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The Effects of Minimum Wage on Store Level Employment and Working Hours – An Empirical Study Using Small Retailers in the US

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Résumé

Ce document examine la relation entre le salaire minimum et l'économie : l'emploi agrégé au niveau des magasins et les heures de travail au niveau individuel, en mettant l'accent sur les petites entreprises. Les observations proviennent de dossiers individuels qui suivent les individus travaillant aux États-Unis : heures de travail, salaire moyen, magasin dans lequel ils travaillent et informations géographiques pertinentes. L'ensemble de données enregistre strictement des informations sur les petits détaillants de différents secteurs. En utilisant un modèle de panel par état, en incorporant un certain nombre de variables dépendantes au niveau de l'état, en ajoutant un certain nombre d'effets fixes et de tendances au niveau de l'état, ce document présente de nouvelles preuves que les petites entreprises ne modifient pas le niveau d'emploi lorsqu'elles sont confrontées à une augmentation du salaire minimum. Toutefois, ce document montre qu'il existe des preuves statistiques que les petites entreprises réduisent les heures de travail dans de telles circonstances.

Mots clés : salaire minimum ; petites entreprises ; heures de travail ; emploi ; détaillants

Méthodes de recherche : conception de panel d'état ; régression avec une variable explicative principale, plusieurs variables de contrôle et des effets fixes

Abstract

This paper examines the relationship between minimum wages and the economy: aggregate store-level employment and individual-level working hours with a focus on small businesses. The observations come from individual records that track individuals working in the United States: working hours, average salary, store they work in and relevant geographic information. The dataset strictly records information on the small retailers from different sectors. By using a state-panel design, incorporating a number of state-level dependent variables, adding a number of fixed effects and state level trends, this paper reports new evidence that small businesses do not alter the level of employment when facing an increase in minimum wages. However, this paper suggests that there is statistical evidence that small businesses do cut working hours in such circumstances.

Keywords: minimum wage; small businesses; working hours; employment; retailers

Research methods: state-panel design; regression with a main explanatory variable, several control variables and fixed effects

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Preface

This thesis is an original and unpublished work by the author Zehua Huang, a student who majors in MSc of Applied Financial Economics in HEC Montréal starting in 2018. This thesis is written to fulfill the graduation requirements of this program.

The main idea for this paper has originally come from my thesis director, Professor Decio Coviello, an expert who has published several papers on the minimum wage. He asked whether I would be interested in doing an empirical study that solely focuses on the behaviors of very small retailors in the United States. I gladly accepted his proposal as I had always been interested in the US economy and in the past, I had read several news articles that depicted how low-income workers fought for a higher minimum wage. It has been a very rewarding process as there has been a lack of focus on the effects that the minimum wage has beyond the pure employment level. My understanding in regards to the big picture of the minimum wage, how it has changed over the years on federal, state and local levels and the effects it may have on different facets of the economy has been greatly enriched.

I hope this paper could showcase how important it is to take working hours or even non-wage benefits into consideration and provide some impetus for those who investigate in this field in the future.

Acknowledgements

First of all, I would love to express my deepest and most sincere gratitude to Professor Decio Coviello, my thesis director, for his guidance, encouragement and patience. Not only has he provided me with the dataset used in this paper, he has shed light on the analytical part as well. He also happened to be the lecturer for the course *Applied Econometrics*, which has shaped how I think critically about the world and the events happening in it. Without him, his constant guidance and illuminating instruction, it would have been impossible for me to reach this stage.

My heartfelt gratitude goes secondly to all the professors, teaching assistances and classmates whom I've met in HEC Montréal. It's a true blessing to be able to attend HEC Montréal to learn from and work with all of them. They have inspired me to jump outside my comfort zone and wander in the world of economics and finance.

Last my thanks go to my friends Jiayu Li, Madeline Bélanger-Trottier, Carine Doufodji and my parents. They having been utterly supportive and understanding and a big part of my inspiration stems from them.

Section 1: Introduction

Minimum wage and the effects that it has on the labor market has been a hot debate among economists for at least three decades. A variety of literatures, both old and new, have discussed the outcome that the minimum wage has on employment, with much of the attention being paid to the fast-food restaurant sector. This is not surprising as the food industry, especially fast-food chains, typically hires a high proportion (if not the highest) of minimum-wage workers. The prevalence of minimum-wage workers in this sector combined with data collected surrounding minimum wage hikes shed light on the various fluctuations that the minimum wage could exert on the labor market.

Nevertheless, as being discussed in Addison (2018), other sectors of the economy have never received an adequate amount of analysis. The only exception is the general retail sector, with a few studies examining the disemployment effects. These sectors are neglected either because scholars so far have assumed that minimum wage changes would be insignificant in these sectors due to the lower proportion of minimum wage workers, or on a more fundamental basis, the lack of data due to scare interest. Studies that focus on whether and how minimum wage hikes impact the hours that individuals supply are also shockingly insufficient, a crucial factor coming from the supply side of the labor market. Thus, two questions remain to be seen: are other sectors truly less susceptible to the change in the minimum wage? And are there any other margins of adjustment other than the employment level that small businesses may resort to?

(Correction: Clarified the research questions of this paper)

This paper aims to fill in the discrepancy of current literature on minimum wage by using state-panel design with a focus on very small retailers from 11 different sectors. To the best of my knowledge, this is the first time that a paper solely addresses small retailers across a plethora of industries. I will show that, consistent with previous literatures, increases in minimum wages have no impact on store level employment for these small retailers. The results are not sensitive to the inclusion of state specific trends, dummy time variable or time trend either, as including these fixed effects (even cross term specifications) does not render the results statistically significant.

Results on working hours is also presented, so as to analyze the effects that minimum wages have on the intensive margin of the economy for small businesses --- a very

important aim of this paper. Although the effects that minimum wage fluctuations have on the extensive margin of the economy have been examined through an abundant collection of literatures using different designs that incorporate different time periods, frameworks, fixed effects, those centering around other aspects of the economy such as working hours, non-wage benefits and training are extremely limited. Fortunately, scholars and economists are realizing the necessity to address the above-mentioned matters. This has led to a rising concern over such topics, even including the nature of employment dynamics. This paper discusses one specific intensive margin of the economy – individual-level working hours. The very few existing literatures on working hours either focus on big corporations from one sector, or have a very small scale of observations due to how the experiment is constructed. This paper, however, places its focus on small businesses from a bigger scale, as the data record relevant information of retailers from 11 distinct sectors. I will show that changes in the minimum wage have no impact on store level aggregate employment, but leads to a slight decrease in the number of working hours. This effect is stronger for the food & drink industry, where in the dataset it is observed that 28.9% of the time, employees are paid with minimum wage or below. The negative relationship between minimum wage and hours of work is not surprising as it fits the competitive labor market theory very well. This particular case sits well with our common perception as the food & drink industry hires a substantial number of workers, but at the same time, usually requires no specific skill sets or talents. Overall, the regression results seem to point out that an increase in the minimum wage doesn't alter the numbers of workers that small businesses hire, but reduces the number of working hours.

The paper is made up by the following sections. Section 2 discusses and summarizes past literatures pertaining to the minimum wage arena, especially those that address the need to include spatial heterogeneity and to go beyond the pure employment level. In Section 3 I describe the data used for this paper in details, including how I found, verified and organized them and the corresponding format. The economic model is explained in Section 4 and limitation of this paper are also discussed. In Section 5 I showcase the key regression results and robustness check is done in Section 6. Conclusions are given in

Section 7 and I present some new evidence regarding the minimum wage and the effects it has on employment and working hours for small businesses.

Section 2: Literature Review

Traditionally, scholars have emphasized on the effects that the minimum wage has on employment stocks, especially in sectors where a substantial percentage of low-skilled workers are paid at or around the minimum wage.

But the results have been inconclusive. Neumark et al. (2021) have researched on dozens of literatures on minimum wage. By documenting every preferred estimate and confirming the results with the original writers of each corresponding paper, the authors. come to the conclusion that the estimates of the effect that the minimum wage has on employment is dominantly negative, especially for teens and young adults. Nevertheless, scholars cannot seem to reach any conclusion or consensus, due to how these results are summarized and presented to the public.

With that being said, very few papers published by prominent scholars in the minimum wage field go with the notion that the minimum wage has a significantly large negative effect on employment. One of the most frequently cited and discussed paper pertaining to the fast-food industry was carried out by Card and Krueger (1994). In their study, they compare the level of after the state minimum wage raised from $4.25 to $5.05 in New Jersey. New Jersey is a state whose economic scale is relatively small. It is also boarded with Pennsylvania which offers supreme comparisons, where minimum wage remained at the $4.25 level. The authors conclude that the average employment per store in New Jersey is not at all negatively affected by the increase in the minimum wage. In fact, they manage to capture a price increase in fast-food meals in New Jersey, suggesting that much of the burden of the increase is passed on to consumers. A major disadvantage of their paper is that although they have considered nonwage benefits, it was still mostly monetary terms. As a result, they do not take into account working hours as a margin of adjustment.

(Correction: Cited Card and Krueger and pointed out that working hours is not previously included as a margin of adjustment.)

By looking at data from the retail-trade sector, Addison et al. (2009) argue that there is little evidence supporting that higher min wages lead to lower employment in this sector.

The authors' primary data source is the Quarterly Census of Employment and Wages (QCEW). After incorporating county specific fixed effects into the equations, the results obtained show very little evidence of a competitive-market model. On the very contrary, the inclusion of county-level trends in sectoral outcomes – a specification often ignored in previous literatures- points to a modest yet robust and positive effect that min wage has on sectoral employment.

To back up their analysis, Addison et al. (2012) study the restaurant-and-bar sector, the most popular sector for conducting analysis when it comes to minimum wage literatures. Again, the authors demonstrate that by incorporating local trends (mostly county level fixed effects), they fail to find any statistical evidence that points to the disemployments effects caused by increases in minimum wages in the overall bar-and-restaurant sector. The authors suggest that previous literatures on this topic may not be very reliable due to lack of sufficient geographic variations. The estimates suggest that the observed downward long-term effects are caused by states that have raised their min wages compared to those that have not. The results are revisited and evaluated by the authors themselves again in 2015. This time they incorporate various detrending methods, including those that are non-linear. Their conclusion stays the same as they fail to find any significant employment effects caused by minimum wage fluctuations, and the results are insensitive to the inclusion of specifications of trends and selection of time periods.

However, the previous conclusions are challenged in Aaronson et al. (2018), where the authors study how the restaurant industry, the largest U.S. employer of low-wage workers, responds to minimum wage hikes. They point out that although in the short-run, minimum wage hikes seemingly have a very small effect on employment, this effect could potentially grow by as much as 5 times in the long-run. As prevailing empirical studies on minimum wage hikes focus on short-run responses, the authors point out that this could be potentially problematic as by design these studies could give misleading implications on how effective minimum wage is as a redistributive tool.

Similar to the criticism that Addison et al. (2015) has discussed in their paper, over the past decade a number of existing literatures on minimum wage have also been criticized for using overly naive trend controls that may cause estimate to be biased. As a result, in

recent years the inclusion of spatial heterogeneity has gained ground among scholars so as to provide more sophisticated results. In their paper, Allegretto et al. (2011) carefully examine the effects that spatial heterogeneity and selectivity have when included in the regressions alongside with state and time fixed effects that are frequently used. The authors use CPS data on teem employment from 1999 to 2009. They come to the conclusion that when accounting for spatial heterogeneity in regional economic shocks and the long-run growth differences across states, the previous negative and significant coefficients are rendered indistinguishable from zero.

Another branch of framework that is becoming increasingly pervasive in recent studies is the border-discontinuity design, which offers a superior way to account for spatial heterogeneity. Counties that straddle a state border proposes excellent examples to study the potential effects of policy discontinuities. Dube et al. (2010) measure average earnings and total employment among local economic areas (typically contiguous county-pairs) that share very similar economic conditions other than the different minimum wage regimes. It is shown that although earning effects are strong, employment effects are non-existent. The author argues that the large negative elasticities in traditional fixed-effect models are brought by local employment trends that are unrelated to minimum wage policies

Another more recent and revised study that applies the border-discontinuity design and has discussed the bias caused by excluding spatial heterogeneity in the field of minimum wage issues is written by the same authors Dube et al. (2016). Again, it is confirmed that much of the negative and significant employment elasticity is caused by spatial heterogeneity and hence is biased. Contrasting to the findings on employment level, the authors predict that minimum wage has a significant and sizeable effect on employment flows, as hires, separations and the turnover rate respond sharply to policy changes. It's also another paper that marks the necessity of investigating minimum wage effects beyond the pure employment level.

Although it is generally recognized that the minimum wage may have offsetting effects on employment in a competitive model, Strobl (2011) demonstrated that minimum wages in fact have ambiguous effects on hours per worker, the number of workers, and total hours worked. The theoretical framework provided in this article indicates that prevailing

empirical studies on minimum wages that focus on one sector may not be representative of other sectors, due to different technologies and labor conditions. Interestingly, a previous study by Allegretto et al. (2011) points out that after accounting for long-term growth differences in different states as well as heterogeneous economic shocks, even employment and hours elasticities for teens are rendered statistically insignificant. Including state-specific trends rules out employment elasticity more negative than -0.072 at the 5 percent level. The authors believe that previous disemployment effects suggested by canonical fix-effect models are induced by the failure to control for the heterogeneity and selectivity of states where minimum wages increased during the selected period. Doppelt has specifically discussed how an increase in minimum wage impacts the number of hours per employee. In his working paper "Minimum wage and hours of wage", Doppelt (2018) proposes that labor-supply is an upward-sloping curve and naturally, employees are willing to work longer hours when the minimum wage increases. The company, on the other hand, will choose to accept the extra hours so long as the marginal profit is positive. Empirically, he studies all workers between 1990 and 2014 using CPS data and arrives at the conclusion that conditional on remaining employed, we can expect the affected employees to increase their working hours by 17.9% after the workers get an 10% real wage increase. The author, however, also points out that this will induce a drop in their probability to stay employed by 4.5% as increasing the minimum wage reduces total profits, employment and vacancy creation. However, Doppelt notes that the disemployment effects caused by the minimum wage is quantitatively small when minimum wage is below $15 but the jump in working hours is always consistent and significant in magnitude.

Worker productivity and its relation with minimum wages has also received a fair amount of attention over the years. This type of study usually requires a rigorous way to record individual output on a homogenous task, so naturally farms and retail stores provide the best selected observations. By looking at personal records from a tomato farm in Florida, Ku (2020) examined the change in individual productivity that happened after a minimum wage raise on January 1, 2009. By comparing low vs. high productivity workers, the author concluded that when facing a 6% increase in minimum wage, workers belonging to the bottom 40^{th} percentile of the worker fixed effect exerted their

productivity by 4.6% relative to those who come from the higher percentile. This cements the notion that minimum wage increases are more pronounced for people who previously do not exhibit enough worker effort, who thus in turn receive lower wages (usually at or around minimum wage).

When examining workers working for a large US retailer, Coviello et al. (2020) arrive at a very similar conclusion. The authors use a border-discontinuity design and show that minimum wage significantly increases productivity for low type workers with an overall implied elasticity of 0.35. This type of worker, defined as the type of worker whose performance is never sufficient enough to earn them anywhere beyond the minimum wage, is also terminated less often. Workers who earn beyond the minimum wage exhibit similar but less pronounced behavior. The findings are interpreted by combining two channels: a hybrid model that includes both pay for performance and efficiency wages, where the ladder has a dominating effect.

Overall, traditional fixed-effect models tend to find negative employment elasticities. However, more recent studies that incorporate frameworks to include spatial heterogeneity contribute large negative employment elasticities to an insufficient control of local economic trends and find no negative or very small employment effects in general. At the same time, there has been a shift of attention in minimum wage studies to focus on other facets of the economy, such as working hours, worker productivity, the turnover rate and so on. It is generally concluded that minimum wages may have more pronounced effects on these issues, but concerning literature are very much lacking.

Section 3: Data Selection and Description

This paper uses a database which tracks employees in the United States from 2018: the hours they work, the industry, the hourly wage earned, and store-level aggregate employment. Individual records are retrieved from a data company called SafeGraph. SafeGraph's dataset includes a breadth of information about physical places in the US. This includes core location data, spatial hierarchy metadata, place traffic data, and more.

In the dataset each employee is given a unique user ID, and the combination of store and location ID creates a unique identifier for all distinctive stores. Every observation contains three layers of information for pinging the geolocation: state FIPS code, county code and zip code. A clear distinction compared to the data often seen in previous literatures is that this database only tracks small retailers. On the other hand, it records retailers from 11 distinctive sectors, which offers us useful insights that could be compared with previous literatures. It is hugely different from Doppelt (2018) since the two papers place focus on distinctive subjects: one uses data gathered from a farm, while my paper has a widespread collection of workers working in more than 10 industries. Thus, I believe that results generated and interpreted by this paper could be more universally applied to various small businesses.

The primary independent variable in this paper is the relevant minimum wage in each state. The federal minimum wage has not changed since it was increased to $7.25/hour in 2009 and continues to be applicable throughout the time period used in this study. Subsequently, I have collected and organized state-level, county-level and city-level/metropolitan-level minimum wage data in daily format. The prevailing minimum wage for each individual is the higher one between state minimum wage (if applicable) and the federal minimum wage. Considering the short passage of time, all minimum wage data are nominal and are not adjusted for inflation. I have personally verified all state-level, county-level and city-level/metropolitan-level minimum wage changes (for reasons I will explain later in the paper) that happened in the 2018-2020 period by referring to a number of sources such as state or local government minimum wage letter(s), official websites that publishes minimum wage acts (typically from labor force related departments), and creditworthy newsletters. Several other independent variables are also collected as well, including monthly unemployment rate, annual population and annual college enrollment rate, all at state-level. School enrollment rate is defined as the percentage of people enrolled in all levels of education in a particular age group. Enrollment rate is a variable that appears frequently in minimum wage literatures. In theory, a higher enrollment rate usually means that a lower proportion of the population is readily available to go into the labor market, thus impacting the level of employment. Previously this data was obtained from the Current Population Survey. But as the Current

Population Survey had not published school enrollment rate for the year 2020 when this paper is written, I use the college enrollment rate instead, a variable that is subtracted from the National Student Clearinghouse. State Population is collected from the United States Census Bureau and is presented in annual log form. The annual estimates data of the resident population of the United States is published by the United States Census Bureau on its official website and the data dates back to 2010. Unemployment rate is subtracted from the official website of the U.S. Bureau of Labor Statistics. It's a state-level monthly statistics that is seasonally adjusted. All data pertaining to Guam, Virgin Island, Puerto Rico and those that are classified as unclassified or not USA are eliminated from the original dataset.

It is well known that aside from federal and state level minimum regimes, counties and cities (including metropolitan areas) could also develop their own minimum wage program. According to the U.S. department of labor, under the current minimum wage law, employees are entitled to receive the highest rate, if there is difference between the federal, state and local minimum wage. To comply with the state-panel design and to make sure that the main coefficient of interest is not biased due to mismatch, I dropped all observations that pertain to a known and effective local minimum wage regime by matching county codes (with county-level minimum wages) and zip codes (with city or metropolitan level minimum wages).

I have also created a variable called the wage gap to measure the discrepancy between individual hourly wage and state minimum wage. Almost all minimum wage studies agree that workers who receive minimum wage (including those who are paid just slightly above minimum wage criteria) are more likely affected by minimum wage changes. Accordingly, I have isolated workers who earn no more than 2 dollars above minimum wage and those who own no more than 1 dollar above minimum wage. This is a widely used methodology to identify the so called low-wage markets. I'll discuss whether minimum wage changes will bring about more evident effects for these workers. Additionally, all data after 2020.03.31 are dropped due to the impact of covid-19 as the pandemic has had profound effects on various facets of the economy to prevent unforeseen complications. It would be extremely unwise to ignore the practical impacts caused by the on-going covid-19 pandemic and the corresponding containment responses

considering. For example, in most states, unemployment rate more than tripled in April and only after three months of time it rose higher than it did in the 2007-2008 financial crisis. Unemployment rate is an independent variable that I use throughout the paper. As such, including the data after the outbreak of the covid-19 pandemic will inevitably introduce bias to the regressions and since the framework used to discuss impacts of the pandemic has not been fully established, it's in my best interest not to involve such complications.

(Corrections: Typos and English grammar.)

Section 4: Empirical Model

In this paper, I use a model that is similar to Addison (2015) but has simplified the variables to a state level. Thus, the empirical model which incorporates a state-panel design is specified as:

$$\log(Y_{i,t}) = \beta_1 log(MW_{s,t}) + \beta_2 X_{s,t} + \lambda_s(t) + \varepsilon_{s,t}$$

where $Y_{i,t}$ refers to the dependent variable. In this paper I examine 2 dependent variables: store level aggregate employment, an annual store-level variable identified by combining company ID and location ID; and hours worked, a daily individual-level variable that is readily recorded in the dataset. By using store level aggregate employment, I measure the number of employees registered in each store every year. Not all employees stay employed year-round, so distinct observations corresponding to the same employee are recorded as one. For this reason, store-level aggregate employment in 2020 is neglected as I only include the first three months in 2020, resulting in an incomplete set of observations.

For the right hand-side of the regression, $\log(MW_{s,t})$ is the state min wage at time t expressed in log form and β is the key coefficient of interest. X is a vector of other independent variables that vary across state and time, including monthly unemployment rate, annual population and college enrollment rate. Initially I had included regional CPI as an independent variable to measure inflation. The best official CPI statistics that I have found is from the U.S. Bureau of Labor Statistics and it offers regional CPI in monthly

format. United States is grossly classified into four regions: West, Midwest, South and Northeast. But as the empirical model is state-level and there is no state-level CPI statistics (to the best of my knowledge), in the end this independent variable is dropped. $\lambda_s(t)$ reflects state-specific trends over time and the error term $\varepsilon_{s,t}$ allows for a state-specific time trend that alters over time. A variety of fixed effects, including cross term specifications are tested and will be discussed in the next section. Time is treated as a dummy variable and a trend variable in separate regressions and are compared as well. In this paper, all dependent and independent variables except for unemployment rate and college enrollment are in logarithmic form. Thus, the results of this paper could be seen as seen as per capita effects that dependent variables have on independent variables. Taking logarithmic forms on both sides of the equation has been the most frequently used in minimum wage literatures and could be seen in various literatures.

This paper alongside with the model that is used however, have a few obvious limitations. Since the data are strictly on small businesses, there is no way of knowing whether the results obtained are applicable for medium sized or large businesses. The time period studied is also relatively short compared to the majority of minimum wage literatures, and in this case, it is difficult to include and discuss long-term economic trends. Finally, this paper mostly uses state-level data while in recent years, the usage of county-level data (when available) is more popular and reports convincing and sophisticated evidence. Lastly, border-discontinuity design could be added to account for more accurate spatial heterogeneity and further reduces any bias that it could cause.

Section 5: Key Regression Results and Analysis

Table 1 provides summary statistics on the proportion of low-wage workers from different industries. Low-wage workers are classified into 3 categories: those who receive equal to or below minimum wage, those who receive no more than minimum wage plus $1, and those who receive no more than minimum wage plus $2. It's no wonder why the food & drink industry has always had scholars' attention: a whopping 28.91% of the

employees are paid equal or below the minimum wage and when a wage gap of no more than 2 dollars above minimum wage is set, more than 65% of the observations fall into this bracket. It's very worth studying the industry alone as it also happens to hold the most observations in the dataset. However, in the dataset this paper uses, retail industry does not stand out when it comes to absolute or proportional figures of low-wage workers and as of such, the retail industry will not be analyzed alone.

I first examine the effects that the minimum wage has on aggregate store-level employment. All dependent variables are included in the regression. The employment effects of the basic model are reported in column 1 of Table 2, which is a simple model that doesn't take any fixed effects and trends into consideration.

Overall, this paper finds no statistical evidence that supports any disemployment effects caused by an increase in the minimum wage when store-level aggregate employment is the dependent variable of interest, a prevalent conclusion supported abundantly by previous literatures. The coefficients on log state minimum wage come back as insignificant under the basic model.

The number of observations (stores) shrinks from 74,105 to 54,290 and 44,426, corresponding to the two different wage gaps established. This means that 73.26% of the stores have at least one employee that receives no more than minimum wage plus $2 and the figure is 59.95% if the wage gap is marked at $1. Results are presented in column 1 of Table 4 and Table 6. Estimates on minimum wage still come back as mostly insignificant after imposing the wage constraints, and no improvement in the efficiency of the model is observed. This stays true even for the food & drink industry, whose results are reported in Tables 8, 9,10, and 11. This suggests that an increase in minimum wage has very little effect on aggregate store-level employment for small businesses. Small businesses seemingly tend not to alter the number of employees to cope with the fluctuations caused by the minimum wage.

The structure for analyzing working hours is largely identical to the previous one. However, it's worth noting that this time instead of store-level data, it's individual-level data that are involved. Starting in Table 12, I present the estimates on working hours. Without adding any fixed effects and trends to the model, the estimate on minimum wage is -0.0642 and is significant at the 99% level of confidence. This points to a negative and

significant result that the minimum wage has on the hours that individual work. The results do not change much after wage constraints are imposed and are presented in Table 13, Table14, Table 15 and Table 16. Admittedly the regression loses some significance as now the coefficients obtained cease to be significant. But when comparing with previous results without wage constraints, it's safe to say that the sign of the variable has maintained to be negative. Cases where time is treated as a trend variable offers superior results. The regressions have produced a few significant and negative estimates on minimum wage ranging from -0.0395 to -0.0405.

The food & drink industry is indeed plagued more fundamentally by the changes in minimum wages than other industries. Again, this paper isolates observations from this particular industry and sees whether any comparable results could be obtained to support notions from existing literatures. Table 17 reports estimates on minimum wage for the food & drink industry. It's obvious that the effects are negative and bigger in absolute value when comparing with previous results. For example, the coefficient for the basic model increments (in magnitude) from -0.0642 to -0.0752 while being significant at the 99% confidence level.

Key regression results are supportive of past literatures of the notion that an increase in minimum wage does not lead to small businesses cutting down employees. However, there is some evidence showing that on the contrary, small businesses tend to decrease employees' working hours.

(Correction: Cited all tables)

Section 6: Robustness Check

As is discussed in various literatures, models that incorporate specific local trends are to be preferred to the simpler fixed-effects ones. I have incorporated identical trends and fixed effects for both aggregate store-level employment and individual-level working hours.

Table 2 and Table 3 record all the estimates with different fixed effects, trends and cross term specifications for the store-level employments. After adding state fixed effect, I report the results in column 2. Starting in column 3 in Table 1 until the last column of Table 3 more fixed effects and state-level trends are added. Under most circumstances the results stay the same: the coefficient on employment level is negative yet unsignificant. The only exception happens in the regression that incorporates a simple state fixed effect. But this specification is very problematic due to the following two reasons: upon checking other independent variables, it seems weird that the coefficient on log population is as big as -12.4989; it also fails to take other state-level fixed effects and trends into consideration and thus contradicts the very purpose of this paper. Compared to the basic model, though, accounting for state specific trends and adding cross term specifications do not largely improve the efficiency of the model. Aside from specification that include the state time cross term, standard error is typically around 0.35.

Regressions with wage gap constraints and identical sequence for adding fixed effects, trends and cross term specifications are presented from Table 4, Table 5, Table 6, and Table 7. However, estimates on minimum wage still come back as mostly insignificant after imposing the wage constraints, and no improvement in the efficiency of the model is observed. This stays true even for the food & drink industry, which is reported in Table 8, Table 9, Table 10, and Table 11. These results further suggest that an increase in minimum wage has very little effect on aggregate store-level employment for small businesses. Small businesses seemingly tend not to alter the number of employees to cope with the fluctuations caused by the minimum wage.

The structure for analyzing working hours with trends and specifications is again identical to the previous one. After the inclusion of state fixed effects, the estimate is -0.0510 (see Table 11 column 2). It drops a little bit in magnitude, but is still significant at the 99% confidence level. For the same reasons explained above, there are credibility issues with regressions that incorporates the state*time specification. Again, it is the only occasion where the coefficient appears positive and sometimes significant. On the other hand, when working hours is the variable that we look at, treating time as a trend variable instead of a dummy variable continues to improve the efficiency of the model. In

columns 2 and 4 of Table 12, the estimates are very close and they are both significant at the 99% confidence level. The results do not change much after wage constraints are imposed and are presented in Table 13, Table14, Table 15, and Table 16. The regressions have produced a few significant and negative estimates on minimum wage ranging from -0.0395 to -0.0405.

Consistent with the result in the previous section, the food & drink industry is more fundamentally affected by the changes in minimum wages than other industries. Again, this paper isolates observations from this particular industry and sees whether any comparable results could be obtained to support notions from existing literatures. Table 17 reports estimates on minimum wage for the food & drink industry. It's obvious that the effects are negative and bigger in absolute value when comparing with previous results. For example, the coefficient for the basic model increments (in magnitude) from -0.0642 to -0.0752 while being significant at the 99% confidence level. When adding state fixed effects and time trend to the regression (a preferred specification already discussed above), an estimate of -0.0461 is produced. It is significant at the 99% confidence level and exceeds in absolute value than the previously obtained range [-0.0395, -0.0405]. Looking at the same column from Table 18 and Table 19 where the same regression is used, we can easily come to the conclusion that the wage gap has produced solid effects for the food & drink industry when individual hours worked is concerned. The coefficients are -0.0621 and -0.0632 respectively. They are negative and significant even at the 99% confidence level and magnitude increases as the gap falls closer to the minimum wage criteria. This cements the theory that the food & drink industry is particularly sensitive to the change in minimum wage as it is the industry where we observe that the majority of workers are paid not more than $2 above the minimum wage. The results discussed in this section strength the notion that small retailers, especially those from the food & drink industry will decrease employees' hours of work when faced with an increase in minimum wage and the effect is hard to neglect from a broad and long-term perspective. In practice it is easier and more flexible to deduct workers' total working hours instead of cutting off labor completely. In fact, prevailing theories show that an increase in minimum wage acts as a stabilizer in the labor force market by lowering labor turnover rate. Thus, it's natural for small companies to turn to the

intensive margin of the economy when it comes to adjusting the rising labor costs brought by the minimum wage. This trend is most obvious in the food & drink industry, where this paper shows that small businesses react more proactively by cutting 10% more percent of employees' working hour (in the per capita form) compared to the whole sample in which all industries are analyzed together.
(Corrections: Cited all tables, specified the column numbers when necessary)

Section 7: Conclusion

This paper examines the possible effects that minimum wage has on both the extensive margin and intensive margin of the economy. As literatures on employment level changes are abundant, I have placed more focus on whether or how working hours, an alternative margin of adjustment, could be exploited by small businesses. The dataset used in this paper records both individual-level information and store-level information. The records used for the analysis comprise solely of small businesses, and thus provides some new evidence on how these small businesses behave when they face an increase in the minimum wage, especially when one takes factors other than the level of employment into account. I have resorted to state-level data on minimum wage, unemployment rate, college enrollment rate and population. This paper uses a state-level analytical framework that is widely applied in previous literatures to study the impacts brought by fluctuations in minimum wages. The majority of existing literatures focus only on sectors of the economy that rely on low-wage workers heavily, such as the restaurant and bar or retail industry. To fill the discrepancy and to verify prevailing theories, I test minimum-wage effects on all industries incorporated in the dataset and later, on the food & drink industry alone. All dependent variables are state-level to match the state-panel framework used in this paper. Two independent variables from two facets of the economy are studied: the aggregate store-level employment and individual-level working hours. The former variable has been thoroughly studied so far by economists and the ladder one, a representative variable from the intensive margin of the economy, is receiving more and more attention.

Overall, this paper finds no statistically significant evidence supporting the notion that increasing minimum wage decreases the number of employees for small businesses. Except for one regression with a problematic specification, no significant and negative coefficient on minimum wage is observed. This conclusion stays true even when wage gap criteria are imposed on the observations, a very common approached used to identify and isolate minimum wage workers and those who earn not much above the minimum wage. A series of separate regressions using the same model (minus the industry fixed effects) are run to study whether the results could turn significant when isolating the food & drink industry. The results show that, under this analytical framework, even the industry with the highest percentage of minimum wage workers does not significantly lower the number of employees to deal with an increase in minimum wage. However, there is some evidence suggesting that instead of cutting the number of employees, small retailers choose to cut employees' working hours. When taking state fixed effects into consideration, the coefficient is -0.05 and is significant at the 99% confidence level. It shrinks to -0.04 when adding time as a trend variable, but still stays significant. Adding wage constraints does not alter the sign or the magnitude of the coefficient, suggesting that across all industries in this dataset, small businesses do not give differential treatments in cutting working hours based on average individual income. However, I do find out that minimum-wage effects on working hours of individuals stand out for the food & drink industry. The coefficient on minimum wage is typically around -0.06 after accounting for state fixed effects and time trend, about 20% higher compared to the previous result. The coefficient generated in this specific industry of the economy is not surprising, as many studies focusing on this particular industry have given similar conclusions. In conclusion, although small retailers do not act on an increase in the minimum wage by decreasing the number of employees hired within each store, they do so by cutting working hours. The ladder is highly in line with the competitive market theory, and the fact that the food & drink industry magnifies such effects is noteworthy. The results suggest that when we look into the effects that an increase in the minimum wage could impose on small businesses, an alternative method would be investigating whether and how these businesses change their employees' working hours, as this intensive margin may be just as important as the employment level. This paper solidifies

the necessity and importance of considering such relatively less studied margins when minimum wage regimes are imposed in the future.

The results on working hours produced by this paper contrasts the conclusion given in Doppelt (2018). There are a number of possible explanations. The most fundamental difference between these two papers is that I have chosen a completely different subject of observation. The dataset used in this paper covers small retailers from 11 different sectors and thus has the potential to offer implications that could be more widely applied. The results produced by this paper also raise new concerns: other than the hours worked, there is a wide range of eligible variables that could be discussed so that a better and more profound understanding of minimum wage effects beyond the pure employment level could be established. Using county-level data may also increase the efficiency of the model as for some regions, state-level data are not accurate enough to capture all the different local trends. Another weakness is that this paper does not include a border design and fails to compare counties that are geographically linked but are subject to different minimum wage policies. A border-discontinuity design that incorporates counties that share the same border but experience different minimum wage regimes has been proven to be very effective at testing for parallel trends when using a difference-in-difference model. Counties that the same border are geographically very close to each other, and hence share a lot of very similar economic trends. But when they are placed in different states and are subject to different minimum wage regimes, one could observe whether there is evidence suggesting any employment stock flows from the more expensive state to the cheaper state, as labor is highly mobile across these counties. Due to my limitations, the test for parallel trends using a border-discontinuity design is not included in this paper. Another limitation is that this study focuses only on small businesses, and it would be interesting to see whether the same conclusion would still be applicable to medium and large businesses as well.

(Correction: Specified the research, conclusion and contribution. Corrected errors in grammar and typos)

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Appendix: Regression Tables

Table 1: Percentage of workers earning no more than $2 above the minimum wage for each industry

Industry	Percentage at or below the minimum wage	Percentage at or below the minimum wage plus $1	Percentage at or below the minimum wage plus $2
Beauty & Personal Care	13.51	32.12	48.55
Charities, Education & Membership	12.77	31.76	48.91
Food & Drink	28.91	49.52	65.24
Health Care & Fitness	6.28	14.52	23.19
Home & Repair	7.50	16.76	26.52
Leisure & Entertainment	19.64	41.68	57.99
Other	11.42	26.24	40.09
Professional Services	6.66	16.80	30.25
Retail	12.58	31.41	48.58
Transportation	8.80	16.71	25.99
Unknown	15.49	32.06	47.90

Notes: The sample comprises of state-level observations only. Observations with a corresponding higher local minimum wage regime that is affective are omitted to stay in line with the state-panel design.

Table 2: Effects of Minimum Wage on Store-Level Aggregate Employment with State-Level Specifications

Dep. Var.	Store-Level Aggregate Employment	Store-Level Aggregate Employment	Store-Level Aggregate Employment	Store-Level Aggregate Employment
Model Specification	Basic Model	Basic Model + State FE	Basic Model + State& Industry FE + Time Dummy	Basic Model + State*Time Dummy + Industry FE
	(1)	(2)	(3)	(4)
State Min W	0.0047	-2.3149*	-0.6963	-2.3897
Robust Std. Err.	0.0566	0.2914	0.3677	1.5249
Units	Stores	Stores	Stores	Stores
Observations	74105	74105	74105	74105

Notes: The sample comprises of state-level observations across all industries. All regressions control for state population, unemployment rate, and college enrollment rate. Column 1 is the basic regression without any type of fixed effects. Column 2 includes state fixed effects and column 3 controls for industry fixed effect and adds a time dummy variable. Column 4 controls for industry fixed effect and state*time fixed effect. *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Effects of Minimum Wage on Store-Level Aggregate Employment with State-Level Specifications (cont'd)

Dep. Var.	Store-Level Aggregate Employment	Store-Level Aggregate Employment	Store-Level Aggregate Employment	Store-Level Aggregate Employment
Model Specification	Basic Model+ State*Industry FE + Time Dummy	Basic Model + State & Industry FE + Time Trend	Basic Model + State FE * Time Trend+ Industry FE	Basic Model + State* Industry FE + Time Trend
	(1)	(2)	(3)	(4)
State Min W	-0.7335	-0.6963	-2.3896	-0.7335
Robust Std. Err.	0.3520	0.3677	1.5249	0.3520
Units	Stores	Stores	Stores	Stores
Observations	74105	74105	74105	74105

Notes: This table is a continuation of Table 2. Column 1 controls for time fixed effect and state*industry fixed effect. Starting in Column 2 time is treated as a trend variable alongside with control for state and industry fixed effect. Column 3 controls for state*time trend alongside with industry fixed effect. Column 4 controls for state*industry fixed effect alongside with time trend. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Effects of Minimum Wage on Store-Level Aggregate Employment with State-Level Specifications with wage gap ≤ 2

Dep. Var.	Store-Level Aggregate Employment	Store-Level Aggregate Employment	Store-Level Aggregate Employment	Store-Level Aggregate Employment
Model Specification	Basic Model	Basic Model + State FE	Basic Model + State& Industry FE + Time Dummy	Basic Model + State*Time Dummy + Industry FE
	(1)	(2)	(3)	(4)
State Min W	0.1292	-1.9202	0.1231	-1.8054
Robust Std. Err.	0.1408	0.7729	0.5801	1.2976
Units	Stores	Stores	Stores	Stores
Observations	54290	54290	54290	54290

Notes: The sample comprises of state-level observations in which individual wage does not exceed minimum wage + $2, across all industries. All regressions control for state population, unemployment rate, and college enrollment rate. Column 1 is the basic regression without any type of fixed effects. Column 2 includes state fixed effects and column 3 controls for industry fixed effect and adds a time dummy variable. Column 4 controls for industry fixed effect and state*time fixed effect. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Effects of Minimum Wage on Store-Level Aggregate Employment with State-Level Specifications with wage gap ≤ 2 (cont'd)

Dep. Var.	Store-Level Aggregate Employment	Store-Level Aggregate Employment	Store-Level Aggregate Employment	Store-Level Aggregate Employment
Model Specification	Basic Model+ State*Industry FE + Time Dummy	Basic Model + State & Industry FE + Time Trend	Basic Model + State FE * Time Trend+ Industry FE	Basic Model + State* Industry FE + Time Trend
	(1)	(2)	(3)	(4)
State Min W	0.0536	0.1231	-1.8054	0.0536
Robust Std. Err.	0.5741	0.5801	1.2975	0.5741
Units	Stores	Stores	Stores	Stores
Observations	54290	54290	54290	54290

Notes: This table is a continuation of Table 4. Column 1 controls for time fixed effect and state*industry fixed effect. Starting in Column 2 time is treated as a trend variable alongside with control for state and industry fixed effect. Column 3 controls for state*time trend alongside with industry fixed effect. Column 4 controls for state*industry fixed effect alongside with time trend. *** p<0.01, ** p<0.05, * p<0.1

Table 6: Effects of Minimum Wage on Store-Level Aggregate Employment with State-Level Specifications with wage gap ≤ 1

Dep. Var.	Aggregate Employment	Aggregate Employment	Aggregate Employment	Aggregate Employment
Model Specification	Basic Model	Basic Model + State FE	Basic Model + State& Industry FE + Time Dummy	Basic Model + State*Time Dummy + Industry FE
	(1)	(2)	(3)	(4)
State Min W	0.2324	-1.9202	0.7370	-1.1177
Robust Std. Err.	0.1811	0.7729	0.9241	1.7194
Units	Stores	Stores	Stores	Stores
Observations	44,426	44,426	44,426	44,426

Notes: This table is a continuation of Table 4. Column 1 controls for time fixed effect and state*industry fixed effect. Starting in Column 2 time is treated as a trend variable alongside with control for state and industry fixed effect. Column 3 controls for state*time trend alongside with industry fixed effect. Column 4 controls for state*industry fixed effect alongside with time trend. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Effects of Minimum Wage on Store-Level Aggregate Employment with State-Level Specifications with wage gap ≤1 (cont'd)

Dep. Var.	Aggregate Employment	Aggregate Employment	Aggregate Employment	Aggregate Employment
Model Specification	Basic Model+ State*Industry FE + Time Dummy	Basic Model + State & Industry FE + Time Trend	Basic Model + State FE * Time Trend+ Industry FE	Basic Model + State* Industry FE + Time Trend
	(1)	(2)	(3)	(4)
State Min W	0.6038	0.7370	-1.1177	0.6038
Robust Std. Err.	0.8868	0.9241	1.7191	0.8868
Units	Stores	Stores	Stores	Stores
Observations	44,426	44,426	44,426	44,426

Notes: This table is a continuation of Table 6. Column 1 controls for time fixed effect and state*industry fixed effect. Starting in Column 2 time is treated as a trend variable alongside with control for state and industry fixed effect. Column 3 controls for state*time trend alongside with industry fixed effect. Column 4 controls for state*industry fixed effect alongside with time trend. *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Effects of Minimum Wage on Store-Level Aggregate Employment with State-Level Specifications on Food & drinks industry

Dep. Var.	Aggregate Employment	Aggregate Employment	Aggregate Employment	Aggregate Employment	Aggregate Employment	Aggregate Employment
Model Specification	Basic Model	Basic Model + State FE	Basic Model + State FE + Time Dummy	Basic Model + State FE*Time Dummy	Basic Model + State FE + Time Trend	Basic Model + State FE * Time Trend
	(1)	(2)	(3)	(4)	(5)	(6)
State Min W	-0.0289	-2.0819	-0.7184	-1.3802	-0.7184	-1.3802
Robust Std. Err.	0.0448	0.4047	0.6268	2.3061	0.6268	2.3061
Units	Stores	Stores	Stores	Stores	Stores	Stores
Observations	30640	30640	30640	30640	30640	30640

Notes: The sample comprises of state-level observations with a focus on the food & drink industry. All regressions control for state population, unemployment rate, and college enrollment rate. Column 1 is the most basic regression without any type of fixed effects. Column 2 includes state fixed effects and a time dummy variable is added in column 3. Column 4 controls for the state*time fixed effect. Column 5 controls for state fixed effect while adding time as a trend variable. Column 6 controls for state*time trend. *** p<0.01, ** p<0.05, * p<0.1.

Table 9: Effects of Minimum Wage on Store-Level Aggregate Employment with State-Level Specifications on Food & drinks industry with wage gap ≤ 2

Dep. Var.	Aggregate Employment	Aggregate Employment	Aggregate Employment	Aggregate Employment	Aggregate Employment	Aggregate Employment
Model Specification	Basic Model	Basic Model + State FE	Basic Model + State FE + Time Dummy	Basic Model + State FE*Time Dummy	Basic Model + State FE + Time Trend	Basic Model + State FE * Time Trend
	(1)	(2)	(3)	(4)	(5)	(6)
State Min W	0.2702	-1.2545	0.3618	-0.6296	0.3618	-0.6296
Robust Std. Err.	0.1231	0.7495	0.8424	1.9141	0.8424	1.9141
Units	Stores	Stores	Stores	Stores	Stores	Stores
Observations	27906	27906	27906	27906	27906	27906

The sample comprises of state-level observations in which individuals receive no more than the minimum wage +$2 with a focus on the food & drink industry. All regressions control for state population, unemployment rate, and college enrollment rate. Column 1 is the basic regression without any type of fixed effects. Column 2 includes state fixed effects and a time dummy variable is added in column 3. Column 4 controls for the state*time fixed effect. Column 5 controls for state fixed effect while adding time as a trend variable. Column 6 controls for state*time trend. *** p<0.01, ** p<0.05, * p<0.1.

Table 10: Effects of Minimum Wage on Store-Level Aggregate Employment with State-Level Specifications on Food & drinks industry with wage gap ≤ 1

Dep. Var.	Aggregate Employment	Aggregate Employment	Aggregate Employment	Aggregate Employment	Aggregate Employment	Aggregate Employment
Model Specification	Basic Model	Basic Model + State FE	Basic Model + State FE + Time Dummy	Basic Model + State FE*Time Dummy	Basic Model + State FE + Time Trend	Basic Model + State FE * Time Trend
	(1)	(2)	(3)	(4)	(5)	(6)
State Min W	0.3864	-0.8900	0.5924	-1.0422	0.5924	-1.0422
Robust Std. Err.	0.1410	0.8604	0.9610	1.6137	0.9610	1.6136
Units	Stores	Stores	Stores	Stores	Stores	Stores
Observations	24840	24840	24840	24840	24840	24840

Notes: The sample comprises of state-level observations in which individuals receive no more than the minimum wage +$1 with a focus on the food & drink industry. All regressions control for state population, unemployment rate, and college enrollment rate. Column 1 is the basic regression without any type of fixed effects. Column 2 includes state fixed effects and a time dummy variable is added in column 3. Column 4 controls for the state*time fixed effect. Column 5 controls for state fixed effect while adding time as a trend variable. Column 6 controls for state*time trend. *** p<0.01, ** p<0.05, * p<0.1.

Table 11: Effects of Minimum Wage on Hours Worked with State-Level Specifications

Dep. Var.	Hours Worked	Hours Worked	Hours Worked	Hours Worked
Model Specification	Basic Model	Basic Model + State FE	Basic Model + State& Industry FE + Time Dummy	Basic Model + State*Time Dummy + Industry FE
	(1)	(2)	(3)	(4)
State Min W	-0.0642***	-0.0510***	-0.0155	-0.0598*
Robust Std. Err.	0.0098	0.0110	0.0124	0.0361
Units	Individual	Individual	Individual	Individual
Observations	6,517,375	6,517,375	6,517,375	6,517,375

Notes: The sample comprises of state-level observations across all industries. All regressions control for state population, unemployment rate, and college enrollment rate. Column 1 is the basic regression without any type of fixed effects. Column 2 includes state fixed effects and column 3 controls for industry fixed effect and adds a time dummy variable. Column 4 controls for industry fixed effect and state*time fixed effect. *** p<0.01, ** p<0.05, * p<0.1.

Table 12: Effects of Minimum Wage on Hours Worked with State-Level Specifications (cont'd)

Dep. Var.	Hours Worked	Hours Worked	Hours Worked	Hours Worked
Model Specification	Basic Model+ State*Industry FE + Time Dummy	Basic Model + State & Industry FE + Time Trend	Basic Model + State FE * Time Trend+ Industry FE	Basic Model + State* Industry FE + Time Trend
	(1)	(2)	(3)	(4)
State Min W	-0.0148	-0.0396***	-0.0293	-0.0389***
Robust Std. Err.	0.0124	0.0122	0.0227	0.0122
Units	Individual	Individual	Individual	Individual
Observations	6,517,375	6,517,375	6,517,375	6,517,375

Notes: This table is a continuation of Table 11. Column 1 controls for time fixed effect and state*industry fixed effect. Starting in Column 2 time is treated as a trend variable alongside with control for state and industry fixed effect. Column 3 controls for state*time trend alongside with industry fixed effect. Column 4 controls for state*industry fixed effect alongside with time trend. *** p<0.01, ** p<0.05, * p<0.1.

Table 13: Effects of Minimum Wage on Hours Worked with State-Level Specifications with wage gap ≤ 2

Dep. Var.	Hours Worked	Hours Worked	Hours Worked	Hours Worked
Model Specification	Basic Model	Basic Model + State FE	Basic Model + State& Industry FE + Time Dummy	Basic Model + State*Time Dummy + Industry FE
	(1)	(2)	(3)	(4)
State Min W	-0.1318	-0.0156	-0.0173	0.1031**
Robust Std. Err.	0.0131	0.0150	0.0171	0.0478
Units	Individual	Individual	Individual	Individual
Observations	3,634,867	3,634,867	3,634,867	3,634,867

Notes: The sample comprises of state-level observations in which individual wage does not exceed minimum wage + $2, across all industries. All regressions control for state population, unemployment rate, and college enrollment rate. Column 1 is the basic regression without any type of fixed effects. Column 2 includes state fixed effects and column 3 controls for industry fixed effect and adds a time dummy variable. Column 4 controls for industry fixed effect and state*time fixed effect. *** p<0.01, ** p<0.05, * p<0.1.

Table 14: Effects of Minimum Wage on Hours Worked with State-Level Specifications with wage gap ≤ 2 (cont'd)

Dep. Var.	Hours Worked	Hours Worked	Hours Worked	Hours Worked
Model Specification	Basic Model+ State*Industry FE + Time Dummy	Basic Model + State & Industry FE + Time Trend	Basic Model + State FE * Time Trend+ Industry FE	Basic Model + State* Industry FE + Time Trend
	(1)	(2)	(3)	(4)
State Min W	-0.0195	-0.0373	-0.0026	-0.0395**
Robust Std. Err.	0.0170	0.0168	0.0312	0.0168
Units	Individual	Individual	Individual	Individual
Observations	3,634,867	3,634,867	3,634,867	3,634,867

Notes: This table is a continuation of Table 13. Column 1 controls for time fixed effect and state*industry fixed effect. Starting in Column 2 time is treated as a trend variable alongside with control for state and industry fixed effect. Column 3 controls for state*time trend alongside with industry fixed effect. Column 4 controls for state*industry fixed effect alongside with time trend. *** p<0.01, ** p<0.05, * p<0.1.

Table 15: Effects of Minimum Wage on Hours Worked with State-Level Specifications with wage gap≤ 1

Dep. Var.	Hours Worked	Hours Worked	Hours Worked	Hours Worked
Model Specification	Basic Model	Basic Model + State FE	Basic Model + State& Industry FE + Time Dummy	Basic Model + State*Time Dummy + Industry FE
	(1)	(2)	(3)	(4)
State Min W	-0.0110	-0.0131	0.0189	0.0973*
Robust Std. Err.	0.0157	0.0177	0.9241	0.0556
Units	Individual	Individual	Individual	Individual
Observations	2,630,264	2,630,264	2,630,264	2,630,264

Notes: The sample comprises of state-level observations in which individual wage does not exceed minimum wage + $1, across all industries. All regressions control for state population, unemployment rate, and college enrollment rate. Column 1 is the most basic regression without any type of fixed effects. Column 2 includes state fixed effects and column 3 controls for industry fixed effect and adds a time dummy variable. Column 4 controls for industry fixed effect and state*time fixed effect. *** p<0.01, ** p<0.05, * p<0.1.

Table 16: Effects of Minimum Wage on Hours Worked Employment with State-Level Specifications with wage gap ≤1 (cont'd)

Dep. Var.	Hours Worked	Hours Worked	Hours Worked	Hours Worked
Model Specification	Basic Model+ State*Industry FE + Time Dummy	Basic Model + State & Industry FE + Time Trend	Basic Model + State FE * Time Trend+ Industry FE	Basic Model + State* Industry FE + Time Trend
	(1)	(2)	(3)	(4)
State Min W	-0.0223	-0.0371*	0.0235	-0.0405**
Robust Std. Err.	0.0203	0.0202	0.0377	0.0202
Units	Individual	Individual	Individual	Individual
Observations	2,630,264	2,630,264	2,630,264	2,630,264

Notes: This table is a continuation of Table 15. Column 1 controls for time fixed effect and state*industry fixed effect. Starting in Column 2 time is treated as a trend variable alongside with control for state and industry fixed effect. Column 3 controls for state*time trend alongside with industry fixed effect. Column 4 controls for state*industry fixed effect alongside with time trend. *** p<0.01, ** p<0.05, * p<0.1.

Table 17: Effects of Minimum Wage on Hours Worked with State-Level Specifications on Food & drinks industry

Dep. Var.	Hours Worked	Hours Worked	Hours Worked	Hours Worked	Hours Worked	Hours Worked
Model Specification	Basic Model	Basic Model + State FE	Basic Model + State FE + Time Dummy	Basic Model + State FE*Time Dummy	Basic Model + State FE + Time Trend	Basic Model + State FE * Time Trend
	(1)	(2)	(3)	(4)	(5)	(6)
State Min W	-0.0752***	-0.0660***	-0.0208	0.0786	-0.0461***	-0.0411
Robust Std. Err.	0.0131	0.0146	0.0166	0.0485	0.0163	0.0306
Units	Individual	Individual	Individual	Individual	Individual	Individual
Observations	3,637,868	3,637,868	3,637,8682	3,637,868	3,637,868	3,637,868

Notes: The sample comprises of state-level observations with a focus on the food & drink industry. All regressions control for state population, unemployment rate, and college enrollment rate. Column 1 is the most basic regression without any type of fixed effects. Column 2 includes state fixed effects and a time dummy variable is added in column 3. Column 4 controls for the state*time fixed effect. Column 5 controls for state fixed effect while adding time as a trend variable. Column 6 controls for state*time trend. *** p<0.01, ** p<0.05, * p<0.1.

Table 18: Effects of Minimum Wage on Hours Worked with State-Level Specifications on Food & drinks industry with wage gap ≤ 2

Dep. Var.	Hours Worked	Hours Worked	Hours Worked	Hours Worked	Hours Worked	Hours Worked
Model Specification	Basic Model	Basic Model + State FE	Basic Model + State FE + Time Dummy	Basic Model + State FE*Time Dummy	Basic Model + State FE + Time Trend	Basic Model + State FE * Time Trend
	(1)	(2)	(3)	(4)	(5)	(6)
State Min W	-0.0402**	-0.0424**	-0.0396*	0.0843	-0.0621***	-0.0491
Robust Std. Err.	0.1622	0.1856	0.0211	0.0612	0.0209	0.0395
Units	Individual	Individual	Individual	Individual	Individual	Individual
Observations	2,373,200	2,373,200	2,373,200	2,373,200	2,373,200	2,373,200

Notes: The sample comprises of state-level observations in which individuals receive no more than the minimum wage +$2 with a focus on the food & drink industry. All regressions control for state population, unemployment rate, and college enrollment rate. Column 1 is the most basic regression without any type of fixed effects. Column 2 includes state fixed effects and a time dummy variable is added in column 3. Column 4 controls for the state*time fixed effect. Column 5 controls for state fixed effect while adding time as a trend variable. Column 6 controls for state*time trend. *** p<0.01, ** p<0.05, * p<0.1.

Table 19: Effects of Minimum Wage on Hours Worked with State-Level Specifications on Food & drinks industry with wage gap ≤ 1

Dep. Var.	Hours Worked	Hours Worked	Hours Worked	Hours Worked	Hours Worked	Hours Worked
Model Specification	Basic Model	Basic Model + State FE	Basic Model + State FE + Time Dummy	Basic Model + State FE*Time Dummy	Basic Model + State FE + Time Trend	Basic Model + State FE * Time Trend
	(1)	(2)	(3)	(4)	(5)	(6)
State Min W	-0.0399**	-0.0457**	-0.0412*	0.0956	-0.0632***	-0.0210
Robust Std. Err.	0.0187	0.0212	0.0245	0.0708	0.0242	0.0462
Units	Individual	Individual	Individual	Individual	Individual	Individual
Observations	1,801,451	1,801,451	1,801,451	1,801,451	1,801,451	1,801,451

Notes: The sample comprises of state-level observations in which individuals receive no more than the minimum wage +$1 with a focus on the food & drink industry. All regressions control for state population, unemployment rate, and college enrollment rate. Column 1 is the most basic regression without any type of fixed effects. Column 2 includes state fixed effects and a time dummy variable is added in column 3. Column 4 controls for the state*time fixed effect. Column 5 controls for state fixed effect while adding time as a trend variable. Column 6 controls for state*time trend. *** p<0.01, ** p<0.05, * p<0.1.