

Report to  
The City of Pasadena

*Estimates of the Impact of  
Pasadena's Minimum Wage Ordinance*

Prepared by

Edward E. Leamer, Professor, UCLA

Mengshan Cui, UCLA

Jonathan Gu, UCLA

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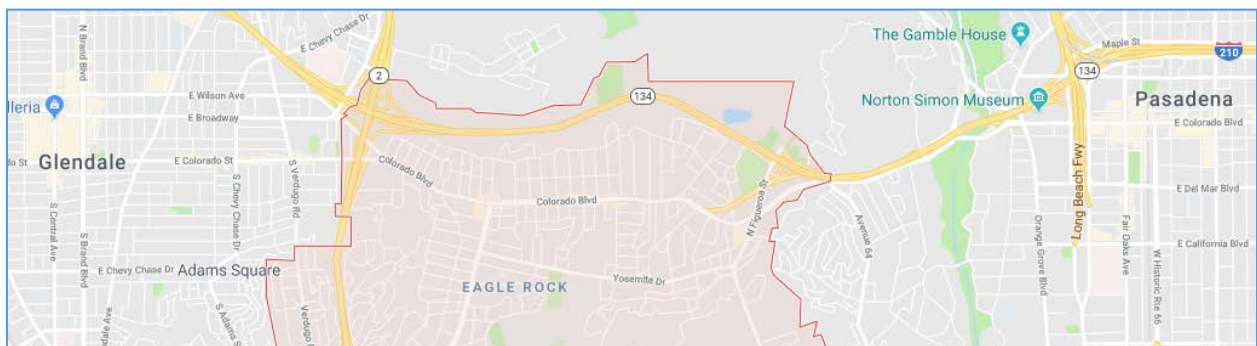
## Introduction

California Senate Bill No. 3, which was approved by Governor Brown on April 4, 2016, established a California minimum wage equal to \$10.50 per hour for employers with 26 or more employees beginning on January 1, 2017, and stipulated annual increases in the California minimum wage up to \$15 per hour on January 1, 2022. Prior to the passage of the California minimum wage, the City of Los Angeles had legislated its own minimum wage schedule with a level of \$10.50 on July 1, 2016, six months earlier than the State of California, with increments that increase the LA City minimum wage to \$15 on July 1, 2020, a year and a half before the California State minimum wage will reach \$15.

The Pasadena Minimum Wage ordinance (Ordinance #7278) passed on March 14, 2016 adopts the City of LA minimum wage schedule through the end of June 2019. The Pasadena ordinance requires a review of the effects of this local minimum wage on or before February 2019 to serve as input into deliberations concerning the adoption of the City of Los Angeles minimum wage indefinitely or something else. This document is designed to support the deliberations via a careful study of the historical data.

In particular, we have worked hard to distinguish the effect of the California minimum wage increases from the Pasadena increment since the City of Pasadena cannot call off the future increases in the California minimum wage and thus has discretion over only its local increment. This is not easy to accomplish because the evidence so far is limited.

Figure 1 Colorado Boulevard



An example of something that might be at stake in this local minimum wage decision is the location of restaurants along Colorado Boulevard illustrated in **Figure 1** above. Colorado St/Bldv extends from Glendale through Eagle Rock and into Pasadena, with restaurants on all three segments. The Eagle Rock segment is governed by the higher minimum wage of the City of Los Angeles but Glendale has the lower minimum wage of the State of California. Eagle Rock may have the most at stake here, since if the City of Pasadena opts for the lower minimum wages of the State of California then Eagle Rock would face lower-wage competition both from the East (Pasadena) and from the West (Glendale), and jobs customers could move from Eagle Rock into both Pasadena and Glendale. On the other hand, if Pasadena continues to opt for the high-minimum-wage schedule of the City of Los Angeles, that puts enterprises within Pasadena in an adverse position compared with places like Glendale, La Cañada

Flintridge and Alhambra and Monterey Park. The very limited experience with the Pasadena increment so far has not produced much evidence of this kind of movement of jobs or enterprises.

In retrospect, it would have been wise not to have adjacent regions within Southern California with different minimum wages, but the legislation adopted by the City of Los Angeles has created a patchwork of minimum wages. The City of Pasadena can choose from one of the two prevailing minimum wage schedules, both of which leave local geographic variability in minimum wages favoring businesses in some regions compared with others. It's a difficult choice. The choice is made more difficult because the social benefits that come from higher minimum wages are not fully understood. The money that is required to raise the wages of some workers has to come from somewhere. It could come from customers via higher product prices, or from other workers or from management or from business owners or from property owners. The wisdom of deploying higher minimum wages depends on where the money is coming from as well as where it is going.

### Scope of the work

The RFP issued by the City raises a broad set of important questions:

1. What is the impact on workers in Pasadena: change in hourly wages earned, change in hours worked, net change in wage income, job loss, changes in public assistance, etc. Information should be sorted by industry, age and race if possible.
2. What is the impact on businesses in Pasadena: changes in payroll costs, total hours paid, gross revenue; changes in business model to accommodate higher hourly labor costs, changes in hiring practices, impact on prices, profits and an estimate of business closures or relocations due to this change.

Some of these questions cannot be addressed with the data that we have. The work described in this document is based primarily on the Quarterly Census of Employment and Wages collected by the State of California, which for each geographic region and each industry includes three items: number of establishments, number of employees and total wages paid. We use these data to assess the impact of the California and Pasadena minimum wages on number of establishments, number of employees and earnings per employee in 24 different industries. We also have been provided Pasadena and Los Angeles sales tax revenue, and carry out a similar analysis to determine the impact of the minimum wages on sales tax revenue.

Most critically, we do not have hours worked, and the Pasadena questions that involve hours cannot be studied using the available data. Edward Leamer has been suggesting to both the State Legislature and to Governor Brown directly that to determine the effectiveness of the minimum wage law we really need hours worked. Some states do collect this information but California does not.

The State has but we do not have access to the records of individual enterprises and individual workers. Averages across enterprises and across workers can be constant but with great differences in the outcomes of firms or workers within those averages.

Several of these Pasadena concerns could be summarized by one question: Who pays the minimum wages? The fact that this question cannot now be reliably answered should cast a shadow on the use of the minimum wage for income redistribution. It could be that the minimum wage is passed on to customers via higher prices, or onto commercial landlords via lower rental rates, or onto workers via

higher home rental rates or onto workers via more onerous working conditions or onto owners via lower profits, and so on. The business reaction to the increased minimum wage plays a large role in determining who pays the minimum wage. Much more work and better data sets would be needed to answer Pasadena's important questions regarding the business reaction to the minimum wage.

The other important question is : "Who benefits from the minimum wage?" We are able to identify the industries that have the closest connection between earnings per worker and the minimum wage, and we can describe those sectors in terms of worker race and age, but within an industry we cannot determine with the data we are studying which race and which age is most affected.

Also, it's not just the workers with the increased pay who benefit. If the minimum wage channels sufficient amounts of new money to poorer neighborhoods, we should be expecting not just a reduction in public assistance but better health outcomes, better schools and better educational outcomes in those locales. For these critical long-run benefits it takes time for them materialize and they consequently difficult to detect.

### Summary of Findings

Solid conclusions regarding the impacts of the Pasadena minimum wage increment on earnings, employment, and number of establishments are difficult to make because of the limitations of the minimum wage "experiment" that has so far occurred, because the data we rely on only has labor earnings and number of workers but not hours worked, because the data are not individuals but enterprise based, because the geography of temporarily lower minimum wages surrounding Pasadena is complex, because the California minimum wage legislation dictates the precise dates when some workers must receive their wage increases but all other responses to this legislation may be made slowly over time possibly in anticipation of higher minimum wages to come, and because each industry has unobserved drivers that might mask the effects of minimum wage increments.

However, using several different econometric models for interpreting the data from 2011 to 2018q2, the evidence overall points to a positive impact of the combined California/Pasadena minimum wage on the earnings of restaurant workers and of other low wage industries, confirming that the law is being obeyed. Our preferred model implies that a minimum wage increase of 10% would increase the average quarterly earnings per worker in limited-service restaurants by 8% and in full-service restaurants by 5%.<sup>1</sup>

Our preferred model also supports the conclusion that about half of the total increase in earnings resulting from a minimum wage increase occurs within the first quarter of the minimum wage increment. This response is consistent with the legislation which directly and immediately affects only part of each firm's employees but has lingering effects on the others.<sup>2</sup>

While effects on average wages of employed workers are clear in the theory and clear in the data, employment effects are not a sure thing theoretically and are harder to detect in the data. The

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<sup>1</sup> This increase in average earnings does not mean necessarily that the low-wage workers are better off. An increase in earnings per worker might occur if the workers with the lowest earnings were laid off but we have not found evidence of job losses coincident with the earnings increases. It is also possible that the increase in average earnings per employee is a result of a reduction of hours worked by the low-wage employees and/or an increase in hours worked by the high-wage employees. Absent data on hours worked we are not in a position to comment on this possibility.

<sup>2</sup> It is also possible that the effect on the directly impacted workers is gradual even though the legislation is not.

economists' favorite supply and demand model makes it a virtual certainty that job losses come with minimum wage increases. It is only a matter of when and how much. But there are two other theoretical models that suggest employment effects may be absent. One theory is that wages are determined not by competitive labor markets but by bilateral bargains between employers with many options and employees with few. The extreme version of this is a "company town" with only one employer. According to the theory, a minimum wage in a company town can raise both wages and employment. While Pasadena is far from a company town, there also is no organized labor market where worker hours are auctioned off to the highest bidders. For that reason a minimum wage might improve the bargaining power of workers and support higher wages with no loss of employment.

The second theoretical reason why there may be small employment effects is that industry-wide increases in costs are normally passed on to customers in the form of higher prices. If these higher prices do not reduce sales, the level of employment required to provide those services also remains the same. Depending on how the market for the product or service works, this can be good for the employers as well as the employees for the following reason. Restaurants that understand that the increase in minimum wages is going to cause all restaurants to raise prices can, for a period of time, increase prices in excess of the cost increase, since it is going to take considerable time before customers can determine which locations have the best deals after the minimum wage increase occurs. (Remember how hotels imposed an energy surcharge when the oil price spiked up but were slow to remove those surcharges when oil prices went back down.)

If the minimum wage does create higher product prices, then in effect the minimum wage requires customers to make contributions to the workers. Public policy then needs to be cognizant of who are the customers and who are the workers. If the Pasadena customers and Pasadena workers are in the same social-economic group, this would not be an effective way to redistribute income from the wealthy to the poor. If the Pasadena customers live in Pasadena and the Pasadena workers live elsewhere, the minimum wage is a contribution by Pasadena residents in favor of people who live elsewhere. This is not a bad thing, but it needs to be understood. If the Pasadena customers are wealthy "tourists" who live elsewhere and the workers are Pasadena residents, then the tourists would be making a contribution to help out Pasadena residents. From the standpoint of local government, that seems like an appealing outcome.

This lengthy discussion of the theory of employment effects of the minimum wage foreshadows the fact the evidence about employment effects is not so clear. Our preferred model only shows convincing negative employment effects of a minimum wage increase local to Pasadena for Limited Service Restaurants. In most cases, the traditional error bands around our estimates of the impact of either the State minimum wage and the Pasadena minimum wage on employment in the 24 industries within our dataset are wide enough to include zero. To express this differently, the employment response to higher minimum wages is neither so sudden nor so great to make it transparent in the data we are studying, though a negative employment response appears generally present when viewed with the help of some models.

### [Visual Displays That Help to Interpret the Results](#)

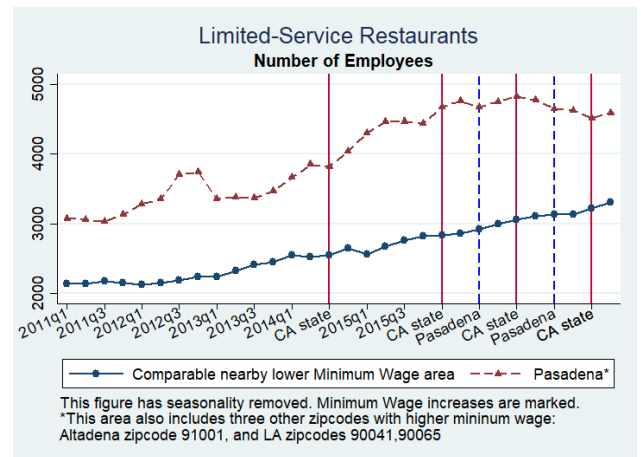
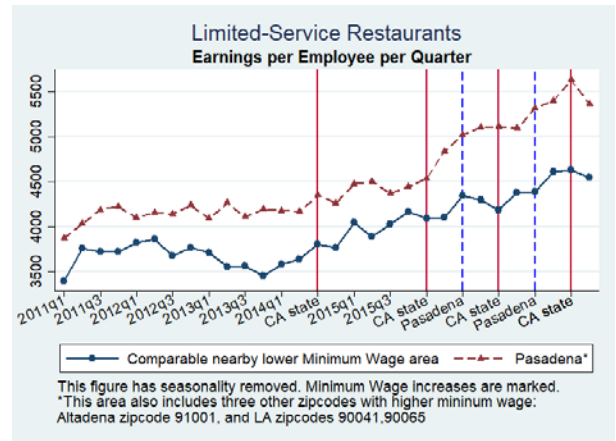
The data have been filtered through various models to create estimated minimum wage effects, but the conclusions from those models can be made transparent and much more credible when supported by

well-designed data displays. We show you some pertinent figures here, and have many more in Appendices

Estimates of the impact of minimum wage can be based on comparisons across regions with different minimum wages or across time as the minimum wage changes in one region. The first is called “cross-sectional” evidence and the second is “time-series” evidence. The econometric estimation work we have done relies mostly on the time series evidence except that we contrast Pasadena with regions with lower minimum wages surrounding Pasadena. In addition, we have explored visual displays that contrast California with other states to establish a firmer cross-sectional foundation for our conclusions.

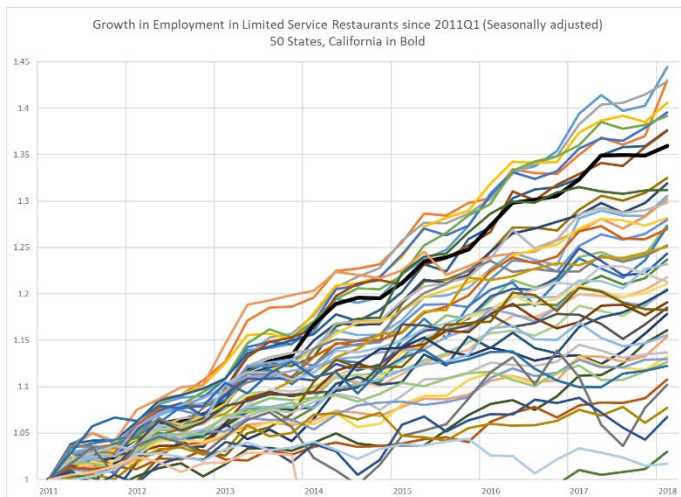
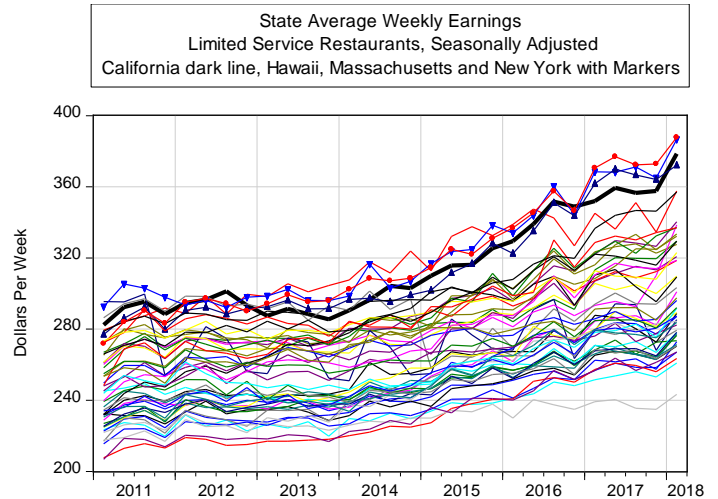
These two types of evidence are illustrated in the figures on the right. The top figure depicts the earnings per worker and the lower figure depicts employment of limited service restaurants in the high-MW Pasadena area and also comparable close low-MW regions from 2011q1 to 2018q2. In order to avoid confidentiality nondisclosure issues, we have also included in the high MW group together with the Pasadena data three other zipcodes that are also on the same minimum wage schedule as Pasadena. Vertical lines in these figures represent increases in the CA minimum wage, affecting all regions, and increases in the Pasadena minimum wage affecting only the High-MW Pasadena region.

Readers may make their own judgements about what they see in these displays, but we see clearly rising earnings per worker in the period when the minimum wage increases were occurring, more in the high MW region than the low MW region, and we see a cessation of employment growth in Pasadena during the same period. These features support the conclusion that the minimum wage is increasing earnings per worker in limited service restaurants but is also holding down the growth of employment in limited service restaurants.





It is also informative to compare the state of California with other states that did or did not have minimum wages in excess of the Federal \$7.25 minimum. The figure to the right provides additional “cross-sectional” evidence comparing seasonally adjusted earnings per worker in limited service restaurants in California with the other 49 states in America with California in bold. We can see here that the average weekly earnings of limited service restaurant workers in California in 2011 already ranked near the top, but from 2015 onward four states separated from the pack: These were California, Hawaii, Massachusetts and New York. All four have had increases in minimum wages. This is evidence of the effect of minimum wages on earnings in limited service restaurants.



The limited service restaurant *employment growth* data for the 50 US states illustrated in the figure on the left has California eighth from the top in terms of growth of jobs since 2011. Here there is no evidence of harmful employment effects from the California minimum wage.

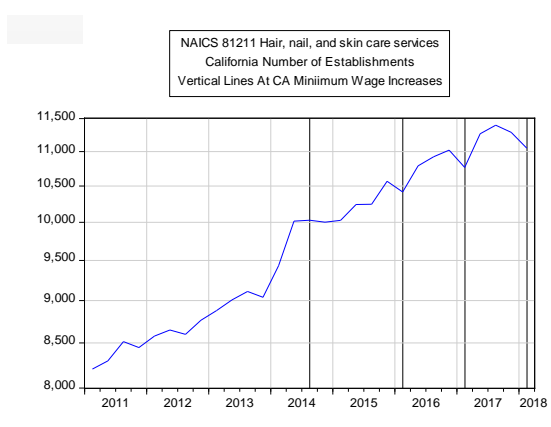
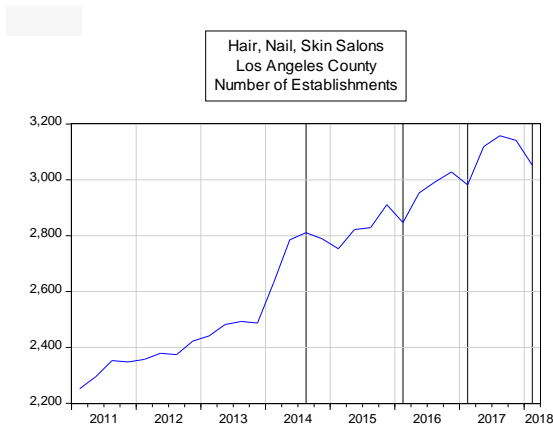
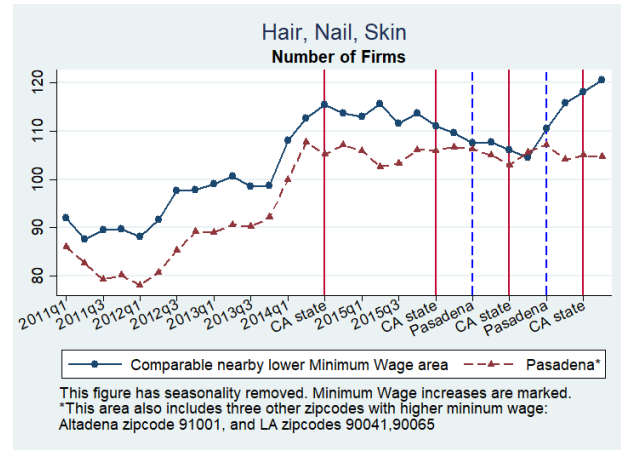
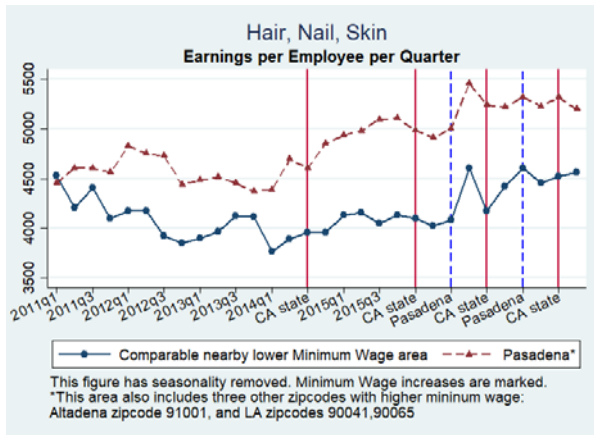
Upon examining the impact of minimum wages on the employment in many sectors, the limited-service restaurant industry is the only low wage sector in which we found a significant negative impact of the Pasadena minimum wage on employment. All other

low-wage sectors display statistically insignificant impact of either the California or the Pasadena minimum wage on jobs. Be careful not to interpret the words “statistically insignificant” to mean “no effect.” A better interpretation of those words is: “The employment effects at the industry level are difficult to measure with no clear assessment of magnitude so far.” However, we do see that an increase in minimum wages is associated with less (not more) employment in many of the industries that have been examined in this report, which raises the effective statistical significance of each estimate separately.

As for the number of establishments, we actually do find a significant negative impact of minimum wages in Hair, Nail, and Skincare Salons: a 10% increase in minimum wages is associated with a 24% decline in the number of Hair, Nail, and Skincare Salons. Once again we can say that there is a general pattern of negative relationship between minimum wages and the number of establishments, but other

than Hair, Nail, Skincare, there isn't any individually statistically significant impact of minimum wages on number of establishments in low wage industries.

The two figures below show earnings per worker and number of establishments for Hair, Nail, and Skincare Salons. The top right figure exemplifies a recent sharp increase in the number of Hair/Nail/Skincare salons in regions near to Pasadena but with lower minimum wages. This is strong visual evidence that entrepreneurs in the beauty salon business are responding to the changes in minimum wages by moving their firms. Further evidence of something happening are the images that depict number of establishments in LA County and in California overall. Both have a jump up in 2014, making us concerned about some classification change in the QCEW data.



For employment and establishments, we have estimated that only one-fifth of the full decline is realized within the first quarter. Thus any negative impact of minimum wages will take some time to be realized. As we will explain below, this makes it difficult to ascertain the impact of the increment of the Pasadena minimum wage above the California state minimum wage because Pasadena and California are both on increasing schedules, with Pasadena only slightly ahead of California.

## The California Minimum Wage “Experiment” Has Important Limitations

An ideal minimum wage experiment would be a randomized controlled trial in which a group of identical regions is randomly divided into two groups: one group with an increase in the minimum wage and the other with no increase. Then the data on employment, for example, can be summarized in four numbers: the levels of employment in the two groups, both before and after the minimum wage increase. If the communities that experienced the minimum wage increase had a smaller increment in employment than the communities that did not have the minimum wage increase, we would conclude that the minimum wage was suppressing employment. That is what economists call a “difference in differences” estimate.

Unfortunately, there are no such experiments. There are no identical regions that have adopted different minimum wages. The level of local minimum wage was never chosen randomly but was determined by a political process that is presumably sensitive to the possibility that a minimum wage set too high can have adverse employment outcomes. If we discover that the sickest people take the most medicine, that is not proving that the medicine has adverse effects. Likewise, if we discover that the communities with the highest minimum wages have the greatest increases in employment, that is not proving that higher minimum wages increase employment. What we are saying is that it’s complicated to pull from the data convincing evidence about the effects of the minimum wage. But we have to do the best with what we have, providing appropriate caveats when needed. The first step in that journey is to think clearly about the nature of the experiment we are observing.

We think that the two major problems with the data that we have available are: (1) the whole schedule of minimum wage increases was announced in advance, allowing firms to react in anticipation of minimum wage increments yet to come. (2) the Pasadena minimum wage increment creates a complex local geography of business competition, allowing enterprises to escape the Pasadena increment with a fairly short move to a different jurisdiction. These two issues are now discussed.

### The minimum wage increases are determined years in advance

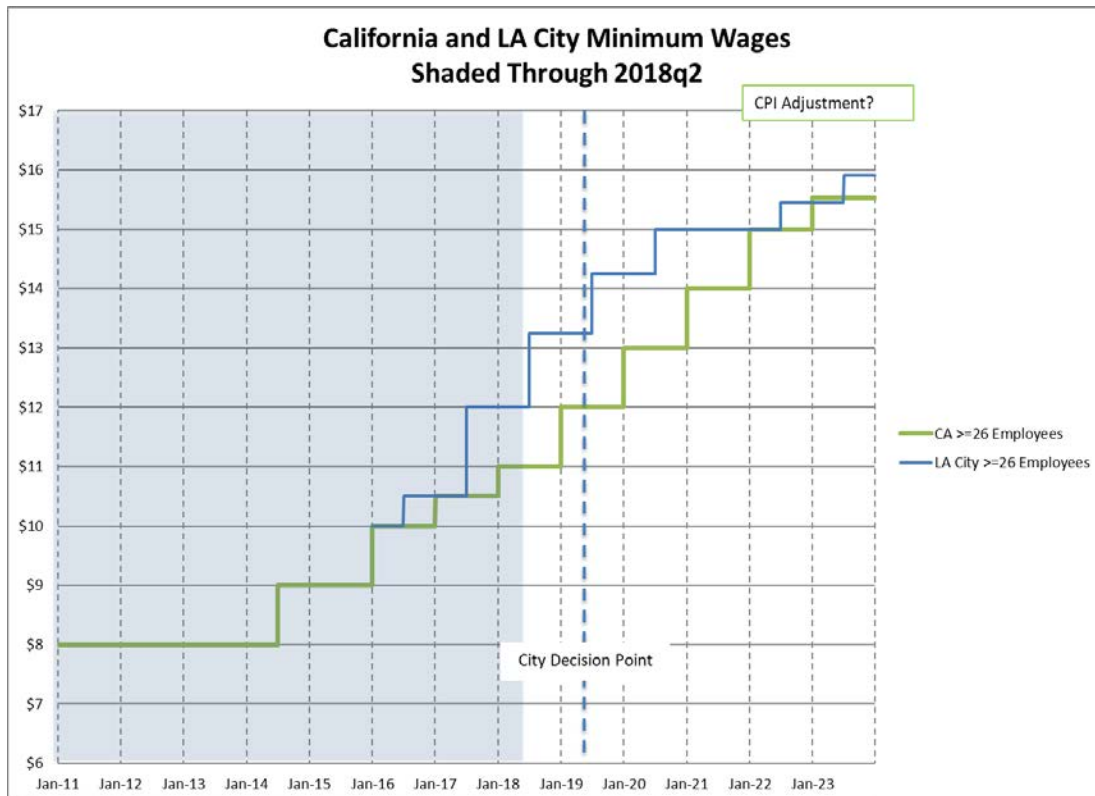
The California and City of LA minimum wage schedules beginning in 2011 (the first year of the Pasadena data that we are studying) are illustrated in the **Figure 2** which has a shaded region representing the data set that we have studied through 2018q2, and a dashed vertical line indicating the limit of Ordinance #7278, at which point Pasadena will either revert to the California minimum or stick with the LA minimum or something else. Parenthetically, now in January 2019, the California minimum wage is \$12 and Pasadena minimum wage is \$13.25.

The legislation adopted by the State of California and by the City of Los Angeles firmly established increases in the minimum wage for six or seven years into the future and even indefinitely because of the inflation adjustment that commences in 2022/2023. The best way to summarize this graph in words is that California and Los Angeles/Pasadena have adopted two different but parallel paths toward \$15, which means that the impact of the Pasadena ordinance might be only to accelerate by a year or two the impact of the California minimum wage.

But it’s more complicated than that. This legislation gives businesses plenty of advance warning and plenty of time to plan how to respond, such as by moving to another location or not opening a new enterprise, by changing the nature of the service provided, by adopting HR systems that weed out the less productive workers, by automating, by passing the incremental costs on to customers via higher

prices or onto building owners via lower rents, or by owners absorbing part of the cost increase. The possible reactions are quite diverse and many are hard or impossible to identify in the data that we have. **In particular, it may be difficult to identify an employment effect because any employment reductions that occur can be more a consequence of the whole schedule of minimum wage increments rather than the year-by-year increments.** The data analysis that we carry out focusses on the year-by-year increments and only incidentally picks up the effect of the whole schedule. This is quite different from the likely evidence about wage effects since the legislation stipulates exactly when wages have to increment, which is something we should be able to see in the data, and do.

Figure 2 California and City of Los Angeles Minimum Wages



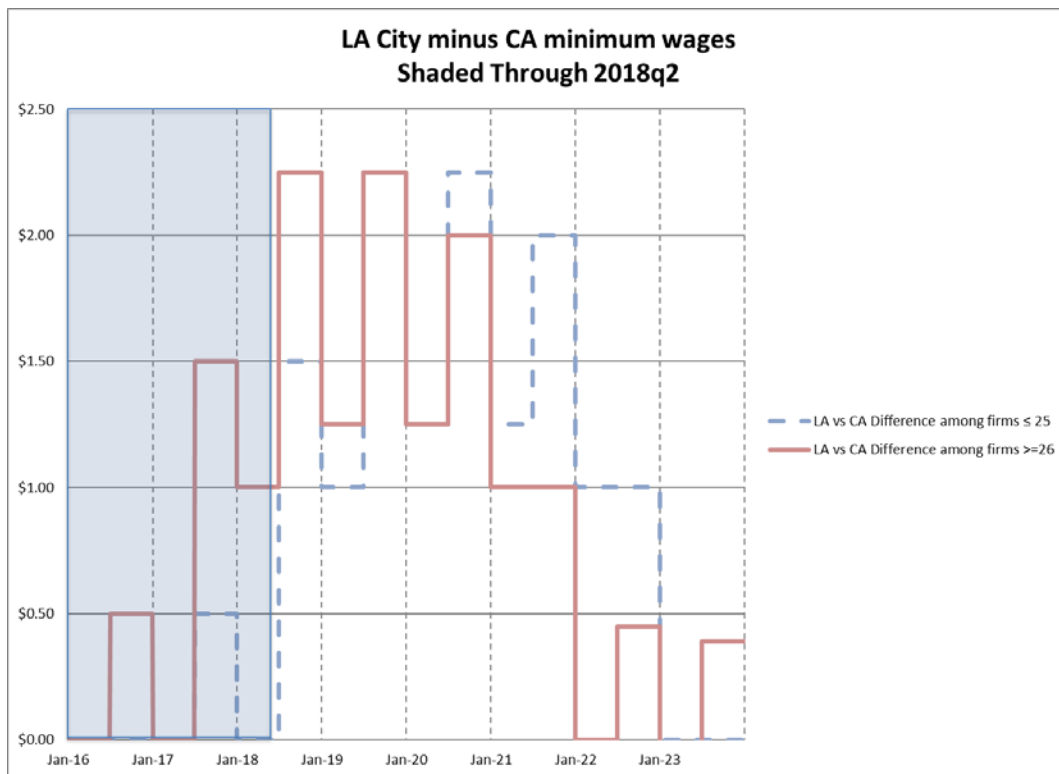
### The local increment to the California minimum wage is small and variable

We will be studying the possibility that the Pasadena increment has a different effect than the California minimum wage. Our models will include two variables: (1) the prevailing minimum wage equal to the California minimum wage plus the local increment and (2) the local increment which is the amount by which the Pasadena minimum wage exceeds the California minimum wage. The second variable has a zero coefficient if all that matters is the prevailing minimum wage but a nonzero coefficient if the effect of the local increment is different. For wages we expect the first coefficient to be positive and the second zero, meaning that what matters for setting wages is the prevailing minimum wage not how much of it is dictated by local legislation. For employment, we expect negative coefficients on both, meaning the adverse employment effect is greater for the local components of the minimum wage because it encourages firms to move to close locations with lower minimum wages. In contrast, escaping the California minimum wage requires a move out-of-state. On the other hand, moving from Pasadena to one of the surrounding communities would only delay the minimum wage increment by

about a year and a half, and that short delay might not justify the cost of moving. In that case, responses like automation at the Pasadena location might be preferred to moving in pursuit of a temporarily lower minimum wage.

The local increment for the City of Los Angeles is illustrated in Figure 3, which distinguishes enterprises with more than 25 employees from smaller enterprises. Here we see a problem for our study: through 2018q2 when our current data set ends, the Pasadena increment was only \$0.50 in the second half of 2016 and \$1.50 for the second half of 2017 and then \$1.00 the first half of 2018 for firms with 26 or more employees, but much less for firms with 25 or fewer employees. That difference should show up in wages but maybe not so clearly in employment. Moreover, the future unshaded part of the figure has a much higher Pasadena increment and significant variability. When that kicks in the Pasadena ordinance may become more apparent.

Figure 3 City of Los Angeles Increments to the California minimum wage



The geographical variability of minimum wages can make the response complex.

The Pasadena/City of LA increment to minimum wages creates a geographical aspect to the minimum wage experiment by establishing adjacent or close communities with different minimum wages. The local geography is illustrated in the four images in **Figure 4** below. The image in the upper left has Pasadena shaded in blue and adjacent or close regions that are subject only to the California minimum wage shaded in light red. (La Canada, Glendale, South Pasadena, Alhambra, San Gabriel, Temple City, San Marino, Arcadia and Sierra Madre.) The lighter regions to the northeast and southwest of Pasadena are Altadena and the City of LA, both with the same minimum wage schedule as Pasadena.

A special risk created by the Pasadena minimum wage is that jobs might leave Pasadena in favor of one of the close cities with a lower minimum wage. That could make the effect of the Pasadena increment on employment greater than the effects of the California increments. It also raises the possibility that we will double-count the employment effects if we use regions close to Pasadena as a control group for Pasadena since we would count the job loss in Pasadena and also the job gain in the neighboring community.

This image captures the difficult question that confronts the Pasadena City Council: Should Pasadena align itself with the City of LA and Altadena, which would encourage the movement of jobs to the region shaded red (Glendale, La Canada, South Pasadena, San Marino and so on), or should Pasadena align itself with the red region, thus encouraging a job flow into Pasadena or other red cities out of the City of LA and Altadena.

The three other images in Figure 4 help understand what is at risk in this decision. The image at the upper right has the zip codes color-coded by median income of the residents. Data for these zipcodes is reported in Appendix B. The highest median incomes are in La Cañada Flintridge and San Marino. Within Pasadena the southwestern zipcode 91105 has a high median income but the rest of the zipcodes have lower and comparable income levels. The image on the lower left illustrates the percent of the residents who work in food service and accommodations. It is the northern zipcodes of Pasadena, 91103 and 91104, that have high fractions of residents in this sector. Outside of Pasadena the region with a high fraction of the residents in food services and accommodations is Highland Park (90042).

### [Pasadena has some very different neighborhoods](#)

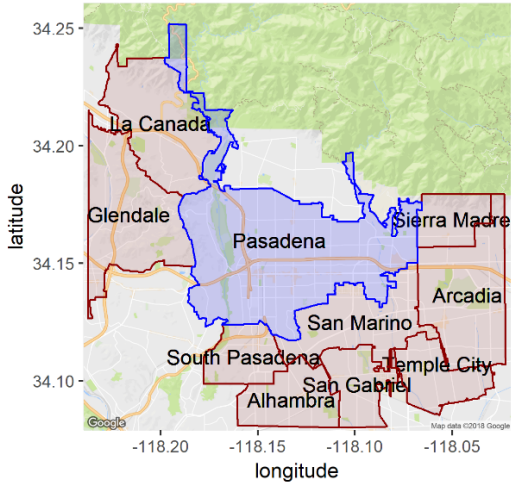
Another geographic complexity is that Pasadena has neighborhoods that are quite different in terms of income, age, and sectoral job mix. Per the data reported in the Table on page 39, median incomes within Pasadena vary from a low of \$61,473 in 91101 to a high of \$107,284 in 91105. Among the other differences are: 48.7% of workers in 91101 were young (20-39) while 27% were young in 91105; 27% earned less than \$25,000 in 91101 but only 11.1% in 91105. It is likely that the younger lower-paid workers from 91101 would be more impacted by the minimum wage than older better paid workers who live in 91105, but our data sets are based on location of work not location of residence.

Figure 4

Competitive Geography

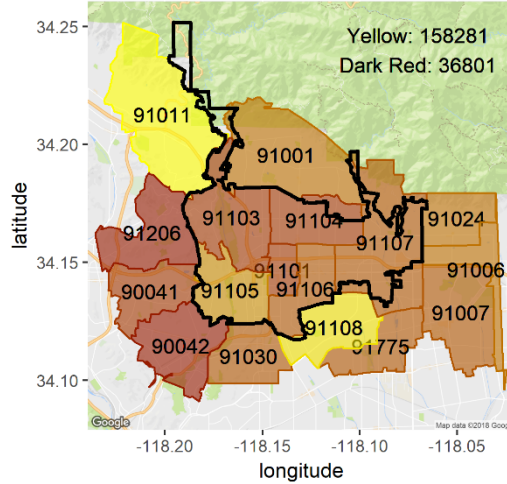
Pasadena City and Neighbors

Showing all incorporated neighboring cities in red. Incorporated neighboring cities have lower minimum wage



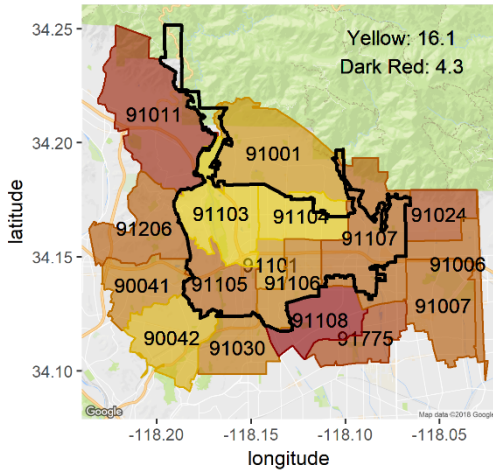
Pasadena City and ZipCodes Colored by: median income

Lowest are dark red, Highest are yellow  
Pasadena City is outlined



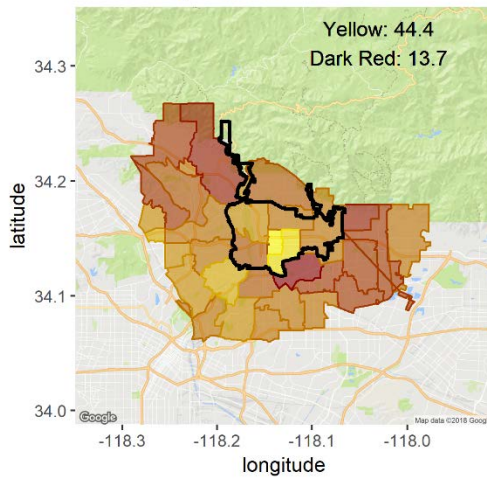
Pasadena City and ZipCodes Colored by: Percent In Food and Accomodation

Lowest are dark red, Highest are yellow  
Pasadena City is outlined



Pasadena City and ZipCodes Colored by: Percent aged 20 to 39, Further Zipcodes

Lowest are dark red, Highest are yellow  
Pasadena City is outlined



## The Data Studied Come from Two Sources

### QCEW Data

We rely primarily on data collected by the Quarterly Census of Employment and Wages. Every enterprise in the United States is required to report quarterly the total wages paid in the quarter and the number of employees in each month of the quarter. The following paragraphs have been extracted from <https://www.bls.gov/cew/cewfaq.htm#Q17>

#### **16. What is included in employment?**

The QCEW employment count is a total derived from quarterly contribution reports filed by almost every employer in the U.S., Puerto Rico and the U.S. Virgin Islands. It counts only filled jobs, whether full or part-time, temporary or permanent, by place of work. The quarterly reports include the establishment's monthly employment levels for the pay periods that include the twelfth of the month.

#### **17. What is included in total wages?**

Under most State laws or regulations, wages include bonuses, stock options, severance pay, profit distributions, cash value of meals and lodging, tips and other gratuities, and, in some States, employer contributions to certain deferred compensation plans such as 401(k) plans.

Covered employers in most States report total compensation paid during the calendar quarter, regardless of when the services were performed. A few State laws, however, specify that wages be reported for or based on the period during which services are performed rather than the period during which compensation is paid.



## QCEW Industry Detail

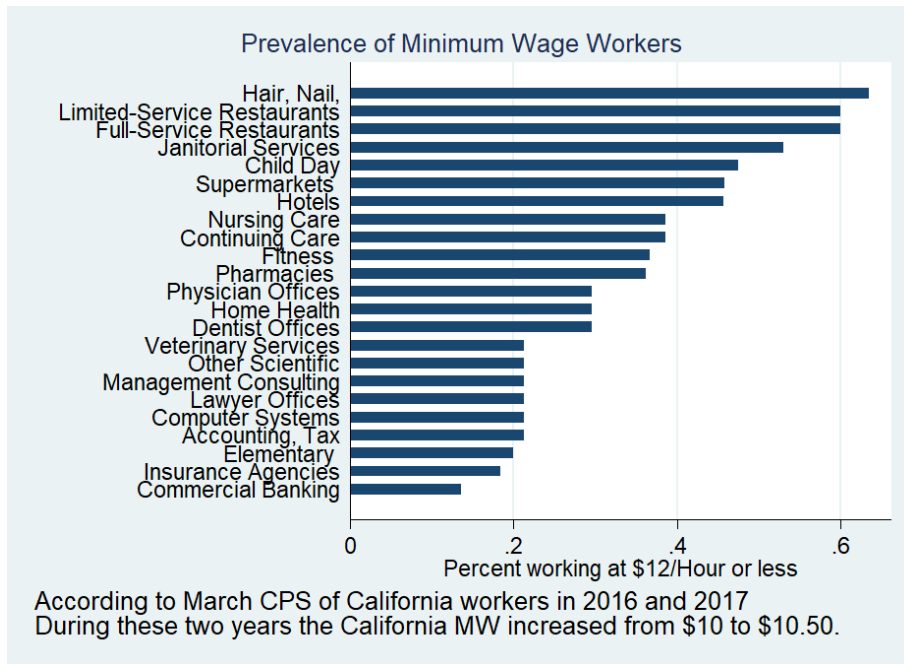
Table 1 includes all the industries for which the Quarterly Census of Employment and Wages has data for going back to 2011. The values are average employment numbers during the period 2011q1 to 2017q4 for the region with the Pasadena minimum wage composed of Pasadena, Altadena zipcode 91001, and LA zipcodes 90041,90065. The sectors are sorted by employment levels and each column shaded with the largest numbers dark and the smallest light.

Figure 5 illustrates the fractions of minimum wage workers in various industries. At the top are hair and nail salons with 60% of the workers paid less than \$12 per hour, and restaurants with 50% of their workers in that category. These are sectors which require special scrutiny.

Table 1 Pasadena Industry Detail

Industry	Employment	Firms	Earnings Per Person Per Quarter
Full-Service Restaurants	6361	257	\$6,379
Limited-Service Restaurants	4662	235	\$5,298
Physician Offices	3139	502	\$17,531
Supermarkets and Groceries	2488	42	\$7,385
Lawyer Offices	1550	401	\$20,082
Elementary and Secondary Schools	1441	24	\$13,627
Nursing Facilities	1363	19	\$8,364
Computer Systems Design	1215	130	\$23,756
Management Consulting Services	1126	187	\$22,024
Dentist Offices	1060	173	\$11,545
Insurance Agencies and Brokerages	1017	138	\$20,631
Accounting, Tax Preparation	759	109	\$14,411
Pharmacies and Drug Stores	583	61	\$11,442
Child Day Care Services	563	49	\$6,858
Residential Building Construction	560	114	\$14,925
Hair, Nail, and Skin Care Services	539	105	\$5,240
Home Health Care Services	475	16	\$9,179
Other Technical Consulting Services	264	138	\$16,373
Veterinary Services	256	22	\$8,979
Commercial Banking	237	21	\$17,635
Fitness and Recreational Sports Centers	212	10	\$4,769
Hotels and Motels	188	16	\$5,416
Continuing Care Retirement Communities	185	5	\$6,073
Janitorial Services	61	11	\$5,894

Figure 5 Prevalence of Minimum Wage Workers



### Sales Tax Revenue for Selected Cities and Business Types

The sales tax data has been assembled by HdL Companies and contains quarterly city level data for sales tax revenue for apparel, fast casual dining, casual dining, quick-service dining, and specialty stores. This data set includes the city of Pasadena, Glendale, Monrovia, Burbank, Arcadia, Temple City, Sierra Madre, West Hollywood, Santa Monica, the city of Los Angeles, and Los Angeles County. It covers the period from 2011 quarter 1 to 2018 quarter 1.

The following table compares the sales tax revenue in the whole of Los Angeles county with the City of Pasadena in year 2011 and 2017. From this table we can see that the biggest source of sales tax revenue in the county is quick-service dining with around \$66 million in sales taxes in 2011 and almost \$93 million in 2017. However, in Pasadena, both casual dining and apparel have larger sales than quick-service dining in both 2011 and 2017. However, quick-service dining grew 41.49% in Pasadena from 2011 to 2017, while apparel has almost no growth during this period. The standout industry in terms of growth of revenue in both LA County and Pasadena is fast casual dining. From this table, it doesn't appear that the increases in minimum wages are reducing tax revenue, but more on this below when this data is filtered through an econometric model.

Table 2 Industry Sales Comparasion between LA county and Pasadena

Industry	2011		2017		Growth Rate of LA County 2011-2017	Growth Rate of Pasadena 2011-2017
	LA County Annual Sales	Pasadena Annual Sales	LA County Annual Sales	Pasadena Annual Sales		
Quick-Service Dining	\$66,455,360	\$1,084,072	\$92,918,480	\$1,533,899	39.82%	41.49%
Apparel	\$66,382,680	\$1,755,670	\$84,285,120	\$1,767,651	26.97%	0.68%
Casual Dining	\$54,843,800	\$2,027,759	\$86,950,080	\$2,942,134	58.54%	45.09%
Specialty Stores	\$32,802,512	\$753,472	\$40,547,560	\$863,900	23.61%	14.66%
Fast Casual Dining	\$7,598,740	\$285,851	\$17,678,712	\$712,750	132.65%	149.34%

### Several Models Are Used to Study the Pasadena Minimum Wage

The estimates that we have so far reported all stem from our preferred model selected from the many alternatives that we have explored. Our models use three “dependent” variables observed quarterly at the level of an industry in a particular region: Earnings per employee, Employment, and Number of Establishments. To explain the movements in these three dependent variables we have used “dynamic” models that allow the impact of an increment in the minimum wage to be spread over time. We include as explanatory variables two minimum wage variables, the prevailing minimum wage and the part of the prevailing wage that is due to the local legislation. We also include explanatory variables that reflect overall area-wide changes like the total employment and overall average earnings per employee which we take to be unaffected by minimum wages.

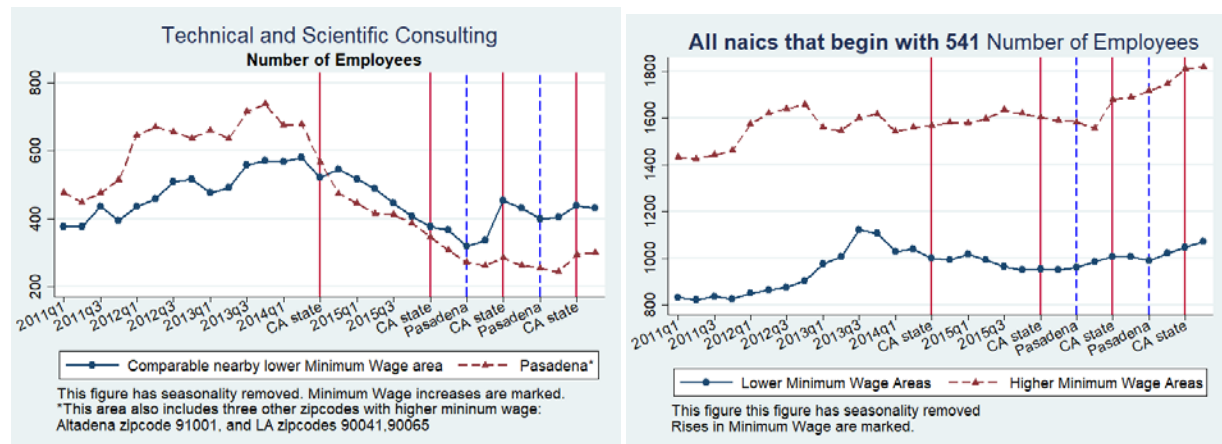
Each variable we have included in our models captures the effect one of the key factors mentioned above. Previous literature on minimum wage has mainly used the “two-way fixed effects” approach. Our model deviates from the previous literature in a number of ways, most notably, by taking into account the dynamic nature of our data: we are able to say how much of the impact of minimum wage we expect to occur in the first quarter. This difference is essential when analyzing dynamic data with measurements of the same quantity (such as employment in Supermarkets in Pasadena) over multiple periods. Without taking into account the dynamic nature of the data, some other researchers may assume that the number of employees on the payroll at Ralphs on Monday is completely independent of the number of employees on the payroll on the following Tuesday. In order to account for the correlation between outcomes we have included lagged dependent variables. These lagged dependent variables will also tell us how much of the minimum wage impact is expected to occur in the first quarter of a minimum wage increase.

In order to account for underlying forces that affect our outcomes separate from the minimum wage we have included a time trend and also the sum total of the outcome variable across all industries. The sum total outcome variable (such as the total number of employees in all industries in Pasadena) is included to reflect the changes in the economy that are local to the city.

The time trend is included to capture factors that may affect the real price of labor in the economy such as the constantly increasing technological progress, increasing availability of capital, or increasing rates of educated eligible workers. Without adding the time trend our results would actually be quite similar, indeed, without adding time trends we do find more results that are individually significant. However without a time trend the minimum wage is the only variable that documents the passage of time in our model, so any underlying force that is changing over the time of our study could be attributed to minimum wage, therefore we add time trends so that our results will indicate the impact of minimum wage above and beyond the time trend. As we can see in the data display of the number of establishments of Hair, Nail, Skincare Salons, including a time trend would lead us to expect that without minimum wages, the growth in the number of Salons would have continued. This can be seen as both a positive and a negative attribute of the time trend: Positive if it were actually the case the Hair/ Nail/ Skincare Salons is a booming industry that would have continued its growth without minimum wages, and Negative if we believe that the timing of number of Salon establishments reaching an equilibrium level coincided with the implementation of California state minimum wage.

It is important to note that our analysis does give what we deem to be false positives because the industries that our model and our data report to be impacted by the minimum wage are not low-wage industries. Specifically, we see positive earnings impact of the minimum wage on Veterinary Services and Dentist’s Offices even though the average employee at a Veterinary clinic or a Dentist’s Office makes twice as much as an average restaurant worker. These false positives highlight a caveat of our model: adding a linear time trend and total industry outcome variables into our model does not capture all of the underlying forces that can drive changes in earnings. If a sudden boom in dog ownership and dental hygiene occurred in 2014, then we cannot disentangle the sudden boom with the increasing California state minimum wage in 2014.

A third problem industry we have is the industry known as “Other Technical and Consulting Service” which is an amalgamation of consulting services that have not been classified into a specific industry. This sector is highly paid and ranks among the lowest in the proportion of employees that are working at minimum wage. This sector also happens to experience a nationwide decline in employment near the end of 2013, which precedes the California state minimum wage increase. This decline is likely simply a transfer of jobs from one industry code to another: on the aggregate level, there has actually been no change in the number of consulting jobs over this time, and management and business consulting (which have their own industry code) is on the rise during our data.



The preceding paragraph highlights the level of detail as an important consideration in our model. We can see that looking too deep into the detail of the consulting jobs will yield spurious results, and in the case of “Other Technical and Consulting Services”, the 5-digit NAICS (North American Industry Classification System) is too detailed and it would behoove us to use a more general 3-digit NAICS.

This report is also meant to advise what is the impact of the *Pasadena* minimum wage increment, which is implemented to hold the Pasadena minimum wage at the same level as the Los Angeles City minimum wage, sometimes above the California state minimum wage. Accordingly, we have designed our analysis to capture such an effect if there is one. We have split Pasadena and the surrounding (lower minimum wage) neighbors into comparable groups (in terms of median income) and have therefore constructed comparison groups for each wealth quintile in Pasadena. We see evidence that the Pasadena minimum wage increment does not have as strong an impact as a California minimum wage increase, although the time of the increase is too short and the size of the minimum wage difference is too small for us to make statistically significant statements.

Regions: Groups of similar zipcodes: in Pasadena and close to Pasadena

Our strategy for estimating the impact of the Pasadena minimum wage is to compare pairs of regions that are similar to each other but have different minimum wage schedules. We have split Pasadena and its surrounding regions up into ten areas, with five areas consisting of a distinct section of Pasadena and five areas capturing economically similar areas around Pasadena. These areas capture much variation in income within the Pasadena: for example the neighborhood of Pasadena to the southeast near San Marino is quite wealthy, and we would like to compare this wealthy Pasadena neighborhood with another relatively wealthy district nearby that is not impacted by the Pasadena minimum wage ordinance. As another example, the area around Cal tech is populated by many residents between the ages of twenty and thirty, and we would have found two other zipcodes near Pasadena that has the most similar economic and demographic characteristics. Several of the groups also include close zipcodes outside Pasadena with the same minimum wage as the Pasadena zipcodes.

Our groups are reported in **Table 3** which begins with Group 1 which has a high minimum wage region composed of Pasadena 91101 and the City of LA 90065, contrasted with the low MW zipcodes in Alhambra and Glendale.

Figure 6 illustrates the median incomes in each of these zipcodes by groups, which was the basis for our groups. **Figure 7** is a color coded map of these regions. More discussion of these groups can be found in the Appendix B.

Table 2 Zipcodes with similar median incomes

Group	Far Option
G1:	Low MW: Alhambra 91803, Glendale 91202
	High MW: Pasadena 91101, LA 90065
G2:	Low MW: Temple City 91780, Monrovia 91016
	High MW: Pasadena 91103, LA 90041
G3:	Low MW: Montrose 91020 Arcadia 91007
	High MW: Pasadena 91104, 91106
G4:	Low MW: San Gabriel 91775, South Pasadena 91030
	High MW: Pasadena 91107, Altadena 91001
G5:	Low MW: Sierra Madre 91024, Glendale 91208, San Marino 91108, La Crescenta 91214
	High MW: Pasadena 91105

Figure 6 Median Income Comparisons

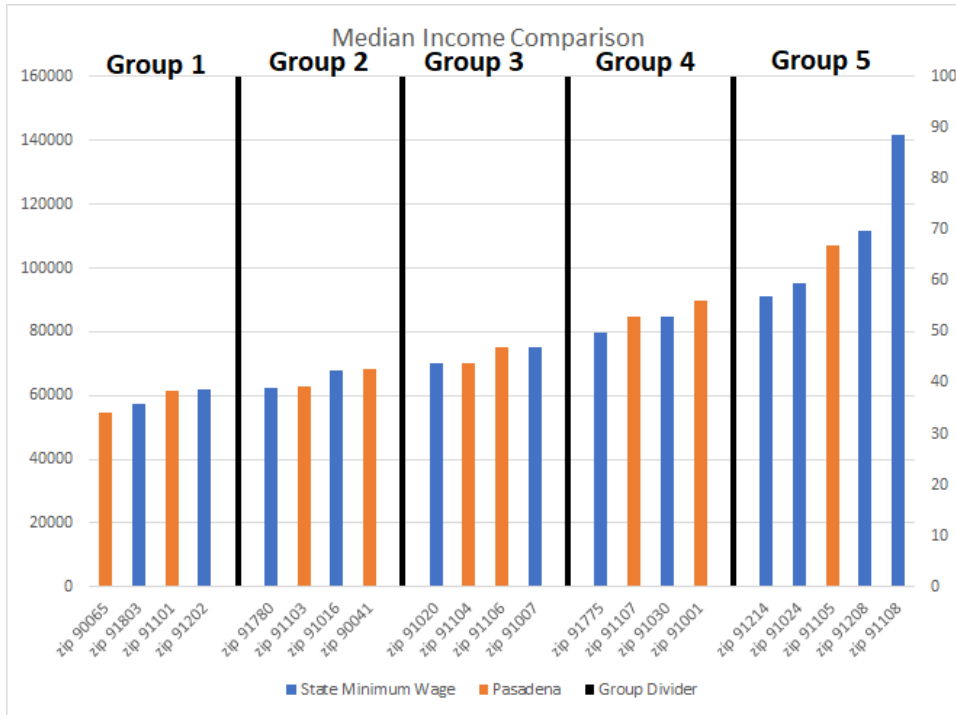
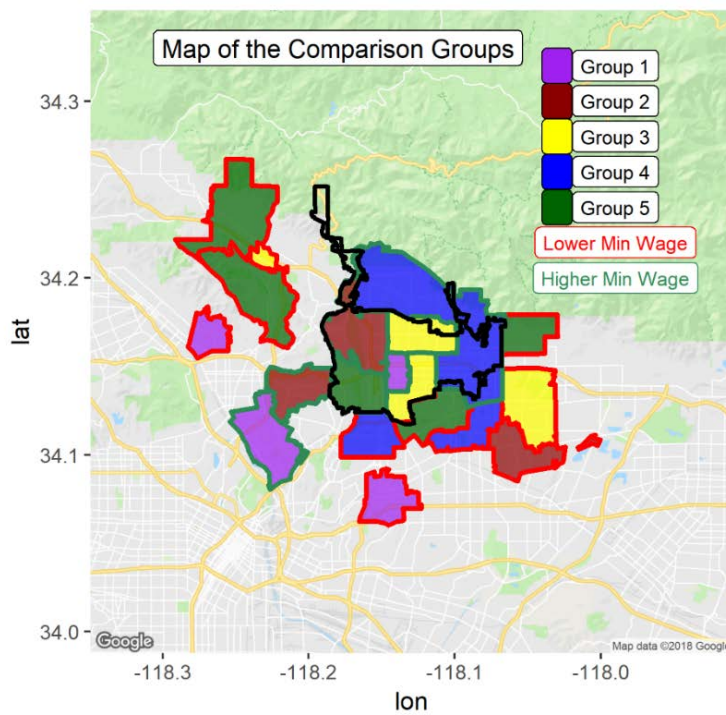


Figure 7 Map of Five Comparison Groups



## Variables in the models used to study the Pasadena minimum wage

The models that we use to infer the impact of the minimum wage explain three different dependent variables for *each industry* in each region. All variables with continuous scales are in logarithmic form

### **Three different dependent variables for each industry (y\_ind):**

Employment in the industry in the region

Earnings per Worker in the industry in the region

Number of Establishments in the industry in the region

These three different dependent variables are explained with the following variables

### **Explanatory variables, always present**

Dependent variable, previous quarter:	$y\_ind(-1)$
Prevailing minimum wage:	$MINWAGE\_CA + LOCAL\_INCREMENT$
Seasonal adjustment	Quarterly Indicators
Current value of y for all industries	$y\_overall$
Lagged value of y for all industries	$y\_overall(-1)$
Region fixed effects	

### **Explanatory variables, sometimes present**

Time trend

Local minimum wage increment:  $1 + LOCAL\_INCREMENT / MINWAGE\_CA$

The overall variables ( $y\_overall$ ) reflect economic conditions in the region which we suppose is not much influenced by the minimum wage. In a sense we are taking the dependent variable to be employment in the sector as a share of overall employment, or the ratio of earnings per worker in the sector compared with earnings per worker overall or the share of establishments in the sector.

## Multiple Model Structures

It takes the assistance of an econometric model to allow the data to speak, but what the data say usually depends on the model that is deployed. If small but reasonable changes in the model lead to substantially different inferences from the data set, these conclusions are said to be fragile. We deploy an array of different models in an attempt to separate fragile from sturdy inferences.

### **With and without time trends (2 variants)**

The increments in the minimum wage all occur in the second half of our brief data set that extends from 2011q1 to 2018q4. This focuses attention on how the second half was different



from the first half. Without the trend variable, the difference that is looked for is in the level of the dependent variables. With time trends, we are looking also for differences in the trends of the variable in the first half of the data versus the second half.

### **All Groups or One Group at a time (6 Variants)**

#### **With or without the Pasadena increment to the minimum wage (2 variants)**

### Findings: One Specification

For each industry and each dependent variable we have estimated a total of 24 different models described above. We report in this section the results generated by the one specification that we think yields the most reliable results. This model includes time trends, utilizes the data from all the five groups of regions together, and includes the Pasadena increment to the minimum wage.

The minimum wage on January 1, 2019 in Pasadena is \$13.25 (going on \$14.25 in July 2019) and the state minimum wage is \$12 in January of 2019 (going to \$13 in 2020. Pasadena is scheduled to have a \$15 minimum wage by 2020, while California will have \$15 by 2022.

We will first examine the findings of an increase in minimum wages inclusive of the Pasadena increment. It is important to note that these results may be driven primarily by increases in the California state minimum wage because the California minimum wage rose by \$4 from \$8 per hour in 2011 to \$12 per hour in 2019, while the Pasadena minimum wage has risen above the California minimum wage by 50 cents in the second half of 2016, and by \$1.50 during the second half of 2017 and by \$2.25 in the second half of 2018 and the second half of 2019.

We find significant impact of the rising California state minimum wage on earnings per worker for many industries. We have highlighted four industries because they form a relatively large part of the Pasadena labor force, they have a high proportion of workers working within \$2 of the minimum wage, and our model specification suggests that the rise in minimum wages has a positive impact on earnings: Full and Limited service restaurants, Supermarkets, and Hair/Nail/Skin Salons.

### The impact of rising minimum wages on earnings, employment and number of establishments (QCEW data)

Table 4 below reports estimates of the impact of a minimum wage increase from \$13.25 to \$15 (13%) for the four sectors which have the clearest and largest effects of the minimum wage. This table includes estimated impacts on earnings per worker per quarter, employment and number of establishments. Darker colors signify stronger impacts relative to the other industries in the column. Table 9, Table 10, and Table 11 in Appendix A contain the same information for all sectors.

In Table 4 the (positive) estimated impact on earnings per worker varies from 2.5% of payrolls in groceries to 10.7% of payrolls in limited service restaurants. If every worker were paid the minimum wage and if there were no employment effect, a 13% increase in the minimum wage would be associated with a 13% increase in earnings. The estimated earnings gain for limited service restaurant employees is 10.7%, presumably because most but not all are at or close to the minimum wage. We can estimate the fraction of earnings that go to minimum wage workers on the assumption of no

employment effect by dividing the impact 10.7% by the wage increase 13%.<sup>3</sup> Based on the earnings percent gains in the table, this suggests that the fraction of earnings that accrue to minimum wage workers is 82% in limited service restaurants, 49% in full service restaurants, 30% in Hair and Nail salons and 19% in groceries.

The estimated impact on employment varies from negative 0.25% in limited service restaurants to a negative 9.4% in full service restaurants. Although none of these estimated jobs lost is individually statistically significant, we do see predominantly negative estimates of the impact of increasing minimum wage on employment. Taken as a whole, 20 out of the 24 industries in our dataset have estimates that imply that a minimum wage increase would decrease employment.

We have estimated that half of the increase in earnings and one fifth of the job loss will be realized in the same quarter of the minimum wage increase.

The impact of the hypothetical 13% increase in minimum wages on number of establishments ranges from a negative 4.93% in full service restaurants to a negative 31.7% Hair, Nail and Skin Care. Taken as a whole 18 out of the 24 industries show that a minimum wage increase would decrease the number of establishments

As we have noted in the introduction, the number of these Hair/Nail Salons in Pasadena had been increasing at a rapid rate prior to the minimum wage increases. This rapid increase subsided in 2016, which coincides with when the California State minimum wage began to increase. Our model takes this as evidence that the minimum wage increase has a significant negative impact on employment in nail salons. We also see a resumed increase in the number of Hair/Nail Salons in areas nearby Pasadena that have lower minimum wages, but there is yet to be a resumed increase within Pasadena. The readers should take care to note that it is possible that new entrepreneurs are responding to the increased minimum wages by opening their Hair/Nail Salons out of Pasadena. To convey the statistical uncertainty in the employment effects and the establishment effects, we use the language “jobs at risk” and “establishments at risk.”

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<sup>3</sup> Consider two categories of workers,  $i=0$  for minimum wage worker and  $i= 1$  for the others. Denote the number of workers of type  $i$  by  $N_i$  and the corresponding earnings per worker by  $E_i$ . Then holding fixed the earnings of the non-minimum wage workers we discover that the overall percentage increase in earnings per worker (e.g. 10.7%) is the percent increase in the minimum wage  $d(E_0)/ E_0$  times the earnings share of the minimum workers:

$$\frac{N_0 d(E_0)}{N_0 E_0 + N_1 E_1} = \left( \frac{N_0 E_0}{N_0 E_0 + N_1 E_1} \right) \left( \frac{d(E_0)}{E_0} \right)$$

Table 3 Estimated Impact of the Rise from \$13.25 to \$15.00 per hour

*The impact of rising state level minimum wages (\$13.25 to \$15) on Earnings per quarter*

Earnings:

Industry	Average Earnings Per Quarter	Potential Increase	Percent Increase
Full-Service Restaurants	\$6,379	\$409.47	6.42%
Limited-Service Restaurants	\$5,298	\$568.20	10.72%
Supermarkets and Groceries	\$7,385	\$182.40*	2.47%
Hair, Nail, and Skin Care Services	\$5,240	\$206.94*	3.95%

\*This impact is not individually statistically significant

*The impact of rising state level minimum wages (\$13.25 to \$15) on Employment*

Industry	Average Total Employment	Jobs at risk	Percent at risk
Full-Service Restaurants	6361	597*	9.38%
Limited-Service Restaurants	4662	12*	0.25%
Supermarkets and Groceries	2488	82*	3.28%
Hair, Nail, and Skin Care Services	539	18*	3.34%

\*This impact is not individually statistically significant

*The impact of rising state level minimum wages (\$13.25 to \$15) on Establishments*

Industry	Average Total Firms	Firms at risk	Percent at Risk
Full-Service Restaurants	257	13*	4.93%
Limited-Service Restaurants	235	19*	7.92%
Supermarkets and Groceries	42	(x)	
Hair, Nail, and Skin Care Services	105	33	31.70%

\*This impact is not individually statistically significant

(x) No estimated Jobs Lost

## The Pasadena Increment

Pasadena is due to raise their minimum wage to \$15 by 2020 (it is currently at \$13.25 for more than 25 employees) while the California the minimum wage for large businesses is due to increase to \$15 by 2022, 2 years ahead of California but are again identical in January 2022. We have very sparse evidence of the differential impact of the Pasadena minimum wage which in the data through 2018q2 is not dramatically different from the California minimum wage.

In our model the Pasadena increment enters twice, once by rising the local prevailing minimum wage and a second time to allow the possibility that the Pasadena increment has a different effect. The tables below report the sum of these two effects. Our evidence indicates that a minimum wage increase local to Pasadena will not have the same magnitude of impact as a minimum wage increase that applies to the entire state of California. In fact we only find significant evidence of a differential impact for limited service restaurants, although the predicted impact of a Pasadena minimum wage is quite strong, with nearly one quarter of the jobs at risk. This table below is calculated using a minimum wage increase from \$13.25 to \$15.

### *The impact of rising Pasadena local minimum wages (\$13.25 to \$15) on Earnings per quarter*

Industry	Average Earnings Per Quarter	Potential Increase	Percent Increase
Full-Service Restaurants	\$6,379	(x)	
Limited-Service Restaurants	\$5,298	\$459.04	8.66%
Supermarkets and Groceries	\$7,385	(x)	
Hair, Nail, and Skin Care Services	\$5,240	(x)	

\*The impact is not statistically significant  
(x) No earnings gain estimated

### *The impact of rising Pasadena local minimum wages (\$13.25 to \$15) on the number of Employment*

Industry	Average Total Employment	Jobs at risk	Percent at risk
Full-Service Restaurants	6361	(x)	
Limited-Service Restaurants	4662	1001	21.46%
Supermarkets and Groceries	2488	54*	2.17%
Hair, Nail, and Skin Care Services	539	77*	14.20%

\*This impact is not individually statistically significant  
(x) No jobs lost estimated

### *The impact of rising Pasadena local minimum wages (\$13.25 to \$15) on the number of Establishments*

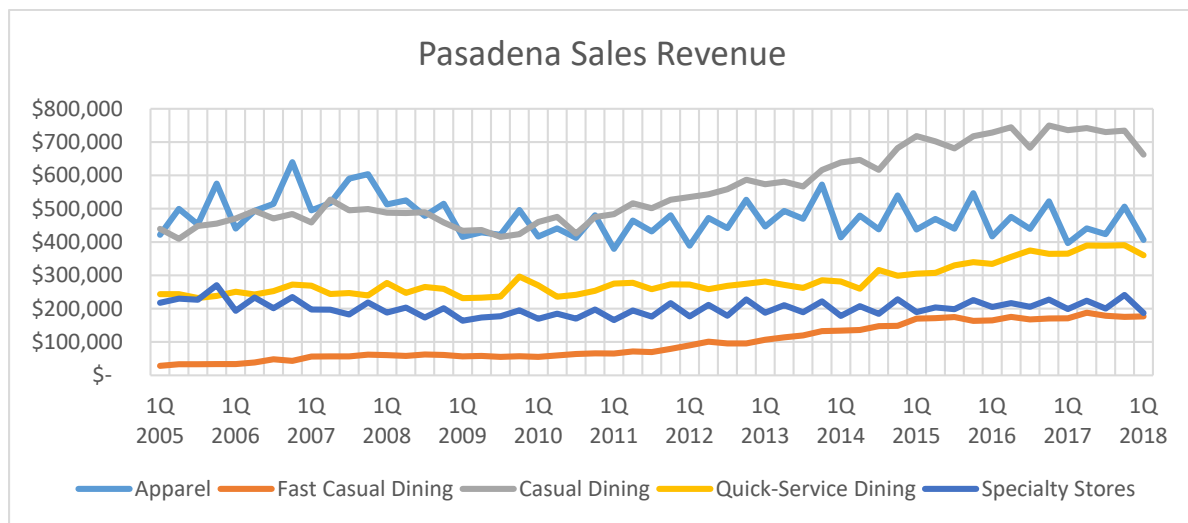
Industry	Average Total Firms	Firms at risk	Percent at Risk
Full-Service Restaurants	257	4*	1.65%
Limited-Service Restaurants	235	35*	14.75%
Supermarkets and Groceries	42	3*	7.55%
Hair, Nail, and Skin Care Services	105	13*	12.12%

\*This impact is not individually statistically significant

### Impact of minimum wage on sales tax revenue

Sales tax revenue data that have been provided to us by the city of Pasadena can also be explored for minimum wage effects. Although this dataset does not break Pasadena and the surrounding regions apart into smaller pieces like the QCEW data, it does include data from nearby other cities that are similar to Pasadena in terms of income. These other cities are: Glendale, Monrovia, Santa Monica, and West Hollywood.

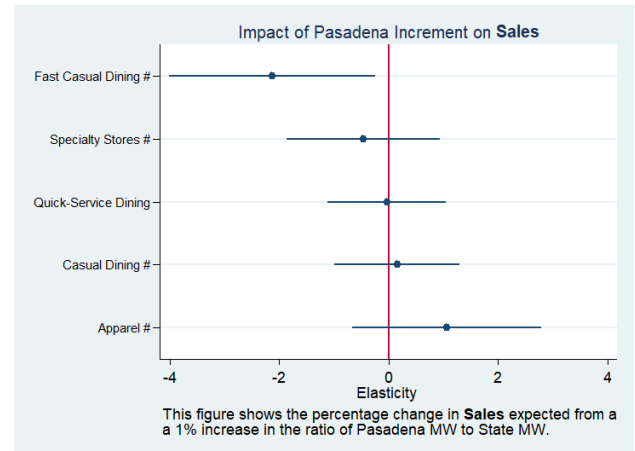
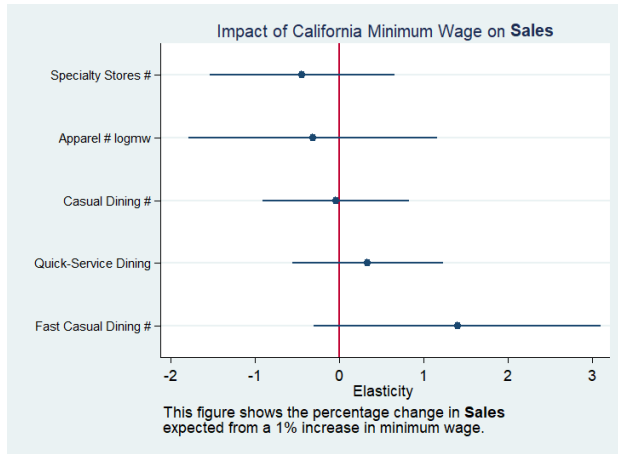
The chart below illustrates the increasing importance of food services as a source of tax revenue for Pasadena since 2011. Casual dining, quick-service dining, and fast casual dining have all experienced substantial increases in tax revenue since 2011 while apparel and specialty stores have been quite stable.



The timing of the rise in tax revenue from the restaurant sectors after 2011 suggests that the tax revenue is favorably affected by the rise in the minimum wage. A positive impact of minimum wages on sales revenue can occur either because more quantity is sold or because prices rise. A reason why more quantity might be sold is that the added income of restaurant workers allows them to buy more of their own product. A more likely story is that the increase in minimum wages is passed on to customers via higher prices. And of course there may be reasons for increases in price or increases in sales volumes that have nothing to do with the minimum wage.

We can use the same specifications as we have in our previous analysis of earnings, employment, and establishments to examine the impact of minimum wage on sales revenue in these five industries. The first figure below shows the impact of an increase in minimum wages inclusive of the local increment. The solid dots are our point estimates, which show that for Fast Casual Dining, (for example: McDonalds), a 1% increase in minimum wage would result in a 1% increase in sales revenue. The line intervals indicate a 95% confidence interval of our point estimates, and if the lines intersect the solid red line at 0, then our point estimates are not statistically significant at the 5% confidence level. We can see that none of our point estimates of the impact of minimum wage on sales revenue is statistically significant, although we could say that cheaper restaurants seem to have a stronger response than more expensive restaurants and clothing stores. For the restaurants classified as fast casual dining, the

evidence says that we would see only 30% of the increase in sales revenue in response to minimum wages would occur within three months.



The figure at the right illustrates the separate impact of the Pasadena increment to the minimum wage. Our model includes two minimum wage variables, one is the prevailing minimum wage inclusive of the Pasadena increment and the other is the Pasadena increment separately. If the Pasadena increment behaves just like the California increment, then this second variable would have a zero effect. Once again we would like to stress that we do not have much evidence of this second effect because the Pasadena minimum wage has only risen above the California minimum wage briefly three times in our dataset (which spans to the 2018q1). From the line intervals displayed we can see that only the fast casual dining effect is bounded away from zero, suggesting that the Pasadena increment has much less of an impact than a statewide increase in minimum wages.

Overall our evidence says that sales revenue has a stronger response to minimum wages for restaurants that are cheaper and faster, while restaurants that are more expensive, clothing, and specialty stores do not show evidence of a response.

## Findings from other models

### Other Models or Specifications:

- Without Pasadena increment:

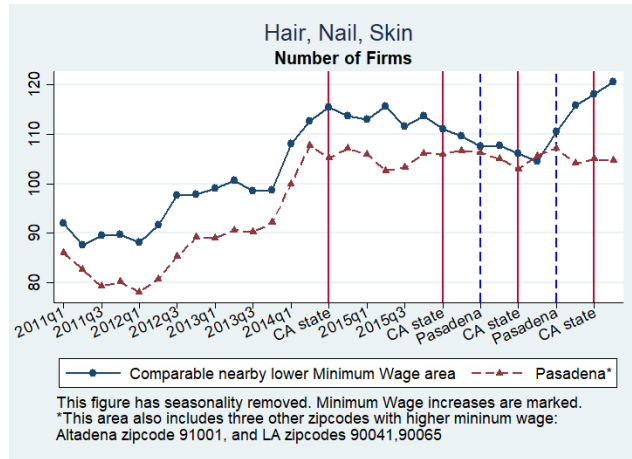
Our model that includes the prevailing minimum wage and separately the Pasadena increment would have a zero coefficient on the Pasadena increment if the Pasadena legislation were equivalent to an early adoption of the California minimum wage but a non-zero coefficients suggests otherwise. Including in the model an additional variable representing the Pasadena minimum wage increment does not change the impact of minimum wage on earnings, employment, or number of establishments, except for limited-service restaurants. The negative impact of Pasadena increment on employment level for limited-service restaurants suggests that when local minimum wage increase, minimum wage jobs may migrate to nearby areas with lower minimum wages

- Without time trend:

When a time trend is not included in the specification, we observe more industries with statistically significant impact of minimum wage on earnings. This is because both earnings and minimum wages are generally increasing over time. Even without increasing minimum wages, historically we observe earnings increase over time due to inflation. Without controlling for the time trend, we would mix the increase of earnings due to inflation with the impact of minimum wage.

There is little evidence of impact of minimum wage on employment with or without the time trend.

More industries have significant negative impact of minimum wage on establishments when time trends are added. As the figure to the right shows, some industries exhibit increasing establishments until minimum wages are increased. Therefore adding a time trend allows us to project the number of establishments that would have been there had there not been a minimum wage increase.



The results we have discussed so far use all the groups (The groups are separated by income level. Group 1 has the least income, and Group 5 has the most). We also conducted analyses for each group separately. The purpose of doing group-wise analysis is to examine whether a change in minimum wage has different impact depending on the income level of the affected area and depending on the “control group.” We find that the impact of minimum wage differs little across groups. Groups 2 and 3 provide the most significant evidence that an increase in the minimum wage would increase earnings. Group 4 presents the weakest evidence. Most industries show different results across different groups. However, for Full and Limited service restaurants, there are consistent results across all groups showing that an increase in minimum wages would increase earnings. There is little evidence of the impact of minimum wages on employment or number of establishments.

## Conclusion

We have used the data available to us to analyze the impact of minimum wages on earnings per worker, employment, establishments, and sales tax revenue. We find that minimum wages have a measurable impact on earnings per worker for low wage industries (such as full and limited service restaurants), and

our preferred model supports a significant negative estimate of the impact of minimum wages on the number of Hair/Nail Salons and also a negative impact of the Pasadena increment on the number of jobs in Limited Service Restaurants. We also obtain negative estimates of the impact of minimum wages on employment and establishments in most industries, though considerable statistical uncertainty.

This study has difficulty detecting the impact of minimum wages on employment and establishments because firms may anticipate upcoming changes in minimum wages, and also may adjust everything but wages slowly over time. Indeed our own estimates show that only one-fifth of the impact of an increase in minimum wages would show in the employment data within three months.

Data from the second half of 2018 would be quite helpful because 2018 and 2019 are the years during which the Pasadena minimum wage is highest above the California state minimum wage.

We find evidence that 50% of the impact of minimum wages on earnings is realized in the first quarter, while only 20% of the impact of minimum wages on employment of on establishments is realized in the first quarter.

We find smaller estimates in general of the impact of a Pasadena increment than a Statewide increment, however jobs in limited service restaurants show evidence of leaving Pasadena in higher numbers when the difference between the Pasadena minimum wage and the California minimum wage is greater. An additional year of data and the corresponding greater time and greater difference between the Pasadena and Statewide minimum wage levels would allow us to more accurately estimate the separate effect of the Pasadena increment.



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# Appendix A: Regressions and Impact Estimates Using the Preferred Model

## Estimated Regressions

Table 4 Regressions For Predicting Impact of MW on Earnings per person

Industry	log prevailing MW	log increment*	lagged earnings per person	logged total earnings per person	lag total earnings per person	linear time trend	R-squared	long run MW impact	long run increment impact
Accounting, Tax Preparation, Bookkeeping	0.306	-0.698	0.242	0.265	0.583	-0.004	0.758	0.404	-0.921
Child Day Care Services	0.156	-0.158	0.277	0.072	-0.155	0.002	0.681	0.215	-0.219
Commercial Banking	0.09	0.943	0.527	0.674	-0.389	0	0.779	0.191	1.995
Computer Systems Design and Related Ser	-0.244	-0.302	0.46	0.109	0.306	0.005	0.704	-0.451	-0.56
Continuing Care Retirement Communities	0.069	-0.854	-0.187	-0.103	-0.003	0.005	0.359	0.058	-0.719
Dentist Offices	0.381	-0.891	0.045	-0.022	-0.29	0	0.825	0.398	-0.932
Elementary and Secondary Schools	0.317	-0.558	-0.222	0.023	0.016	0.007	0.8	0.26	-0.457
Fitness and Recreational Sports Centers	-0.949	0.524	-0.181	0.355	1.937	-0.006	0.273	-0.803	0.443
Full-Service Restaurants	0.246	-0.318	0.493	0.053	-0.015	0.003	0.896	0.486	-0.627
Hair, Nail, and Skin Care Services	0.153	-0.162	0.488	0.055	0.182	-0.001	0.816	0.299	-0.317
Home Health Care Services	-0.33	0.491	0.435	-0.011	0.365	0.001	0.575	-0.584	0.87
Hotels (except Casino Hotels) and Motel	0.159	-0.562	0.676	-0.471	0.798	-0.002	0.636	0.491	-1.733
Insurance Agencies and Brokerages	0.798	-0.061	-0.033	0.183	-0.236	-0.003	0.639	0.773	-0.0587
Janitorial Services	0.571	-0.117	-0.195	0.226	0.252	0.003	0.839	0.477	-0.0982
Lawyer Offices	0.028	0.19	0.13	0.139	0.109	0.002	0.685	0.032	0.218
Limited-Service Restaurants	0.461	-0.088	0.433	0.214	-0.096	-0.002	0.846	0.812	-0.156
Management Consulting Services	0.104	0.12	0.565	0.058	-0.098	0.002	0.594	0.24	0.275
Nursing Care Facilities (Skilled Nursin	-0.191	-0.157	-0.02	0.008	-0.294	0.013	0.494	-0.188	-0.154
Other Scientific and Technical Consulti	-0.321	0.714	0.422	-0.066	-0.892	0.015	0.594	-0.556	1.235
Pharmacies and Drug Stores	0.236	0.148	0.227	0.035	-0.076	0	0.635	0.306	0.192
Physician Offices	0.035	-0.609	0.332	0.406	0.422	-0.005	0.776	0.0531	-0.912
Residential Building Construction	0.086	-0.786	0.533	-0.056	0.296	0.003	0.636	0.184	-1.683
Supermarkets and Other Grocery (except	0.108	-0.299	0.422	-0.002	-0.029	0.001	0.74	0.187	-0.518
Veterinary Services	0.46	-0.607	0.489	0.37	-0.49	-0.003	0.856	0.901	-1.188

\* The increment is the ratio of Pasadena MW to the California state MW

Green or Red: This result is individually significant

Table 5 Regressions For Predicting Impact of MW on Employment

Industry	log prevailing MW	log increment*	lagged employment	logged total employment	lag total employment	linear time trend	R-squared	long run MW impact	long run increment impact
Accounting, Tax Preparation, Bookkeeping	-0.263	0.413	0.803	0.338	-0.109	0.003	0.977	-1.336	2.099
Child Day Care Services	-0.017	-0.055	0.818	1.016	-1.092	0.002	0.948	-0.0957	-0.3
Commercial Banking	0.079	0.082	0.813	-0.621	0.131	0.003	0.975	0.423	0.441
Computer Systems Design and Related Ser	-0.134	-0.021	0.927	0.464	0.009	0	0.967	-1.82	-0.283
Continuing Care Retirement Communities	-0.391	1.071	0.865	-0.85	-0.563	0.014	0.977	-2.884	7.907
Dentist Offices	-0.032	0.124	0.879	0.299	-0.068	0	0.988	-0.261	1.027
Elementary and Secondary Schools	-0.118	0.6	0.893	0.67	-0.808	0.001	0.975	-1.098	5.605
Fitness and Recreational Sports Centers	0.044	-0.095	0.285	-1.004	-2.509	0.051	0.977	0.0609	-0.133
Full-Service Restaurants	-0.129	0.157	0.819	0.313	-0.202	0.002	0.989	-0.71	0.867
Hair, Nail, and Skin Care Services	-0.039	-0.126	0.847	0.148	0.224	-0.001	0.955	-0.253	-0.822
Home Health Care Services	-0.625	1.089	0.809	0.573	-1.081	0.008	0.978	-3.273	5.709
Hotels (except Casino Hotels) and Motel	-0.01	0.069	0.733	0.763	-0.486	-0.001	0.981	-0.0372	0.258
Insurance Agencies and Brokerages	-0.045	0.295	0.827	0.293	-0.315	0.002	0.962	-0.261	1.701
Janitorial Services	-0.686	-0.247	0.681	4.938	-4.16	0.007	0.994	-2.152	-0.774
Lawyer Offices	-0.102	-0.051	0.895	-0.024	-0.02	0.002	0.991	-0.97	-0.487
Limited-Service Restaurants	-0.005	-0.397	0.753	0.508	-0.483	0.004	0.986	-0.0192	-1.606
Management Consulting Services	0.445	-0.359	0.764	0.801	-0.71	-0.004	0.921	1.882	-1.52
Nursing Care Facilities (Skilled Nursin	0.062	0.271	0.825	0.247	-0.298	-0.003	0.986	0.354	1.548
Other Scientific and Technical Consulti	-0.807	1.099	0.85	-0.648	0.377	0.005	0.89	-5.391	7.34
Pharmacies and Drug Stores	-0.136	0.232	0.902	0.321	-0.391	0.002	0.946	-1.387	2.361
Physician Offices	-0.281	0.551	0.724	0.752	-0.672	0.004	0.981	-1.016	1.994
Residential Building Construction	-0.073	0.324	0.842	-0.324	-0.373	0.006	0.94	-0.462	2.049
Supermarkets and Other Grocery (except	-0.06	0.02	0.76	0.319	-0.228	0.001	0.955	-0.248	0.0835
Veterinary Services	-0.306	0.384	0.857	2.31	-1.939	0.005	0.972	-2.144	2.691

\* The increment is the ratio of Pasadena MW to the California state MW

Green or Red: This result is individually significant

Table 6 Regressions For Predicting Impact of MW on Number of Establishments

Industry	log prevailing MW	log increment*	lagged establishments	logged total establishments	lag total establishments	linear time trend	R-squared	long run MW impact	long run increment impact
Accounting, Tax Preparation, Bookkeeping	-0.342	0.449	0.844	-0.112	0.512	0.004	0.991	-2.195	2.882
Child Day Care Services	-0.018	-0.023	0.906	-0.335	0.408	0.001	0.963	-0.187	-0.251
Commercial Banking	0.165	-0.461	0.746	1.392	-0.191	-0.006	0.962	0.651	-1.817
Computer Systems Design and Related Services	-0.15	0.503	0.851	0.322	-0.001	0.001	0.968	-1.012	3.385
Continuing Care Retirement Communities	-0.497	1.337	0.934	1.006	0.185	-0.001	0.857	-7.541	20.28
Dentist Offices	-0.11	0.135	0.888	-0.086	0.074	0.002	0.994	-0.988	1.207
Elementary and Secondary Schools	-0.193	0.523	0.881	0.178	-0.205	0.001	0.979	-1.624	4.414
Fitness and Recreational Sports Centers	0.108	0.105	0.812	0.009	0.63	0	0.935	0.576	0.559
Full-Service Restaurants	-0.061	0.04	0.838	0.089	-0.046	0.001	0.976	-0.373	0.248
Hair, Nail, and Skin Care Services	-0.373	0.23	0.845	-0.586	0.577	0.007	0.974	-2.4	1.482
Home Health Care Services	-0.683	0.322	0.597	-0.289	0.4	0.009	0.967	-1.694	0.799
Hotels (except Casino Hotels) and Motel	-0.23	0.335	0.745	-0.924	1.188	0.004	0.978	-0.899	1.311
Insurance Agencies and Brokerages	0.044	-0.026	0.889	0.17	0.036	-0.001	0.989	0.392	-0.234
Janitorial Services	-0.529	0.142	0.767	-0.049	0.15	0.01	0.957	-2.269	0.607
Lawyer Offices	-0.232	0.232	0.846	0.357	-0.115	0.003	0.997	-1.509	1.506
Limited-Service Restaurants	-0.106	-0.091	0.823	-0.14	0.193	0.003	0.988	-0.6	-0.517
Management Consulting Services	-0.649	0.98	0.777	0.831	-0.047	0.01	0.975	-2.906	4.386
Nursing Care Facilities (Skilled Nursing)	0.133	-0.109	0.891	0.487	-0.436	-0.004	0.94	1.221	-1.002
Other Scientific and Technical Consulting	-0.609	0.645	0.843	0.152	-0.7	0.007	0.976	-3.872	4.1
Pharmacies and Drug Stores	0.068	0.112	0.786	0.063	-0.015	0.001	0.951	0.319	0.523
Physician Offices	-0.258	0.302	0.73	0.064	0.106	0.004	0.998	-0.955	1.12
Residential Building Construction	-0.212	0.418	0.809	0.377	0.351	0	0.986	-1.109	2.19
Supermarkets and Other Grocery (except)	0.024	-0.063	0.933	-0.582	0.719	-0.001	0.975	0.36	-0.932
Veterinary Services	-0.159	0.226	0.847	0.096	0.221	0.003	0.985	-1.042	1.479

\* The increment is the ratio of Pasadena MW to the California state MW

Green or Red: This result is individually significant

## Impact Tables: Minimum Wage Increment from \$13.25 to \$15

Table 7 Estimated Impact of MW Increase on Earnings per worker, Industries Sorted by Potential Increase

Industry	Average Earnings Per Quarter	Potential Increase	Percent Increase
Insurance Agencies and Brokerages	\$20,631	\$2,106	10.21%
Veterinary Services	\$8,979	\$1,069*	11.90%
Accounting, Tax Preparation	\$14,411	\$769*	5.34%
Management Consulting Services	\$22,024	\$698*	3.17%
Dentist Offices	\$11,545	\$607	5.26%
Limited-Service Restaurants	\$5,298	\$568	10.72%
Elementary and Secondary Schools	\$13,627	\$468	3.43%
Pharmacies and Drug Stores	\$11,442	\$462*	4.04%
Commercial Banking	\$17,635	\$445*	2.52%
Full-Service Restaurants	\$6,379	\$409	6.42%
Janitorial Services	\$5,894	\$371	6.30%
Residential Building Construction	\$14,925	\$363*	2.43%
Hotels and Motels	\$5,416	\$351*	6.48%
Hair, Nail, and Skin Care Services	\$5,240	\$207*	3.95%
Child Day Care Services	\$6,858	\$195*	2.84%
Supermarkets and Groceries	\$7,385	\$182*	2.47%
Physician Offices	\$17,531	\$123*	0.70%
Lawyer Offices	\$20,082	\$85*	0.42%
Continuing Care Retirement Communities	\$6,073	\$47*	0.77%
Nursing Facilities	\$8,364	(X)	
Fitness and Recreational Sports Centers	\$4,769	(X)	
Home Health Care Services	\$9,179	(X)	
Other Technical Consulting Services	\$16,373	(X)	
Computer Systems Design	\$23,756	(X)	

\*This impact is not individually statistically significant  
(x) No Increase Estimated

Table 8 Estimated Impact of MW Increase on Employment, Industries Sorted by Jobs at Risk

Industry	Average Total Employment	Jobs at risk	(x) No Increase Estimated
Full-Service Restaurants	6361	597*	9.38%
Physician Offices	3139	421*	13.42%
Computer Systems Design	1215	292*	24.04%
Elementary and Secondary Schools	1441	209*	14.50%
Home Health Care Services	475	205	43.23%
Lawyer Offices	1550	199*	12.81%
Other Technical Consulting Services	264	188	71.20%
Accounting, Tax Preparation	759	134*	17.65%
Pharmacies and Drug Stores	583	107*	18.32%
Supermarkets and Groceries	2488	82*	3.28%
Veterinary Services	256	73*	28.32%
Continuing Care Retirement Communities	185	70*	38.09%
Dentist Offices	1060	37*	3.45%
Insurance Agencies and Brokerages	1017	35*	3.45%
Residential Building Construction	560	34*	6.10%
Hair, Nail, and Skin Care Services	539	18*	3.34%
Janitorial Services	61	17*	28.42%
Limited-Service Restaurants	4662	12*	0.25%
Child Day Care Services	563	7*	1.26%
Hotels and Motels	188	1*	0.49%
Fitness and Recreational Sports Centers	212	(x)	
Commercial Banking	237	(x)	
Nursing Facilities	1363	(x)	
Management Consulting Services	1126	(x)	

\*This impact is not individually statistically significant  
(x) No closures estimated

Table 9 Estimated Impact of MW Increase on Number of Establishments, Industries Sorted by Establishments at Risk

Industry	Firms	Firms at risk	Percent at Risk
Lawyer Offices	401	80	19.93%
Management Consulting Services	187	72	38.38%
Other Technical Consulting Services	138	71	51.14%
Physician Offices	502	63	12.61%
Hair, Nail, and Skin Care Services	105	33	31.70%
Accounting, Tax Preparation	109	32	28.99%
Dentist Offices	173	23*	13.05%
Limited-Service Restaurants	235	19*	7.92%
Computer Systems Design	130	17*	13.37%
Residential Building Construction	114	17	14.65%
Full-Service Restaurants	257	13*	4.93%
Elementary and Secondary Schools	24	5*	21.45%
Continuing Care Retirement Communities	5	5*	99.60%
Home Health Care Services	16	4	22.37%
Janitorial Services	11	3*	29.97%
Veterinary Services	22	3*	13.76%
Hotels and Motels	16	2*	11.87%
Child Day Care Services	49	1*	2.47%
Fitness and Recreational Sports Centers	10	(x)	
Commercial Banking	21	(x)	
Supermarkets and Groceries	42	(x)	
Pharmacies and Drug Stores	61	(x)	
Nursing Facilities	19	(x)	
Insurance Agencies and Brokerages	138	(x)	

\*This impact is not individually statistically significant  
(x) No job loss estimated

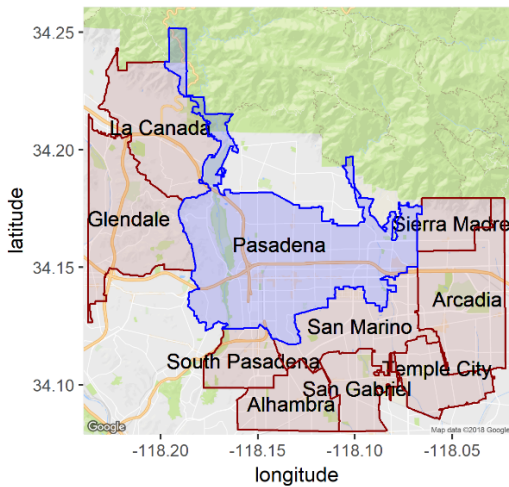
## Appendix B – Breakdown of zipcodes surrounding Pasadena into groups

### Maps

Below we can see a map of Pasadena and all the neighboring cities that actually have a lower minimum wage. If we were to do a complete local city comparison, we would simply compare the blue regions with the red regions. Further analysis below will show that there is strong zip code level heterogeneity within the cities. We would be better off comparing zipcodes that are similar with each other.

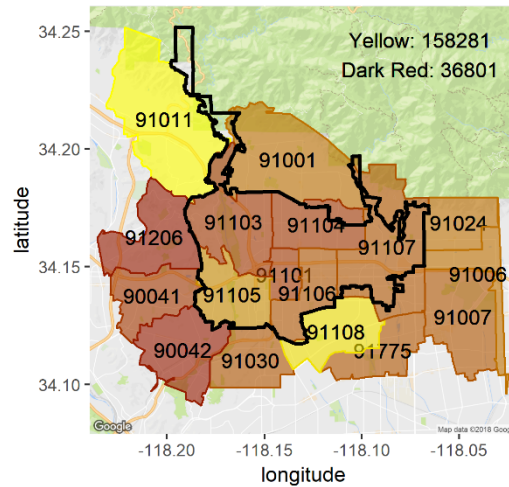
**Pasadena City and Neighbors**

Showing all incorporated neighboring cities in red. Incorporated neighboring cities have lower minimum wage



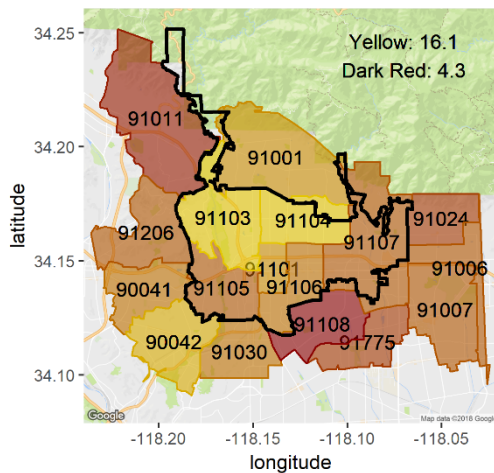
**Pasadena City and ZipCodes Colored by: median income**

Lowest are dark red, Highest are yellow  
Pasadena City is outlined



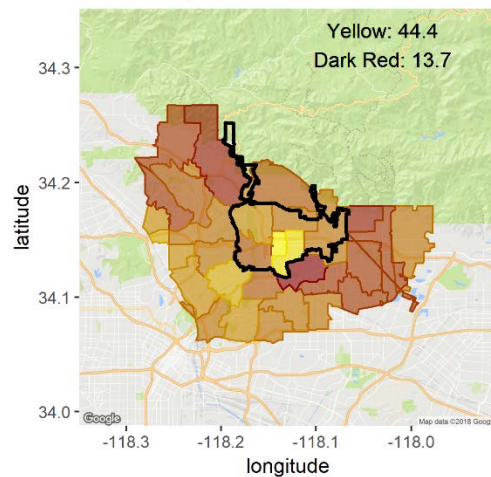
**Pasadena City and ZipCodes Colored by: Percent In Food and Accomodation**

Lowest are dark red, Highest are yellow  
Pasadena City is outlined



**Pasadena City and ZipCodes Colored by: Percent aged 20 to 39, Further Zipcodes**

Lowest are dark red, Highest are yellow  
Pasadena City is outlined



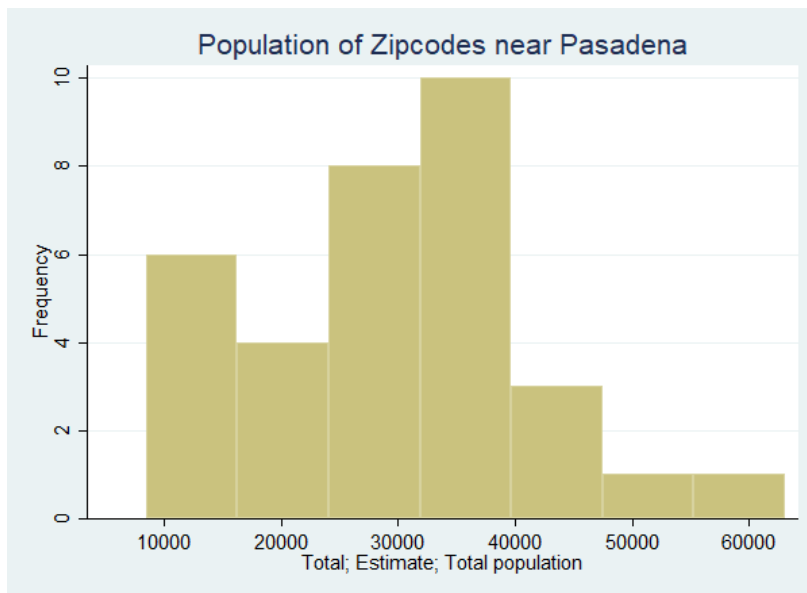


### Analysis of Maps

The maps above illustrate the heterogeneity among zipcodes. The top right map shows the variation in income. We can see the pitfalls of comparing the zipcode 91105 in Pasadena with zipcode 91206 in Glendale. The Pasadena zipcode has a much higher median income. The bottom left map shows that Pasadena zipcodes 91103 and 91104 have the highest percentages of people working in the food and accommodation occupation. Finally we can see that Pasadena zipcodes 91101 and 91106 have 44.% of their population aged between 20 and 40. Perhaps this is where all the young professionals live? For reference, classic Old Town Pasadena and Caltech are in zipcode 91101. The administrative buildings and dormitories of Caltech actually have their own zipcode (91126).

### Size of the Zipcodes

Before we continue on, it is important to note the distribution of the population of the zipcodes. The mean population in among the zipcodes near Pasadena is 30,000, the 10th percentile is 11,000, 25th percentile is 20,000. We will work off of the assumption that 20,000 people is enough to get QCEW estimates.



### Check for Balanced Characteristics

The following table provides balance checks of control zipcodes (CA minimum wage) and treatment zipcodes (Pasadena). For the balance checks, we examine variables that are relevant to the impact of minimum wage.

Table: Check for Balanced Characteristics of Comparison Groups

Group	1			2			3			
Minimum Wage Schedule	State Minimum Wage		Above State Min Wage	State Minimum Wage		Above State Min Wage	State Minimum Wage		Above State Minimum Wage	
city	Glendale	Alhambra	Pasadena	Temple City	Monrovia	Pasadena	Arcadia	Montrose	Pasadena	Pasadena
Zipcode	91202	91803	91101	91780	91016	91103	91007	91020	91106	91104
Total Population	23219	29502	20761	35674	41901	28124	34619	8448	24875	38725
Number of Households	8768	9566	10745	11305	14699	8381	11647	3345	10540	13081
Median Income	62104	57380	61473	62461	67868	62697	75353	70014	75160	70208
Age 20-39	33.8%	32.3%	48.7%	29.2%	32.7%	36.4%	25.3%	33.6%	44.9%	33%
High School or less	23.2%	32.7%	13.8%	26.9%	26.5%	28%	21.7%	20.8%	12.5%	22.3%
Earning less than \$25,000	23.6%	21.5%	27.4%	20.2%	17.1%	23.4%	17.7%	18.7%	16.9%	21.6%
Labor Force Participation	61%	60.7%	68.3%	59.1%	71.1%	63.6%	58.5%	68%	70.4%	66.2%
Unemployment rate	8.7%	5%	7.2%	7%	9.3%	7.2%	7%	7.4%	5.5%	8.5%
Occ Ind										
Service	14.2%	21.9%	11.9%	16.9%	18.1%	25.1%	11.9%	11.8%	11.7%	19.7%
Sales	29.1%	26.9%	17.9%	32.3%	24.7%	21.4%	28%	28.5%	18.4%	20%
Construction	3.2%	4.8%	4.3%	4.4%	6.1%	8.6%	3%	3.8%	3.8%	3.9%
Retail	12.7%	11.2%	5.9%	11%	10.5%	10.3%	8.6%	8.5%	8.1%	8.6%
Accommodation and Food	6.9%	12.3%	10.4%	10.9%	10.6%	13.2%	8.6%	6.3%	10%	13.3%
Group	4			5						
Minimum Wage Schedule	State Minimum Wage		Above State Min Wage	State Minimum Wage		Above State Min Wage				
city	South Pasadena	San Gabriel	Pasadena	Glendale	Sierra Madre	Pasadena				
Zipcode	91030	91775	91107	91208	91024	91105				
Total Population	25905	25389	32027	17180	11067	11728				
Number of Households	10150	8164	12502	5876	4403	5485				
Median Income	84683	79637	84663	111563	95256	107284				
Age 20-39	30.7%	27.2%	31.3%	28.7%	23.1%	27%				
High School or less	11.8%	24.6%	15%	14.4%	11.6%	10.8%				
Earning less than \$25,000	13.2%	15.6%	15.1%	9.6%	10.7%	11.1%				
Labor Force Participation	70.8%	61.2%	64.9%	65.3%	66.2%	64.5%				
Unemployment rate	6.1%	3.8%	6.6%	4.5%	5.3%	5.9%				
Occ Ind										
Service	10%	13.8%	12.3%	11.3%	5.5%	6.9%				
Sales	19.9%	23.1%	23%	25.9%	25.1%	17.8%				
Construction	4%	4.6%	4.2%	3.9%	3.4%	5.3%				
Retail	6.7%	8.9%	9.5%	8.5%	7.5%	5.6%				
Accommodation and Food	9.3%	6.9%	8.3%	9.1%	6.7%	8.7%				

## DESCRIPTION OF GROUPS

### GROUP 1

In Group 1, Pasadena 91101 (which surrounds Caltech) has more young people, more educated people, more people earning less than 25k. In terms of occupation, Pasadena has less Service, Sales, and Retail than their proposed controls in Alhambra and Glendale. Here we can see the benefits of including more zipcodes. Glendale 91202 and Alhambra 91803 were not in the near option.

### GROUP 2

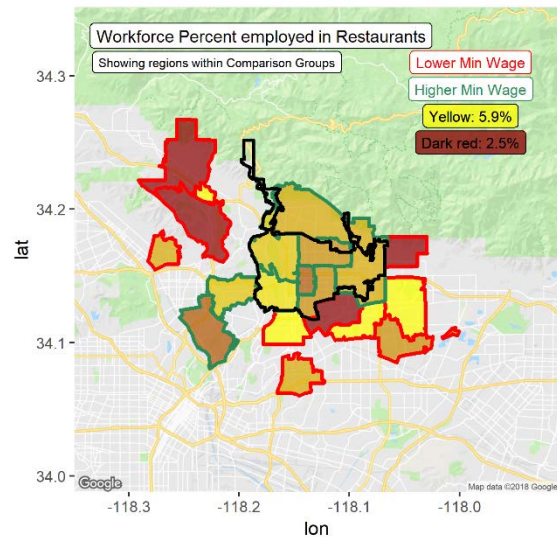
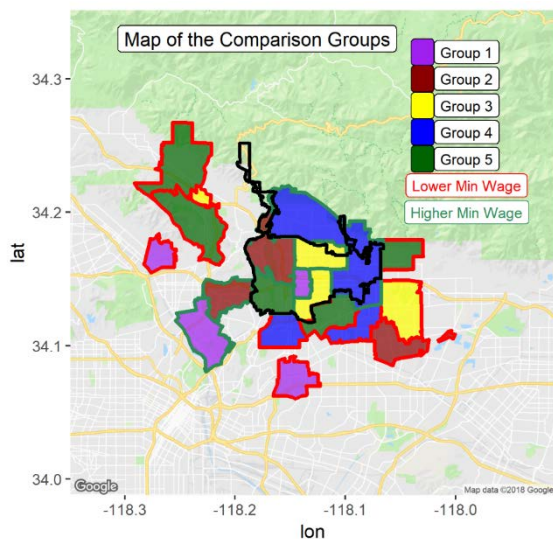
In Group 2, Pasadena 91003 has more young people, but also it has more less educated people and people with low earnings. Here we can see the benefits of including more zipcodes. Temple City and Monrovia are large zipcodes with population above the median of our sample. In terms of occupation, Pasadena has more service and less sales.

### GROUP 3

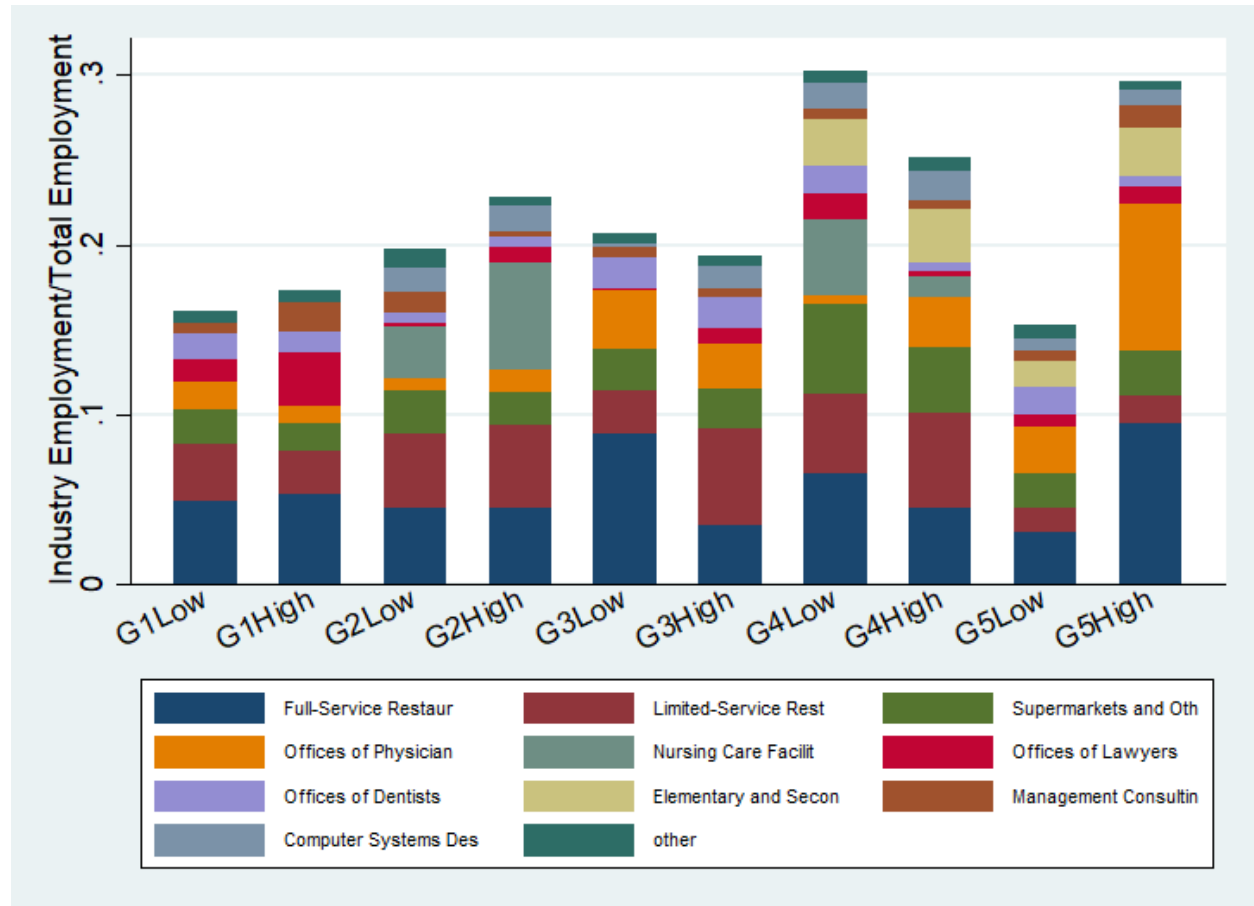
In Group 3, we have a very small proposed control zipcode in Montrose. Montrose is tiny city, with only one zipcode and a population of 8500. Pasadena 91106 has more young people and is more educated than the proposed controls. Pasadena 91104 is actually quite similar to the proposed controls, although it has twice the percentage of people working in service occupations.

### GROUP 4 AND 5

Among the rich counties, all the zipcodes are quite similar in terms of characteristics and are likely to affect the impact of minimum wage.



## Group industry composition



The above figure presents city (zipcodes within a group with same minimum wage schedule) industry composition difference. We present the top-ten employed industries from QCEW non-confidential data. The “other” means all other industries that are non-confidential. This figure shows that cities within the same group have relatively similar industry compositions. However, each city has very different industry compositions. For example, Group 1 cities have relatively higher ratio of employments in offices of lawyers without any employment in nursing care or computer system. Group 1 cities have high level of employment in nursing care facilities. Group 4 and 5 have higher employment in Elementary and Secondary Schools. This figure emphasizes the importance of including a city-industry fixed effect in regression to better control for this difference.

## Appendix C: Images for Preliminary Exploratory Analysis

Our first step in studying the data is to create figures that can be explored in search of minimum wage effects. This Appendix has three kinds of figures: data that are season and trend adjusted, restaurant data relative to area overall data, and comparisons of the data in the same quarter one year apart.

Appendix Figures C1–C6 present intertemporal patterns (controlling for seasonal fixed effects and a time trend) of (1) average earnings, (2) employment, and (3) the number of establishments. Each figure includes the data for all-industries, and for full-service and limited-service restaurants. Figures are presented for (A) high minimum wage areas (Pasadena, and zipcodes 91001, 90041, and 90065 in Los Angeles, and Altadena) and for (B) low minimum areas. All figures include vertical lines that indicate when either the California or the Pasadena minimum wage was increased. The removal of trends from all these figures supports visual displays that mimic the model-based analysis that also includes trends. These images are different if the trends are not removed, just as our estimates are different if the trend variables are not included.

Appendix Figures C1–C6 are designed to allow the viewer to compare the restaurant sectors with the overall data, and to compare the high- and low minimum wage regions.

The main take-aways from these figures are:

1. High minimum areas and low minimum areas have similar patterns for average of all industries, but very different patterns for restaurants.
2. Restaurants react to minimum wage changes very differently than the average of all industries. This indicates that minimum wages have heterogenous impact depending on the industry. The source of the heterogenous reponse in minimum wages could be due to the prevalence of minimum wage workers in each industry, substitutability of low-wage workers with technological capital, the average turnover of employees, etc.
3. Full and limited service restaurants react differently to minimum wage changes. This emphasizes the importance of looking at finer detail industry level. The finest detail that we have obtained from the QCEW is at the 5 digit NAICS level. The higher number of digits indicates a finer level of detail of the classification of businesses.

Appendix Figures C7-C10 show seasonal adjusted quarterly fixed effect of  $\log(\text{restaurant earnings} / \text{average earning of all industries in the area})$  and of  $\log(\text{restaurant employment} / \text{employment of all industries in the area})$ . They are also presented separately for high and low minimum wage areas. A decreasing trend means the restaurant earnings or employment grows slower than the whole economy. An increasing trend means restaurant earnings or employment grows faster than the whole economy. The main take-away from these figures are:

1. Restaurants earnings are slightly increased compared to the economy. The increase is more consistent after the first California minimum wage increase in July 2014.
2. Restaurants employment are increasing compared to the economy. This increase pattern seems to be unaffected by minimum wage change.
3. Employment change pattern varies across high and low minimum wage areas and across industry. In high minimum areas, full-service restaurant employment moves very closely with the whole economy, while limited-service restaurant employment increases.

Figures C11-C14 are groups scatter diagrams that compare of earnings in full-service restaurants versus earnings in all industries in the different areas for a given year and quarter. (Each marker represents a different one of our 5 regions. ) Each figure has two scatters using data in the same quarter one year apart.

Figures C15-C18 present similar figures for limited-service restaurants. Each figure includes two scatter diagrams representing the data A upward sloping fitted line indicates that restaurants pay more in regions where other sectors are paying more. A shift up in the fitted line implies that compa The main take-away from these figures are:

1. There is clear evidence that both full-service and limited-service restaurant earnings increase compared to the whole economy after minimum wage change. This confirms that restaurants are low income intensive and sensitive to minimum wage change.
2. There is no clear pattern or evidence to show that low income areas are more affected by minimum wage change. The fitted line has a parallel shift up most of the time. Parallel shift up means for the earning in restaurant

Figures C19-C20 present state level and county level visual analysis of earnings and employment growth for limited and full service restaurants, and supermarkets.

# Season and Trend Adjusted Data Restaurants and All Industries

Figure C1

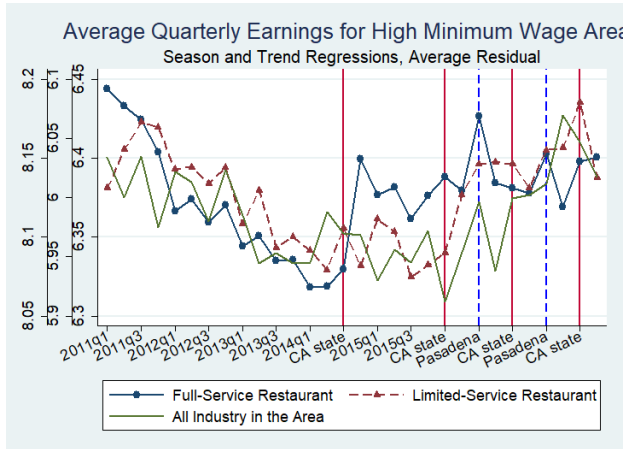


Figure C2

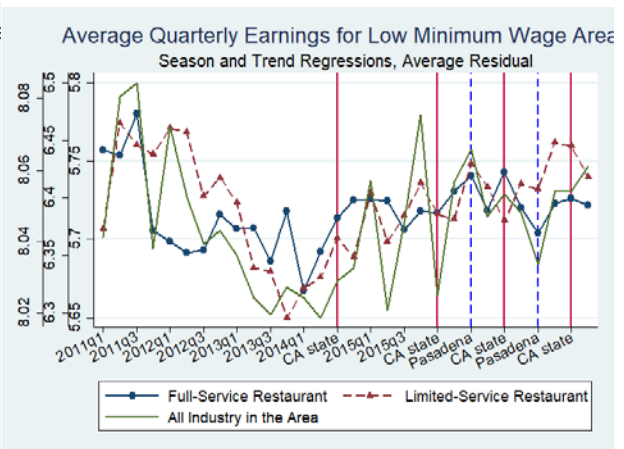


Figure C3

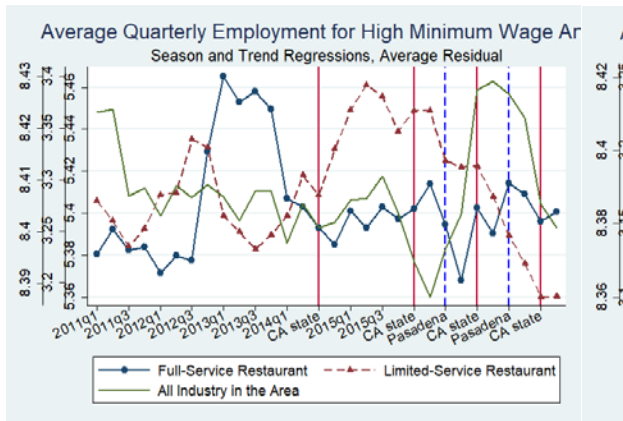


Figure C4

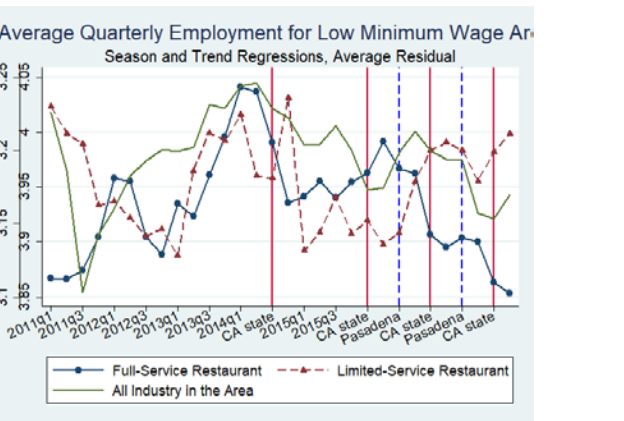


Figure C5

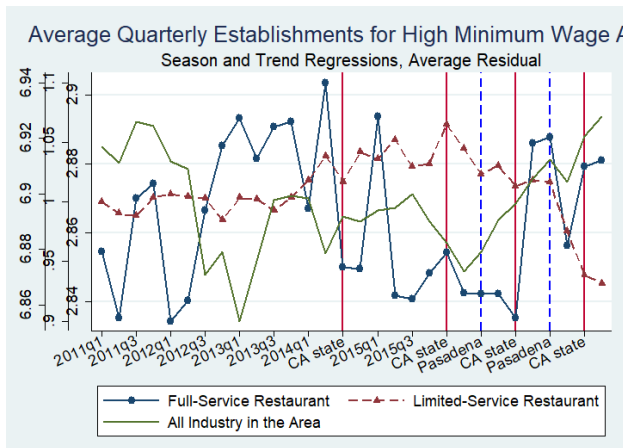
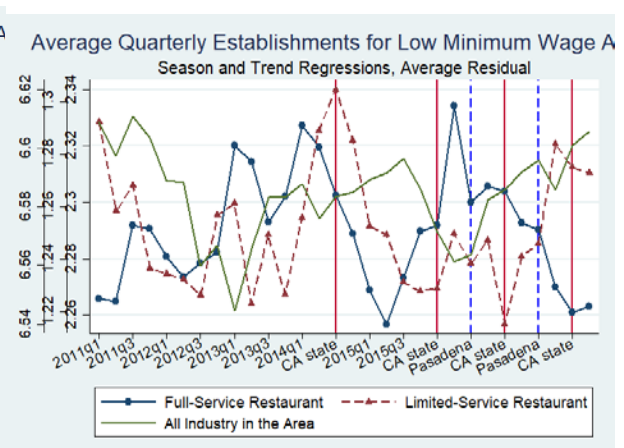


Figure C6



Restaurants/ Totals, Seasonally Adjusted  
Figure C7



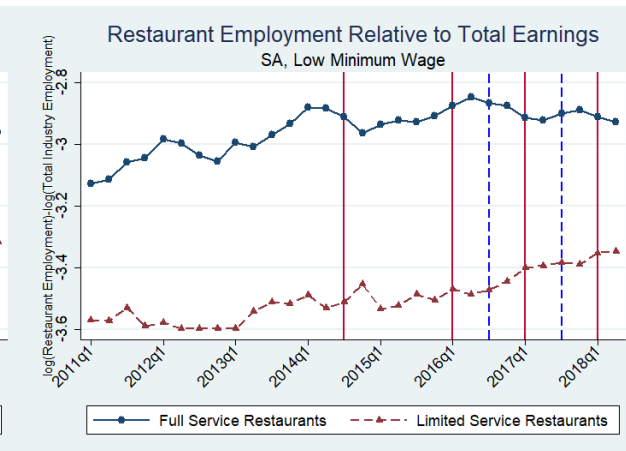
Figure C8



Figure C9



Figure C10





## Same Quarter, One Year Apart

### Full Service Restaurants

Figure C11: Full Service Restaurants: All Groups pulled together. Quarter 1:

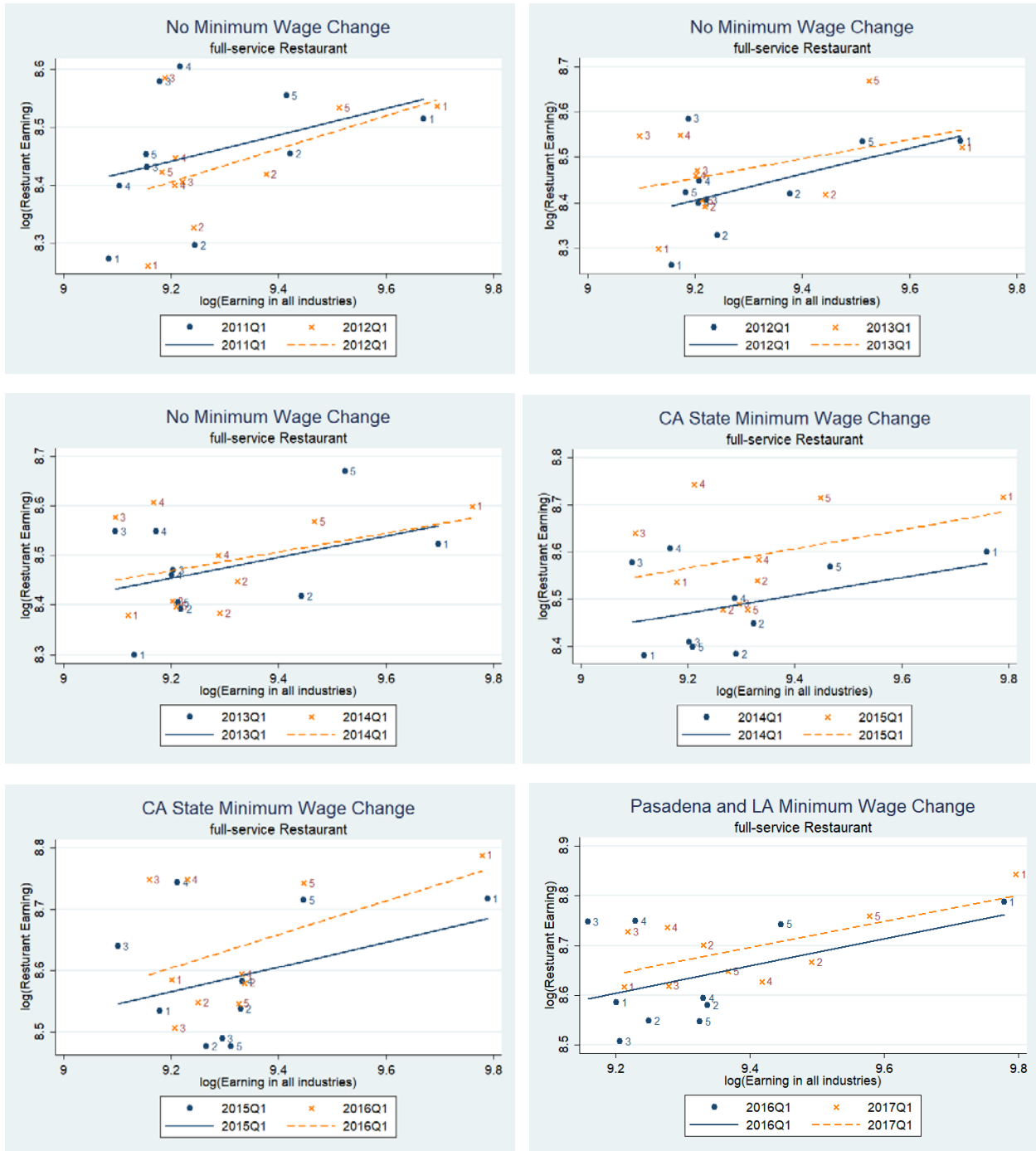


Figure C12: Full Service Restaurants: All Groups pulled together. Quarter 2:

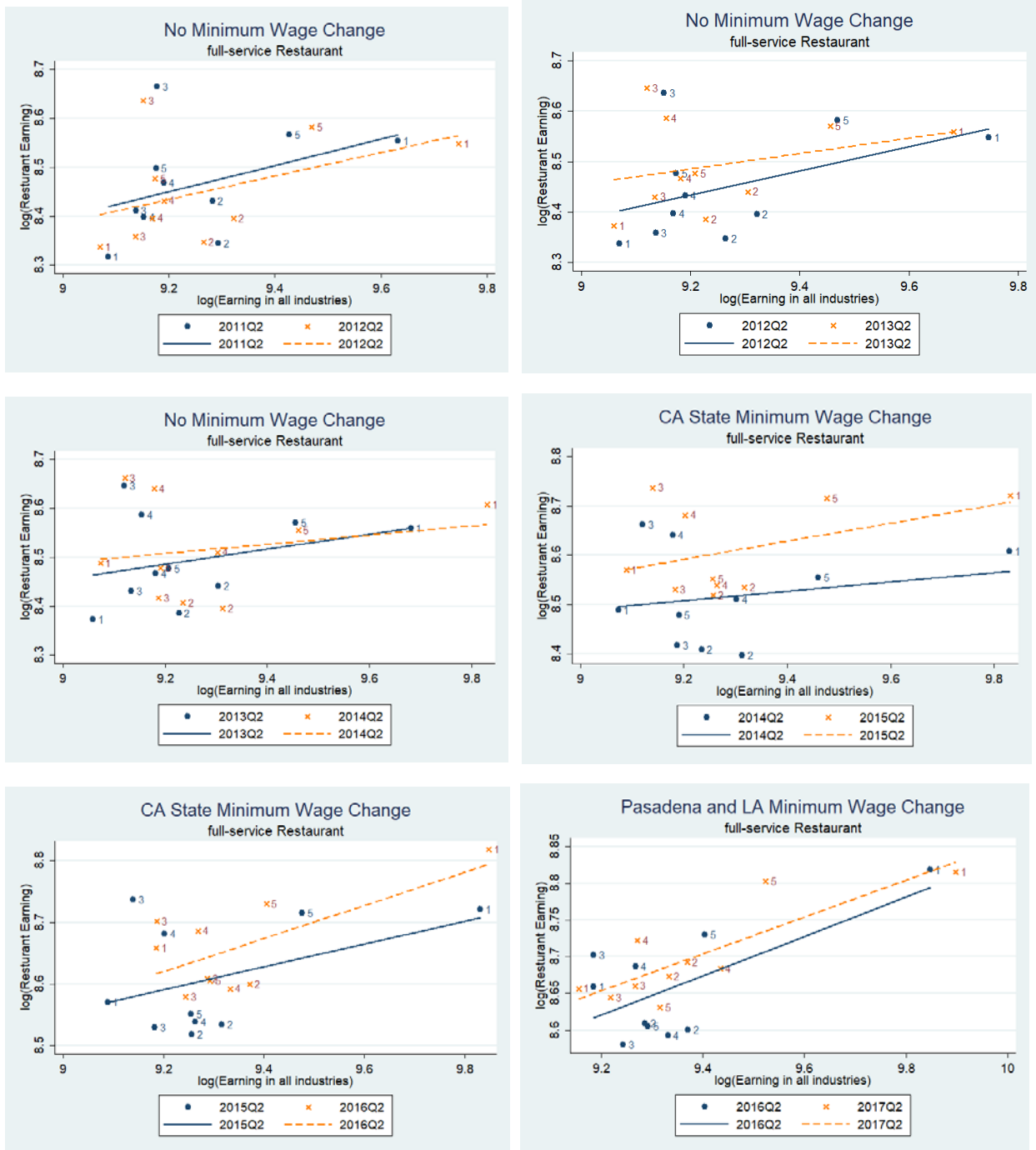


Figure C13: Full Service Restaurants: All Groups pulled together. Quarter 3:

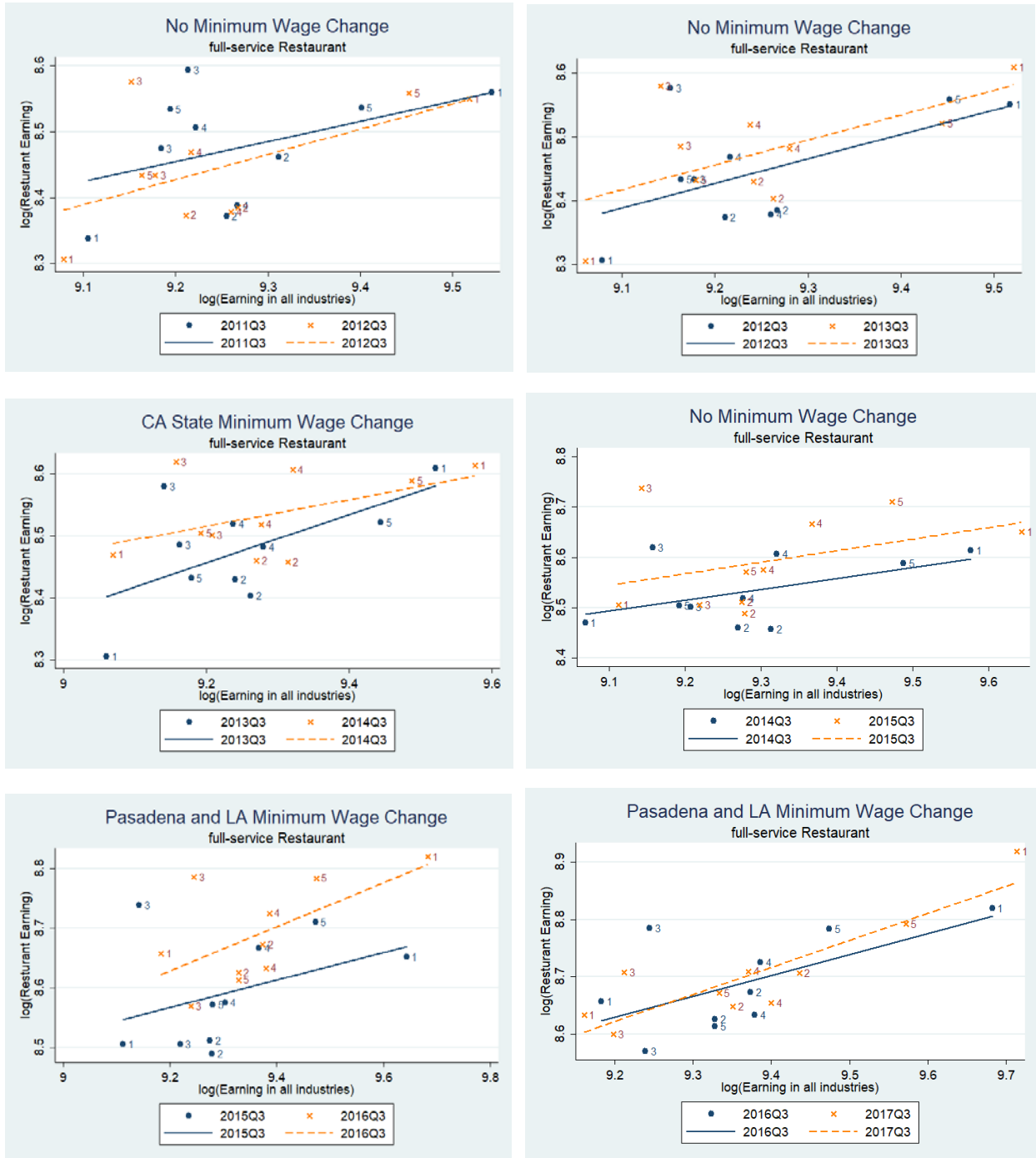
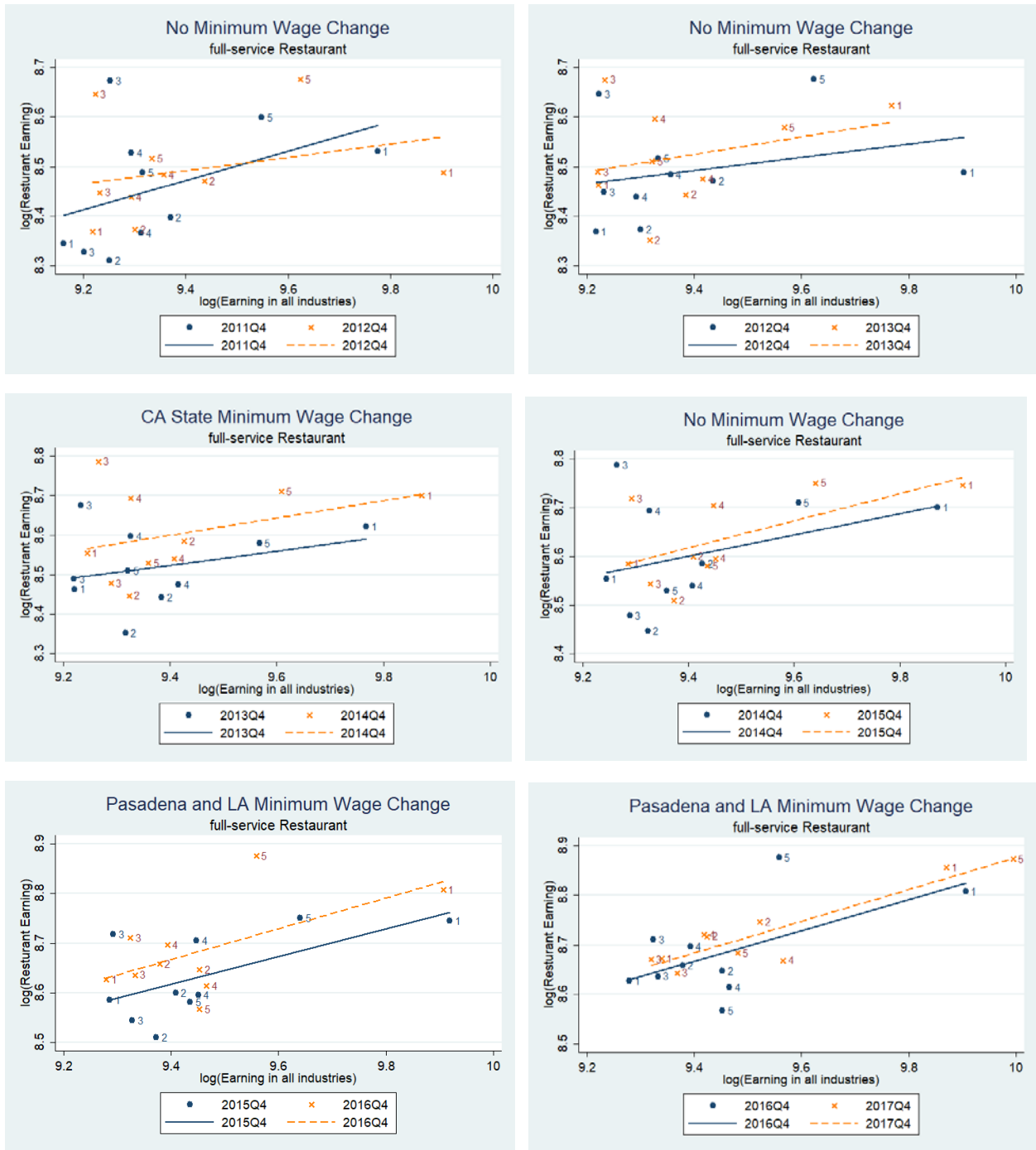


Figure C14: Full Service Restaurants: All Groups pulled together. Quarter 4:



Limited Service Restaurants: Same Quarter, One Year Apart

Figure C15: Limited Service Restaurants: All Groups pulled together. Quarter 1:

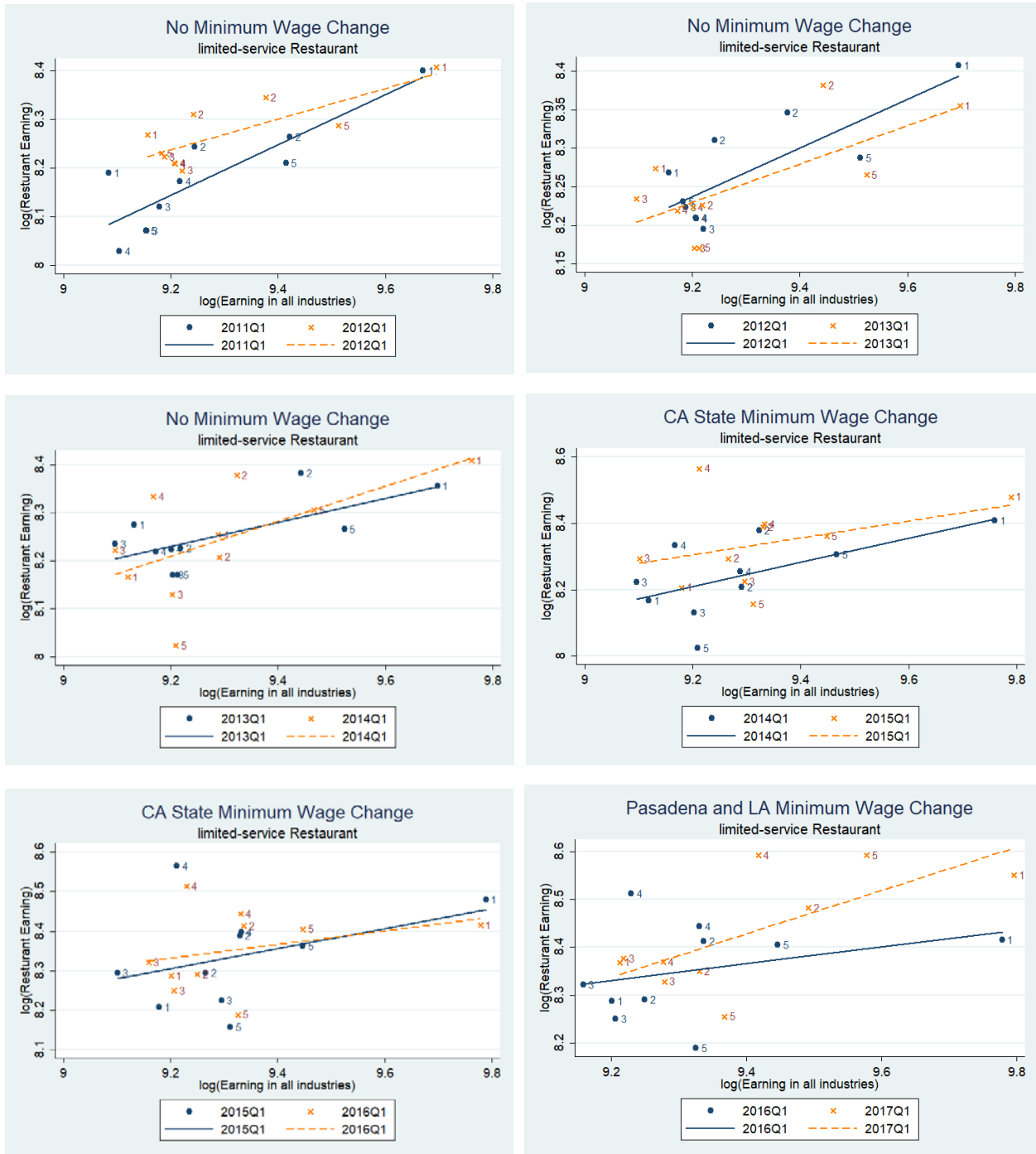


Figure C16: Limited Service Restaurants: All Groups pulled together. Quarter 2:

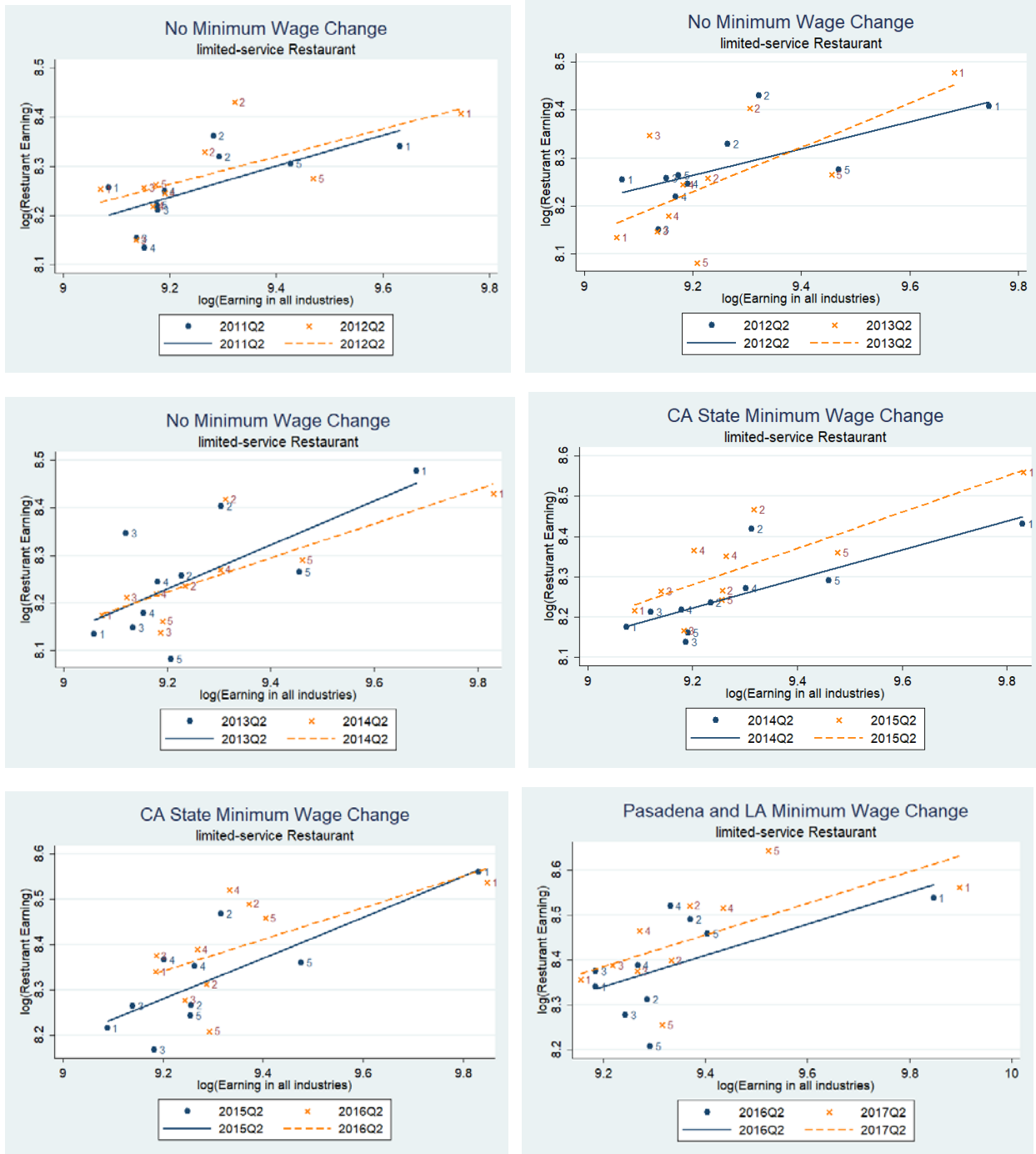


Figure C17: Limited Service Restaurants: All Groups pulled together. Quarter 3:

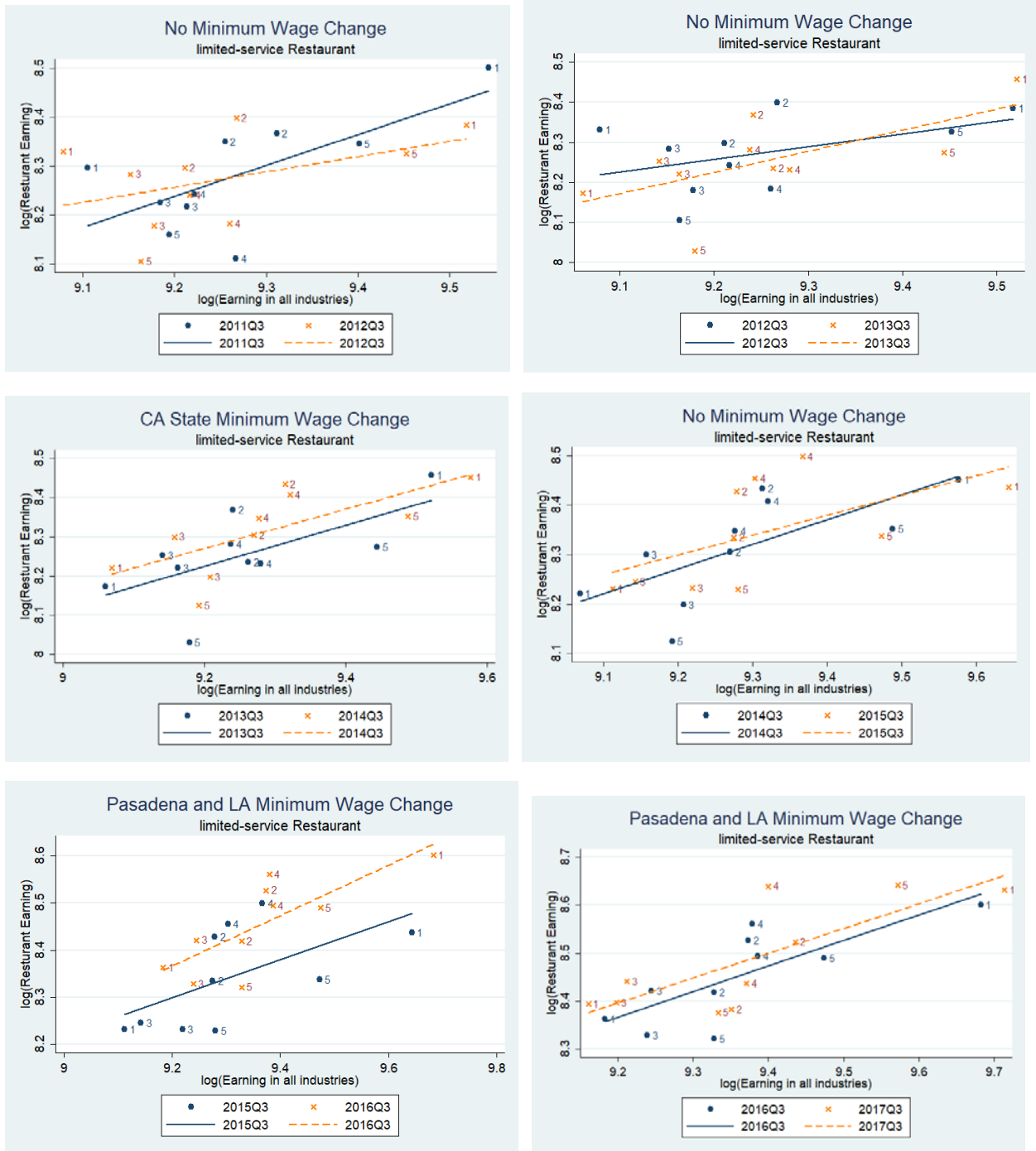


Figure C18: Limited Service Restaurants: All Groups pulled together. Quarter 4:

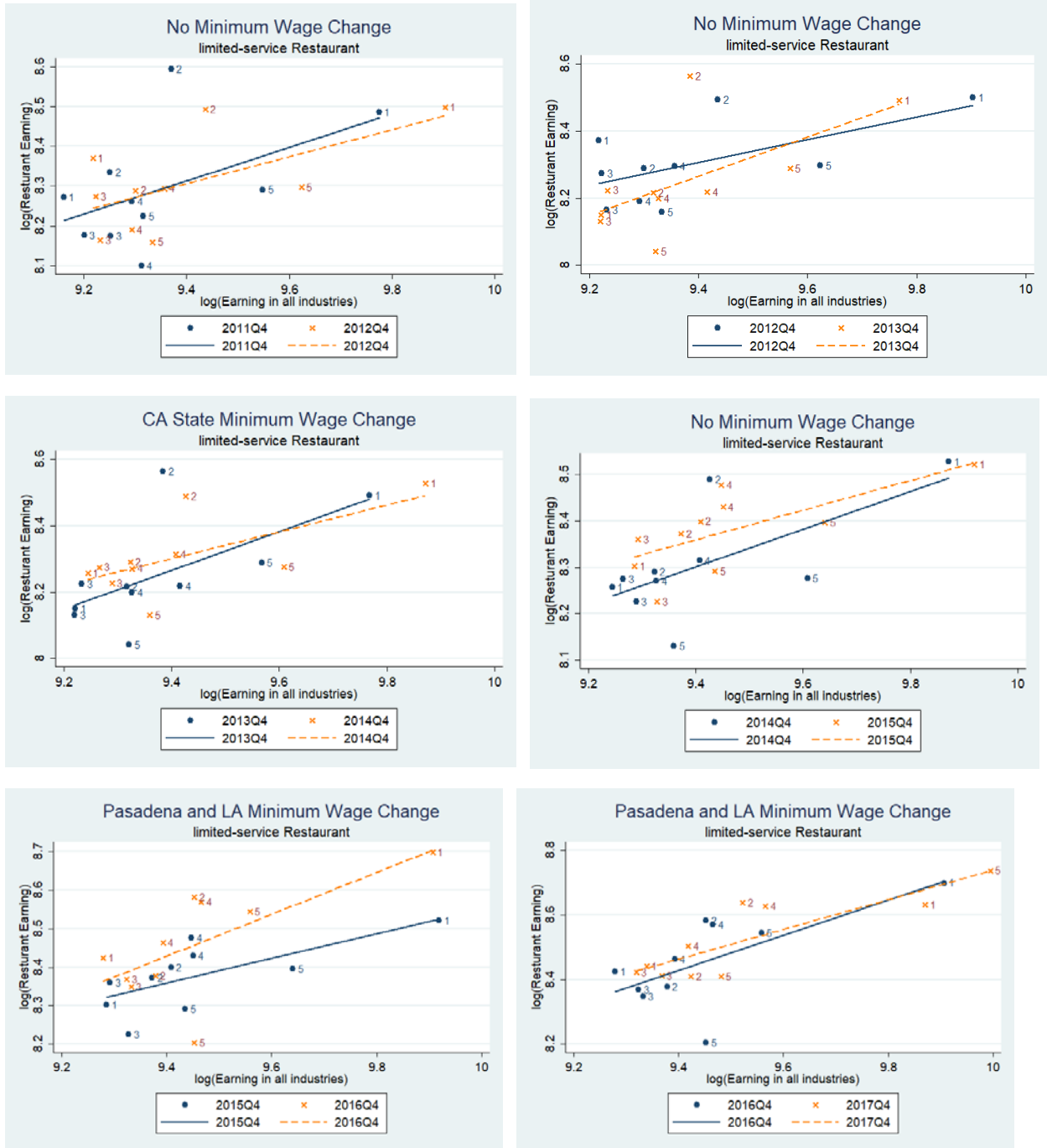
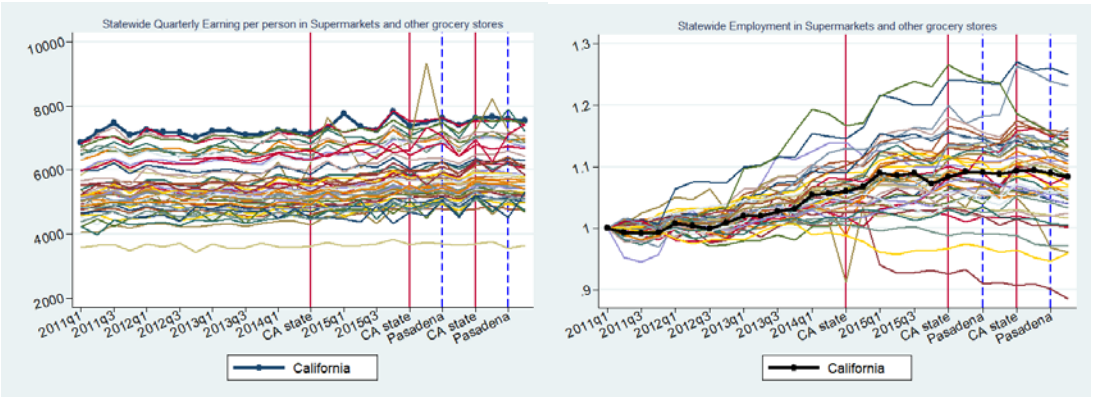
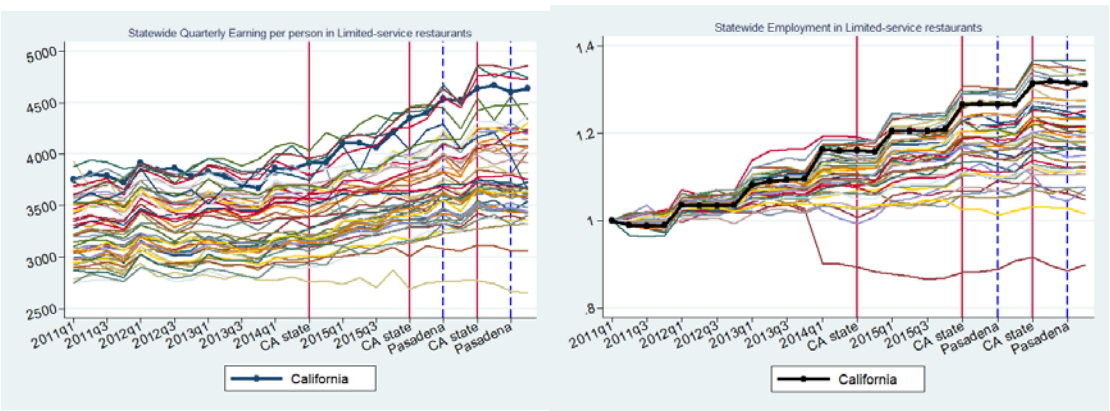




Figure C19 State Level Comparison of Earnings and Employment Growth  
 Supermarkets and other Grocery Stores



Limited-Service Restaurants:



Full-Service Restaurants:

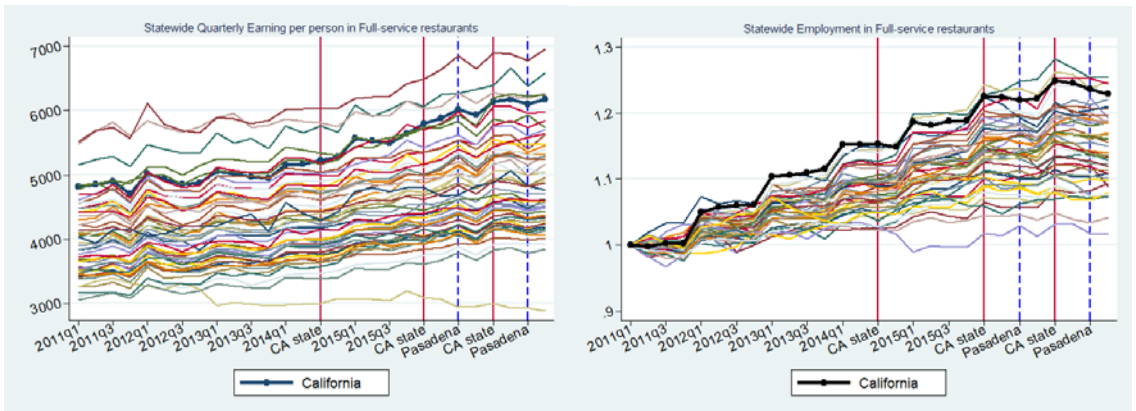
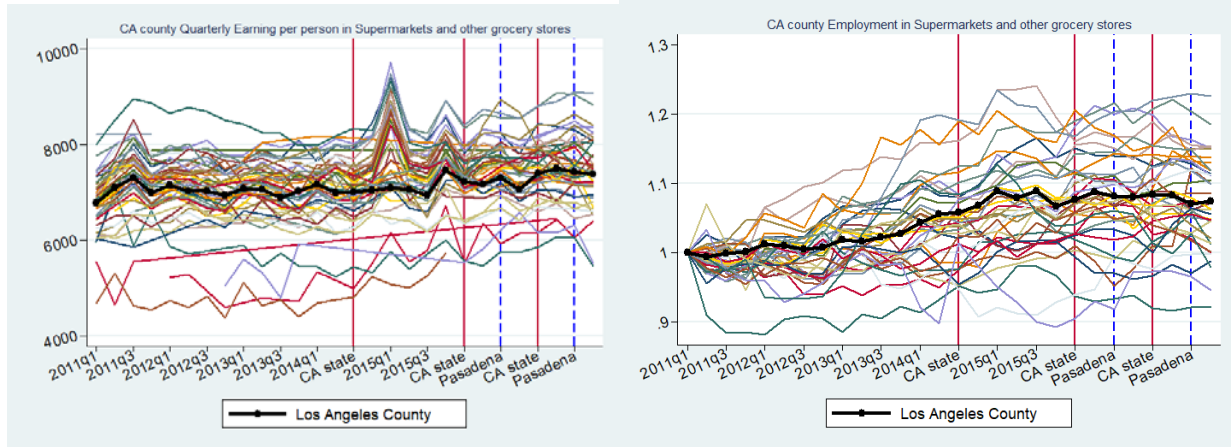
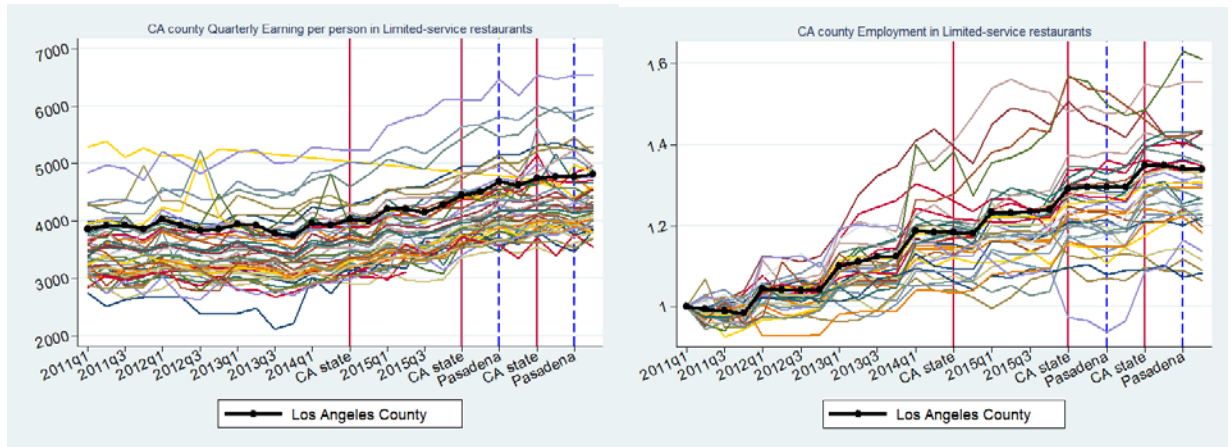


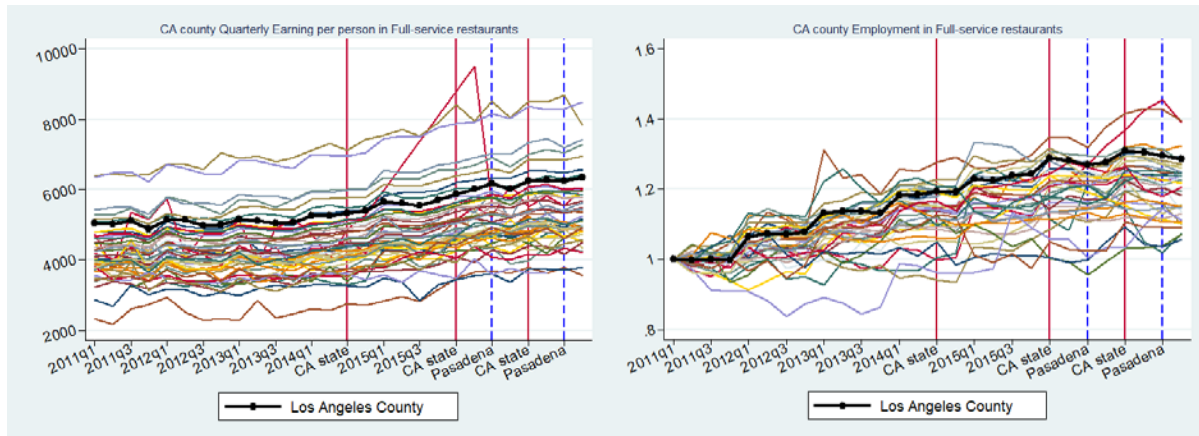
Figure C20 California County Level Comparison:  
Supermarkets and other Grocery Stores:



Limited-Service Restaurants:



Full-Service Restaurants:

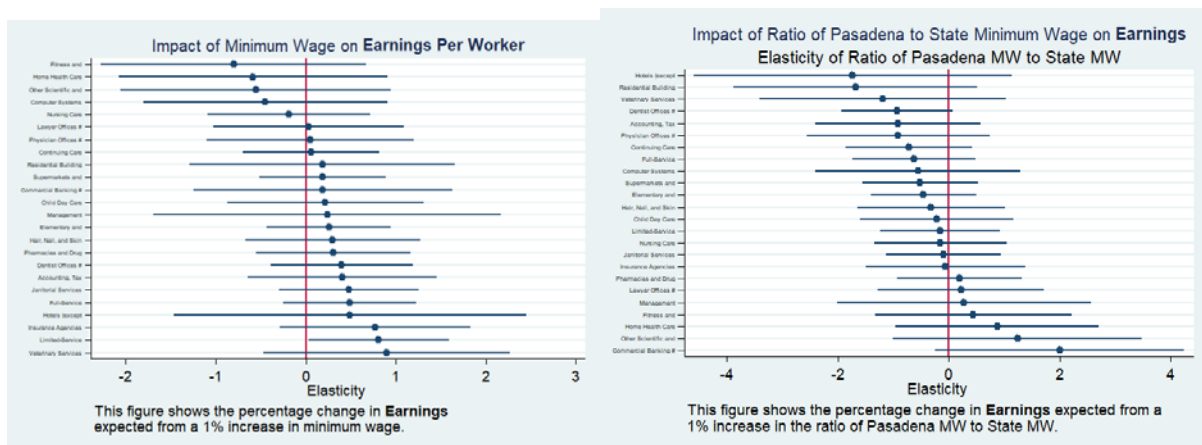


## Appendix D: Images of Estimated Error Bands

In this appendix we display the estimated effects of both the prevailing minimum wage inclusive of any local increment and also effect of the local increment. Impacts on earnings per worker, number of workers and number of establishments for each industry are displayed. Each estimate is surrounded with corresponding error bands around the estimate, plus or minus twice the standard error. When this error band excludes zero, the estimate is said to be “statistically significant.” These estimates are based on the preferred model described in detail above. The estimated impacts below include the estimated impact of minimum wages on all the industries for which we have a complete set of datapoints over our time period. Many of these industries are not comprised of many minimum wage workers, therefore we would not expect to find a strong impact of minimum wages on these industries at all.

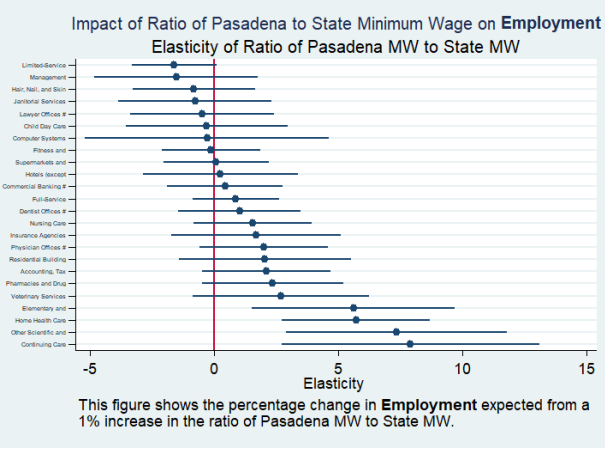
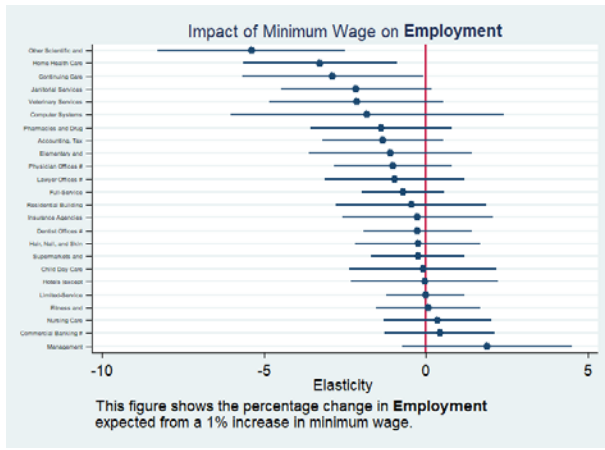
### Impact of minimum wage on earnings:

The below left figure presents the impact of minimum wage on earnings per worker by industry. Veterinary Service, Hotels, and Limited-Service restaurants have the largest point estimates. The below right figure shows that differential impact of a local Pasadena increment. A negative estimate indicates a smaller impact of a Pasadena minimum wage increase on earnings. Notice that nearly all of our results are not individually statistically significant.



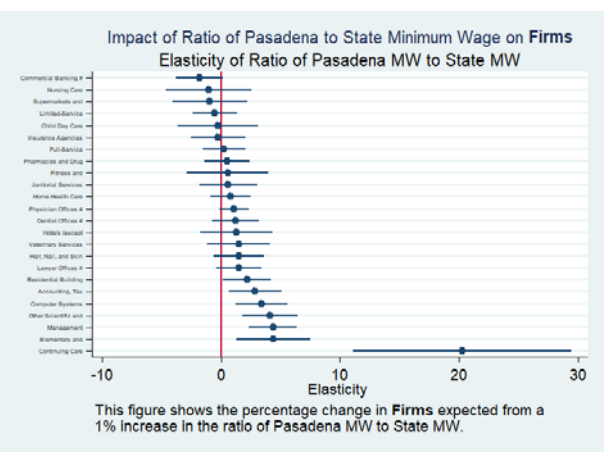
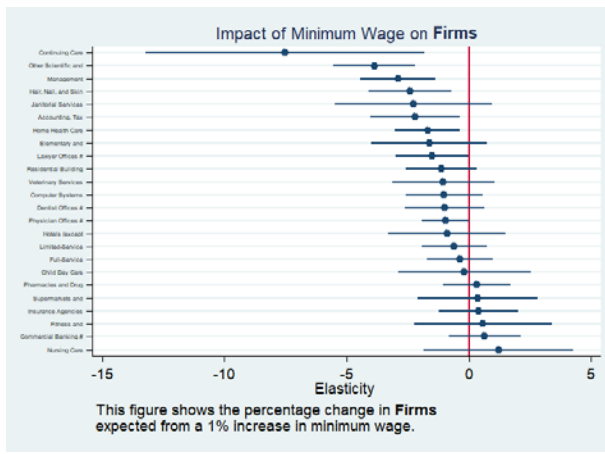
### The impact of minimum wage on employment

The below left figure presents the impact of minimum wage on employment by industry. Other scientific and technical consulting, Home health care, and Continuing care have the largest negative point estimates. The negative impact of minimum wage on the two consulting industries are quite surprising because they do not have a large proportion of their workforce working at minimum wage. Our analysis shows that these two industries have been shrinking nationwide as well. Furthermore, the broader category of consulting firms in general (NAICS code 541) has remained stable over this time period. Therefore there is evidence that the decrease is due to the reclassification of many firms in the “Other Technical Consulting” sector to a different consulting designation. The below right figure shows that differential impact of a local Pasadena increment. A negative estimate indicates a stronger negative impact of a Pasadena minimum wage increase on employment. Notice that nearly all of our results are not individually statistically significant.



**Impact of minimum wage on establishments**

The below left figure presents the impact of minimum wage on establishments by industry. Continuing care, Other scientific and technical consulting, and Management Consulting have the largest negative point estimates. Nursing and continuing care also exhibit negative establishment effects. The below right figure shows that differential impact of a local Pasadena increment. A negative estimate indicates a stronger negative impact of a Pasadena minimum wage increase on establishments. Notice that nearly all of our results are not individually statistically significant.



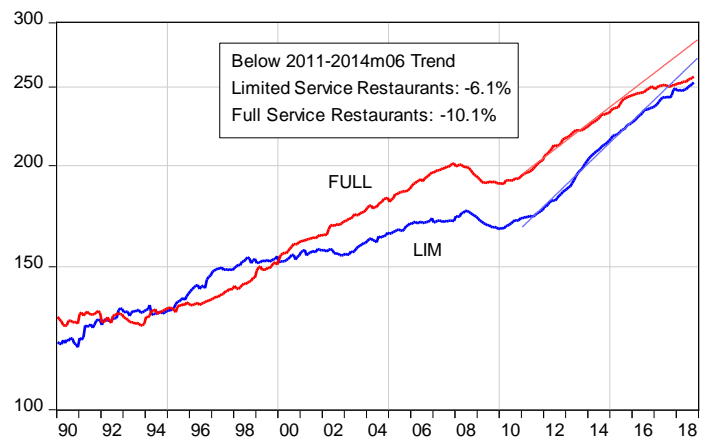
## Appendix E: Role of the Time Trend

Something the City Council needs to understand is that we are not studying a scientifically designed experiment that will reveal unambiguously the impact of the Pasadena minimum wage ordinance. The data cannot speak without help. An econometric model allows the data to speak to us, but what the data say depends on the features embodied in the model.

We have tried to deal with the model-dependence of our inferences from the data by studying a total of 24 different models. Our preferred model includes a time trend as one of the explanatory variables and this has a critical role in uncovering employment effects of minimum wage increases. The image below is intended to be an alert. This image depicts employment in full-service and limited-service restaurants in the Los Angeles- Long Beach – Anaheim MSA from 1990 to 2018q1. The vertical scale on the left is logarithmic which squeezes together the larger numbers. With this transformation, straight lines represent constant rates of growth. On top of the data for full-service restaurants we have laid a straight line representing the rate of growth from 2011 to 2014. A gap between this line and the actual data emerges in 2016 and grows to about 20 thousand jobs by 2018, around 10% of employment. There is a gap of 6.1% between the trend of employment in limited-service restaurants and the trend. This change in trend cries out for an explanation. It might be a minimum wage effect. But it might be something else.

One of the obvious omitted variables is the growth in the economy overall, measured perhaps by the total jobs. The next image depicts the shares of restaurant jobs among the total jobs in the area. The same trend analysis picks up a smaller amount of job loss: -0.2% in limited service restaurants and -0.4% in full service restaurants.

Employment in Full-Service and Limited-Service Restaurants  
in Los Angeles-Long Beach-Anaheim, CA (MSA)



Shares of Employment in Full-Service and Limited-Service Restaurants  
in Los Angeles-Long Beach-Anaheim, CA (MSA)

