0.0180)	(0.0239)	(0.0172)	(0.0232)	(0.0173)	(0.0543)
Non-Member	1.005	0.978	1.042	0.932	1.034	1.065	1.003	0.968
	(0.0375)	(0.0498)	(0.0576)	(0.0698)	(0.0448)	(0.0693)	(0.0490)	(0.131)
Non-Member - Income Control	1.014	0.981	1.057	0.967	1.036	1.096	1.015	0.967
	(0.0379)	(0.0500)	(0.0587)	(0.0723)	(0.0450)	(0.0713)	(0.0496)	(0.131)

This robustness check only includes the first time an individual was in the data
In ordinal logit, dependent variable has worst self-rated health at 1 and best at 5
Results are given in odds ratios
The comparison group for labor union members are those who are not represented by a union
The comparison group for non-members are labor union members
Robustness checks are excluding the second wave of all individuals

Table C.3: Propensity Score Matching Results - Robustness Check

	Full Workforce	Public	Private	Blue Collar	White Collar	Low Wage	Middle Wage	High Wage
Ordinal Logistic Results								
Members	1.074***	1.065***	1.058***	1.194***	1.011	1.088***	1.058***	1.068*
	(0.0112)	(0.0157)	(0.0156)	(0.0204)	(0.0133)	(0.0216)	(0.0139)	(0.0375)
Non-members	0.954	0.958	1.004	0.993	1.034	1.024	0.971	0.980
	(0.0308)	(0.0413)	(0.0490)	(0.0692)	(0.0377)	(0.0590)	(0.0408)	(0.103)
Nominal Logistic Results								
Members	1.101***	1.066***	1.088***	1.210***	1.030*	1.110***	1.060***	1.057
	(0.0137)	(0.0192)	(0.0188)	(0.0239)	(0.0165)	(0.0251)	(0.0168)	(0.0486)
Non-members	0.946	0.919	1.025	0.965	1.054	1.016	0.956	1.106
	(0.0373)	(0.0488)	(0.0603)	(0.0781)	(0.0472)	(0.0685)	(0.0498)	(0.150)

This robustness check only includes the first time an individual was in the data
Dependent variable is binary self-reported health
Estimates given in odds ratios
Full matching occurs for both PSM and CEM with number of matches for each estimation given in Table C.1

Table C.4: Coarsened Exact Matching - Robustness Check

	Full Workforce	Public	Private	Blue Collar	White Collar	Low Wage	Middle Wage	High Wage
Ordinal Logistic Results								
Members	1.070***	0.956***	1.135***	1.287***	1.053***	1.113***	1.026***	0.958
	(0.00848)	(0.0104)	(0.0151)	(0.0173)	(0.0104)	(0.0165)	(0.0104)	(0.0253)
Non-members	1.044*	1.080**	0.986	0.911*	1.026	1.115**	1.043	0.936
	(0.0251)	(0.0390)	(0.0318)	(0.0466)	(0.0281)	(0.0485)	(0.0324)	(0.0738)
Nominal Logistic Results								
Members	1.090***	0.973**	1.147***	1.322***	1.065***	1.138***	1.028**	0.964
	(0.0104)	(0.0126)	(0.0186)	(0.0207)	(0.0129)	(0.0194)	(0.0127)	(0.0338)
Non-members	1.047	1.091**	0.980	0.900*	1.035	1.086	1.061	0.948
	(0.0305)	(0.0475)	(0.0385)	(0.0529)	(0.0350)	(0.0547)	(0.0406)	(0.0970)

This robustness check only includes the first time an individual was in the data
Estimates given in odds ratios
Full matching occurs for CEM. Hence, number of matches is sum of matches and off support in Table C.1

Table C.5: Odds Ratios, Ordinal Logistic Results for Union Members

	Full Workforce	Public	Private	Blue Collar	White Collar	Low Wage	Middle Wage	High Wage
health								
Union Member	1.077***	1.020*	1.101***	1.204***	1.008	1.089***	1.034***	1.059**
	(0.00728)	(0.0121)	(0.00948)	(0.0130)	(0.00879)	(0.0127)	(0.00931)	(0.0253)
/								
cut1	0.00347***	0.00440***	0.00334***	0.00345***	0.00353***	0.00366***	0.00186***	0.00179***
	(0.0000980)	(0.000326)	(0.0001000)	(0.000171)	(0.000123)	(0.000149)	(0.0000792)	(0.000235)
cut2	0.0284***	0.0359***	0.0273***	0.0281***	0.0289***	0.0285***	0.0166***	0.0149***
	(0.000721)	(0.00240)	(0.000735)	(0.00128)	(0.000902)	(0.00107)	(0.000618)	(0.00175)
cut3	0.223***	0.273***	0.216***	0.226***	0.225***	0.208***	0.145***	0.125***
	(0.00557)	(0.0180)	(0.00572)	(0.0101)	(0.00691)	(0.00774)	(0.00531)	(0.0142)
cut4	1.164***	1.492***	1.122***	1.125***	1.200***	1.027	0.809***	0.685***
	(0.0291)	(0.0984)	(0.0296)	(0.0502)	(0.0368)	(0.0381)	(0.0295)	(0.0778)
N	1159330	195532	958357	315002	844328	451576	594125	113629
health								
Union Member	1.069***	1.014	1.089***	1.145***	1.011	1.027**	1.015*	1.064***
	(0.00722)	(0.0120)	(0.00937)	(0.0128)	(0.00883)	(0.0121)	(0.00914)	(0.0255)
Income	1.000***	1.000***	1.000***	1.000***	1.000***	1.000***	1.000***	1.000***
	(6.90e-08)	(0.000000233)	(7.28e-08)	(0.000000274)	(7.12e-08)	(0.000000307)	(0.000000134)	(6.75e-08)
/								
cut1	0.00328***	0.00419***	0.00321***	0.00329***	0.00329***	0.00396***	0.00186***	0.00179***
	(0.0000927)	(0.000312)	(0.0000962)	(0.000164)	(0.000115)	(0.000162)	(0.0000788)	(0.000236)
cut2	0.0268***	0.0343***	0.0263***	0.0269***	0.0269***	0.0309***	0.0165***	0.0150***
	(0.000684)	(0.00231)	(0.000708)	(0.00122)	(0.000843)	(0.00117)	(0.000616)	(0.00176)
cut3	0.212***	0.261***	0.209***	0.217***	0.211***	0.228***	0.145***	0.125***
	(0.00530)	(0.0174)	(0.00553)	(0.00975)	(0.00649)	(0.00851)	(0.00531)	(0.0143)
cut4	1.112***	1.434***	1.092***	1.088*	1.130***	1.134***	0.812***	0.688***
	(0.0278)	(0.0952)	(0.0288)	(0.0487)	(0.0347)	(0.0422)	(0.0296)	(0.0783)
N	1159330	195532	958357	315002	844328	451576	594125	113629

Results also in Table 3.2
Cut points for health scores 1 through 4
Sample size for ordinal logit is the same for nominal logit results in Table 3.2

Table C.6: Odds Ratios, Ordinal Logit Results for Union Members - Robustness Check

	Full Workforce	Public	Private	Blue Collar	White Collar	Low Wage	Middle Wage	High Wage
health								
Union Member	1.069***	1.022	1.088***	1.216***	0.992	1.078***	1.033**	1.058
	(0.0113)	(0.0185)	(0.0148)	(0.0205)	(0.0135)	(0.0203)	(0.0142)	(0.0388)
/								
cut1	0.00326***	0.00450***	0.00300***	0.00293***	0.00345***	0.00363***	0.00180***	0.00146***
	(0.000151)	(0.000533)	(0.000149)	(0.000239)	(0.000197)	(0.000255)	(0.000121)	(0.000294)
cut2	0.0295***	0.0375***	0.0277***	0.0278***	0.0304***	0.0317***	0.0170***	0.0148***
	(0.00122)	(0.00404)	(0.00121)	(0.00202)	(0.00155)	(0.00204)	(0.000989)	(0.00267)
cut3	0.233***	0.292***	0.220***	0.223***	0.241***	0.234***	0.148***	0.123***
	(0.00949)	(0.0311)	(0.00949)	(0.0160)	(0.0121)	(0.0149)	(0.00848)	(0.0217)
cut4	1.238***	1.622***	1.159***	1.126*	1.304***	1.157**	0.836***	0.696**
	(0.0502)	(0.173)	(0.0498)	(0.0806)	(0.0655)	(0.0735)	(0.0476)	(0.122)
N	438166	79261	357043	117618	320548	153988	238819	45359
health								
Union Member	1.063***	1.020	1.076***	1.157***	0.997	1.016	1.015	1.063*
	(0.0112)	(0.0185)	(0.0146)	(0.0201)	(0.0136)	(0.0193)	(0.0140)	(0.0391)
Income	1.000***	1.000***	1.000***	1.000***	1.000***	1.000***	1.000***	1.000***
	(0.000000108)	(0.000000384)	(0.000000112)	(0.000000403)	(0.000000112)	(0.000000519)	(0.000000212)	(0.000000106)
/								
cut1	0.00307***	0.00434***	0.00288***	0.00281***	0.00320***	0.00405***	0.00181***	0.00146***
	(0.000143)	(0.000519)	(0.000143)	(0.000229)	(0.000183)	(0.000285)	(0.000121)	(0.000295)
cut2	0.0278***	0.0362***	0.0266***	0.0267***	0.0282***	0.0354***	0.0171***	0.0148***
	(0.00115)	(0.00395)	(0.00116)	(0.00195)	(0.00145)	(0.00228)	(0.000993)	(0.00268)
cut3	0.221***	0.282***	0.213***	0.215***	0.225***	0.264***	0.149***	0.124***
	(0.00903)	(0.0305)	(0.00917)	(0.0155)	(0.0113)	(0.0168)	(0.00854)	(0.0219)
cut4	1.181***	1.576***	1.128***	1.094	1.223***	1.318***	0.844***	0.697**
	(0.0480)	(0.170)	(0.0484)	(0.0784)	(0.0616)	(0.0838)	(0.0481)	(0.123)
N	438166	79261	357043	117618	320548	153988	238819	45359

Results also in Table 3.2
Cut points for health scores 1 through 4
Sample size for ordinal logit is the same for nominal logit results in Table 3.2

Table C.7: Odds Ratios, Ordinal Logit Results for Non-Union Members

	Full Workforce	Public	Private	Blue Collar	White Collar	Low Wage	Middle Wage	High Wage
health								
Non-Member	1.009	1.025	1.000	0.956	1.030	1.071**	0.990	0.995
	(0.0194)	(0.0274)	(0.0279)	(0.0378)	(0.0228)	(0.0357)	(0.0251)	(0.0639)
/								
cut1	0.00422***	0.00474***	0.00396***	0.00322***	0.00504***	0.00358***	0.00278***	0.00348***
	(0.000351)	(0.000611)	(0.000452)	(0.000426)	(0.000553)	(0.000497)	(0.000311)	(0.00137)
cut2	0.0360***	0.0404***	0.0342***	0.0279***	0.0427***	0.0280***	0.0257***	0.0338***
	(0.00273)	(0.00481)	(0.00357)	(0.00336)	(0.00431)	(0.00364)	(0.00259)	(0.0118)
cut3	0.283***	0.315***	0.271***	0.230***	0.326***	0.202***	0.217***	0.291***
	(0.0213)	(0.0372)	(0.0280)	(0.0274)	(0.0326)	(0.0259)	(0.0217)	(0.0994)
cut4	1.559***	1.770***	1.474***	1.231*	1.831***	1.055	1.243**	1.678
	(0.117)	(0.209)	(0.152)	(0.147)	(0.183)	(0.136)	(0.124)	(0.573)
N	165994	81878	83761	58853	107141	49570	101594	14830
health								
Non-Member	1.013	1.030	1.001	0.986	1.029	1.100***	0.999	0.989
	(0.0195)	(0.0276)	(0.0280)	(0.0392)	(0.0228)	(0.0367)	(0.0253)	(0.0636)
Income	1.000***	1.000***	1.000***	1.000***	1.000***	1.000***	1.000***	1.000***
	(0.000000252)	(0.000000363)	(0.000000351)	(0.000000469)	(0.000000287)	(0.000000907)	(0.000000360)	(0.000000221)
/								
cut1	0.00407***	0.00460***	0.00386***	0.00305***	0.00486***	0.00430***	0.00295***	0.00357***
	(0.000339)	(0.000593)	(0.000441)	(0.000404)	(0.000533)	(0.000599)	(0.000328)	(0.00141)
cut2	0.0348***	0.0392***	0.0334***	0.0264***	0.0412***	0.0338***	0.0272***	0.0347***
	(0.00265)	(0.00467)	(0.00349)	(0.00320)	(0.00416)	(0.00440)	(0.00274)	(0.0122)
cut3	0.275***	0.308***	0.266***	0.219***	0.316***	0.245***	0.231***	0.299***
	(0.0207)	(0.0363)	(0.0275)	(0.0262)	(0.0316)	(0.0315)	(0.0230)	(0.102)
cut4	1.524***	1.737***	1.458***	1.187	1.781***	1.290**	1.330***	1.727
	(0.114)	(0.205)	(0.151)	(0.142)	(0.178)	(0.166)	(0.132)	(0.591)
N	165994	81878	83761	58853	107141	49570	101594	14830

Results also in Table 3.2
Cut points for health scores 1 through 4
Sample size for ordinal logit is the same for nominal logit results in Table 3.2

Table C.8: Odds Ratios, Ordinal Logit Results for Non-Union Members - Robustness Check

	Full Workforce	Public	Private	Blue Collar	White Collar	Low Wage	Middle Wage	High Wage
health								
Non-Member	1.011	1.009	1.020	0.916	1.045	1.098*	0.993	0.929
	(0.0307)	(0.0426)	(0.0449)	(0.0582)	(0.0363)	(0.0616)	(0.0385)	(0.0963)
/								
cut1	0.00402***	0.00427***	0.00404***	0.00278***	0.00513***	0.00296***	0.00303***	0.00253***
	(0.000504)	(0.000841)	(0.000688)	(0.000541)	(0.000868)	(0.000630)	(0.000515)	(0.00140)
cut2	0.0382***	0.0394***	0.0396***	0.0277***	0.0474***	0.0269***	0.0303***	0.0233***
	(0.00433)	(0.00712)	(0.00608)	(0.00484)	(0.00734)	(0.00532)	(0.00461)	(0.0115)
cut3	0.302***	0.306***	0.321***	0.224***	0.371***	0.195***	0.255***	0.215***
	(0.0339)	(0.0546)	(0.0487)	(0.0385)	(0.0569)	(0.0381)	(0.0384)	(0.104)
cut4	1.678***	1.739***	1.754***	1.222	2.088***	1.026	1.468**	1.303
	(0.188)	(0.309)	(0.266)	(0.210)	(0.320)	(0.200)	(0.220)	(0.627)
N	68063	34620	33320	24098	43965	18784	43064	6215
health								
Non-Member	1.015	1.011	1.025	0.940	1.045	1.126**	1.005	0.929
	(0.0308)	(0.0428)	(0.0452)	(0.0597)	(0.0364)	(0.0628)	(0.0389)	(0.0964)
Income	1.000***	1.000***	1.000***	1.000***	1.000***	1.000***	1.000***	1.000
	(0.000000372)	(0.000000578)	(0.000000509)	(0.000000669)	(0.000000431)	(0.00000148)	(0.000000552)	(0.000000332)
/								
cut1	0.00391***	0.00418***	0.00396***	0.00266***	0.00498***	0.00361***	0.00325***	0.00253***
	(0.000491)	(0.000823)	(0.000677)	(0.000519)	(0.000843)	(0.000774)	(0.000552)	(0.00140)
cut2	0.0372***	0.0386***	0.0388***	0.0265***	0.0460***	0.0329***	0.0325***	0.0233***
	(0.00423)	(0.00697)	(0.00600)	(0.00465)	(0.00714)	(0.00655)	(0.00494)	(0.0115)
cut3	0.295***	0.301***	0.316***	0.216***	0.362***	0.240***	0.275***	0.215***
	(0.0332)	(0.0536)	(0.0483)	(0.0373)	(0.0555)	(0.0473)	(0.0414)	(0.104)
cut4	1.648***	1.716***	1.741***	1.188	2.041***	1.274	1.589***	1.303
	(0.185)	(0.305)	(0.266)	(0.205)	(0.313)	(0.250)	(0.239)	(0.627)
N	68063	34620	33320	24098	43965	18784	43064	6215

Results also in Table 3.2
Cut points for health scores 1 through 4
Sample size for ordinal logit is the same for nominal logit results in Table 3.2