

Minimum Wage Increases and Low-Wage Employment: Evidence from Seattle

Ekaterina Jardim, Mark C. Long, Robert Plotnick,
Emma van Inwegen, Jacob Vigdor, Hilary Wething

Online Appendix

Appendix A: Supplemental data analysis

For the most part, discussion of the tables and figures included in this appendix occurs in the text and footnotes of the published paper.

Figures A9 and A10 illustrate the sensitivity of the estimated effects on wages and hours (based on the synthetic control method applied to growth rates) to thresholds ranging from \$12 to \$25 per hour.¹ Figure A9 shows that as we raise the threshold towards \$25 per hour, the estimated effect on wage growth diminishes. This pattern is not surprising since as we raise the threshold the marginal jobs added to the sample are less likely to be affected by the minimum wage increase.²

Figure A10 illustrates results for the absolute number of hours worked, found by multiplying the estimated percentage effects on hours at different thresholds by the baseline number of hours worked in jobs paying below the threshold. The effects of raising the minimum wage to \$11, shown in the top panels, become insignificant once the threshold rises to around \$16-17 per hour. It appears that any “loss” in hours at lower thresholds likely reflects a cascade of workers to higher wage levels or affects too few workers to overcome statistical noise in larger samples. In contrast, in the bottom panels the negative effects of the second phase-in to \$13 are significant at the 5-percent level as we raise the threshold all of the way to \$25 per hour for 2016.1, and close to significant at all thresholds for 2016.2 and 2016.3.³ At the \$19 threshold, we attribute a loss of 3 million low-wage hours to the 2016 minimum wage increase. This point estimate varies little as we increase the threshold to \$25 per hour.

¹ More specifically, we evaluate jobs paying the highest minimum wage in Seattle in that quarter plus \$1 (i.e., \$12 for 2015.2-2015.4 and \$14 for 2016.1 to 2016.3) up to \$25 per hour.

² Estimated wage impacts are larger when the low-wage threshold is lowered below \$19. This result is consistent with the Ordinance having sizable effects on the lowest-paid workers and smaller cascading impacts on workers with initial wages closer to \$19. Alternatively, a smaller wage effect for larger wage thresholds is consistent with an attenuation bias when we pool affected and unaffected workers.

³ Note that confidence intervals for the final quarter, 2016.3, are wider than for 2016.1 and 2016.2 as β_9^{cum} is composed of a product containing three estimated coefficients (i.e., β_1 , β_5 , and β_9), whereas β_7^{cum} and β_8^{cum} are each only composed of a product containing two estimated coefficients.

Figure A11 takes a different approach to identifying cumulative effects. In this figure, each bar shows the estimated effects on hours worked within one-dollar wage bins using the synthetic control method applied to year-over-year growth rates in hours in this bin. The line in this figure shows the cumulative sum of the estimated impacts on hours worked. This figure is comparable in style to the analysis in Cengiz et al. (2019). Largely, this figure confirms the results shown in Figure A10, but suggests larger declines in hours. For example, for the third quarter of 2016, we estimate cumulative reductions of 3.68 million hours worked for wages below \$25. Our results contrast with Cengiz et al. (2019), who evaluate state-level minimum wages, as we do not find large increases in hours worked above the new minimum wage threshold that offset reductions in hours worked for wage below the new minimum. Additionally, this approach finds larger reductions in hours worked for low wages in response to the \$11 minimum wage in (e.g., 2.60 million fewer hours worked for wages below \$25 in fourth quarter of 2015). We believe that the approach shown in our main results in Figure 7, is a better method for evaluating changes in cumulative effects as our featured analysis directly estimates cumulative hours worked below a wage threshold rather than accumulating a set of estimates for wage bins, each of which is measured with error.

Figure A11 further shows bins going to \$40 and a final bin for cumulative hours for workers with wages above \$40. There is scant evidence that the loss in hours in low-wage jobs can be attributed to a rightward shift of the whole wage distribution. Through \$40 per hour, *which is more than 50% above the median wage in Seattle*, these results suggest a clawing back of at most 0.6-1 million hours. Increases in hours between \$25 and \$40 per hour is only notable for the third quarters of 2015 and 2016. There appear to be sizable gains in employment in high wage jobs (those paying above \$40), yet our estimates are noisy for this last bin, which is to be expected as Seattle doesn't have a good comparison group for such high wage employment in the state of WA. Seattle is generally outside of the convex hull of other PUMAs for the \$40+ bin and, as a result, we do not believe that the estimates of "impacts" for hours worked at wages above \$40 should be taken as reliably estimated.

Figure A13 shows the sensitivity of estimated labor demand elasticities for the aggregate analysis using different thresholds. These very large elasticities do not appear to be artifacts of setting the threshold at \$19 per hour. The upper panels show the conventional 95-percent confidence intervals, which get quite wide for higher thresholds due to lower estimated effects

on wages at higher wage thresholds. The bottom panels zoom-in on the 50-percent confidence intervals, which, arguably, might be more valuable information for policymakers. As shown more clearly in the lower part of Figure A13, the estimated elasticities are very close to -3 when the threshold is set anywhere between \$16 and \$25 per hour.⁴ At most thresholds, an elasticity of -1 is not within the 50-percent confidence intervals – the preponderance of the evidence suggests that hours fell more than wages rose in Seattle’s low-wage jobs.

Appendix B: Review of Causal Inference Strategies in Prior Literature

Many prior aggregate employment studies use variation in state-based minimum wages and estimate minimum wage-employment elasticities using a two-way fixed effect OLS regression (Neumark and Wascher 2008). This approach assumes parallel trends across treatment and control states and estimates the overall impact on wages and employment of multiple minimum wages over time. Applied in our context, this approach would involve city-fixed effects within Washington State.

The two-way fixed effect approach has come under criticism in recent years because of the geographic distribution of minimum wage adoption (Allegretto et al. 2016). States with higher minimum wages are concentrated in the Northeast and West coast, regions that have different employment patterns than states in the South and parts of the Midwest. If this underlying regional pattern affects state employment trends differentially, then the parallel trends assumption of the two-way fixed effects model does not hold. Subsequently, difference-in-difference estimation strategies that weight all states without a higher minimum wage equally as their control region may negatively bias employment elasticity estimates. This concern would apply to a parallel approach using Washington State data.

To account for this issue, researchers have argued for a variety of specifications. These include: use of local area controls, such as division-period fixed effects or a border discontinuity approach (Dube et al. 2010, 2016; Allegretto et al. 2011), use and order of region-specific time trends (Addison et al. 2012, 2014), use of a synthetic control to identify control regions with pre-

⁴ While it may be argued that our wage effects combine a large effect on the lowest-paid workers with near-zero impacts on those paid above \$13 per hour at baseline, this only implies an overestimated elasticity for the least-paid workers if the employment effects are somehow concentrated among higher-paid workers. Our evidence does not support this conjecture.

trend employment levels similar to the treatment region (Neumark et al. 2014), and linear factor estimation (Totty 2017).

Local area control designs assume that neighboring counties or states within a census division region are more similar in trends and levels than regions further away. Researchers using local-area controls (Dube et al. 2010, 2016; Allegretto et al. 2011) show strong and significant earnings elasticity estimates but insignificant employment elasticities near zero. While it is reasonable to think that nearby regions share many background characteristics with the treated region, a local area control design will yield biased estimates when policies have spillover effects in nearby areas, such as when businesses raise wages in response to a minimum wage increase in a nearby jurisdiction.⁵ Such a spillover effect would violate the “stable unit treatment value assumption” or SUTVA (Rubin, 1980).

A final approach has used linear factor estimation and interactive fixed effects, which relaxes the assumption of parallel trends in control and treatment regions by explicitly modelling unobserved regional trends. Totty (2017) utilizes Pesaran’s (2006) common correlated effects estimators as a linear factor estimation. Pesaran’s estimators do not estimate common factor and common factor loadings, like the interactive fixed effects estimator, but rather use cross-sectional averages of the dependent and independent variables as a proxy for factors. Totty also uses an interactive fixed effects estimator, similar the one we employ below, which involves estimating the common factors and factor loadings across space and over time and finds insignificant and null employment effects of minimum wages.

Appendix C: Decomposition Based on Longitudinal Analysis of Individual Jobs

To assess the importance of wage increases above the \$19 threshold, we decompose the year-over-year observed percentage change in low-wage hours worked as follows:

⁵ The notion that nearby regions offer the best match on background characteristics is itself a matter of debate. Using a synthetic matching estimator approach, Neumark et al. (2014) show that local areas are not picked as donors in the synthetic estimator of panel national data. Dube et al. (2016) rebut this claim, noting statistically significant larger mean absolute differences in covariates not related to the minimum wage for noncontiguous counties compared to contiguous counties.

$$(4) \quad \frac{h_t - h_{t-4}}{h_{t-4}} = \frac{\Delta h_{t,t-4}(\text{job stayers})}{h_{t-4}} + \frac{h_t(\text{hires})}{h_{t-4}} + \frac{h_t(\text{wage fell below \$19 threshold})}{h_{t-4}} + \frac{h_t(\text{missing wage in } t-4)}{h_{t-4}} - \frac{h_{t-4}(\text{separations})}{h_{t-4}} - \frac{h_t(\text{wage rose above \$19 threshold})}{h_{t-4}} - \frac{h_{t-4}(\text{missing wage in } t)}{h_{t-4}},$$

where h_t denotes quarterly hours worked in jobs paying less than \$19 per hour in period t . The year-over-year percentage change in this variable incorporates changes in hours among workers employed at low wages in both periods (i.e., job stayers), three additions and three subtractions. Additions include hours worked by newly hired low-wage employees, workers whose wages fell below the threshold, and those whose hourly wage was not observed at baseline (e.g., because of missing hours data). Subtractions include hours worked by employees no longer working at any wage level (i.e., separations), those who shift to working for wages above the threshold, and those whose wage is no longer observed. “Rightward shift” is reflected by the sixth term on the right-hand side of equation (4), hours we no longer include because the employee has received a raise above the threshold. As shown below, by not accounting for this sixth term, our methods may be overestimating the adverse effects on hours worked by around 1.0 percentage point.⁶ This decomposition offers some reassurance but cannot be fully definitive. The observed change in hours worked below a given wage threshold can be decomposed. We cannot, however, incorporate a term for the hours worked by new employees hired at wages over \$19 that would have been hired for lower wages in the absence of the minimum wage policy.

Our third evaluation of the rightward-shift hypothesis appears in Figure C1, which plots results from the decomposition described in section III.G, isolating the change in low-wage hours worked in Seattle attributable to longitudinally-tracked workers transitioning to wages above \$19.⁷ In the years before the minimum wage increase, workers transitioning from wages below \$19 to above \$19 from one year to the next account for between 7% and 13% of the baseline Seattle low-wage workforce. In Synthetic Seattle, this proportion tends to be somewhat lower, ranging between 5% and 11%. Thus, even in the absence of a Seattle-specific minimum

⁶ To conduct a decomposition of the total estimated effect, and to specifically evaluate the sixth term, we compute each term for Seattle, and compute a control group estimate by applying the same weights used by the synthetic control method that produced the results in the eighth column of Table 6 (i.e., under “Hours: S.C. Growth Rates”).

⁷ Results for the full decomposition described in equation (4) appear as Appendix Table C1.

wage increase, low-wage workers in the city are more likely to transition to higher paying work.⁸ This may reflect the relative concentration of colleges and universities in Seattle, as noted in section IV.C. For our purposes, the key question is whether this pre-existing difference widened considerably as Seattle’s minimum wage increased.

While the Seattle to Synthetic Seattle difference appears steady at about two percentage points for the first six quarters after passage, the gap widens to three percentage points by the end of the time series.⁹ These point estimates suggest that our methods overestimate the adverse effects on hours worked by around one percentage point. This finding suggests that the second phase-in to \$13 per hour caused an average decline in hours of 6.0%, rather than 7.0%. While we proceed with using the Table 6 results in computing elasticity estimates, readers may deflate them by one-seventh if they are persuaded that our methods have overstated employment impacts.

Appendix D: Restaurant industry analysis

Table D1 compares our results to those obtained from a more common methodology, analyzing restaurant industry employment. The first three columns repeat the main synthetic control year-over-year growth rates results from Table 6. The middle three columns evaluate impacts on all jobs in the restaurant industry using synthetic control methodology, as in Reich et al. (2017). Note that the quality of the synthetic match is poor in these specifications relative to the main results, with RMSPE values three to four times higher across specifications. While it may be said that Seattle’s low wage labor market bears a strong resemblance to that elsewhere in the state, it is apparent that the city’s restaurant labor market does not. This may reflect the higher concentration of high-end eateries in a relatively high-income city.

⁸ Seattle also had persistently higher rates of hires of workers earning less than \$19 per hour than Synthetic Seattle (i.e., the first term in equation (4) was persistently positive) during the entire pre-Ordinance period, averaging about 5%, and had a persistently higher rate of separations (i.e., the second term) of about 2%-3%. The offsetting combination of the first, second, and sixth terms of equation (4) produced the tight fit of growth in hours worked in Seattle and Synthetic Seattle shown in Panel B of Figure 3.

⁹ The vast majority of the overall change in growth of hours worked for wages under \$19 came from a large decline in the first term of equation (4) (i.e., growth rate of hours worked from newly hired workers earning less than \$19 per hour), which dropped from a pre-Ordinance average of about +5% to about -2% in the quarters following the increase to \$13. While a more gradual trend in this difference might suggest a phenomenon where jobs in Seattle were gradually transitioning to higher wages at the point of hire, the sudden difference coincident with the minimum wage increase suggests a simple reduction in hiring.

With this caveat in mind, estimates show that wages paid to Seattle’s restaurant workers increased substantially and significantly relative to Synthetic Seattle after passage of the law. Significant wage effects can be seen before the Ordinance was actually implemented, along with positive effects on employment at the extensive margin. Together, these results suggest that Seattle’s restaurant labor market received a positive demand shock relative to the synthetic control region in late 2014, which complicates analysis of later developments.¹⁰ Wage effects amplify in 2015 and 2016, to magnitudes larger than those seen in our main analysis. Estimates of employment effects, whether measured in hours or beginning-of-quarter jobs, are statistically insignificant once the minimum wage begins increasing. While one could interpret these findings as suggestive of a positive wage effect of the minimum wage ordinance alongside zero employment impact, evidence of a confounding trend reduces confidence in this conclusion.

The last three columns of Table D1 restrict the analysis to restaurant employment in jobs that pay less than \$19 per hour, and thus are more directly comparable to the first three columns. We caution once again that the quality of the pre-policy match between Seattle and the synthetic control region is relatively poor, hence the estimates relatively imprecise. Wage effects are fairly precise and substantial, with the \$13 minimum wage associated with a 6.6% boost, roughly twice the magnitude of our main estimates. The larger magnitude here could reflect a higher concentration of lower-paying jobs in the industry, conditional on paying under \$19 per hour. It could also reflect the influence of confounding trends. There is once again evidence of positive wage effects in the pre-implementation period, though not in this case accompanied by significant employment impacts.

Point estimates indicate that the \$13 minimum wage reduced hours by 10-11%. An analysis of low-wage jobs in the restaurant industry, rather than all jobs in the restaurant industry, yields conclusions comparable to analysis of the entire low-wage job market. To be fair, this analysis is subject to rightward-shift concerns comparable to those in our main analysis. Nonetheless, it is instructive to note that using the restaurant-industry methodology common in existing literature yields results quite similar to those in prior studies, while raising concerns regarding the validity of those methods in light of apparent pre-implementation divergence in the restaurant labor market.

¹⁰ A falsification test examining the nine-quarter period beginning in 2012 reveals additional acceleration of wages in Seattle relative to the control region.

Table A1. Number of Jobs in Seattle's Locatable Establishments, by Industry and Wage Level

| Industry (NAICS Sector) | All Employees | | | Employees Paid <\$19 per Hour | | |
|--|----------------------------|------------------------------|-------------------|-------------------------------|------------------------------|-------------------|
| | Included in Analysis | Excluded from Analysis | Share Included | Included in Analysis | Excluded from Analysis | Share Included |
| Agriculture, Forestry, Fishing and Hunting | 62,412 | 19,922 | 75.8% | 52,001 | 16,913 | 75.5% |
| Mining, Quarrying, and Oil and Gas Extraction | 1,672 | 885 | 65.4% | 324 | 97 | 76.9% |
| Utilities | 6,903 | 7,512 | 47.9% | 693 | 313 | 68.9% |
| Construction | 132,064 | 19,420 | 87.2% | 32,255 | 3,503 | 90.2% |
| Manufacturing | 148,163 | 129,881 | 53.3% | 61,907 | 20,061 | 75.5% |
| Wholesale Trade | 74,819 | 45,185 | 62.3% | 26,800 | 14,736 | 64.5% |
| Retail Trade | 137,500 | 175,024 | 44.0% | 86,998 | 116,205 | 42.8% |
| Transportation and Warehousing | 47,772 | 47,329 | 50.2% | 18,169 | 10,142 | 64.2% |
| Information | 73,490 | 31,685 | 69.9% | 7,714 | 6,817 | 53.1% |
| Finance and Insurance | 36,823 | 59,111 | 38.4% | 9,446 | 16,701 | 36.1% |
| Real Estate and Rental and Leasing | 32,184 | 14,242 | 69.3% | 16,260 | 6,986 | 69.9% |
| Professional, Scientific, and Technical Services | 118,649 | 33,067 | 78.2% | 22,762 | 6,360 | 78.2% |
| Management of Companies and Enterprises | 3,896 | 3,801 | 50.6% | 471 | 1,138 | 29.3% |
| Admin. and Support and Waste Mgmt. and Remediation Serv. | 98,437 | 53,451 | 64.8% | 49,645 | 34,242 | 59.2% |
| Educational Services | 182,502 | 64,196 | 74.0% | 59,582 | 16,298 | 78.5% |
| Health Care and Social Assistance | 189,124 | 130,104 | 59.2% | 82,314 | 53,030 | 60.8% |
| Arts, Entertainment, and Recreation | 51,797 | 8,654 | 85.7% | 33,060 | 5,117 | 86.6% |
| Accommodation and Food Services | 134,570 | 80,558 | 62.6% | 107,948 | 60,987 | 63.9% |
| Other Services (except Public Administration) | 60,077 | 19,842 | 75.2% | 31,743 | 13,151 | 70.7% |
| Public Administration | 83,764 | 63,704 | 56.8% | 15,686 | 9,911 | 61.3% |
| Total | 1,676,653 | 1,007,585 | 62.5% | 715,808 | 412,715 | 63.4% |

Notes: Data derived from administrative employment records obtained from the Washington Employment Security Department. Firms are defined by federal tax Employer Identification Numbers. Statistics are computed for the average quarter between 2005.1 to 2016.3. "Excluded from Analysis" includes two categories of firms: (1) Multi-location firms (flagged as such in UI data), and (2) Single-location firms which operate statewide or whose location could not be determined.

Table A2: Number of Jobs in Locatable Establishments, by Wage Level

| Table 1: Number of Jobs in Retail Establishments, by Wage Level | | | | | | | | |
|---|--|------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|----------------------------|
| Quarter | Quarters After Passage / Enforcement | Number of Jobs | | | | | | |
| | | Wages Under \$13 | Wages \$13-\$19 | Wages \$19-\$25 | Wages \$25-\$30 | Wages \$30-\$35 | Wages \$35-\$40 | Wages \$40 and Above |
| <i>Panel A: Seattle</i> | | | | | | | | |
| 2014.2 | 0 | 38,013 | 52,744 | 44,357 | 28,049 | 22,039 | 20,480 | 87,575 |
| 2014.3 | 1 | 38,906 | 53,939 | 44,108 | 27,642 | 21,873 | 20,166 | 94,846 |
| 2014.4 | 2 | 33,949 | 53,830 | 43,614 | 29,146 | 23,091 | 21,030 | 99,461 |
| 2015.1 | 3 | 33,438 | 55,320 | 43,484 | 29,068 | 23,259 | 21,050 | 100,085 |
| 2015.2 | 4/1 | 33,380 | 57,146 | 45,719 | 30,263 | 24,079 | 19,392 | 102,371 |
| 2015.3 | 5/2 | 32,363 | 59,044 | 45,385 | 30,350 | 24,052 | 21,604 | 108,753 |
| 2015.4 | 6/3 | 28,516 | 56,674 | 44,776 | 30,795 | 24,318 | 22,626 | 113,590 |
| 2016.1 | 7/4 | 23,292 | 62,326 | 46,117 | 31,004 | 24,803 | 22,374 | 113,520 |
| 2016.2 | 8/5 | 25,053 | 64,135 | 49,771 | 32,443 | 25,876 | 23,120 | 115,779 |
| 2016.3 | 9/6 | 23,896 | 63,857 | 49,451 | 31,550 | 25,051 | 23,297 | 123,653 |
| <i>Panel B: Washington State, Excluding Seattle</i> | | | | | | | | |
| 2014.2 | 0 | 384,871 | 375,096 | 264,934 | 147,109 | 109,039 | 89,161 | 320,431 |
| 2014.3 | 1 | 407,189 | 371,539 | 265,634 | 150,630 | 109,265 | 85,610 | 355,287 |
| 2014.4 | 2 | 363,477 | 389,002 | 270,684 | 161,085 | 117,072 | 94,220 | 348,300 |
| 2015.1 | 3 | 364,759 | 378,662 | 262,050 | 156,912 | 114,000 | 93,630 | 340,416 |
| 2015.2 | 4/1 | 364,390 | 395,654 | 272,725 | 157,239 | 114,294 | 91,567 | 349,290 |
| 2015.3 | 5/2 | 375,648 | 395,554 | 272,598 | 162,801 | 116,637 | 90,992 | 395,276 |
| 2015.4 | 6/3 | 338,312 | 405,489 | 275,875 | 166,989 | 121,529 | 96,530 | 380,988 |
| 2016.1 | 7/4 | 336,045 | 394,867 | 269,599 | 163,559 | 118,733 | 95,149 | 360,242 |
| 2016.2 | 8/5 | 346,153 | 415,777 | 290,745 | 161,408 | 119,439 | 95,953 | 372,448 |
| 2016.3 | 9/6 | 348,872 | 404,641 | 281,151 | 161,555 | 117,832 | 91,963 | 404,124 |

Note: Data derived from administrative employment records obtained from the Washington Employment Security Department. Wages have been adjusted for inflation using CPI-W. Non-locatable employers (i.e., multi-location single-account firms and single-location firms which operate statewide or whose location could not be determined) are excluded.

Table A3: Growth in Jobs by Industry During the Year Before the Ordinance was Passed

| | Seattle | | | | Synthetic Seattle | | | |
|---|----------------|--------|--------|-----------------|-------------------|--------|--------|-----------------|
| | | | Change | Share of Change | | | Change | Share of Change |
| | Number of Jobs | | | | Number of Jobs | | | |
| <i>Panel A: Jobs Paying Less Than \$19 Per Hour</i> | 2013.2 | 2014.2 | | | 2013.2 | 2014.2 | | |
| Industry | | | | | | | | |
| Admin./Support & Waste Mgmt./Remediation Serv. | 6,072 | 7,819 | 1,747 | 39% | 1,000 | 1,137 | 137 | 21% |
| Accommodation and Food Services | 21,015 | 22,087 | 1,072 | 24% | 2,102 | 2,200 | 99 | 15% |
| Health Care and Social Assistance | 11,251 | 11,652 | 401 | 9% | 1,574 | 1,655 | 81 | 12% |
| Retail Trade | 7,398 | 7,655 | 257 | 6% | 3,315 | 3,366 | 51 | 8% |
| Construction | 1,877 | 2,130 | 253 | 6% | 624 | 712 | 87 | 13% |
| Real Estate and Rental and Leasing | 3,390 | 3,624 | 234 | 5% | 229 | 235 | 6 | 1% |
| Arts, Entertainment, and Recreation | 4,044 | 4,241 | 197 | 4% | 786 | 778 | -8 | -1% |
| Other Services (except Public Administration) | 5,916 | 6,037 | 121 | 3% | 678 | 693 | 16 | 2% |
| Educational Services | 4,295 | 4,407 | 112 | 3% | 1,787 | 1,855 | 68 | 10% |
| Wholesale Trade | 3,238 | 3,342 | 104 | 2% | 481 | 484 | 3 | 1% |
| Finance and Insurance | 1,477 | 1,559 | 82 | 2% | 186 | 183 | -3 | 0% |
| Professional, Scientific, and Technical Services | 4,982 | 4,993 | 11 | 0% | 495 | 520 | 25 | 4% |
| Small Seattle Industries Combined* | 327 | 332 | 5 | 0% | 1,083 | 1,064 | -19 | -3% |
| Information | 1,653 | 1,619 | -34 | -1% | 195 | 213 | 18 | 3% |
| Manufacturing | 6,488 | 6,450 | -38 | -1% | 1,712 | 1,810 | 97 | 15% |
| Transportation and Warehousing | 2,865 | 2,810 | -55 | -1% | 348 | 376 | 28 | 4% |
| Total | 86,615 | 91,089 | 4,474 | 100% | 17,680 | 18,346 | 667 | 100% |
| Percentage Change in Jobs | 5.2% | | | | 3.8% | | | |

Table continues next page

Panel B: Jobs Paying Greater Than or Equal to \$19 Per Hour

| Industry | | | | | | | | |
|--|---------|---------|--------|------|--------|--------|-----|------|
| Retail Trade | 16,011 | 19,472 | 3,461 | 32% | 1,364 | 1,418 | 54 | 13% |
| Finance and Insurance | 8,963 | 11,334 | 2,371 | 22% | 404 | 399 | -6 | -1% |
| Professional, Scientific, and Technical Services | 40,791 | 42,482 | 1,691 | 15% | 1,552 | 1,584 | 32 | 8% |
| Information | 12,784 | 14,081 | 1,297 | 12% | 418 | 388 | -29 | -7% |
| Accommodation and Food Services | 10,117 | 11,043 | 926 | 8% | 376 | 393 | 17 | 4% |
| Health Care and Social Assistance | 21,878 | 22,586 | 708 | 6% | 1,904 | 1,901 | -3 | -1% |
| Other Services (except Public Administration) | 8,601 | 9,267 | 666 | 6% | 517 | 526 | 8 | 2% |
| Educational Services | 13,464 | 13,815 | 351 | 3% | 2,973 | 3,038 | 64 | 15% |
| Admin./Support & Waste Mgmt./Remediation Svcs | 5,485 | 5,831 | 346 | 3% | 629 | 676 | 47 | 11% |
| Construction | 12,072 | 12,367 | 295 | 3% | 1,901 | 2,008 | 106 | 25% |
| Real Estate and Rental and Leasing | 4,949 | 5,243 | 294 | 3% | 199 | 196 | -3 | -1% |
| Arts, Entertainment, and Recreation | 3,611 | 3,889 | 278 | 3% | 487 | 460 | -27 | -6% |
| Wholesale Trade | 7,886 | 8,018 | 132 | 1% | 928 | 944 | 15 | 4% |
| Manufacturing | 10,229 | 10,279 | 50 | 0% | 2,408 | 2,449 | 40 | 10% |
| Small Seattle Industries Combined* | 1,770 | 1,642 | -128 | -1% | 4,258 | 4,296 | 38 | 9% |
| Transportation and Warehousing | 12,800 | 11,151 | -1,649 | -15% | 452 | 484 | 32 | 8% |
| Total | 193,181 | 204,142 | 10,961 | 100% | 25,031 | 25,455 | 423 | 100% |
| Percentage Change in Jobs | 5.7% | | | | 1.7% | | | |

Notes: Data derived from administrative employment records obtained from the Washington Employment Security Department. Wages have been adjusted for inflation using CPI-W. Non-locatable employers (i.e., multi-location single-account firms and single-location firms which operate statewide or whose location could not be determined) are excluded. "Small Seattle Industries" include Utilities; Mining, Quarrying, and Oil and Gas Extraction; Public Administration; Management of Companies and Enterprises; and Agriculture, Forestry, Fishing and Hunting. These industry totals are combined to address disclosure concerns, particularly for jobs paying less than \$19 per hour.

Table A4: Robustness Check Comparing Estimated Effects Using Synthetic Control Method with Outcome-Specific Weights for PUMAs (i.e., Preferred Method) to Synthetic Control Method with Common Weights across Outcomes

| Quarter | Quarter since Passage / Enforcement | Wages | | Hours | | Jobs | | Payroll | |
|------------------|---|---------------------|---------------------|----------------------|----------------------|---------------------|--------------------|---------------------|-------------------|
| | | Specific Weights | Common Weights | Specific Weights | Common Weights | Specific Weights | Common Weights | Specific Weights | Common Weights |
| 2014.3 | 1 | 0.002 [0.585] | 0.002 [0.653] | 0.002 [0.916] | -0.006 [0.824] | 0.002 [0.924] | -0.007 [0.843] | -0.001 [0.946] | -0.004 [0.896] |
| 2014.4 | 2 | 0.003 [0.465] | 0.007 [0.102] | 0.006 [0.713] | 0.004 [0.83] | -0.002 [0.892] | -0.007 [0.829] | 0.012 [0.479] | 0.011 [0.561] |
| 2015.1 | 3 | 0.002 [0.598] | 0.006 [0.165] | -0.018 [0.336] | -0.016 [0.443] | 0.007 [0.659] | 0.01 [0.539] | -0.004 [0.836] | -0.011 [0.679] |
| 2015.2 | 4/1 | 0.011** [0.029] | 0.016*** [0.000] | -0.006 [0.756] | -0.005 [0.799] | -0.010 [0.549] | -0.01 [0.553] | 0.017 [0.399] | 0.011 [0.55] |
| 2015.3 | 5/2 | 0.016*** [0.006] | 0.023*** [0.001] | -0.027 [0.356] | -0.021 [0.476] | -0.011 [0.576] | -0.014 [0.555] | 0.006 [0.847] | 0.000 [0.991] |
| 2015.4 | 6/3 | 0.019*** [0.000] | 0.022*** [0.000] | -0.006 [0.894] | -0.014 [0.763] | -0.033 [0.391] | -0.025 [0.532] | 0.025 [0.614] | 0.007 [0.877] |
| 2016.1 | 7/4 | 0.030*** [0.000] | 0.037*** [0.000] | -0.087*** [0.005] | -0.069*** [0.012] | -0.038 [0.293] | -0.011 [0.741] | -0.032 [0.416] | -0.034 [0.307] |
| 2016.2 | 8/5 | 0.031*** [0.000] | 0.037*** [0.000] | -0.066*** [0.022] | -0.058* [0.051] | -0.052* [0.076] | -0.048* [0.054] | -0.013 [0.739] | -0.024 [0.472] |
| 2016.3 | 9/6 | 0.033*** [0.000] | 0.039*** [0.000] | -0.092* [0.051] | -0.077 [0.115] | -0.072* [0.067] | -0.058 [0.203] | -0.037 [0.519] | -0.042 [0.455] |
| Pre-Policy RMSPE | | 0.003 | 0.005 | 0.013 | 0.022 | 0.013 | 0.021 | 0.012 | 0.021 |
| Obs | | 1,890 | 1,890 | 1,890 | 1,890 | 1,890 | 1,890 | 1,890 | 1,890 |

Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. Estimates for all jobs paying < \$19 in all industries. Estimates using Synthetic Control reported. Cumulative effect since 2014.2 is reported. Dependent variable is year-over-year growth rate in each outcome. "Specific weights" denote coefficients generated using weighting for control region PUMAs that is specific for the particular outcome. "Common weights" denote coefficients generated using weighting for control region PUMAs that is common across outcomes. P-value for a two-tailed test of the hypothesis that the coefficient equals to zero are reported in square brackets. P-values are calculated based on permutation. RMSPE shows the root mean squared prediction error for the synthetic control's pre-policy predictions. The number of observations used in the synthetic control specification equals the number of PUMAs (45) times the number of quarters included in this analysis (42). However, note that some of these PUMAs receive zero weight in the synthetic control results. ***, **, and * denote statistical significance using a two-tailed test with $p \leq 0.01$, 0.05 , and 0.10 , respectively.

Table A5: Sensitivity of Estimated Effects on Growth Rates in Outcomes using Synthetic Control Without Matching on the 4 Quarters Prior to the Ordinance

| Quarter | Quarters After Passage / Enforcement | Wages | Hours | Jobs | Payroll |
|------------------|--------------------------------------|---------------------|----------------------|--------------------|-------------------|
| | | S.C. Growth Rates | S.C. Growth Rates | S.C. Growth Rates | S.C. Growth Rates |
| 2014.3 | 1 | 0.004 [0.235] | 0.001 [0.944] | 0.001 [0.965] | -0.003 [0.870] |
| 2014.4 | 2 | 0.004 [0.372] | 0.007 [0.718] | -0.003 [0.892] | 0.012 [0.548] |
| 2015.1 | 3 | 0.003 [0.464] | -0.019 [0.299] | 0.007 [0.669] | -0.005 [0.791] |
| 2015.2 | 4/1 | 0.012*** [0.016] | -0.006 [0.748] | -0.009 [0.616] | 0.018 [0.380] |
| 2015.3 | 5/2 | 0.019*** [0.004] | -0.028 [0.364] | -0.011 [0.671] | 0.002 [0.939] |
| 2015.4 | 6/3 | 0.020*** [0.000] | -0.008 [0.858] | -0.033 [0.473] | 0.021 [0.644] |
| 2016.1 | 7/4 | 0.032*** [0.000] | -0.087*** [0.005] | -0.037 [0.330] | -0.037 [0.321] |
| 2016.2 | 8/5 | 0.034*** [0.000] | -0.066*** [0.022] | -0.052 [0.104] | -0.016 [0.690] |
| 2016.3 | 9/6 | 0.038*** [0.000] | -0.092* [0.054] | -0.073* [0.100] | -0.042 [0.472] |
| R2 | | | | | |
| Pre-Policy RMSPE | | 0.003 | 0.014 | 0.013 | 0.013 |
| Obs | | 1,710 | 1,710 | 1,710 | 1,710 |

Notes: Source: UI records from WA. Sample: Workers at single-location firms. Wages have been adjusted for inflation using CPI-W. Estimates for all jobs paying < \$19 in all industries. Estimates using Synthetic Control reported. Cumulative effect since 2014.2 is reported. Dependent variable in levels specifications is the level of each outcome divided by five, except for mean wages. Dependent variable in growth rates specification is year-over-year percentage change in each outcome. P-value for a two-tailed test of the hypothesis that the coefficient equals to zero are reported in square brackets. P-values are calculated based on permutation. RMSPE shows the root mean squared prediction error for the Synthetic Controls' pre-policy predictions. The number of observations used in the synthetic control specification equals the number of PUMAs (45) times the number of quarters included in this analysis (38). However, note that some of these PUMAs receive zero weight in the synthetic control results. ***, **, and * denote statistical significance using a two-tailed test with $p \leq 0.01$, 0.05, and 0.10, respectively.

Table A6: Falsification Test: Pseudo-Effect of Placebo Law Passed in 2012

| Quarter | Quarters After Pseudo Passage / Enforcement | Synthetic Control | | Interactive Fixed Effects | |
|------------------|---|----------------------|--------------------|------------------------------|-------------------|
| | | Wage | Hours | Wage | Hours |
| 2012.3 | 1 | 0.003 [0.417] | -0.025* [0.076] | -0.003 [0.384] | -0.009 [0.326] |
| 2012.4 | 2 | 0.003 [0.357] | -0.024 [0.398] | -0.001 [0.641] | -0.018 [0.418] |
| 2013.1 | 3 | 0.002 [0.526] | -0.007 [0.826] | 0.001 [0.658] | -0.022 [0.541] |
| 2013.2 | 4/1 | 0.002 [0.615] | -0.007 [0.828] | 0.000 [0.908] | -0.005 [0.900] |
| 2013.3 | 5/2 | 0.006 [0.305] | -0.028 [0.358] | -0.005 [0.251] | -0.026 [0.504] |
| 2013.4 | 6/3 | 0.006 [0.186] | -0.039 [0.411] | -0.003 [0.504] | -0.034 [0.487] |
| 2014.1 | 7/4 | 0.006 [0.185] | 0.008 [0.844] | -0.004 [0.325] | -0.008 [0.848] |
| 2014.2 | 8/5 | 0.008* [0.097] | -0.009 [0.800] | -0.001 [0.857] | -0.006 [0.882] |
| 2014.3 | 9/6 | 0.011 [0.192] | -0.020 [0.633] | -0.005 [0.365] | -0.014 [0.749] |
| Average | | 0.005 | -0.017 | -0.002 | -0.016 |
| R^2 | | | | 0.800 | 0.981 |
| Pre-Policy RMSPE | | 0.003 | 0.013 | | |
| Obs. | | 1,530 | 1,530 | 1,530 | 1,530 |

Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. Estimates for all jobs paying < \$19 in all industries. Cumulative effect since 2012.2 is reported. Dependent variable in all regressions is year-over-year growth rate in each outcome. P-value for a two-tailed test of the hypothesis that the coefficient equals to zero are reported in square brackets. P-values are calculated based on permutation inference for synthetic control and based on i.i.d. standard errors for interactive fixed effects. RMSPE shows the root mean squared prediction error for the synthetic control's pre-policy predictions of year-over-year growth. The number of observations used in the synthetic control and interactive fixed effects specifications equals the number of PUMAs (45) times the number of quarters included in this analysis (34). However, note that some of these PUMAs receive zero weight in the synthetic control results. ***, **, and * denote statistical significance using a two-tailed test with $p \leq 0.01$, 0.05 , and 0.10 , respectively.

**Table A7: Estimated Effect of the Seattle Minimum Wage Ordinance on Wages, Employment, Hours Worked, and Earnings
Conditional on Employment in 2015.1 Paying Less Than \$11 Per Hour**

| | Treated Cohort | | | | | | | Pseudo-Treated Cohort | | | | | | |
|--|----------------|----------|----------|----------|----------|----------|----------|-----------------------|---------|---------|---------|---------|---------|---------|
| <i>Panel A: Effect on Wages</i> | 2015.1 | 2015.2 | 2015.3 | 2015.4 | 2016.1 | 2016.2 | 2016.3 | 2012.1 | 2012.2 | 2012.3 | 2012.4 | 2013.1 | 2013.2 | 2013.3 |
| Treated (Seattle Workers), Mean | \$10.06 | \$11.53 | \$12.39 | \$13.16 | \$13.74 | \$14.08 | \$15.08 | \$9.96 | \$10.73 | \$11.13 | \$11.75 | \$11.74 | \$12.20 | \$12.68 |
| Control (Matched Workers), Mean | \$10.06 | \$10.60 | \$11.51 | \$11.82 | \$11.76 | \$12.12 | \$12.84 | \$9.96 | \$10.43 | \$10.85 | \$11.26 | \$11.08 | \$11.44 | \$11.94 |
| Difference (Bias Corrected) | \$0.00 | \$0.96 | \$0.93 | \$1.38 | \$2.01 | \$1.99 | \$2.30 | \$0.01 | \$0.33 | \$0.31 | \$0.52 | \$0.68 | \$0.78 | \$0.78 |
| Difference-in-Differences | | \$0.97 | \$0.93 | \$1.38 | \$2.01 | \$1.99 | \$2.31 | | \$0.32 | \$0.30 | \$0.51 | \$0.66 | \$0.77 | \$0.76 |
| Diff-in-Diff-in-Diff | | \$0.65 | \$0.63 | \$0.88 | \$1.35 | \$1.22 | \$1.54 | | | | | | | |
| Block bootstrapped std. err. | | (\$0.04) | (\$0.06) | (\$0.07) | (\$0.07) | (\$0.08) | (\$0.11) | | | | | | | |
| <i>p</i> -value | | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | | | | | | | |
| <i>Panel B: Effect on Employment</i> | | | | | | | | | | | | | | |
| Treated (Seattle Workers), Mean | 1.000 | 0.858 | 0.788 | 0.731 | 0.696 | 0.694 | 0.681 | 1.000 | 0.874 | 0.811 | 0.757 | 0.720 | 0.714 | 0.708 |
| Control (Matched Workers), Mean | 1.000 | 0.860 | 0.791 | 0.725 | 0.696 | 0.703 | 0.674 | 1.000 | 0.871 | 0.808 | 0.755 | 0.710 | 0.716 | 0.705 |
| Difference (Bias Corrected) | 0.000 | 0.001 | 0.002 | 0.011 | 0.005 | -0.005 | 0.011 | 0.000 | 0.005 | 0.007 | 0.006 | 0.013 | 0.001 | 0.006 |
| Difference-in-Differences | | 0.001 | 0.002 | 0.011 | 0.005 | -0.005 | 0.011 | | 0.005 | 0.007 | 0.006 | 0.013 | 0.001 | 0.006 |
| Diff-in-Diff-in-Diff | | -0.004 | -0.005 | 0.004 | -0.008 | -0.005 | 0.005 | | | | | | | |
| Block bootstrapped std. err. | | (0.005) | (0.006) | (0.006) | (0.007) | (0.007) | (0.007) | | | | | | | |
| <i>p</i> -value | | 0.417 | 0.372 | 0.495 | 0.240 | 0.433 | 0.438 | | | | | | | |
| <i>Panel C: Effect on Quarterly Hours Worked</i> | | | | | | | | | | | | | | |
| Treated (Seattle Workers), Mean | 239.4 | 251.5 | 255.3 | 238.9 | 212.3 | 225.7 | 235.9 | 258.8 | 277.0 | 279.4 | 260.3 | 237.6 | 251.4 | 259.1 |
| Control (Matched Workers), Mean | 236.5 | 260.8 | 260.8 | 236.1 | 215.5 | 235.9 | 239.4 | 256.9 | 274.2 | 276.6 | 253.4 | 230.6 | 250.4 | 257.8 |
| Difference (Bias Corrected) | 8.5 | -5.7 | -2.2 | 6.0 | -0.2 | -7.2 | -0.7 | 5.5 | 5.4 | 5.3 | 9.2 | 9.2 | 3.1 | 3.3 |
| Difference-in-Differences | | -14.3 | -10.7 | -2.6 | -8.7 | -15.8 | -9.3 | | -0.2 | -0.2 | 3.7 | 3.6 | -2.4 | -2.2 |
| Diff-in-Diff-in-Diff | | -14.1 | -10.5 | -6.3 | -12.4 | -13.3 | -7.1 | | | | | | | |
| Block bootstrapped std. err. | | (2.1) | (2.7) | (2.9) | (2.7) | (3.0) | (3.2) | | | | | | | |
| <i>p</i> -value | | 0.000 | 0.000 | 0.030 | 0.000 | 0.000 | 0.027 | | | | | | | |

Table Continues Next Page

Panel D: Effect on Quarterly Earnings

| | | | | | | | | | | | | | | |
|---------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Treated (Seattle Workers), Mean | \$2,417 | \$2,922 | \$3,228 | \$3,146 | \$2,939 | \$3,199 | \$3,531 | \$2,601 | \$2,989 | \$3,124 | \$3,073 | \$2,798 | \$3,092 | \$3,300 |
| Control (Matched Workers), Mean | \$2,393 | \$2,784 | \$2,998 | \$2,820 | \$2,564 | \$2,887 | \$3,084 | \$2,583 | \$2,873 | \$3,010 | \$2,886 | \$2,578 | \$2,878 | \$3,079 |
| Difference (Bias Corrected) | \$80 | \$187 | \$282 | \$374 | \$419 | \$356 | \$496 | \$56 | \$148 | \$148 | \$222 | \$247 | \$243 | \$251 |
| Difference-in-Differences | | \$106 | \$201 | \$293 | \$339 | \$276 | \$416 | | \$92 | \$92 | \$165 | \$191 | \$187 | \$195 |
| Diff-in-Diff-in-Diff | | \$15 | \$110 | \$128 | \$148 | \$90 | \$221 | | | | | | | |
| Block bootstrapped std. err. | | (\$25) | (\$34) | (\$37) | (\$39) | (\$44) | (\$49) | | | | | | | |
| <i>p</i> -value | | 0.560 | 0.001 | 0.001 | 0.000 | 0.042 | 0.000 | | | | | | | |

Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. Estimates for all jobs paying < \$19 in all industries. Treated workers are defined as those employed in 2015.1 in locatable establishments in Seattle, not employed elsewhere in the state, and earning <\$11 per hour. Control workers are defined as those employed in 2015.1 in locatable establishments in Washington State, but not employed in King County, and earning <\$11 per hour. Each treated worker is matched to his/her nearest neighbor control worker, without replacement. The control sample is exact matched in employment status in 2015.1, 2014.4, and 2014.3, and on an indicator for worker first observed in Washington State in 2015.1, 2014.4, or 2014.3. Matching using Mahalanobis distance is based on wage rate, hours worked, tenure on the primary job, number of quarters since first observed in Washington, and indicators for having earnings from more than one job in 2015.1, 2014.4, and 2014.3. The pseudo-treated cohort is constructed analogously, yet beginning from 2012.1. Estimators were bias adjusted using wage rate, hours worked, tenure on the primary job, and number of quarters since first observed in WA in the baseline quarter and prior two quarters.

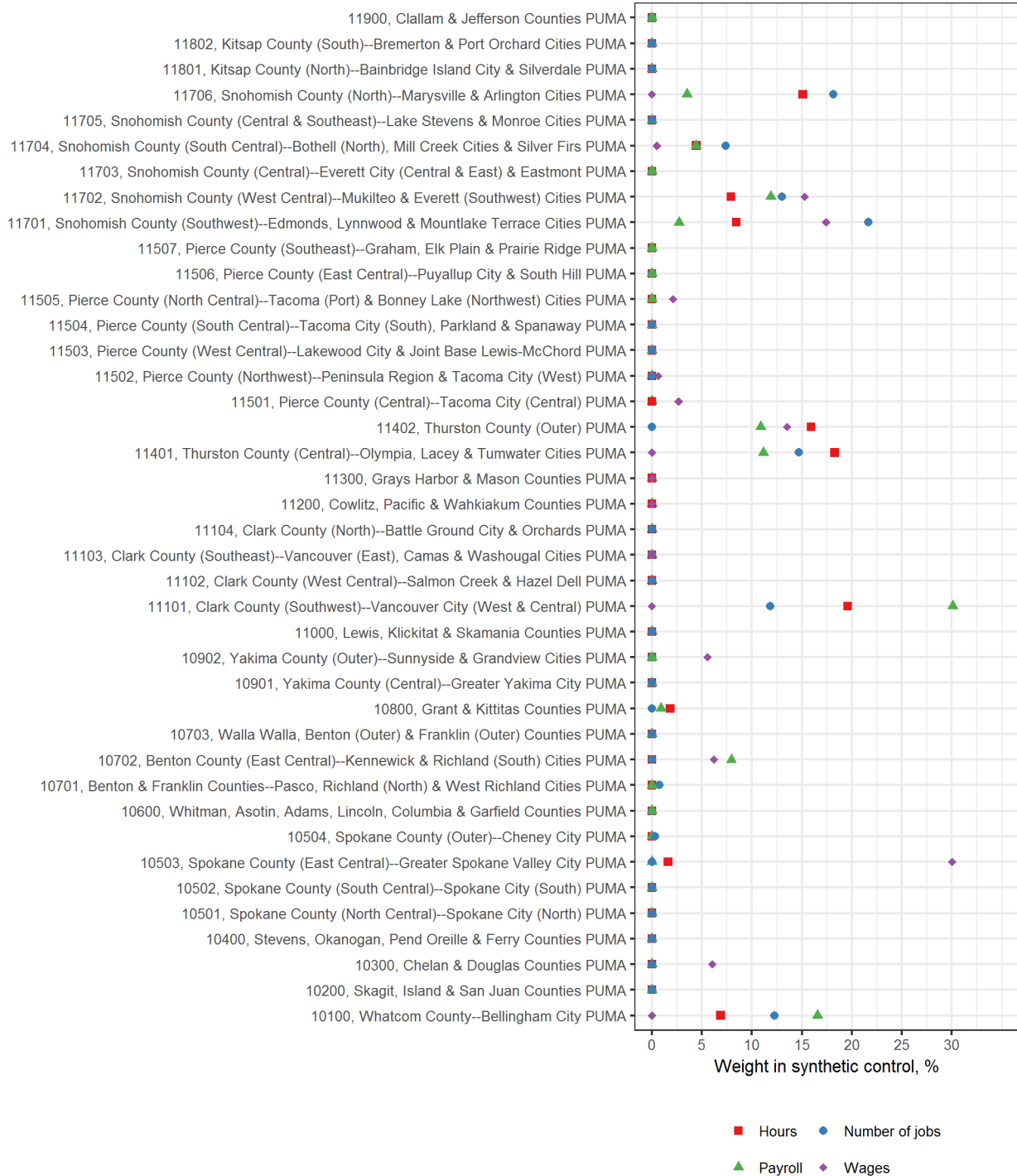
Table A8: Heterogeneity in Estimated Effects of the Ordinance by Decile of Past Hours Worked

| | 2015.2 | | 2015.3 | | 2015.4 | | 2016.1 | | 2016.2 | | 2016.3 | |
|--|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|
| <i>Panel A: Effect on Wages</i> | | | | | | | | | | | | |
| Bottom-10% Work Experience | \$0.40 | * | \$0.68 | * | \$0.94 | * | \$1.62 | * | \$1.61 | * | \$1.53 | * |
| 2nd Decile Work Experience | \$0.72 | * | \$0.50 | * | \$1.10 | * | \$1.12 | * | \$1.67 | * | \$1.87 | * |
| 3rd Decile Work Experience | \$0.85 | * | \$0.43 | * | \$0.55 | * | \$1.07 | * | \$0.87 | * | \$0.44 | |
| 4th Decile Work Experience | \$0.74 | * | \$0.29 | | \$0.75 | * | \$0.71 | * | \$0.77 | * | \$1.06 | * |
| 5th Decile Work Experience | \$0.53 | * | \$0.44 | * | \$0.67 | * | \$1.10 | * | \$1.19 | * | \$0.97 | * |
| 6th Decile Work Experience | \$0.55 | * | \$0.37 | * | \$0.63 | * | \$1.08 | * | \$1.23 | * | \$1.27 | * |
| 7th Decile Work Experience | \$0.76 | * | \$0.67 | * | \$0.90 | * | \$1.54 | * | \$1.43 | * | \$1.02 | * |
| 8th Decile Work Experience | \$0.67 | * | \$0.77 | * | \$1.26 | * | \$1.27 | * | \$1.07 | * | \$1.41 | * |
| 9th Decile Work Experience | \$0.72 | * | \$0.93 | * | \$0.78 | * | \$1.43 | * | \$1.13 | * | \$1.84 | * |
| Top-10% Work Experience | \$1.03 | * | \$1.88 | * | \$1.70 | * | \$2.70 | * | \$1.66 | * | \$4.76 | * |
| <i>Panel B: Effect on Employment</i> | | | | | | | | | | | | |
| Bottom-10% Work Experience | 0.016 | | -0.028 | | -0.013 | | -0.032 | | 0.031 | | 0.018 | |
| 2nd Decile Work Experience | -0.054 | * | -0.016 | | 0.003 | | -0.008 | | -0.008 | | -0.007 | |
| 3rd Decile Work Experience | 0.004 | | 0.010 | | 0.013 | | 0.006 | | -0.021 | | 0.001 | |
| 4th Decile Work Experience | -0.015 | | -0.036 | * | -0.008 | | -0.025 | | -0.034 | | -0.009 | |
| 5th Decile Work Experience | -0.015 | | -0.019 | | -0.027 | | -0.033 | | -0.022 | | -0.030 | |
| 6th Decile Work Experience | -0.008 | | 0.019 | | -0.006 | | -0.008 | | -0.004 | | 0.006 | |
| 7th Decile Work Experience | 0.010 | | -0.002 | | 0.015 | | 0.010 | | 0.002 | | 0.013 | |
| 8th Decile Work Experience | 0.023 | * | 0.023 | | 0.032 | * | 0.006 | | 0.004 | | 0.014 | |
| 9th Decile Work Experience | -0.005 | | 0.004 | | 0.000 | | -0.010 | | -0.004 | | 0.014 | |
| Top-10% Work Experience | 0.001 | | -0.023 | * | 0.000 | | -0.024 | | -0.014 | | 0.018 | |
| <i>Panel C: Effect on Quarterly Hours Worked</i> | | | | | | | | | | | | |
| Bottom-10% Work Experience | -5.3 | | -9.8 | | -5.6 | | -11.7 | | -1.1 | | 3.8 | |
| 2nd Decile Work Experience | -27.1 | * | -20.3 | * | -20.9 | * | -9.4 | | -13.8 | | -4.1 | |
| 3rd Decile Work Experience | -5.8 | | -4.0 | | -6.2 | | -9.8 | | -14.8 | * | -11.5 | |
| 4th Decile Work Experience | -22.9 | * | -21.8 | * | -16.2 | | -10.3 | | -20.1 | * | -15.2 | |
| 5th Decile Work Experience | -16.4 | * | -10.5 | | -7.9 | * | -15.3 | * | -11.9 | | -9.0 | |
| 6th Decile Work Experience | -9.3 | | 4.7 | | 8.7 | | 6.7 | | -3.0 | | 2.1 | |
| 7th Decile Work Experience | -3.1 | | -5.5 | | -4.2 | | -6.7 | | -15.3 | | -9.7 | |
| 8th Decile Work Experience | -16.5 | * | -3.0 | | -2.3 | | -12.0 | | -21.9 | * | -6.8 | |
| 9th Decile Work Experience | -20.1 | * | -13.7 | * | -4.6 | | -17.3 | * | -13.9 | | -2.9 | |
| Top-10% Work Experience | -21.6 | * | -39.2 | * | -31.3 | * | -61.1 | * | -40.3 | * | -40.3 | * |
| <i>Panel D: Effect on Quarterly Earnings</i> | | | | | | | | | | | | |
| Bottom-10% Work Experience | -\$32 | | -\$13 | | \$41 | | \$47 | | \$153 | | \$227 | |
| 2nd Decile Work Experience | -\$225 | * | -\$199 | * | -\$132 | | \$10 | | -\$7 | | \$144 | |
| 3rd Decile Work Experience | \$37 | | \$55 | | -\$112 | | -\$69 | | -\$147 | | -\$153 | |
| 4th Decile Work Experience | -\$140 | * | -\$228 | * | -\$173 | | -\$34 | | -\$188 | | -\$65 | |
| 5th Decile Work Experience | -\$17 | | \$66 | | \$69 | | \$29 | | \$63 | | \$105 | |
| 6th Decile Work Experience | \$35 | | \$202 | * | \$251 | * | \$311 | * | \$217 | * | \$293 | * |
| 7th Decile Work Experience | \$154 | * | \$183 | * | \$263 | * | \$273 | * | \$184 | * | \$216 | |
| 8th Decile Work Experience | \$53 | | \$378 | * | \$381 | * | \$243 | * | \$59 | * | \$364 | * |
| 9th Decile Work Experience | \$49 | | \$212 | * | \$284 | * | \$289 | * | \$280 | * | \$518 | * |
| Top-10% Work Experience | \$423 | * | \$604 | * | \$340 | * | \$311 | * | \$219 | * | \$665 | * |

Notes: Work experience decile is based on the number of hours worked in the baseline and prior two quarters (with cutpoints for the treated and pseudo-treated cohorts based on the distribution among treated workers. Treated workers are defined as those employed in 2015.1 in locatable establishments in Seattle, not employed elsewhere in the state, and earning <\$11 per hour. Control workers are defined as those employed in 2015.1 in locatable establishments in Washington State, but not employed in King County, and earning <\$11 per hour. Each treated worker is matched to his/her nearest neighbor control worker, without replacement. The control sample is exact matched in employment status in 2015.1, 2014.4, and 2014.3, and on an indicator for worker first observed in WA in 2015.1, 2014.4, or 2014.3. Matching using Mahalanobis distance is based on wage rate, hours worked, tenure on the primary job, number of quarters since first observed in WA, and indicators for having earnings from more than one job in 2015.1, 2014.4, and 2014.3. The pseudo-treated cohort is constructed analogously, yet

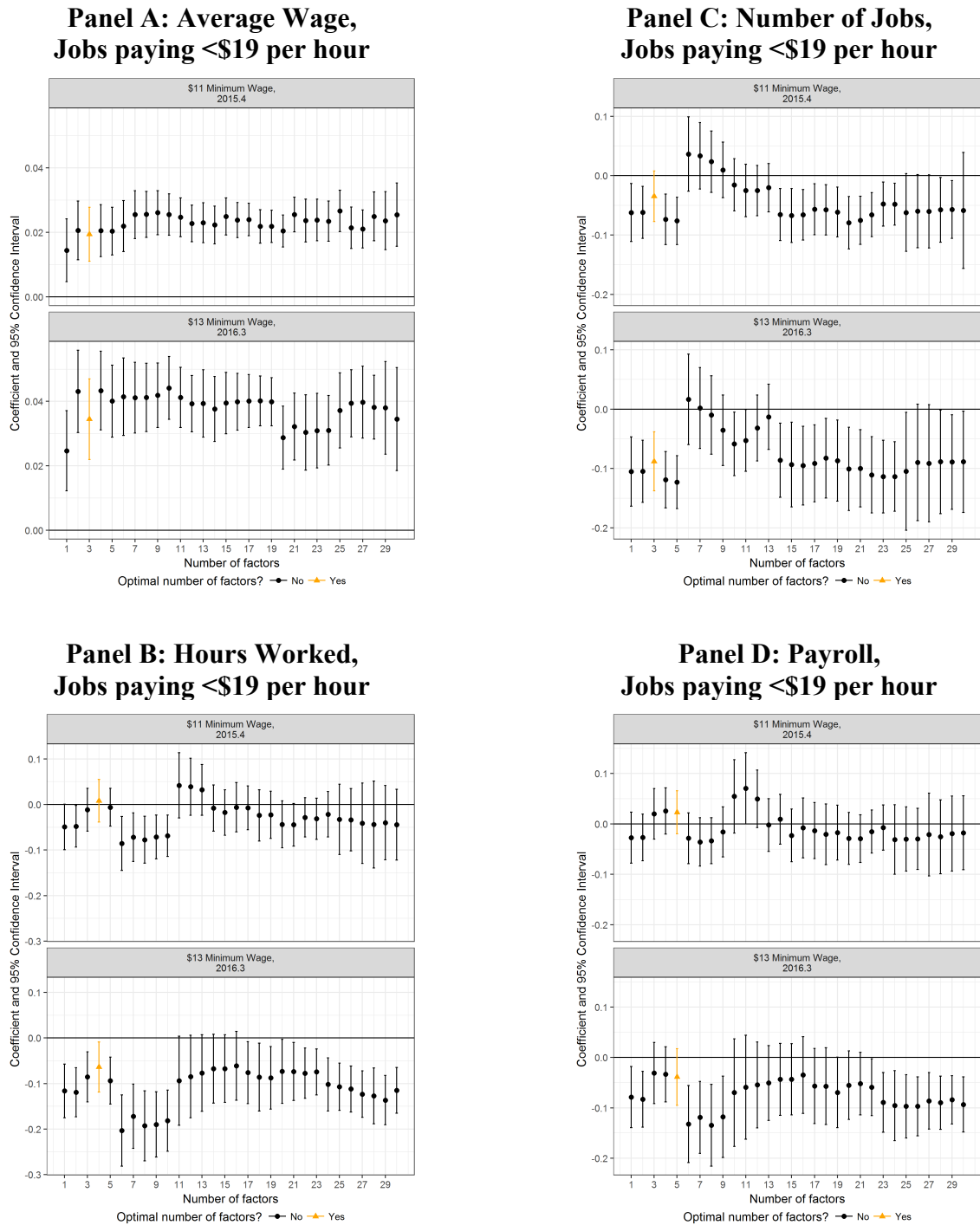
beginning from 2012.1. Estimators were bias adjusted using wage rate, hours worked, tenure on the primary job, and number of quarters since first observed in Washington State in the baseline quarter and prior two quarters. * denotes two-tailed p-value less than or equal to 0.10.

Figure A1: Weights Chosen by Synthetic Control Estimator, by Outcome.



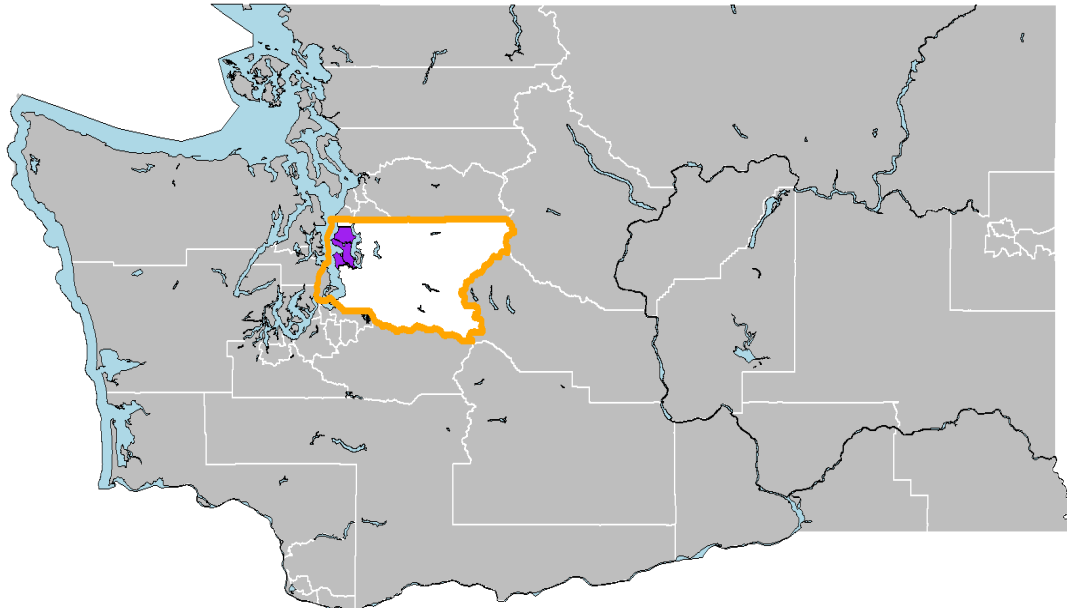
Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. This figure shows the donors and weights for each outcome in the analysis of year-over-year percentage changes in Y . We implement the synthetic control estimator using the R programs provided by Gobillon and Magnac (2016).

Figure A2: Sensitivity of the Interactive Fixed Effects Estimates to the Number of Factors Used



Notes: Source: UI records from WA. Sample: Workers at single-location firms. Wages have been adjusted for inflation using CPI-W. This figure shows the results for the analysis of year-over-year percentage changes in Y . Interactive Fixed Effects Method outlined by Bai, 2009

**Figure A3: Synthetic Control and Interactive Fixed Effects Regions
(Washington State Public Use Microdata Areas)**



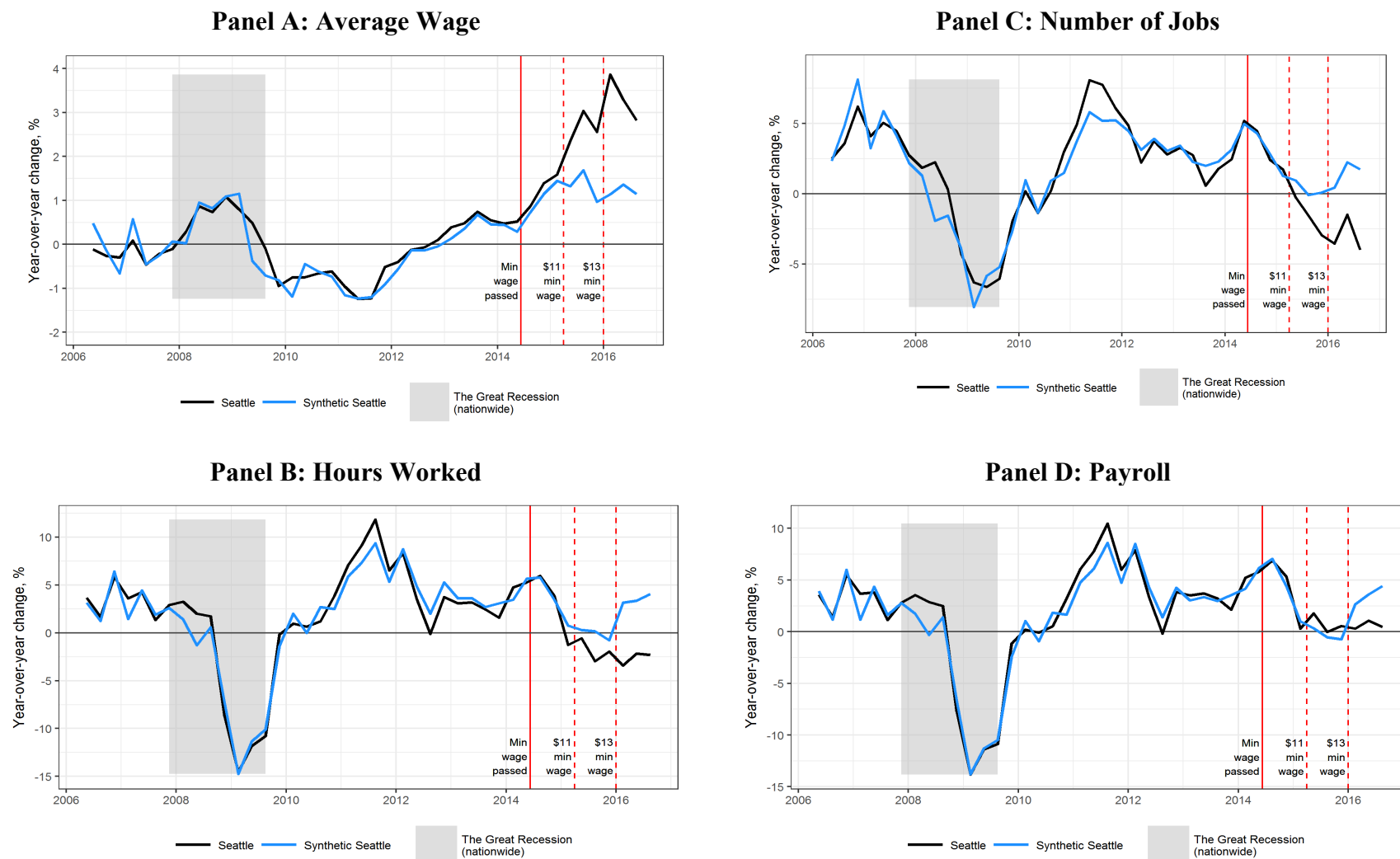
Notes: Washington State Public Use Microdata Areas. Seattle's five PUMAs are in purple. King County PUMAs are within the gold outline, and we do not include in our analysis. The rest of the Washington state PUMAs are in grey.

Figure A4: Levels of Employment, Wages, and Payroll in Seattle Compared to PUMAs Outside of King County in Jobs Paying Less than \$19 Per Hour



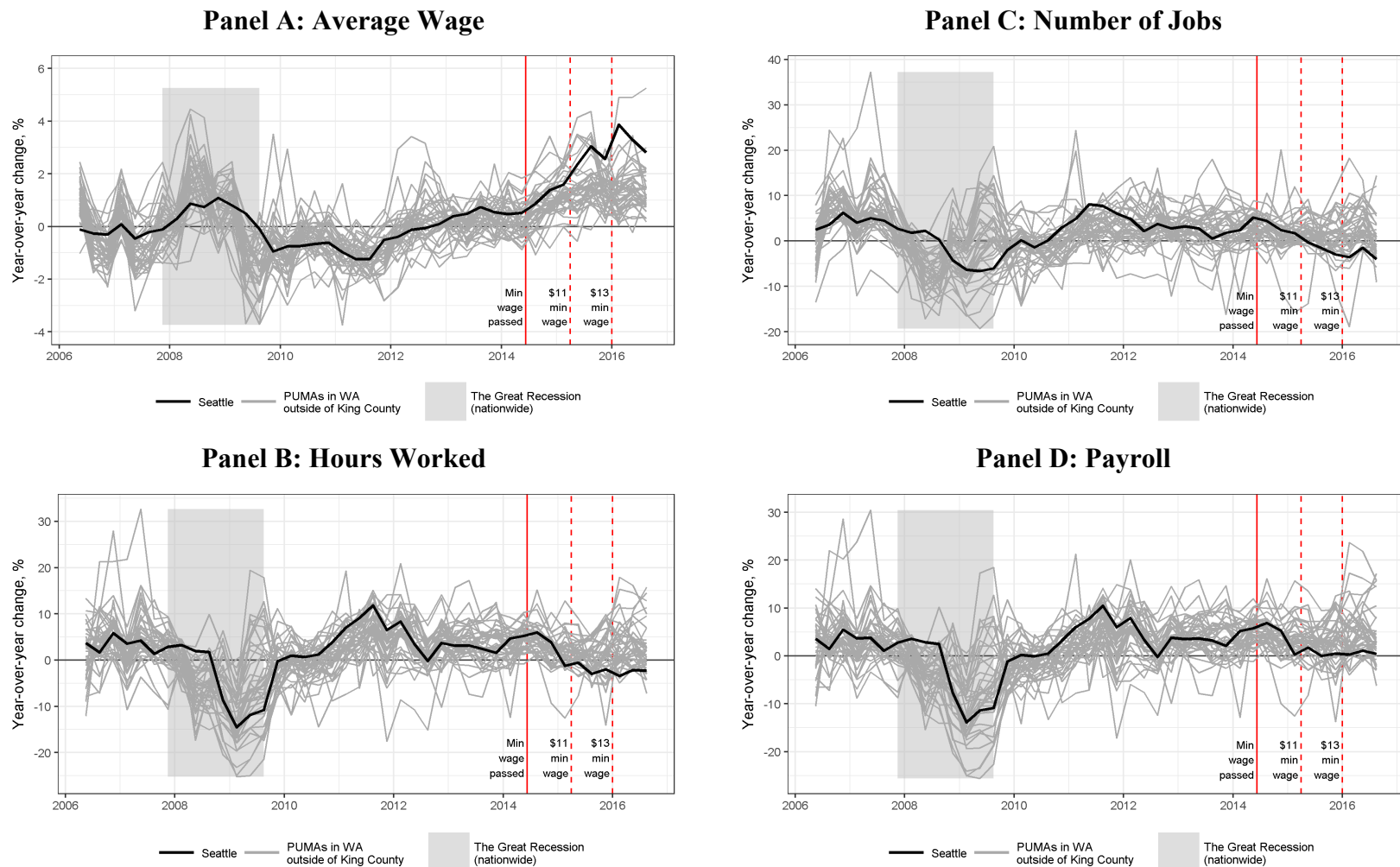
Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W.

Figure A5: Year-over-Year Percentage Change in Employment, Wages, and Payroll in Seattle Compared to Synthetic Seattle in Jobs Paying Less than \$19 Per Hour



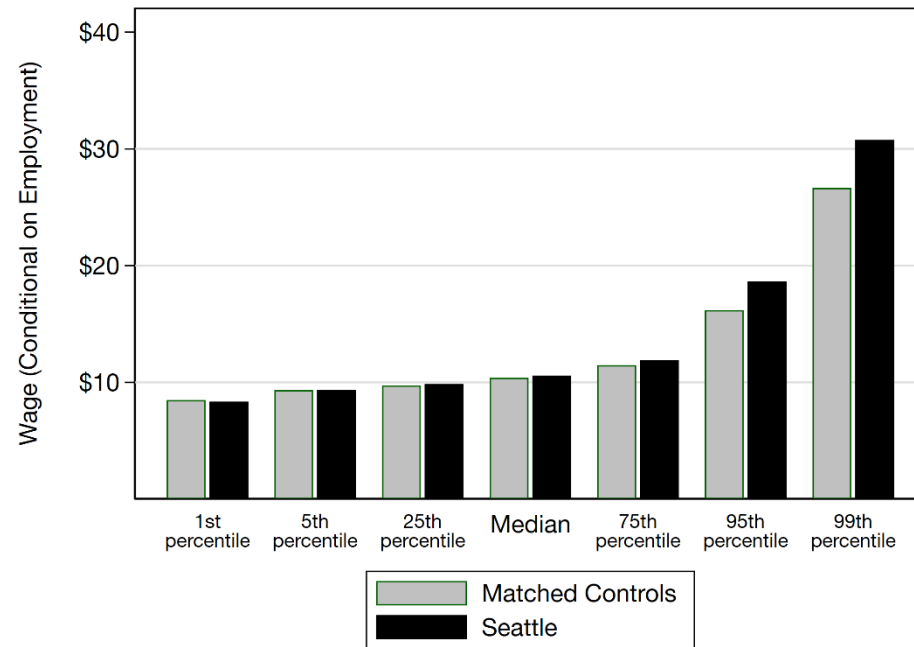
Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. We implement the synthetic control estimator using the R programs provided by Gobillon and Magnac (2016). Donors and weights are described in Appendix Table A1.

Figure A6: Year-over-Year Percentage Change in Employment, Wages, and Payroll in Seattle Compared to PUMAs outside of King County in Jobs Paying Less than \$19 Per Hour



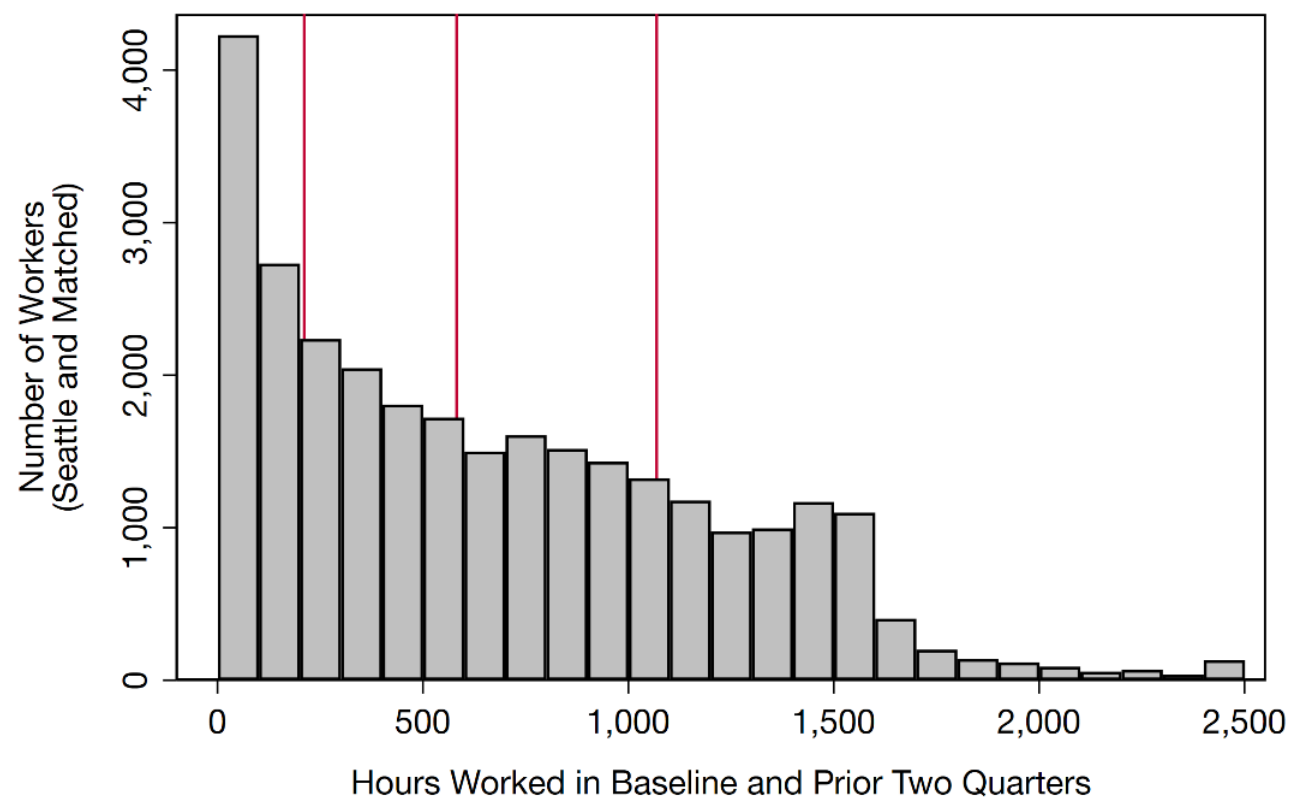
Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. We implement the synthetic control estimator using the R programs provided by Gobillon and Magnac (2016).

Figure A7: Wage Distribution in 2012.4 for Workers Earning Less Than \$11 Per Hour in 2012.1



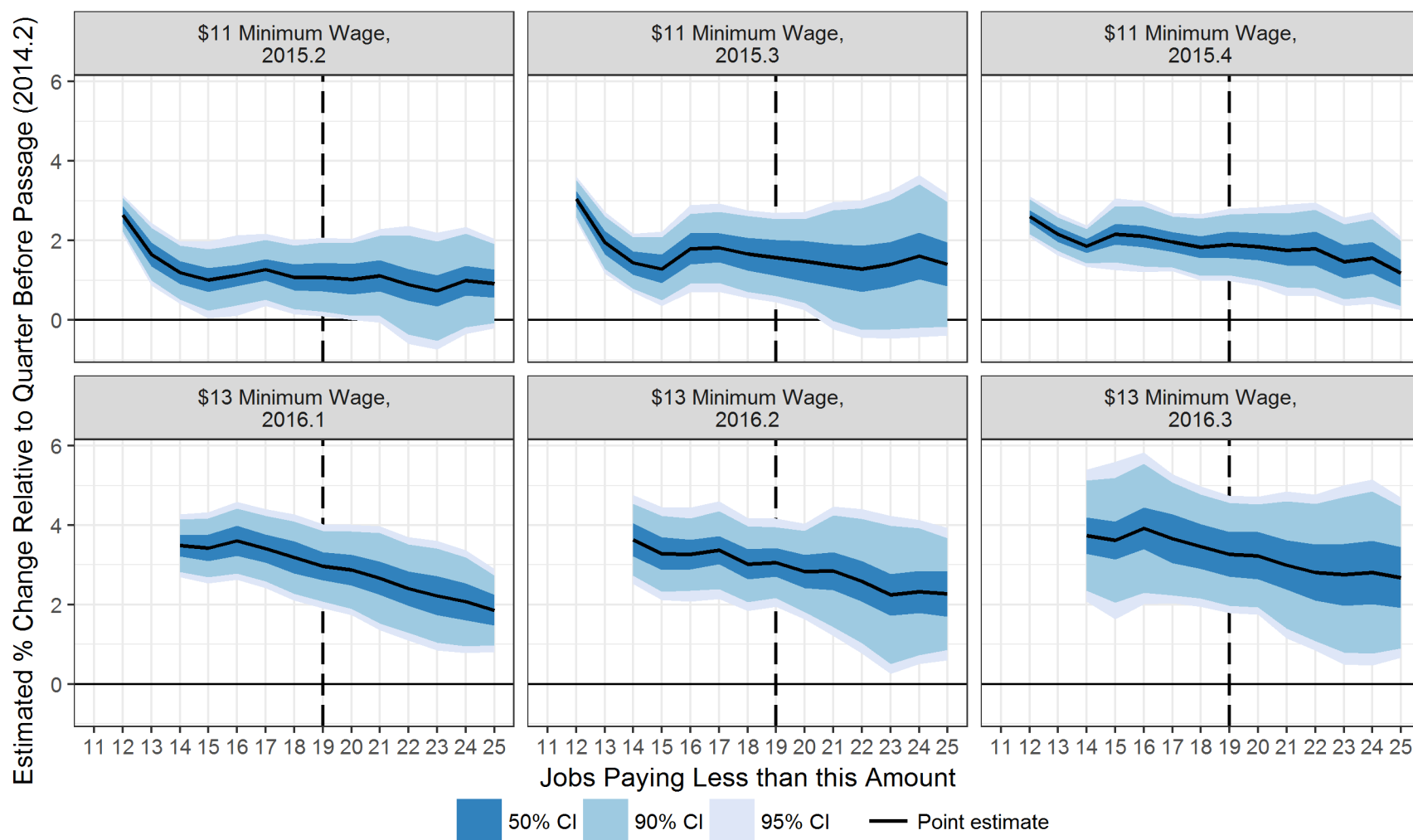
Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. Graph shows wage distribution of WA State workers who made less than \$11 an hour in the first quarter of 2012 in the fourth quarter of 2012.

Figure A8: Distribution of Prior Hours for Treatment and Matched Control Workers



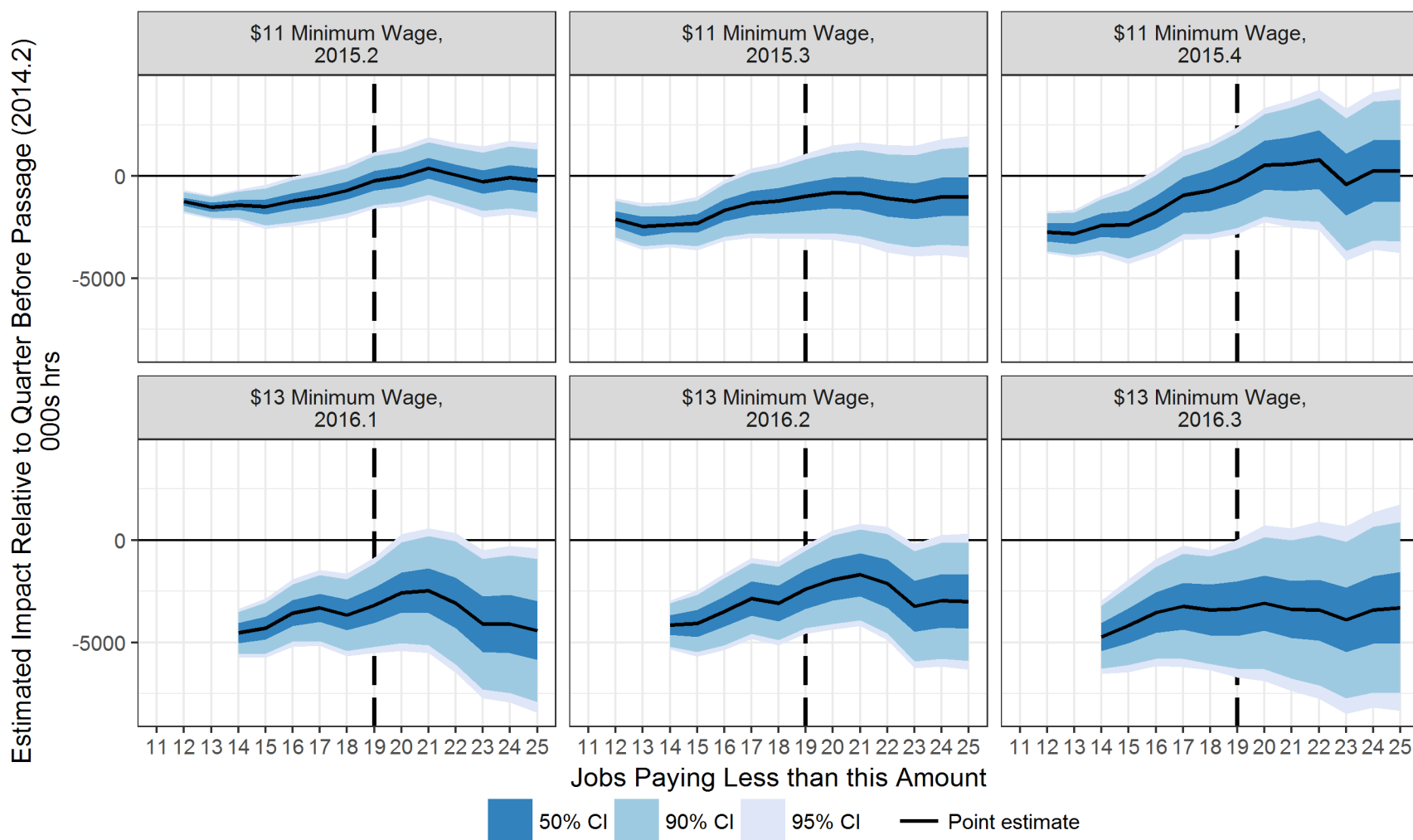
Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. Includes Seattle (treated) workers and other Washington state (control) workers. Vertical lines at 25th, 50th, and 75th percentiles. Hours censored at 2,500.

Figure A9: Sensitivity of the Estimated Percentage Change in Wages Using Different Wage Thresholds



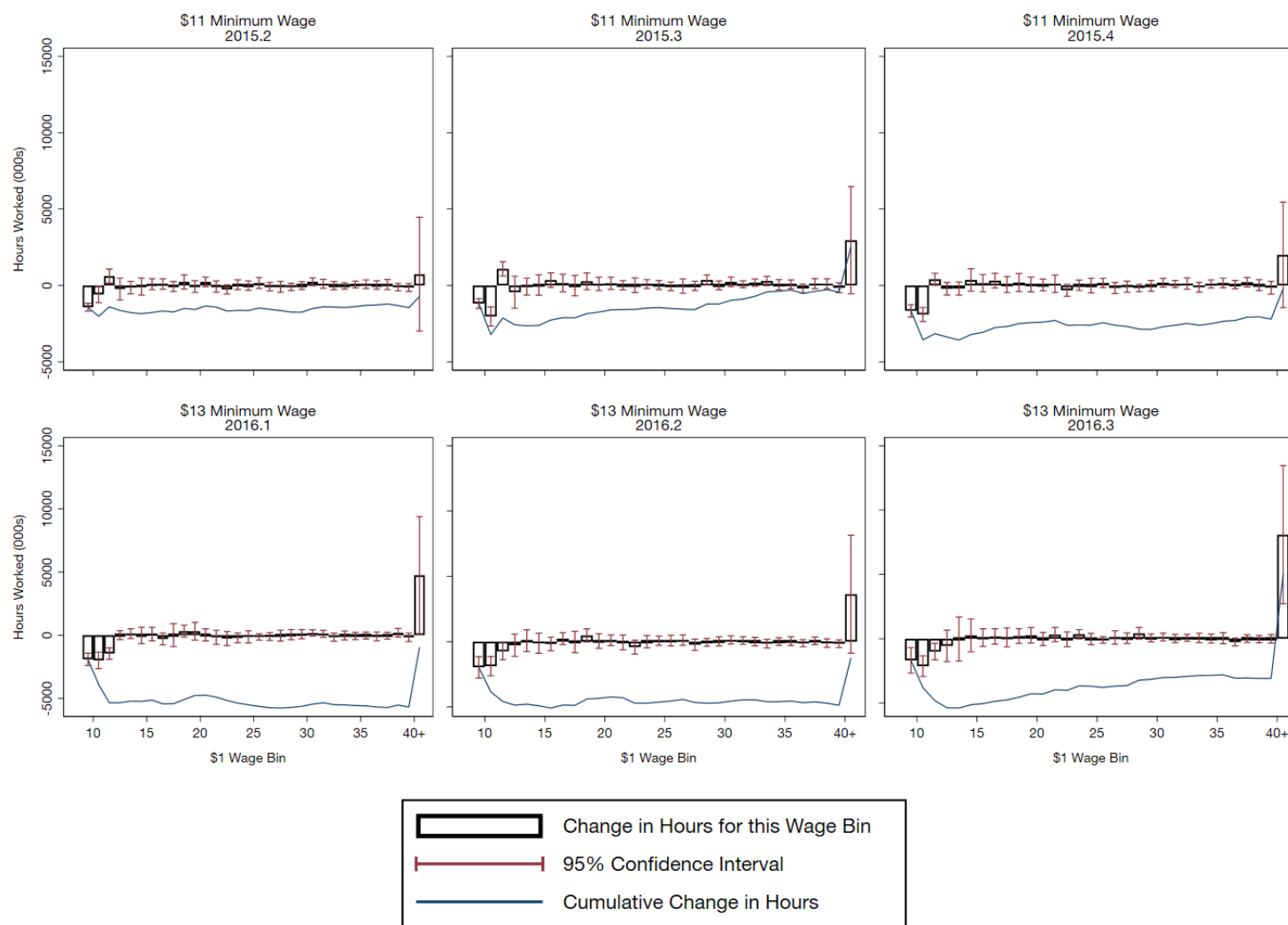
Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. We implement the synthetic control estimator using the R programs provided by Gobillon and Magnac (2016). Point estimates using the synthetic control method (applied to growth rates and then multiplied by the baseline number of hours worked) are shown by the lines, while 50-, 90-, and 95-percent confidence intervals centered around these estimates are shown by the shaded regions.

Figure A10: Sensitivity of the Estimated Level Change in Cumulative Hours Worked Using Different Wage Thresholds



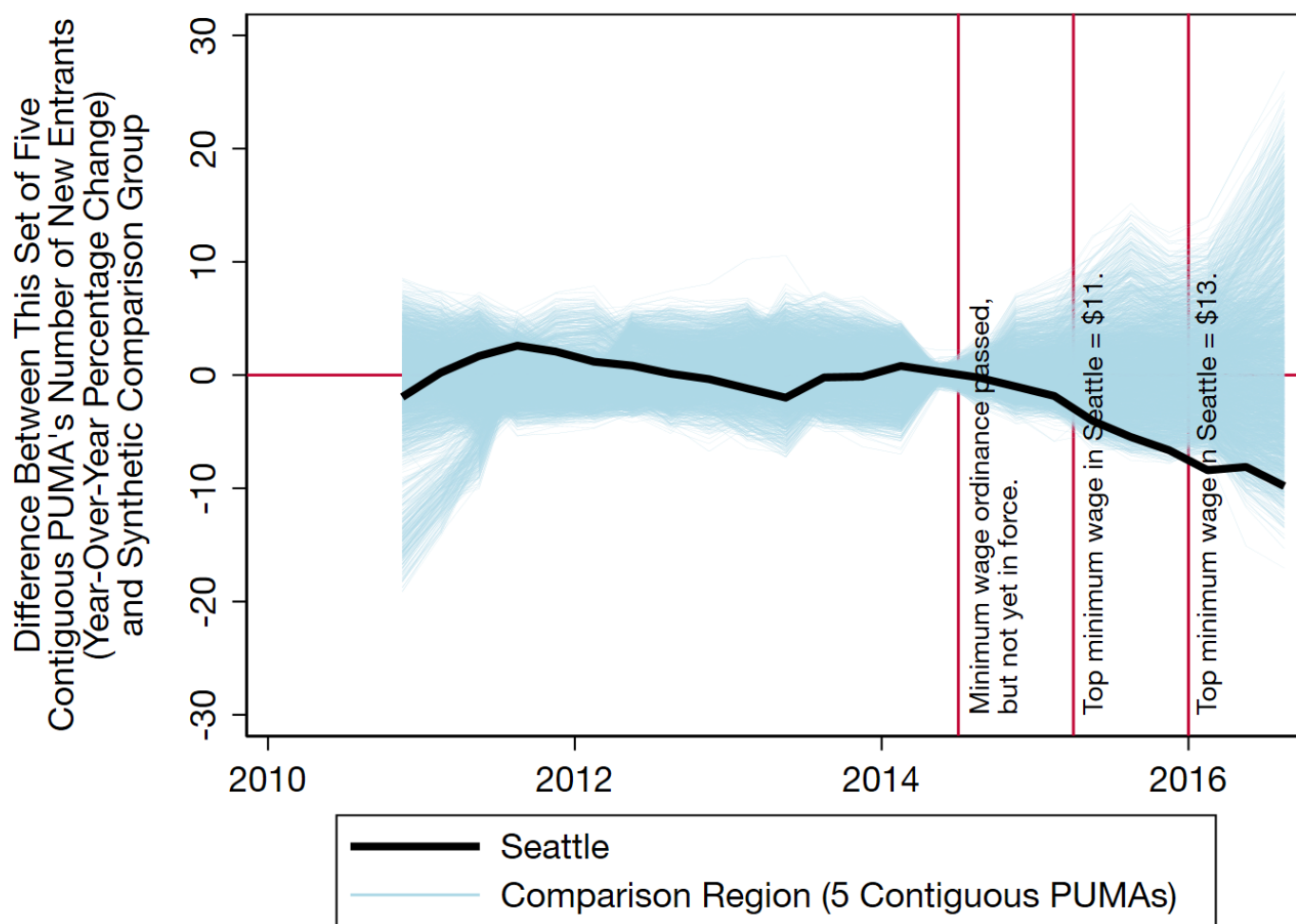
Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. We implement the synthetic control estimator using the R programs provided by Gobillon and Magnac (2016). Point estimates using the synthetic control method (applied to growth rates and then multiplied by the baseline number of hours worked) are shown by the lines, while 50-, 90-, and 95-percent confidence intervals centered around these estimates are shown by the shaded regions.

Figure A11: Cumulative Effects on Hours Worked (Similar to the Approach of Cengiz et al., 2019)



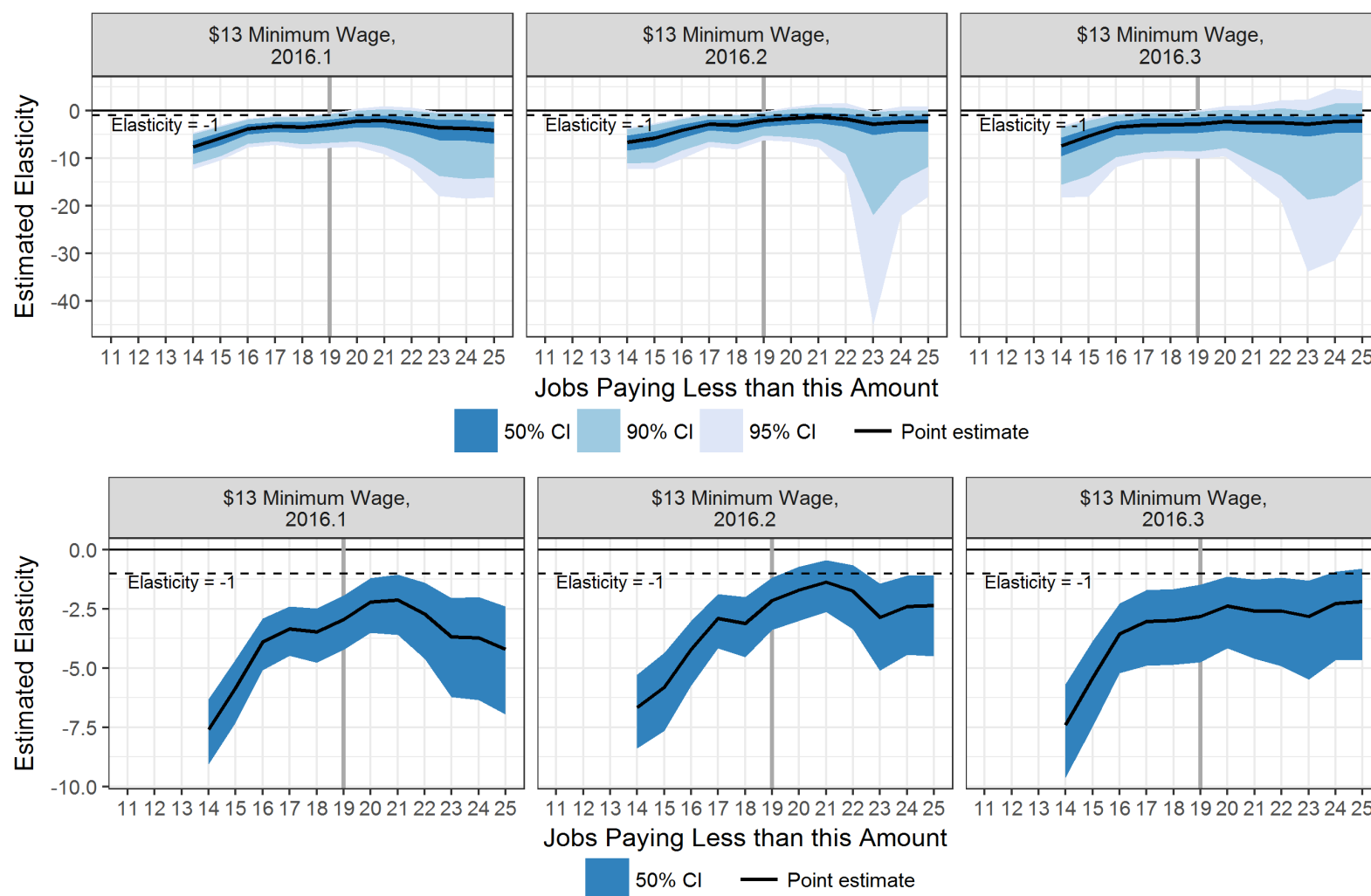
Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. Separate impact estimates are derived for each wage bin. The “Cumulative Change in Hours” presents the sum of the impact estimates for each wage bin up to that bin.

Figure A12: Statistical Significance of the Decline in Low-Wage Entrants in Seattle



Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. New entrants are defined as workers paid under \$15 per hour, inflation-adjusted, who had not been employed in Washington State in the prior five years. Synthetic Comparison Group is a weighted average of time series of new entrants for other Washington PUMAs outside of King County.

Figure A13: Sensitivity of the Estimated Elasticity of Labor Demand With Respect to Wages Using Different Thresholds



Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. We implement the synthetic control estimator using the R programs provided by Gobillon and Magnac (2016). Point estimates using the synthetic control method applied to year-over-year percentage changes in wages are shown by the lines, while 50-, 90-, and 95-percent confidence intervals centered on these estimates are shown by the shaded regions. The lower panels show the same estimates as the upper panels with a different scale on the y-axis to clearly show the point estimates and the 50-percent confidence interval.

Appendix Table C1: Decomposition of the Effect on Hours Worked

| Quarter | Quarters After Passage / Enforcement | Effect on Year-over-Year Hours Worked | Contribution to Estimated Effect on Year-over-year Hours Worked | | | | | |
|------------------|--------------------------------------|---------------------------------------|---|-------------------|----------------------|----------------------|----------------------|-------------------|
| | | | Hires | Separations | Job Stayers | Wage Fell Below \$19 | Wage Rose Above \$19 | Missing Wage |
| 2014.3 | 1 | 0.002 [0.916] | 0.027 [0.133] | -0.004 [0.788] | -0.003 [0.555] | 0.000 [0.942] | -0.021*** [0.000] | -0.001 [0.465] |
| 2014.4 | 2 | 0.006 [0.713] | 0.030* [0.063] | -0.015 [0.294] | -0.005 [0.256] | 0.002 [0.571] | -0.020*** [0.006] | -0.001 [0.65] |
| 2015.1 | 3 | -0.018 [0.336] | 0.010 [0.547] | -0.016 [0.350] | -0.011*** [0.005] | 0.001 [0.631] | -0.019*** [0.015] | 0.000 [0.896] |
| 2015.2 | 4/1 | -0.006 [0.756] | 0.005 [0.766] | -0.019 [0.263] | 0.002 [0.768] | 0.007*** [0.000] | -0.021*** [0.008] | 0.000 [0.966] |
| 2015.3 | 5/2 | -0.029 [0.204] | -0.014 [0.517] | -0.011 [0.441] | -0.001 [0.891] | 0.005* [0.093] | -0.021*** [0.010] | 0.001 [0.606] |
| 2015.4 | 6/3 | -0.012 [0.714] | 0.013 [0.724] | -0.002 [0.888] | -0.004 [0.483] | 0.005* [0.063] | -0.023** [0.033] | -0.004 [0.275] |
| 2016.1 | 7/4 | -0.071*** [0.014] | -0.022 [0.245] | -0.017 [0.303] | -0.015 [0.216] | -0.002 [0.359] | -0.032*** [0.000] | 0.001 [0.722] |
| 2016.2 | 8/5 | -0.060*** [0.008] | -0.027 [0.195] | -0.017 [0.348] | -0.010 [0.38] | 0.004 [0.239] | -0.027*** [0.001] | -0.001 [0.641] |
| 2016.3 | 9/6 | -0.066*** [0.013] | -0.021 [0.511] | -0.012 [0.468] | -0.014 [0.171] | 0.000 [0.949] | -0.032*** [0.000] | 0.000 [0.858] |
| Pre-Policy RMSPE | | 0.013 | 0.021 | 0.023 | 0.003 | 0.005 | 0.015 | 0.005 |
| Obs | | 1,890 | 1,890 | 1,890 | 1,890 | 1,890 | 1,890 | 1,890 |

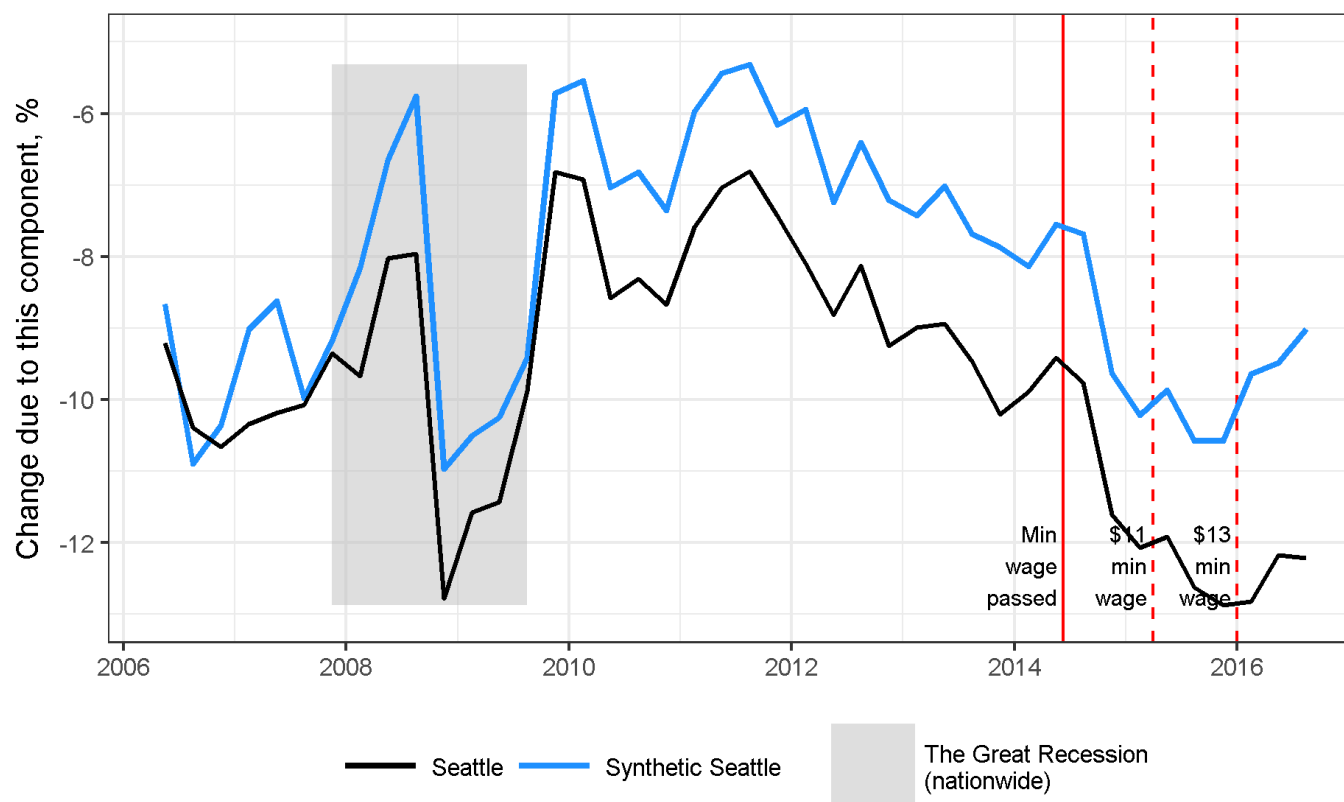
Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. Estimates for all jobs paying < \$19 in all industries. Estimates using synthetic control method reported. Dependent variable in each column is one of the terms from equation 5.

Coefficients show the effects on the contribution of each component to year-over-year growth rate in total hours worked. Common synthetic control weights are used for all outcomes. P-value for a two-tailed test of the hypothesis that the coefficient equals to zero are reported in square brackets. P-values are calculated based on permutation. RMSPE shows the root mean squared prediction error for the synthetic controls' pre-policy predictions. The number of observations used in the synthetic control specification equals the number of PUMAs (45) times the number of quarters included in this analysis (42).

However, note that some of these PUMAs receive zero weight in the synthetic control results.

***, **, and * denote statistical significance using a two-tailed test with $p \leq 0.01$, 0.05 , and 0.10 , respectively.

Figure C1: Decomposition of the Effect on Hours Worked: Contribution of Wages Rising Above the \$19 Threshold



Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. We implement the synthetic control estimator using the R programs provided by Gobillon and Magnac (2016).

Table D1: Effect of Restricting Analysis to Food Service and Drinking Places

| Quarter | Quarters After Passage / Enforcement | All industries | | | Restaurant Industry (NAICS 722) | | | | | |
|------------------|---|---------------------------------|----------------------------------|--------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|-------------------|--------------------------------|
| | | Wages under \$19 | | | Wages under \$19 | | | All wage levels | | |
| | | Wages | Hours | Jobs | Wages | Hours | Jobs | Wages | Hours | Jobs |
| 2014.3 | 1 | 0.002 [0.585] | 0.002 [0.916] | 0.002 [0.924] | 0.004 [0.354] | -0.012 [0.623] | 0.023 [0.247] | 0.024 ^{**} [0.036] | 0.003 [0.862] | 0.035 [*] [0.095] |
| 2014.4 | 2 | 0.003 [0.465] | 0.006 [0.713] | -0.002 [0.892] | 0.013 [*] [0.067] | 0.029 [0.315] | 0.035 [0.289] | 0.043 ^{***} [0.000] | 0.039 [0.107] | 0.065 ^{**} [0.042] |
| 2015.1 | 3 | 0.002 [0.598] | -0.018 [0.336] | 0.007 [0.659] | 0.010 ^{**} [0.037] | -0.043 [0.286] | 0.004 [0.890] | 0.02 ^{***} [0.017] | -0.02 [0.624] | 0.028 [0.364] |
| 2015.2 | 4/1 | 0.011 ^{**} [0.029] | -0.006 [0.756] | -0.010 [0.549] | 0.027 ^{***} [0.000] | -0.064 [*] [0.057] | -0.054 [0.119] | 0.025 ^{***} [0.000] | -0.041 [0.213] | -0.015 [0.632] |
| 2015.3 | 5/2 | 0.016 ^{***} [0.006] | -0.027 [0.356] | -0.011 [0.576] | 0.032 ^{***} [0.000] | -0.071 [*] [0.086] | -0.028 [0.479] | 0.047 ^{***} [0.000] | -0.032 [0.438] | 0.009 [0.814] |
| 2015.4 | 6/3 | 0.019 ^{***} [0.000] | -0.006 [0.894] | -0.033 [0.391] | 0.036 ^{***} [0.000] | -0.106 ^{**} [0.043] | -0.097 ^{**} [0.042] | 0.078 ^{***} [0.000] | -0.049 [0.361] | -0.032 [0.511] |
| 2016.1 | 7/4 | 0.030 ^{***} [0.000] | -0.087 ^{***} [0.005] | -0.038 [0.293] | 0.066 ^{***} [0.000] | -0.121 ^{**} [0.039] | -0.104 [*] [0.069] | 0.094 ^{***} [0.000] | -0.045 [0.465] | -0.014 [0.793] |
| 2016.2 | 8/5 | 0.031 ^{***} [0.000] | -0.066 ^{***} [0.022] | -0.052 [*] [0.076] | 0.068 ^{***} [0.000] | -0.112 [0.150] | -0.118 [*] [0.072] | 0.069 ^{***} [0.000] | -0.034 [0.701] | -0.015 [0.800] |
| 2016.3 | 9/6 | 0.033 ^{***} [0.000] | -0.092 [*] [0.051] | -0.072 [*] [0.067] | 0.064 ^{***} [0.000] | -0.090 [0.147] | -0.078 [0.109] | 0.081 ^{***} [0.000] | 0.001 [0.988] | 0.020 [0.763] |
| Pre-Policy RMSPE | | 0.003 | 0.013 | 0.013 | 0.009 | 0.048 | 0.062 | 0.012 | 0.04 | 0.057 |
| Obs | | 1,890 | 1,890 | 1,890 | 1,890 | 1,890 | 1,890 | 1,890 | 1,890 | 1,890 |

Notes: Source: UI records from WA. NAICS 722 = Food services and drinking places. Estimates using synthetic control with the cumulative effect since 2014.2 are reported. Dependent variable in all regressions is year-over-year growth rate in each outcome. P-value for a two-tailed test of the hypothesis that the coefficient equals to zero are reported in square brackets. P-values are calculated based on permutation. RMSPE shows the root mean squared prediction error for the synthetic control's pre-policy predictions of year-over-year percentage growth. The number of observations used in the synthetic control and interactive fixed effects specifications equals the number of PUMAs (45) times the number of quarters included in this analysis (42). However, note that some of these PUMAs receive zero weight in the synthetic control results. ^{***}, ^{**}, and ^{*} denote statistical significance using a two-tailed test with $p \leq 0.01$, 0.05 , and 0.10 , respectively.