Senior Project
Department of Economics

"Small Business and Minimum Wage"

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1. Abstract

Most of the existing research put a focus on how a minimum wage increases affect the labor force. Small businesses account for roughly half of U.S. GDP, therefore this research focuses on how a minimum wage affects categories of small firms. It is important to discover if less small businesses are founded as a result of a higher minimum wage. The purpose of this study is to test if raising the minimum wage has a negative effect on the number of small businesses in a state. The study first evaluates how minimum wage impacts small businesses in all industries. Specific industries are then selected in order to isolate the effects of minimum wage on the number of small businesses.

2. Introduction

Economic theory suggests that inefficiency will result from imposing a wage floor. The floor will prevent a mutually beneficial transaction, decreasing both the firm and workers' welfare resulting in a deadweight loss. Between 2007 and 2009 the minimum wage increased from $5.15 per hour to now $7.25 per hour. This increase could have a significant negative effect on the number of small firms in business. There has been much media attention focused on the possible negative impacts of a minimum wage hike. Claims have been made that a higher minimum wage along with increasing workers compensation rate could stifle small businesses leading to less entrepreneurs and start up businesses.[1] It is important to be concerned for the well being of small businesses in the U.S. as they historically account for roughly 50% of the Nation's GDP (Kobe 2007). Therefore, it is interesting and necessary to study how an increase in the nationally mandated minimum wage, such as the recent one, has affected the number of small firms in the United States.

Most of the existing research has focused on how a minimum wage increase affects the labor force. Extensive studies have focused on labor force categories such as teenage employment. The studies that focus on the employer side of the market generally focus on the restaurant industry. As mentioned, small businesses account for roughly half of U.S. GDP, therefore research needs to focus on how a minimum wage is affecting this category of business which is already experiencing low profit margins. It is also important to discover if less small businesses are founded as a result of a higher minimum wage. The purpose of this study is to test if raising the minimum wage has a negative effect on the number of small businesses in a state.

[1] http://www.brighthub.com/office/entrepreneurs/articles/54061.aspx

The opposition to increasing the minimum wage comes from the theory that imposing a wage floor will mandate a wage higher than the equilibrium wage which would prevent mutually beneficial transactions that would lead to the market clearing wage. If this is the case small businesses would have to pay workers wages higher than their MRPL leading to inefficiency, putting a strain on the employment practices of small firms. However, much of the research attempting to discover how a higher minimum wage will affect employment has proven to be ambiguous. Card and Krueger (1995) find no evidence that increasing the minimum wage reduces teenage employment, in fact in some instances increasing the minimum wage actually led to an increase in teenage employment. On the other hand Deer et al. (1995) finds evidence supporting the Neo-Classical theory that increasing the minimum wage led to a significant, though modest decrease on teenage employment.

3. Review of Literature

Most economists before 1995 used time series data to study the effects of minimum wage. Card and Krueger (1995) raised points discrediting the use of time series data when assessing minimum wage policy. They were the first to argue that previous studies using time series data to evaluate minimum wage effects on unemployment faced a number of potential problems and presented inaccurate results. First, minimum wage variables in time-series studies produce relatively little variation over a period of time, while the variation that does occur is usually correlated with changes in social welfare and training programs (Neumark and Wascher 1992). Such correlation makes it difficult to isolate the effects minimum wage has on employment. In addition, some states set a minimum wage higher than that of the federal

mandate. Therefore, past studies using the federal minimum wage as a variable experienced an error when measuring its effects (Neumark and Wascher 1992).

Burkhauser, Couch, and Wittenburg (2000) use the same set of control variables to reassess Card and Krueger (1995) as well as Deere et al (1995), two models which address how minimum wage affects teenage employment. Though Burkhauser et al (2000) provide a reevaluation of these two models their primary purpose was to estimate the effects of the 1990's minimum wage increase. Since some states mandate a minimum wage higher than that of the federally mandated wage these two models assess observations for each state over time using CPS data. The limitation to this method is that such panel data will likely not indicate how a minimum wage hike affects the national economy. In addition to being subject to differentials in state economies, these models are limited to evaluating the effect a minimum wage has on teenage labor force participation.

In their reassessment, Burkhauser et al (2000) find that when Card and Krueger (1995) add year effects to their model, they effectively eliminate all of the variation in their data making their results uninformative. For that reason, when they estimate how minimum wage increases of the 1990's affected teenaged employment, Burkhauser et al (2000) followed more closely the model used by Deer et al. where the minimum wage enters the model as a dummy variable. Burhauser et al (2000) find evidence supporting the Neo-Classical theory that increasing the minimum wage will have a significant, though modest impact on teenage employment.

Minimum wage research attempts to discover particular portions of the labor market that are most directly affected by an increase in the nationally mandated minimum wage. Along with teen labor, fast food employment is a particular area of interest to minimum wage scholars. Card and Kreuger (1994) conducted a survey of 410 fast food restaurants in New Jersey and

Pennsylvania in order to assess a 1992 increase in New Jersey's state minimum wage. They found no evidence that the minimum wage increase reduced low wage employment in the fast food industry in New Jersey. The survey also suggests that the higher minimum wage has no effect on the number of newly established fast food restaurants in the area. The study does suggest that most of the increase in wages was passed on to the consumer in terms of higher prices of meals.

Neumark and Wascher (2000) reevaluate these findings suggesting flaws in the research. This reevaluation used administrative payroll records from various fast food restaurants in New Jersey and eastern Pennsylvania. Analysis of the new data finds that first, the survey results used by Card and Kreuger (1994) show substantially greater variation in employment change than what is observed in the payroll data. In addition, Card and Kreuger (1994) data finds evidence that the minimum wage increase led to an increase in employment in the fast food industry while the payroll data indicated a decline in employment in the New Jersey fast food industry relative to the Pennsylvania control group.

Though these two studies focus on fast food industries, much of the previous research has focused on how minimum wage affects the employment of certain categories of the labor force. A notable exception is Rohlin (2010). This study examines how new and existing business locations are affected by a state minimum wage increase. In order to capture the effects of minimum wage on business location Rohlin (2010) used a difference in difference method on data from bordering areas of several states. He finds evidence that, though a minimum wage hike does not have an effect on existing businesses, a higher minimum wage will deter new businesses from entering an area. This could have a substantial impact on local state governments receiving the new businesses.

Like Rohlin (2010) this paper will focus on the firm side and evaluate the minimum wage affects the number of small firms in each state. Firms that are smaller in size can typically adjust to change quickly and inexpensively. For this reason it is expected that areas with higher minimum wage laws will experience lower amounts of small businesses.

4. Model Specification and Development of Results

Many industries pay wages much higher than the mandated minimum wage. Imposing a wage floor on such an industry will have no effect on employment practices or business location. Therefore, in order to address how the minimum wage affects the number of small businesses in an area the data needs to be separated by type of industry. Firms can be classified into industry categories according to their main output of production. According to the level of aggregation, the classification is said to be a 2-digit industries, 3-digit industries, and 4-digit industries with broader level of aggregation associated with lower digit classification. This study will use data for all 2-digit industries to look at industry i in state s from time t (1998 to 2008). The model used is derived from Card and Krueger (1995) and is specified as follows:

$$\mathbf{lsmall}_{sit} = \beta_0 + \beta_1 \, MW_{st} + \mu_t + \delta_s + \gamma_i + \varepsilon_{sit}$$

The dependent variable (**lsmall**) represents the log of the number of small firms by industry in each state s and industry i at time t. There will be a series of regressions for different definitions of small firms depending on the actual size of the firm. Hence **lsmall** will measure alternatively the log of the number of businesses with 1-4, 5-9, 10-19, 20-49 employees. For comparison, the model will also be used to estimate the impact of minimum wage on medium sized companies with 50-99 employees. The explanatory variables are: MW for the minimum

wage, μ is a set of time fixed effects, δ is a set of state fixed effects and γ is a set of fixed effects for each 2 digit industry. The data needed are available from County Business Patterns of the U.S. Census Bureau. The minimum wage data is available from the U.S. Department of Labor website. For variable descriptions and descriptive statistics refer to Table 1 in Appendix A.

In order to determine how minimum wage impacts the number of small businesses in a state several regressions were run, using this log-linear model, starting with firms with 1-4 employees. The model was then used to estimate the impact of minimum wage on firms sized 5-9, 10-19, 20-49, and 50-99 employees. This study consists of a log-linear model with fixed effects for states, industries and years. The minimum wage variable, the variable of interest, is expected to have a significant negative parameter estimate giving evidence that increasing the minimum wage has a negative impact on the number of small businesses in an area.

5. Results

This model was used to first estimate the impact of the minimum wage on the number of small businesses in all industries in a state. For results please see Table 2 in Appendix A. The parameter estimates for each industry size were negative as expected indicating that an increase in minimum wage will reduce the number of small businesses in a state by .04% to 1.4% depending on the size of the business. This suggests that a higher minimum wage puts upward wage pressure on small businesses causing some to go out of business which supports the textbook prediction that imposing a higher wage floor will have a negative effect on employment. However, not one of the parameter estimates for small businesses were statistically significant. Only when firm size was increased to the medium sized companies with 50-99 employees was the minimum wage parameter estimate significant at the 90% confidence level.

This suggests that an increase in the minimum wage will lead to a 4.4% reduction in the number of medium sized businesses with 50-99 employees.

While parameter estimates are negative, because they are not significant I find that increasing the minimum wage will have no effect on the number of small businesses in an area. Though this evidence is contradictory to textbook theory it does support findings of other studies, namely Card and Krueger (1994) who find that minimum wage in some case lead to an increase in employment in fast food industries. This conclusion suggests an alternative model to the conventional competitive model. Where firms are price-takers in the product market but have some monopsony power in the labor market. If small businesses are facing an upward sloping labor supply curve then increasing the minimum wage could actually lead these businesses to increase employment which would indicate that these firms are staying in business resulting in no change to the number of small businesses after a minimum wage increase (Card and Krueger 1994).

In addition to firms having some degree of monopsony power in the labor market, there may be issues with the data set. The above model estimation does not take into consideration whether a firm is in a high wage industry or a low wage industry. Including both high and low wage industries in the estimation may be the reason for finding evidence that increasing the minimum wage will have no impact on the number of small businesses in a state. Only data for businesses in a specific industry will be used in an attempt to isolate the effects of minimum wage on small business. The same model will be used to estimate how minimum wage will impact a number of low wage industries as well as selected high wage industries. The low wage industries include Accommodation and Food Services, Retail Industries, and Manufacturing Industries. It is expected that in these industries minimum wage will have a significant negative impact on the

number of small businesses. Conversely, it is expected that the minimum wage will have no impact on the high wage industries where labor is employed at levels well above the minimum wage.

Accommodation and Food Service is the classic low wage industry used in several previous minimum wage studies. It is expected that minimum wage has the largest negative impact in this industry. Results, available in Table 3 of Appendix A, indicate as expected that in businesses size 20-49 and 50-99 minimum wage has a significant negative impact on number of businesses. In these sizes of businesses, increasing the minimum wage by one dollar leads to a 1.7% -2.7% decrease in the number of businesses. It is important to note that firms with 1-4 and 5-9 employees actually see an increase in the number of businesses with an increase in the minimum wage. Firms employing 1-4 workers experienced a 1.7% increase in the number of businesses resulting from a one dollar increase in the minimum wage. Though this result seems counter intuitive, it is likely that the larger firms which are negatively affected by a higher minimum wage are downsizing rather than going out of business. These larger firms are choosing to employ less labor leading them to become smaller businesses. While some smaller firms may be going out of business, it is likely that more of the larger firms are downsizing at a faster rate leading to the net increase of small firms measured by this model.

In manufacturing industries it is expected that increasing the minimum wage would have a relatively small impact on the number of small businesses as manual labor employees are typically paid more than the minimum wage because of the physically demanding nature of the work. Contrary to this expectation the model finds that a one dollar increase leads to a 2.5% - 5.3% decrease in the number of businesses in a state. This rather large impact is likely a result of a wage premium stemming from the physically demanding nature of the related work. For

example; if a fast food employee is paid a mandated minimum wage of five dollars per hour for relatively easy work while a manufacturing worker is paid twenty dollars per hour for physically demanding work, the manufacturer views himself as fifteen dollars per hour more valuable than the fast food employee. Now the minimum wage is raised to seven dollars per hour. Though the manufacturer still views his work as fifteen dollars per hour more valuable than the fast food worker, he now only makes thirteen dollars per hour more than said fast food worker. Hence, the manufacturer will now demand an increase in wages to again become fifteen dollars per hour more valuable than the fast food employee. An increase in wages such as this one, increases firms costs leading some small businesses to close resulting in the decrease in small businesses captured by this model.

Though increasing the minimum wage may not directly impact the number of small businesses as expected. This model gives evidence that there are significant negative effects of minimum wage on small businesses in low wage industries. Next, when evaluating high wage industries it is expected that minimum wage increases will have no impact on the number of small businesses in existence as these industries employ labor at wages much higher than the minimum. The three high wage industries evaluated are Finance and Insurance, Real Estate Rent and Leasing, and Professional Scientific and Technical Services. For results from regressions in these industries please see Tables 6 through 8 in Appendix A.

Initially, results from these industries seem counterintuitive. In the Finance and Insurance industry this study finds that a one dollar increase in the minimum wage leads to a negative 1.3% decrease in the number of small businesses with 1-4 employees as well as a 1.5% decrease in the number of businesses with 5-9 employees. Finding a negative impact of minimum wage is not isolated in this high wage industry. Firms with 1-4, 5-9, and 10-19 employees in the Real Estate

Rental and Leasing industry also indicate that increasing the minimum wage will have a negative significant impact on high wage industries. Furthermore, Professional Scientific and Technical Services industries shows that for every firm size there is a significant negative impact on the number of small businesses. Depending on the size of a firm increasing the mandated minimum wage by one dollar in this industry will result in a 1.3% to 3% decrease in the number of businesses. Though these results do seem counter intuitive at first glance, further analysis does offer an explanation.

Considering that policy makers typically do not only increase the minimum wage it is important to consider what other policies are being implemented along with an increase to the minimum wage. Some policies can be considered "Pro-business" while others can be considered "Anti-business" policies. Because increasing the minimum wage effectively forces some businesses to pay employees more it is considered an "Anti-business" policy. When the minimum wage is increased it is likely that there are more "Anti-business" policies being implemented as well. Considering that these high wage industries employ their labor at wages well above the minimum wage, the negative impact measured by this model is probably due to these other "Anti-business" policies rather than the minimum wage increase. For this reason there is concern that this model overestimates the impact of a minimum wage increase on high wage small businesses.

6. Conclusion

When businesses in all industries are used it is found that increasing the minimum wage has no impact on the number of small businesses. After further evaluation this study finds that minimum wage affect small businesses in separate industries differently. Small businesses in the

Accommodation and Food Service industry are actually downsizing as a result of a higher minimum wage. This causes the larger companies to be categorized as small companies leading to a measured increase in the number of small businesses when the minimum wage is increased. Though my results were unexpected, downsizing is a particular way in which minimum wage negatively impacts the number of small businesses.

Manufacturing firms of all sizes are negatively affected by an increase in the minimum wage. Workers in this industry see themselves as more valuable than minimum wage workers, therefore when the minimum wage is increased manufacturers demand higher wages to coincide with the higher wages resulting from the policy in order to hold the value of the physically demanding manufacturing work.

When evaluating how a higher minimum wage impacts high wage industries and unexpected significant negative impact leads one to conclude that in these industries the effect of minimum wage is being overestimated. While states increase the minimum wage they are likely implementing other "Anti-business" policies as well. These addition policies are probably impacting the number of small businesses more so than the minimum wage.

Limitations to this study include possible policy endogeneity. Though there are reasonable explanations for why I find that a higher minimum wage, in some cases, positively impacts the number of small businesses, these results are cause for some concern. It is possible that causation could be reversed where the number of small businesses increases because of good economic performance leading policy makers to increase the minimum wage. In addition, this study likely captures little of the marginal effect increasing the minimum wage has. Some entrepreneurs will choose to start businesses regardless of the minimum wage. It is important to isolate those who

elect not to start a business resulting from a minimum wage increase. The direction in which this study should proceed is to use a border approach like Rohlin (2010). This approach looks at the border between two states with differing minimum wages to determine if the number of small businesses founded changes when it is possible to experience a lower minimum wage.

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8. Appendix A

Table 1. Data and Sources

Variable	Description	Source	Mean/St. Dev
lsmall1	The natural log of the number of businesses with 1-4 employees in a state	U.S. Census Bureau County Business Patterns	7.2271 (1.9000)
lsmall5	The natural log of the number of businesses with 5-9 employees in a state	U.S. Census Bureau County Business Patterns	6.080 (2.0190)
lsmall10	The natural log of the number of businesses with 10-19 employees in a state	U.S. Census Bureau County Business Patterns	5.718 (2.0006)
lsmall20	The natural log of the number of businesses with 20-49 employees in a state	U.S. Census Bureau County Business Patterns	5.3936 (1.9516)
lmed50	The natural log of the number of businesses with 50-99 employees in a state	U.S. Census Bureau County Business Patterns	4.4920 (1.7875)
MW	The greater of the state or national minimum wage	U.S. Department of Labor	5.6139 (0.7319)

Descriptive Statistics: Mean and Standard Deviations.

Table 2. The Effects of Minimum Wage on Small Businesses in all Industries

	1-4	5-9	10-19	20-49	50-99
Intercept	4.6762***	1.4526***	-0.3886***	-2.7193***	-6.1685***
	(0.0969)	(0.1136)	(0.1376)	(0.1613)	(0.1713)
MW	-0.0004	-0.0122	-0.0148	-0.0089	-0.0440*
	(0.0142)	(0.0167)	(0.0202)	(.0237)	(0.0252)
State FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
R^2	0.9265	0.9173	0.8948	0.8812	0.9036
RMSE	0.4778	0.5603	0.6771	0.7952	0.8446
N	561	561	561	561	561

These regressions were estimated using data on number of firms by state using variables defined in Table 1
**10% significance **5% Significance ***1% significance*
Standard errors are in parenthesis

Table 3. The Effects of Minimum Wage on Small Businesses in Accommodation and Food Service Industries

	1-4	5-9	10-19	20-49	50-99
Intercept	6.3894***	5.8449***	6.0019***	5.9759***	4.4605
	(0.0412)	(0.0355)	(0.0387)	(0.0319)	(0.0557)
	155	164.42	155	187	80
MW	0.0170***	0.0075*	0.001667	-0.0173***	-0.0269*
	(0.0061)	(0.0053)	(.0055)	(0.0047)	(0.0083)
State FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
R^2	0.9978	0.9983	0.9980	0.9988	0.9968
RMSE	0.0459	0.0396	0.0431	0.0356	0.0621
N	561	561	561	561	561

These regressions were estimated using data on number of firms by state using variables defined in Table 1
**10% significance **5% Significance ***1% significance*
Standard errors are in parenthesis

Table 4. The Effects of Minimum Wage on Small Businesses in Retail Industry

	1-4	5-9	10-19	20-49	50-99
Intercept	5.9424***	5.3103***	4.8599***	4.1769***	2.2940***
	(0.0363)	(0.0421)	(0.0405)	(0.0552)	(0.0978)
MW	-0.00004	-0.01603 ***	0.0081	-0.0028	-0.0293**
	(0.0054)	(0.0061)	(.0060)	(0.0082)	(0.0147)
State FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
R^2	0.9988	0.9983	0.9984	0.9971	0.9927
RMSE	0.0405	0.0459	0.0452	0.0615	0.1090
N	561	561	561	561	561

These regressions were estimated using data on number of firms by state using variables defined in Table 1
**10% significance **5% significance ***1% significance*
Standard errors are in parenthesis

Table 5. The Effects of Minimum Wage on Small Businesses in Manufacturing

	1-4	5-9	10-19	20-49	50-99
Intercept	5.7493***	4.8375***	4.5965***	4.3682***	3.2505***
	(0.0376)	(0.0515)	(0.0634)	(0.0596)	(0.1249)
MW	-0.0255***	-0.0393***	-0.0526***	-0.0516***	-0.0368**
	(0.0056)	(0.0077)	(0.0095)	(0.0089)	(0.0188)
State FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
R^2	0.9986	0.9976	0.9967	0.9975	0.9906
RMSE	0.0420	0.0574	0.0707	0.0664	0.1393
N	561	561	561	561	561

These regressions were estimated using data on number of firms by state using variables defined in Table 1
**10% significance **5% Significance ***1% significance*
Standard errors are in parenthesis

Table 6. The Effects of Minimum Wage on Small Businesses in Finance and Insurance

	1-4	5-9	10-19	20-49	50-99
Intercept	5.9424***	5.3103***	4.8599***	4.1769***	2.2940***
	(0.0363)	(0.0412)	(0.0405)	(0.0552)	(0.0978)
MW	-0.00004	-0.0160***	0.0081	-0.0028	-0.0293**
	(0.0054)	(0.0061)	(0.0060)	(0.0082)	(0.0147)
State FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
R^2	0.9988	0.9983	0.9984	0.9971	0.9927
RMSE	0.0405	0.0459	0.0452	0.0615	0.1090
N	561	561	561	561	561

These regressions were estimated using data on number of firms by state using variables defined in Table 1
**10% significance **5% Significance ***1% significance*
Standard errors are in parenthesis

Table 7. The Effects of Minimum Wage on Small Businesses in Real Estate Rental and Leasing

	1-4	5-9	10-19	20-49	50-99
Intercept	6.9107***	4.9260***	4.0247***	2.8746***	0.4484
	(0.0617)	(0.0549)	(0.0682)	(0.1006)	(0.3517)
MW	-0.0378***	-0.0147*	-0.0306***	0.0041	-0.05803
	(0.0092)	(0.0082)	(0.0102)	(.0151)	(0.0528)
State FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
R^2	0.9957	0.9969	0.9955	0.9911	0.9235
RMSE	0.0688	0.0612	0.0760	0.1122	0.3921
N	561	561	561	561	561

These regressions were estimated using data on number of firms by state using variables defined in Table 1
**10% significance **5% Significance ***1% significance*
Standard errors are in parenthesis

Table 8. The Effects of Minimum Wage on Small Businesses in Professional, Scientific and Technical Services

	1-4	5-9	10-19	20-49	50-99
Intercept	7.3450***	5.7982***	5.0810***	4.0071***	2.3490***
	(0.0440)	(0.0308)	(0.0389)	(0.0529)	(0.1146)
MW	-0.0290***	-0.0168***	-0.0239***	-0.0139*	-0.0299*
	(0.0066)	(0.0046)	(0.0058)	(.0079)	(0.0172)
State FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
R^2	0.9980	0.9989	0.9984	0.9976	0.9910
RMSE	0.0491	0.0343	0.0434	0.0589	0.1278
N	561	561	561	561	561

These regressions were estimated using data on number of firms by state using variables defined in Table 1
**10% significance **5% significance ***1% significance*
Standard errors are in parenthesis

9. Appendix B

```
data all;
set work.renna;

IF industry = 0 THEN delete;

IF industry = 11 THEN FFH = 1;
ELSE FFH = 0;
IF industry = 21 THEN min = 1;
ELSE min = 0;
IF industry = 22 THEN util = 1;
ELSE util = 0;
IF industry = 23 THEN con = 1;
ELSE con = 0;
IF industry = 31 THEN manu = 1;
ELSE manu = 0;
IF industry = 42 THEN whol = 1;
ELSE whol = 0;
IF industry = 44 THEN ret = 1;
ELSE ret = 0;
IF industry = 48 THEN trwa = 1;
ELSE trwa = 0;
IF industry = 51 THEN info = 1;
ELSE info = 0;
IF industry = 52 THEN fin = 1;
ELSE fin = 0;
IF industry = 53 THEN real = 1;
ELSE real = 0;
IF industry = 54 THEN pss = 1;
ELSE pss = 0;
IF industry = 55 THEN mgmt = 1;
ELSE mgmt = 0;
IF industry = 56 THEN admin = 1;
ELSE admin = 0;
IF industry = 61 THEN edu = 1;
ELSE edu = 0;
IF industry = 62 THEN health = 1;
ELSE health = 0;
IF industry = 71 THEN arts = 1;
ELSE arts = 0;
IF industry = 72 THEN food = 1;
ELSE food = 0;
IF industry = 81 THEN other = 1;
ELSE other = 0;
IF industry = 95 THEN aux = 1;
ELSE aux = 0;
IF industry = 99 THEN notclass = 1;
ELSE notclass = 0;

IF year = 1998 THEN y98 = 1;
ELSE y98 = 0;
IF year = 1999 THEN y99 = 1;
ELSE y99 = 0;
IF year = 2000 THEN y00 = 1;
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```
ELSE y00 = 0;
IF year = 2001 THEN y01 = 1;
ELSE y01 = 0;
IF year = 2002 THEN y02 = 1;
ELSE y02 = 0;
IF year = 2003 THEN y03 = 1;
ELSE y03 = 0;
IF year = 2004 THEN y04 = 1;
ELSE y04 = 0;
IF year = 2005 THEN y05 = 1;
ELSE y05 = 0;
IF year = 2006 THEN y06 = 1;
ELSE y06 = 0;
IF year = 2007 THEN y07 = 1;
ELSE y07 = 0;
IF year = 2008 THEN y08 = 1;
ELSE y08 = 0;

IF small1=0 then small1=.01;
IF small5=0 then small5=.01;
IF small10=0 then small10=.01;
IF small20=0 then small20=.01;
IF med50=0 then med50=.01;
lsmall1 = log(small1);
lsmall5=log(small5);
lsmall10=log(small10);
lsmall20=log(small20);
lmed50=log(med50);
lminwage=log(minwage);
run;

proc means;
title 'All Industries';
run;

proc sort;
by state t;
run;
proc tscsreg data=all;
id state t;
model lsmall1= minwage FFH min util con manu whol ret trwa info fin real pss
mgmt admin edu health arts food other aux y98 y99 y00 y01 y02 y03 y04 y05 y06
y07 / fixone;
title 'industry - state - year fixed effects of All industries: firm size 1-4
employees';
testminwage : test minwage=0;
run;
proc tscsreg data=all;
id state t;
model lsmall5= minwage FFH min util con manu whol ret trwa info fin real pss
mgmt admin edu health arts food other aux y98 y99 y00 y01 y02 y03 y04 y05 y06
y07 / fixone;
title 'industry - state - year fixed effects of All industries: firm size 5-9
employees';
run;
proc tscsreg data=all;
id state t;
```

```
model lsmall10= minwage FFH min util con manu whol ret trwa info fin real pss
mgmt admin edu health arts food other aux y98 y99 y00 y01 y02 y03 y04 y05 y06
y07 / fixone;
title 'industry - state - year fixed effects of All industries: firm size 10-
19 employees';
run;
proc tscsreg data=all;
id state t;
model lsmall20= minwage FFH min util con manu whol ret trwa info fin real pss
mgmt admin edu health arts food other aux y98 y99 y00 y01 y02 y03 y04 y05 y06
y07 / fixone;
title 'industry - state - year fixed effects of All industries: firm size 20-
49 employees';
run;
proc tscsreg data=all;
id state t;
model lmed50= minwage FFH min util con manu whol ret trwa info fin real pss
mgmt admin edu health arts food other aux y98 y99 y00 y01 y02 y03 y04 y05 y06
y07 / fixone;
title 'industry - state - year fixed effects of All industries: firm size 1-4
employees';
run;

data one;
set work.renna;

IF industry = 0 THEN delete;
IF industry = 11 THEN delete;
IF industry = 21 THEN delete;
IF industry = 22 THEN delete;
IF industry = 23 THEN delete;
IF industry = 31 THEN delete;
IF industry = 42 THEN delete;
IF industry = 44 THEN delete;
IF industry = 48 THEN delete;
IF industry = 51 THEN delete;
IF industry = 52 THEN delete;
IF industry = 53 THEN delete;
IF industry = 54 THEN delete;
IF industry = 55 THEN delete;
IF industry = 56 THEN delete;
IF industry = 61 THEN delete;
IF industry = 62 THEN delete;
IF industry = 71 THEN delete;
IF industry = 81 THEN delete;
IF industry = 95 THEN delete;
IF industry = 99 THEN delete;

IF small1=0 then small1=.01;
IF small5=0 then small5=.01;
IF small10=0 then small10=.01;
IF small20=0 then small20=.01;
IF med50=0 then med50=.01;
lsmall1 = log(small1);
lsmall5=log(small5);
lsmall10=log(small10);
lsmall20=log(small20);
```

```
lmed50=log(med50);
lminwage=log(minwage);
run;

proc means;
title 'food service';
run;

proc sort;
by state year;
run;
proc tscsreg data=one;
id state year;
model lsmall1= minwage / fixtwo;
title 'state-year fixed effects of food service: firm size 1-4 employees';
run;
proc tscsreg data=one;
id state year;
model lsmall5= minwage / fixtwo;
title 'state-year fixed effects of food service: firm size 5-9 employees';
run;
proc tscsreg data=one;
id state year;
model lsmall10= minwage / fixtwo;
title 'state-year fixed effects of food service: firm size 10-19 employees';
run;
proc tscsreg data=one;
id state year;
model lsmall20= minwage / fixtwo;
title 'state-year fixed effects of food service: firm size 20-49 employees';
run;
proc tscsreg data=one;
id state year;
model lmed50= minwage / fixtwo;
title 'state-year fixed effects of food service: firm size 50-99 employees';
run;

data two;
set work.renna;

IF industry = 0 THEN delete;
IF industry = 11 THEN delete;
IF industry = 21 THEN delete;
IF industry = 22 THEN delete;
IF industry = 23 THEN delete;
IF industry = 31 THEN delete;
IF industry = 44 THEN delete;
IF industry = 48 THEN delete;
IF industry = 51 THEN delete;
IF industry = 52 THEN delete;
IF industry = 53 THEN delete;
IF industry = 54 THEN delete;
IF industry = 55 THEN delete;
IF industry = 56 THEN delete;
IF industry = 61 THEN delete;
IF industry = 62 THEN delete;
IF industry = 71 THEN delete;
```

```
IF industry = 72 THEN delete;
IF industry = 81 THEN delete;
IF industry = 95 THEN delete;
IF industry = 99 THEN delete;

IF small1=0 then small1=.01;
IF small5=0 then small5=.01;
IF small10=0 then small10=.01;
IF small20=0 then small20=.01;
IF med50=0 then med50=.01;
lsmall1 = log(small1);
lsmall5=log(small5);
lsmall10=log(small10);
lsmall20=log(small20);
lmed50=log(med50);
lminwage=log(minwage);
run;

proc means;
title 'Retail';
run;
proc sort;
by state year;
run;
proc tscsreg data=two;
id state year;
model lsmall1= minwage / fixtwo;
title 'state-year fixed effects on retail industry:: firm size 1-4
employees';
run;
proc tscsreg data=two;
id state year;
model lsmall5= minwage / fixtwo;
title 'state-year fixed effects on retail industry: firm size 5-9 employees';
run;
proc tscsreg data=two;
id state year;
model lsmall10= minwage / fixtwo;
title 'state-year fixed effects on retail industry: firm size 10-19
employees';
run;
proc tscsreg data=two;
id state year;
model lsmall20= minwage / fixtwo;
title 'state-year fixed effects on retail industry: firm size 20-49
employees';
run;
proc tscsreg data=two;
id state year;
model lmed50= minwage / fixtwo;
title 'state-year fixed effects on retail industry: firm size 50-99
employees';
run;

data three;
set work.renna;
```

```
IF industry = 0 THEN delete;
IF industry = 11 THEN delete;
IF industry = 21 THEN delete;
IF industry = 22 THEN delete;
IF industry = 23 THEN delete;
IF industry = 42 THEN delete;
IF industry = 44 THEN delete;
IF industry = 48 THEN delete;
IF industry = 51 THEN delete;
IF industry = 52 THEN delete;
IF industry = 53 THEN delete;
IF industry = 54 THEN delete;
IF industry = 55 THEN delete;
IF industry = 56 THEN delete;
IF industry = 61 THEN delete;
IF industry = 62 THEN delete;
IF industry = 71 THEN delete;
IF industry = 72 THEN delete;
IF industry = 81 THEN delete;
IF industry = 95 THEN delete;
IF industry = 99 THEN delete;

IF small1=0 then small1=.01;
IF small5=0 then small5=.01;
IF small10=0 then small10=.01;
IF small20=0 then small20=.01;
IF med50=0 then med50=.01;
lsmall1 = log(small1);
lsmall5=log(small5);
lsmall10=log(small10);
lsmall20=log(small20);
lmed50=log(med50);
lminwage=log(minwage);
run;

proc means;
title 'manufacturing';
run;
proc sort;
by state year;
run;
proc tscsreg data=three;
id state year;
model lsmall1= minwage / fixtwo;
title 'state-year fixed effects on Manufacturing: firm size 1-4 employees';
run;
proc tscsreg data=three;
id state year;
model lsmall5= minwage / fixtwo;
title 'state-year fixed effects on Manufacturing: firm size 5-9 employees';
run;
proc tscsreg data=three;
id state year;
model lsmall10= minwage / fixtwo;
title 'state-year fixed effects on Manufacturing: firm size 10-19 employees';
run;
proc tscsreg data=three;
```

```
id state year;
model lsmall20= minwage / fixtwo;
title 'state-year fixed effects on Manufacturing: firm size 20-49 employees';
run;
proc tscsreg data=three;
id state year;
model lmed50= minwage / fixtwo;
title 'state-year fixed effects on Manufacturing: firm size 50-99 employees';
run;

data four;
set work.renna;

IF industry = 0 THEN delete;
IF industry = 11 THEN delete;
IF industry = 21 THEN delete;
IF industry = 22 THEN delete;
IF industry = 23 THEN delete;
IF industry = 31 THEN delete;
IF industry = 42 THEN delete;
IF industry = 44 THEN delete;
IF industry = 48 THEN delete;
IF industry = 51 THEN delete;
IF industry = 53 THEN delete;
IF industry = 54 THEN delete;
IF industry = 55 THEN delete;
IF industry = 56 THEN delete;
IF industry = 61 THEN delete;
IF industry = 62 THEN delete;
IF industry = 71 THEN delete;
IF industry = 72 THEN delete;
IF industry = 81 THEN delete;
IF industry = 95 THEN delete;
IF industry = 99 THEN delete;

IF small1=0 then small1=.01;
IF small5=0 then small5=.01;
IF small10=0 then small10=.01;
IF small20=0 then small20=.01;
IF med50=0 then med50=.01;
lsmall1 = log(small1);
lsmall5=log(small5);
lsmall10=log(small10);
lsmall20=log(small20);
lmed50=log(med50);
lminwage=log(minwage);
run;

proc means;
title 'Finance and Insurance';
run;
proc sort;
by state year;
run;
proc tscsreg data=four;
id state year;
model lsmall1= minwage / fixtwo;
```

```
title 'state-year fixed effects on Finance and Insurance: firm size 1-4
employees';
run;
proc tscsreg data=four;
id state year;
model lsmall5= minwage / fixtwo;
title 'state-year fixed effects on Finance and Insurance: firm size 5-9
employees';
run;
proc tscsreg data=four;
id state year;
model lsmall10= minwage / fixtwo;
title 'state-year fixed effects on Finance and Insurance: firm size 10-19
employees';
run;
proc tscsreg data=four;
id state year;
model lsmall20= minwage / fixtwo;
title 'state-year fixed effects on Finance and Insurance: firm size 20-49
employees';
run;
proc tscsreg data=four;
id state year;
model lmed50= minwage / fixtwo;
title 'state-year fixed effects on Finance and Insurance: firm size 50-99
employees';
run;

data five;
set work.renna;

IF industry = 0 THEN delete;
IF industry = 11 THEN delete;
IF industry = 21 THEN delete;
IF industry = 22 THEN delete;
IF industry = 23 THEN delete;
IF industry = 31 THEN delete;
IF industry = 42 THEN delete;
IF industry = 44 THEN delete;
IF industry = 48 THEN delete;
IF industry = 51 THEN delete;
IF industry = 52 THEN delete;
IF industry = 54 THEN delete;
IF industry = 55 THEN delete;
IF industry = 56 THEN delete;
IF industry = 61 THEN delete;
IF industry = 62 THEN delete;
IF industry = 71 THEN delete;
IF industry = 72 THEN delete;
IF industry = 81 THEN delete;
IF industry = 95 THEN delete;
IF industry = 99 THEN delete;

IF small1=0 then small1=.01;
IF small5=0 then small5=.01;
IF small10=0 then small10=.01;
IF small20=0 then small20=.01;
```

```
IF med50=0 then med50=.01;
lsmall1 = log(small1);
lsmall5=log(small5);
lsmall10=log(small10);
lsmall20=log(small20);
lmed50=log(med50);
lminwage=log(minwage);
run;

proc means;
title 'Real Estate Rental and Leasing';
run;
proc sort;
by state year;
run;
proc tscsreg data=five;
id state year;
model lsmall1= minwage / fixtwo;
title 'state-year fixed effects on Real Estate Rental and Leasing: firm size
1-4 employees';
run;
proc tscsreg data=five;
id state year;
model lsmall5= minwage / fixtwo;
title 'state-year fixed effects on Real Estate Rental and Leasing: firm size
5-9 employees';
run;
proc tscsreg data=five;
id state year;
model lsmall10= minwage / fixtwo;
title 'state-year fixed effects on Real Estate Rental and Leasing: firm size
10-19 employees';
run;
proc tscsreg data=five;
id state year;
model lsmall20= minwage / fixtwo;
title 'state-year fixed effects on Real Estate Rental and Leasing: firm size
20-49 employees';
run;
proc tscsreg data=five;
id state year;
model lmed50= minwage / fixtwo;
title 'state-year fixed effects on Real Estate Rental and Leasing: firm size
50-99 employees';
run;

data six;
set work.renna;

IF industry = 0 THEN delete;
IF industry = 11 THEN delete;
IF industry = 21 THEN delete;
IF industry = 22 THEN delete;
IF industry = 23 THEN delete;
IF industry = 31 THEN delete;
IF industry = 42 THEN delete;
IF industry = 44 THEN delete;
```

```
IF industry = 48 THEN delete;
IF industry = 51 THEN delete;
IF industry = 52 THEN delete;
IF industry = 53 THEN delete;
IF industry = 55 THEN delete;
IF industry = 56 THEN delete;
IF industry = 61 THEN delete;
IF industry = 62 THEN delete;
IF industry = 71 THEN delete;
IF industry = 72 THEN delete;
IF industry = 81 THEN delete;
IF industry = 95 THEN delete;
IF industry = 99 THEN delete;

IF small1=0 then small1=.01;
IF small5=0 then small5=.01;
IF small10=0 then small10=.01;
IF small20=0 then small20=.01;
IF med50=0 then med50=.01;
lsmall1 = log(small1);
lsmall5=log(small5);
lsmall10=log(small10);
lsmall20=log(small20);
lmed50=log(med50);
lminwage=log(minwage);
run;

proc means;
title 'Professional, Scientific and Technical Services';
run;
proc sort;
by state year;
run;
proc tscsreg data=six;
id state year;
model lsmall1= minwage / fixtwo;
title 'state-year fixed effects on Professional, Scientific and Technical
Services: firm size 1-4 employees';
run;
proc tscsreg data=six;
id state year;
model lsmall5= minwage / fixtwo;
title 'state-year fixed effects on Professional, Scientific and Technical
Services: firm size 5-9 employees';
run;
proc tscsreg data=six;
id state year;
model lsmall10= minwage / fixtwo;
title 'state-year fixed effects on Professional, Scientific and Technical
Services: firm size 10-19 employees';
run;
proc tscsreg data=six;
id state year;
model lsmall20= minwage / fixtwo;
title 'state-year fixed effects on Professional, Scientific and Technical
Services: firm size 20-49 employees';
run;
```

```
proc tscsreg data=six;
id state year;
model lmed50= minwage / fixtwo;
title 'state-year fixed effects on Professional, Scientific and Technical
Services: firm size 50-99 employees';
run;
```