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

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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.

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[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 A10, 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.

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

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

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
Panel A: Seattle								
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
Panel B: Washington State, Excluding Seattle								
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			
	Number of Jobs		Change	Share of Change	Number of Jobs		Change	Share of Change
Panel A: Jobs Paying Less Than $19 Per Hour	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 statistically 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	0.001	0.001	-0.003
		[0.235]	[0.944]	[0.965]	[0.870]
2014.4	2	0.004	0.007	-0.003	0.012
		[0.372]	[0.718]	[0.892]	[0.548]
2015.1	3	0.003	-0.019	0.007	-0.005
		[0.464]	[0.299]	[0.669]	[0.791]
2015.2	4/1	0.012***	-0.006	-0.009	0.018
		[0.016]	[0.748]	[0.616]	[0.380]
2015.3	5/2	0.019***	-0.028	-0.011	0.002
		[0.004]	[0.364]	[0.671]	[0.939]
2015.4	6/3	0.020***	-0.008	-0.033	0.021
		[0.000]	[0.858]	[0.473]	[0.644]
2016.1	7/4	0.032***	-0.087***	-0.037	-0.037
		[0.000]	[0.005]	[0.330]	[0.321]
2016.2	8/5	0.034***	-0.066***	-0.052	-0.016
		[0.000]	[0.022]	[0.104]	[0.690]
2016.3	9/6	0.038***	-0.092*	-0.073*	-0.042
		[0.000]	[0.054]	[0.100]	[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 statistically 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	-0.025*	-0.003	-0.009
		[0.417]	[0.076]	[0.384]	[0.326]
2012.4	2	0.003	-0.024	-0.001	-0.018
		[0.357]	[0.398]	[0.641]	[0.418]
2013.1	3	0.002	-0.007	0.001	-0.022
		[0.526]	[0.826]	[0.658]	[0.541]
2013.2	4/1	0.002	-0.007	0.000	-0.005
		[0.615]	[0.828]	[0.908]	[0.900]
2013.3	5/2	0.006	-0.028	-0.005	-0.026
		[0.305]	[0.358]	[0.251]	[0.504]
2013.4	6/3	0.006	-0.039	-0.003	-0.034
		[0.186]	[0.411]	[0.504]	[0.487]
2014.1	7/4	0.006	0.008	-0.004	-0.008
		[0.185]	[0.844]	[0.325]	[0.848]
2014.2	8/5	0.008*	-0.009	-0.001	-0.006
		[0.097]	[0.800]	[0.857]	[0.882]
2014.3	9/6	0.011	-0.020	-0.005	-0.014
		[0.192]	[0.633]	[0.365]	[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 statistically 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						
Panel A: Effect on Wages	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)							
p-value		0.000	0.000	0.000	0.000	0.000	0.000							
Panel B: Effect on Employment														
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)							
p-value		0.417	0.372	0.495	0.240	0.433	0.438							
Panel C: Effect on Quarterly Hours Worked														
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)							
p-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)							
p-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.

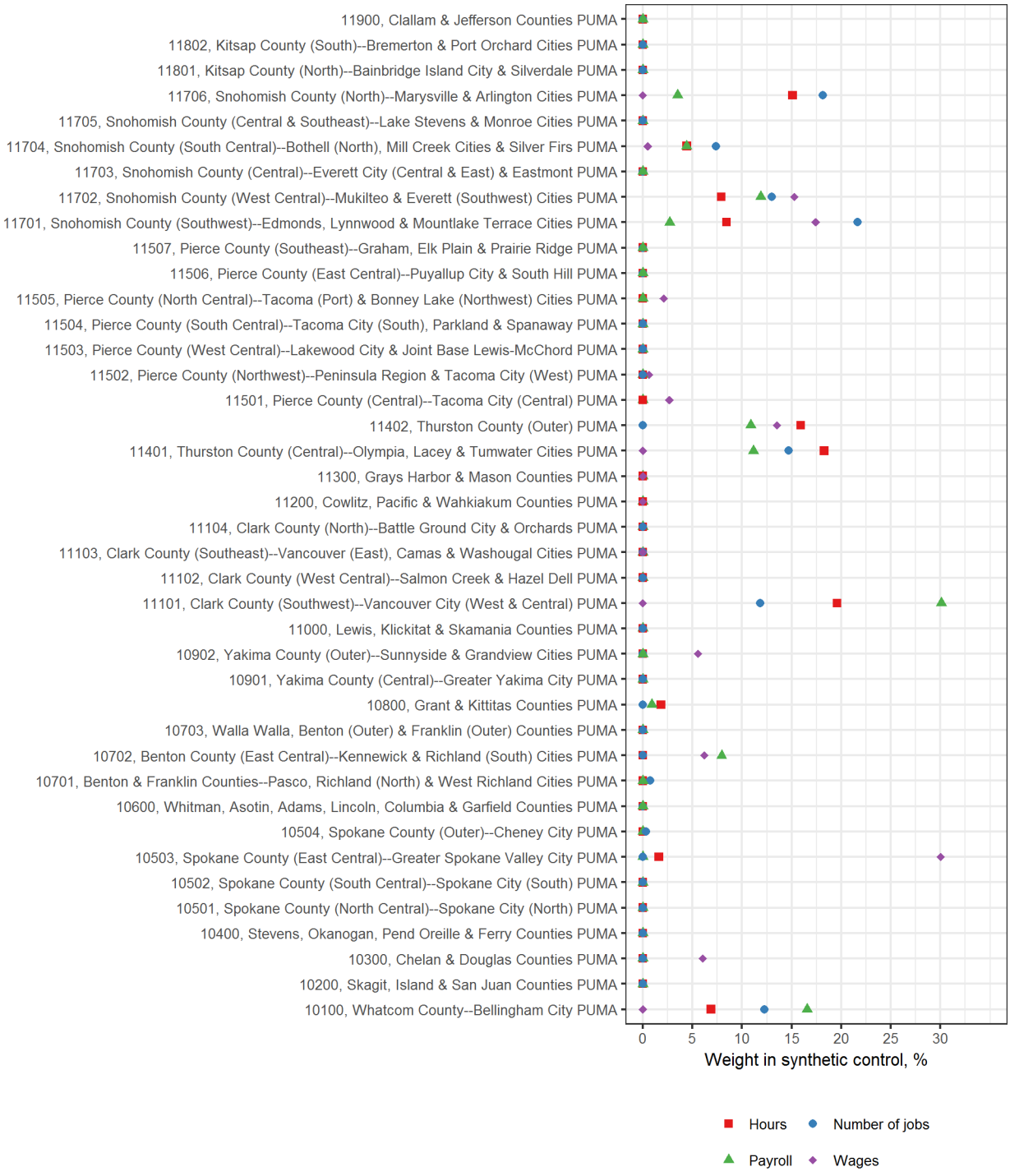
Table A8: Heterogeneity in Estimated Effects of the Ordinance by Decile of Past Hours Worked

	2015.2		2015.3		2015.4		2016.1		2016.2		2016.3	
Panel A: Effect on Wages												
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	*
Panel B: Effect on Employment												
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	
Panel C: Effect on Quarterly Hours Worked												
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	*
Panel D: Effect on Quarterly Earnings												
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.

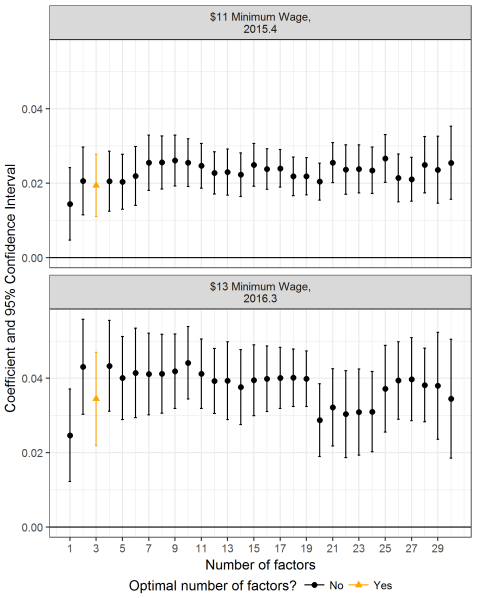
Figure A1: Weights Chosen by Synthetic Control Estimator, by Outcome.



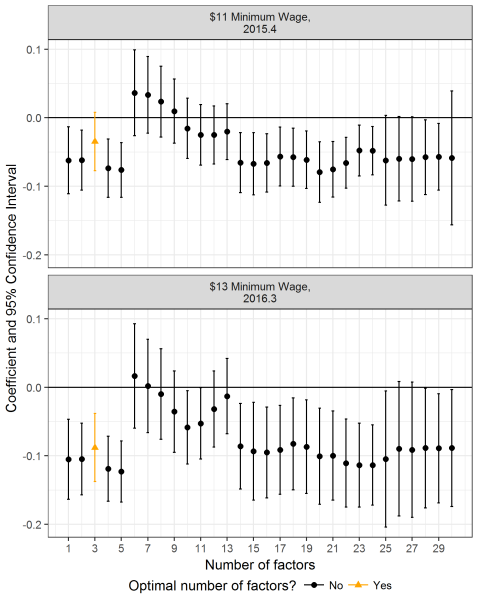
Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. This figure shows the donors and weights for each outcome in the analysis of year-over-year percentage changes in *Y*. We implement the synthetic control estimator using the R programs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

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

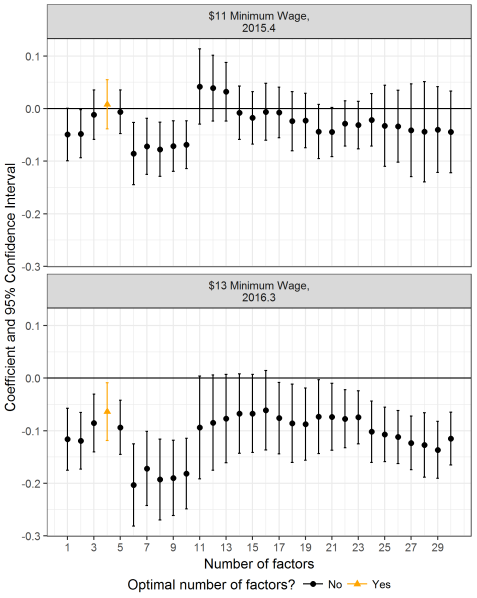
Panel A: Average Wage, Jobs paying <$19 per hour



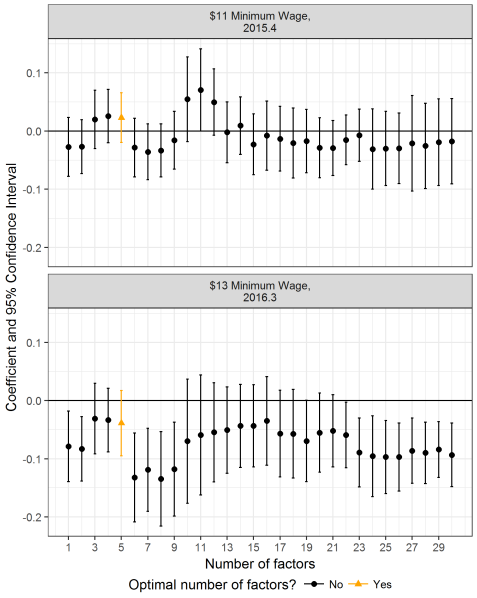
Panel C: Number of Jobs, Jobs paying <$19 per hour



Panel B: Hours Worked, Jobs paying <$19 per hour

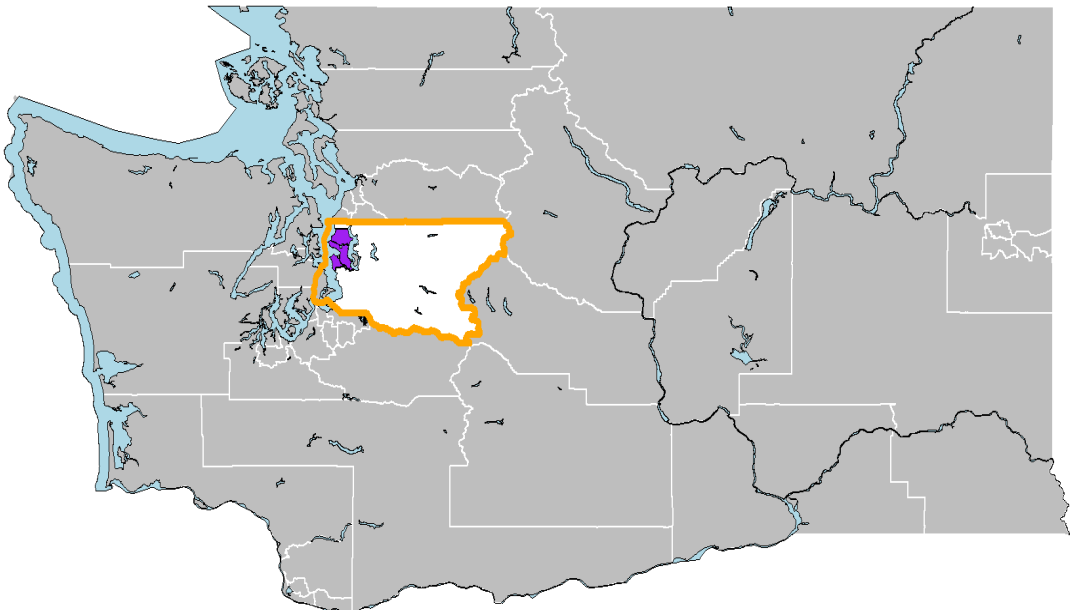


Panel D: Payroll, Jobs paying <$19 per hour



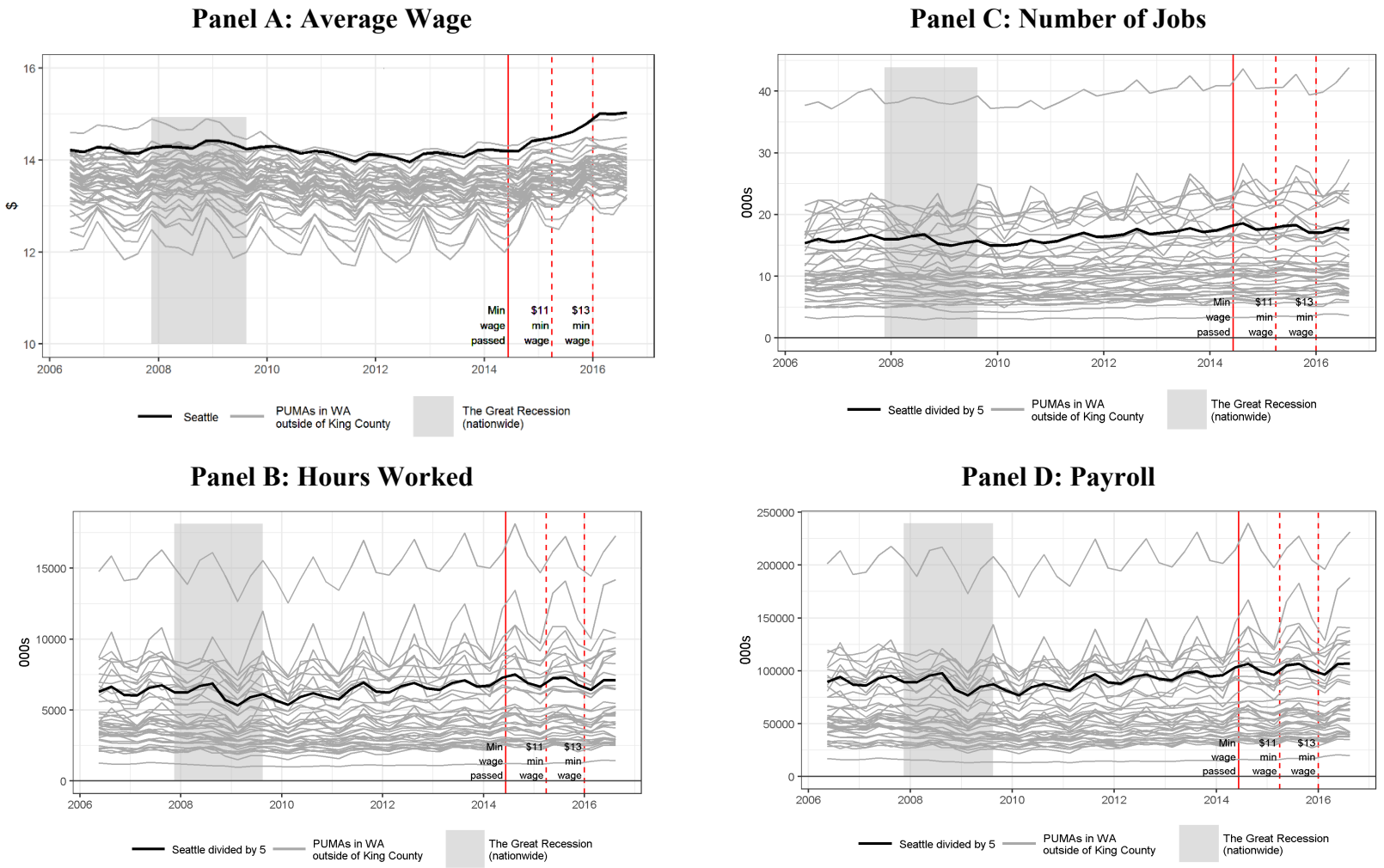
Notes: Source: UI records from WA. Sample: Workers at single-location firms. Wages have been adjusted for inflation using CPI-W. This figure shows the results for the analysis of year-over-year percentage changes in *Y*. Interactive Fixed Effects Method outlined by Bai, 2009

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



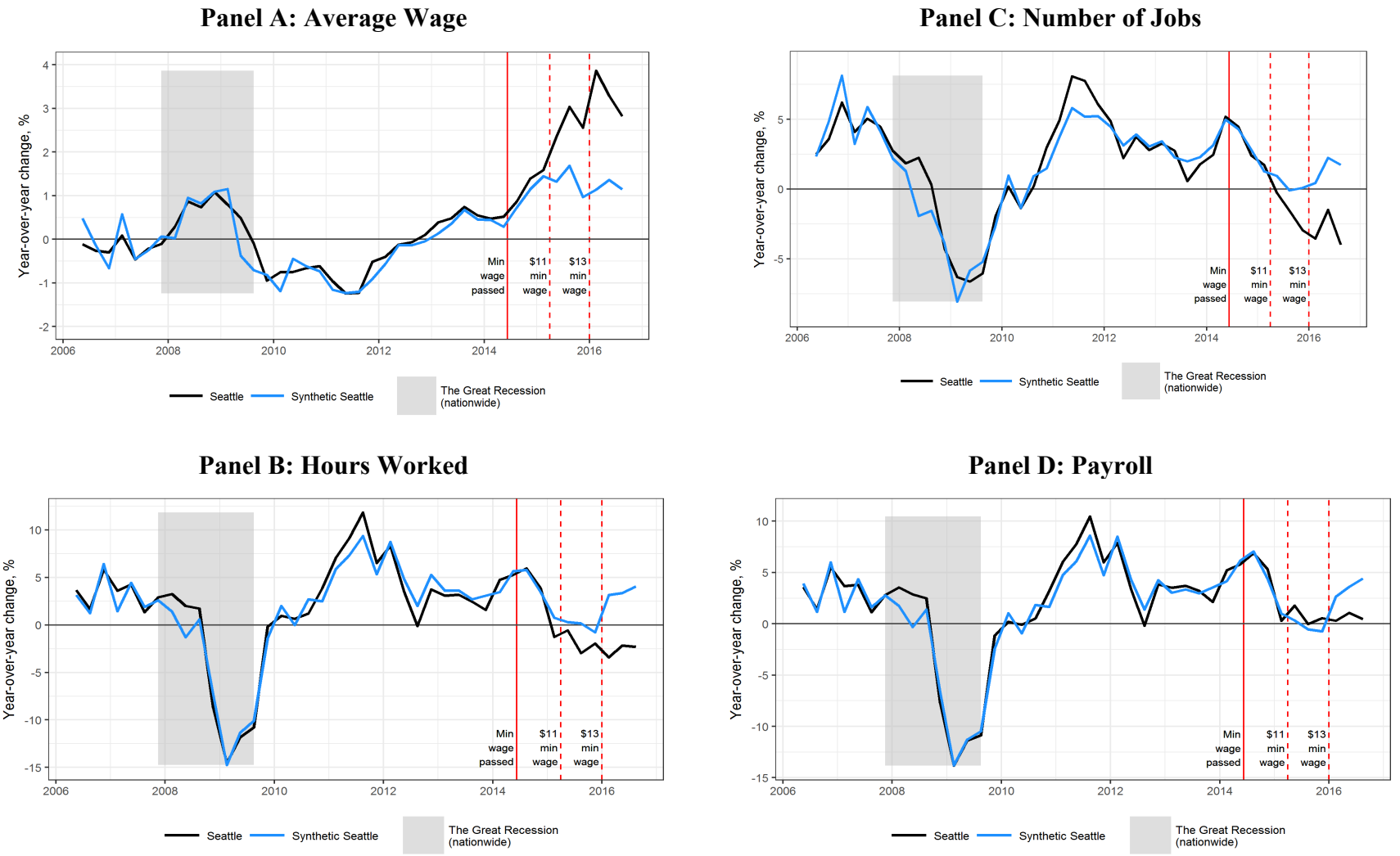
Notes: Washington State Public Use Microdata Areas. Seattle's five PUMAs are in purple. King County PUMAs are within the gold outline, and we do not include in our analysis. The rest of the Washington state PUMAs are in grey.

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



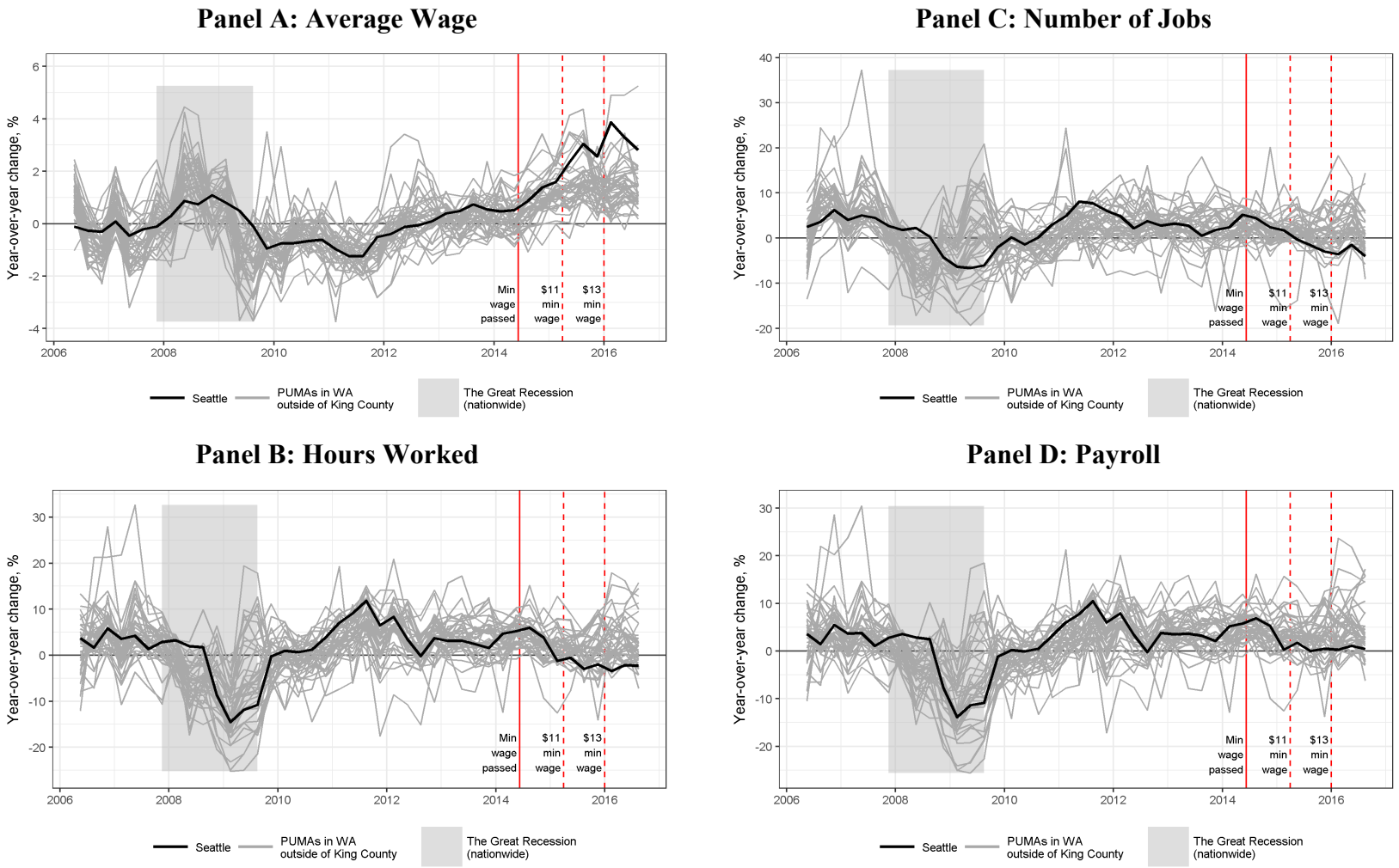
Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. Donors and weights are described in Appendix Table A1.

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



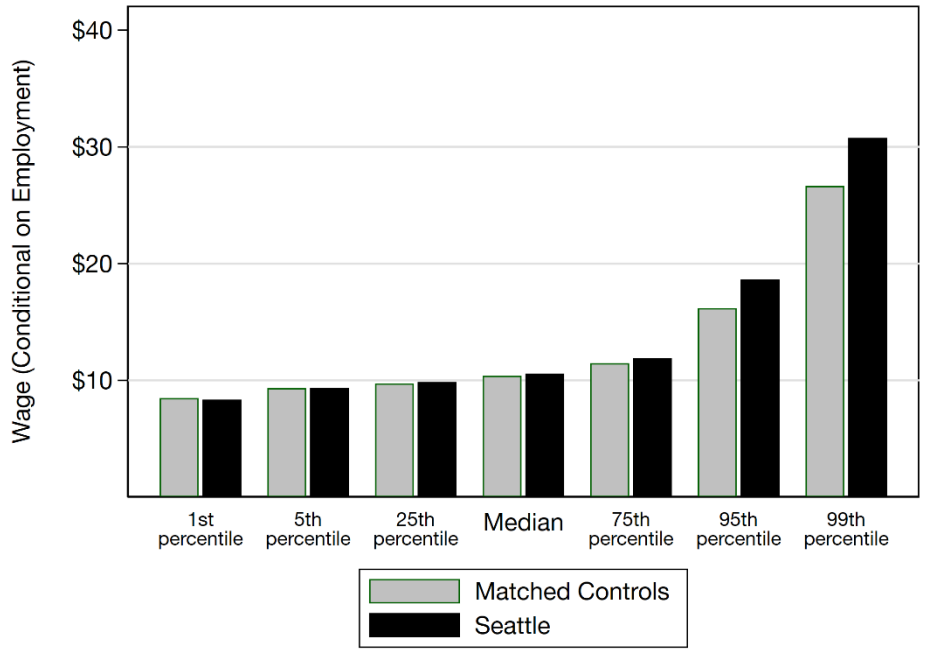
Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. We implement the synthetic control estimator using the R programs provided by Gobillon and Magnac (2016). Donors and weights are described in Appendix Table A1.

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



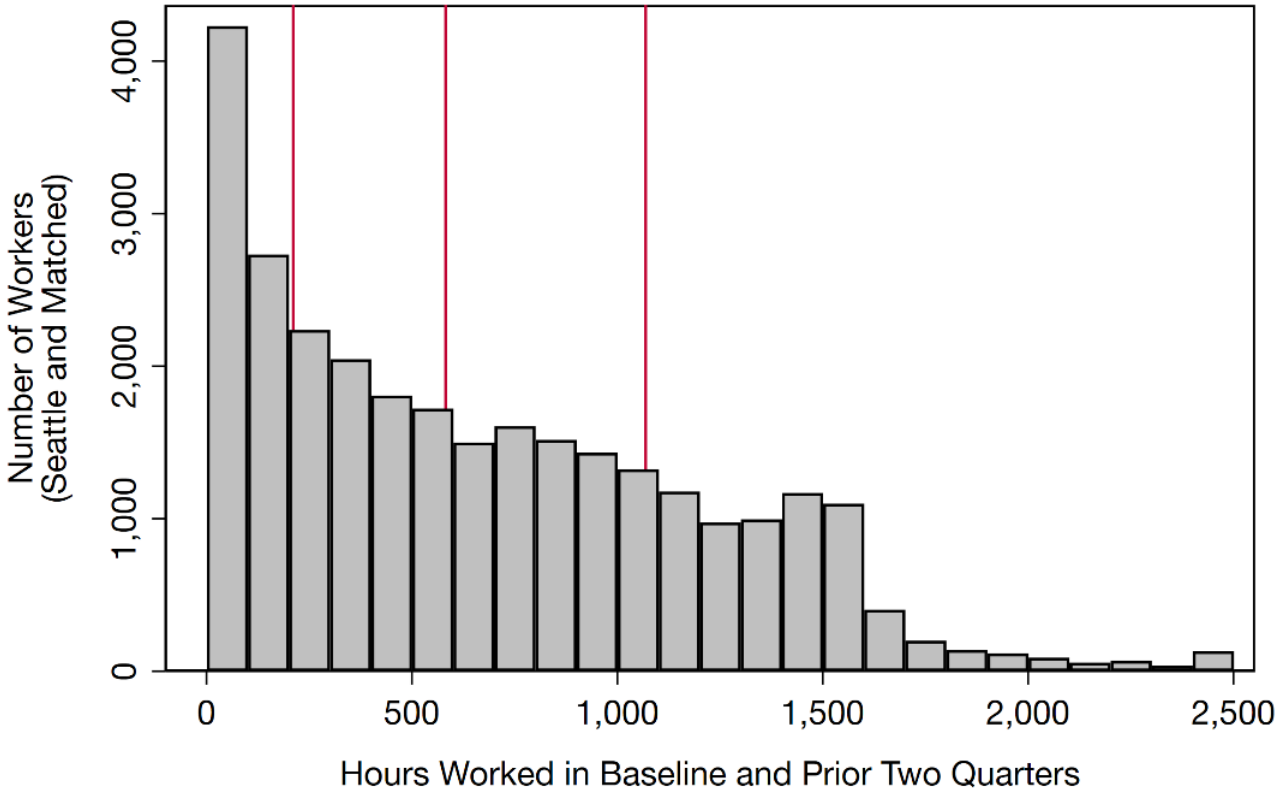
Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. We implement the synthetic control estimator using the R programs provided by Gobillon and Magnac (2016).

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



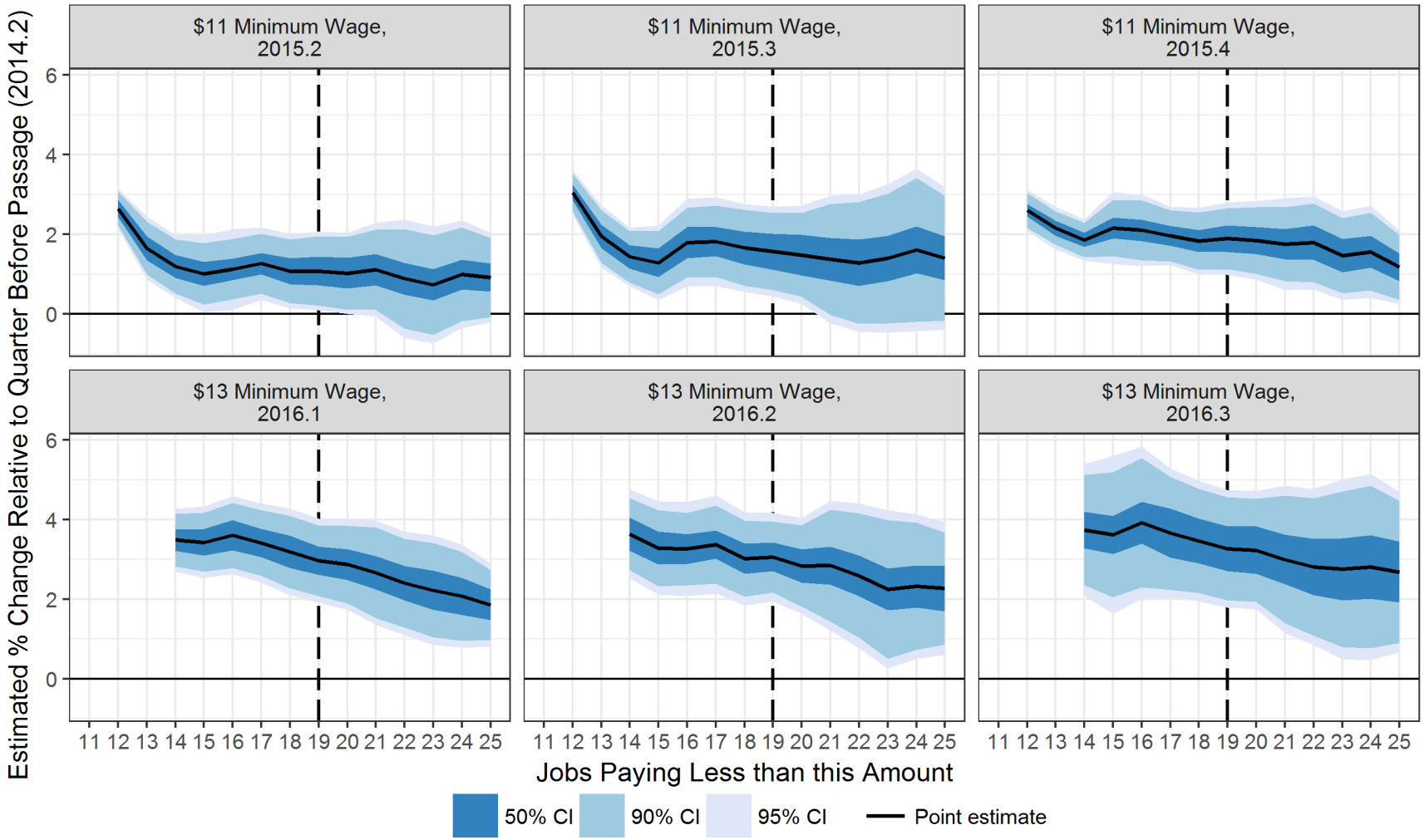
Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. Graph shows wage distribution of WA State workers who made less that $11 an hour in the first quarter of 2012 in the fourth quarter of 2012.

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



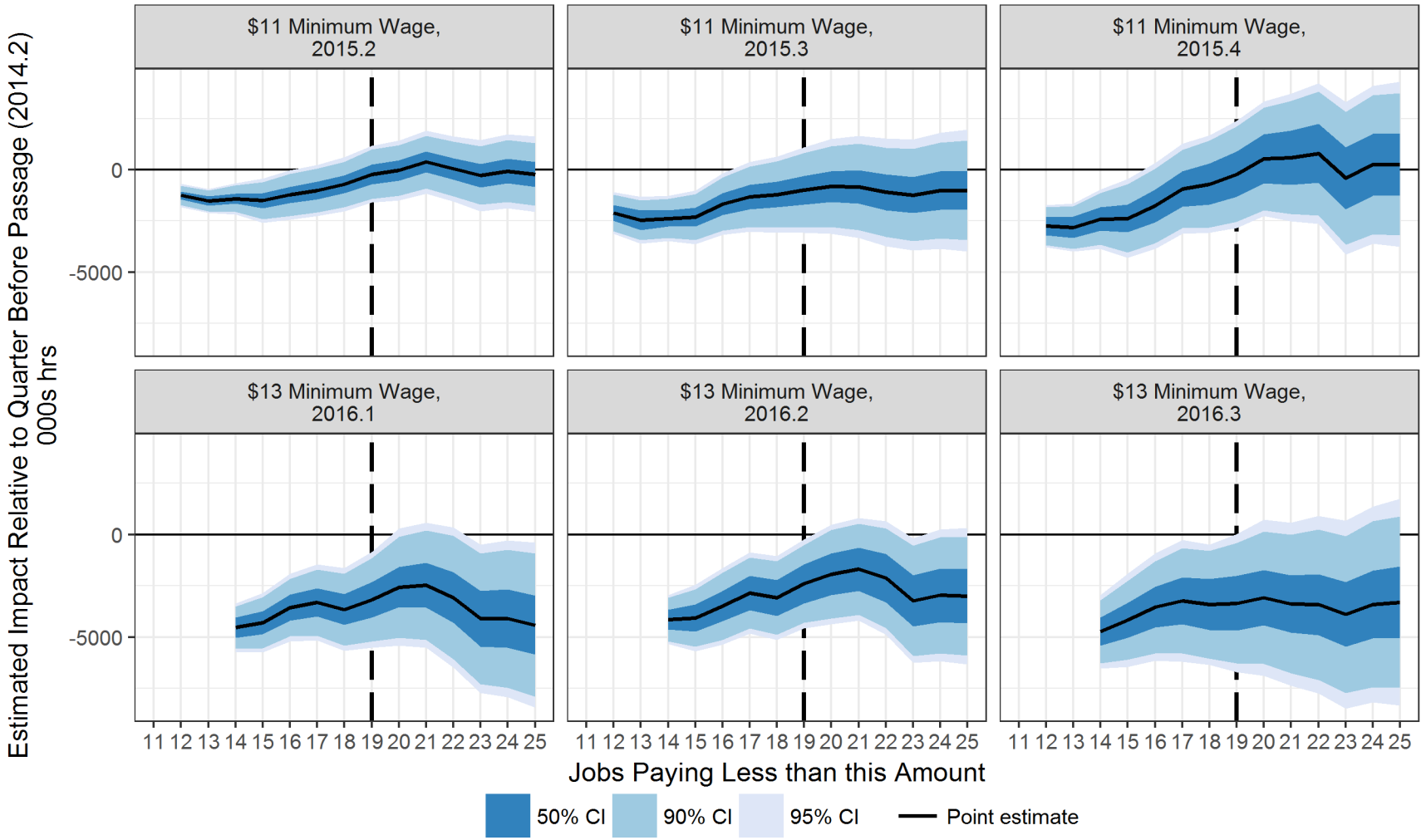
Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. Includes Seattle (treated) workers and other Washington state (control) workers. Vertical lines at 25th, 50th, and 75th percentiles. Hours censored at 2,500.

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



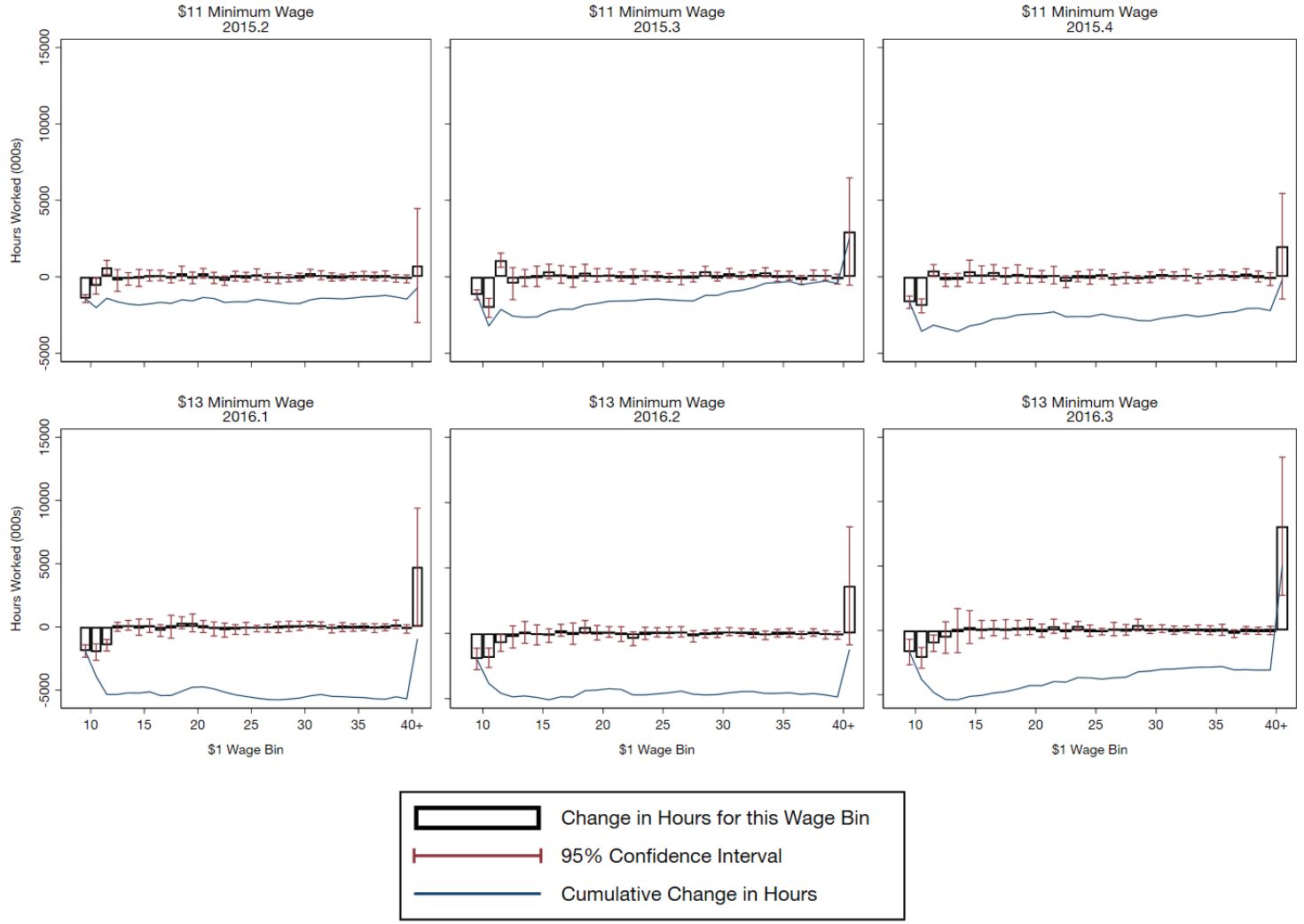
Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. We implement the synthetic control estimator using the R programs provided by Gobillon and Magnac (2016). Point estimates using the synthetic control method (applied to growth rates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



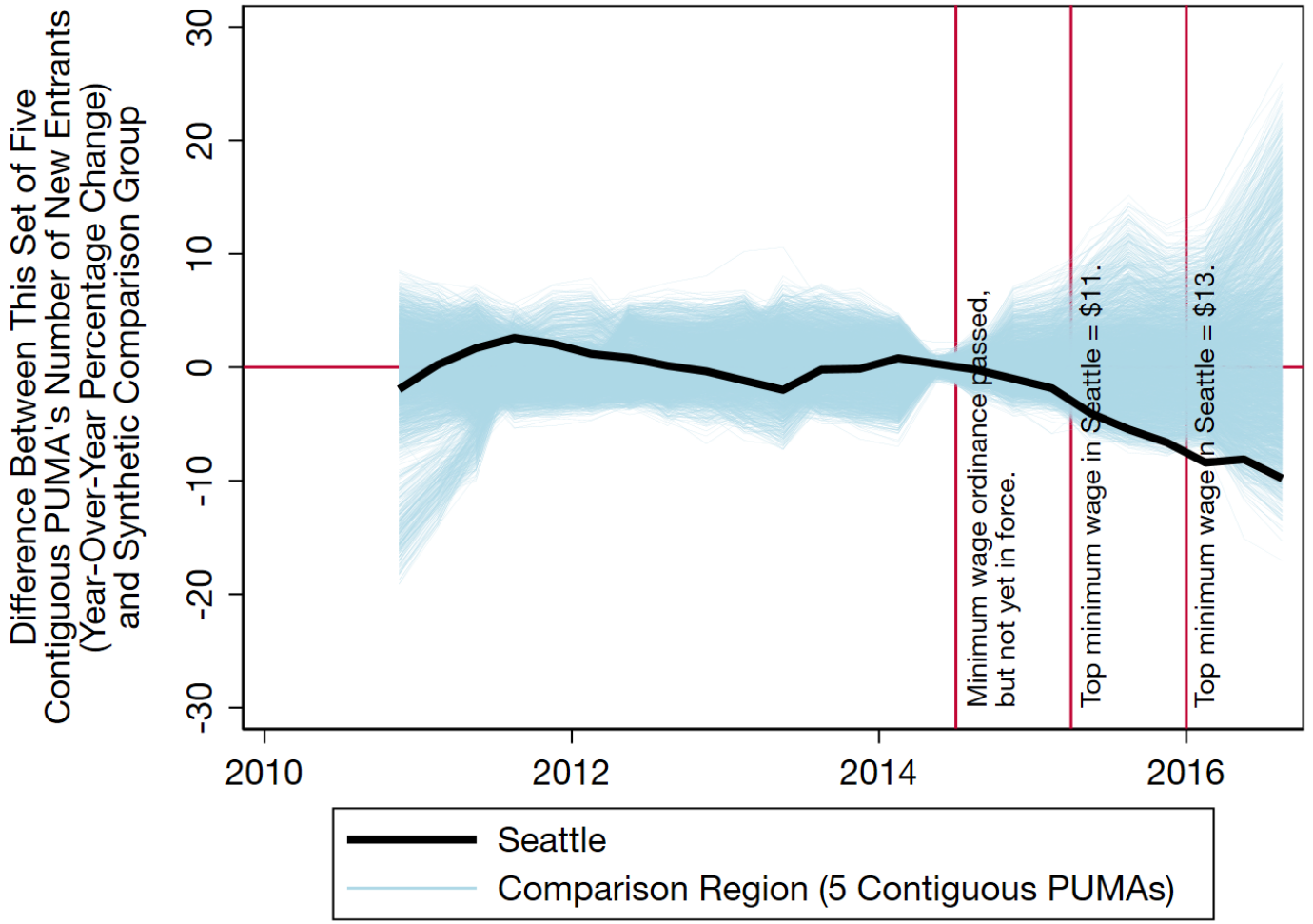
Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. We implement the synthetic control estimator using the R programs provided by Gobillon and Magnac (2016). Point estimates using the synthetic control method (applied to growth rates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



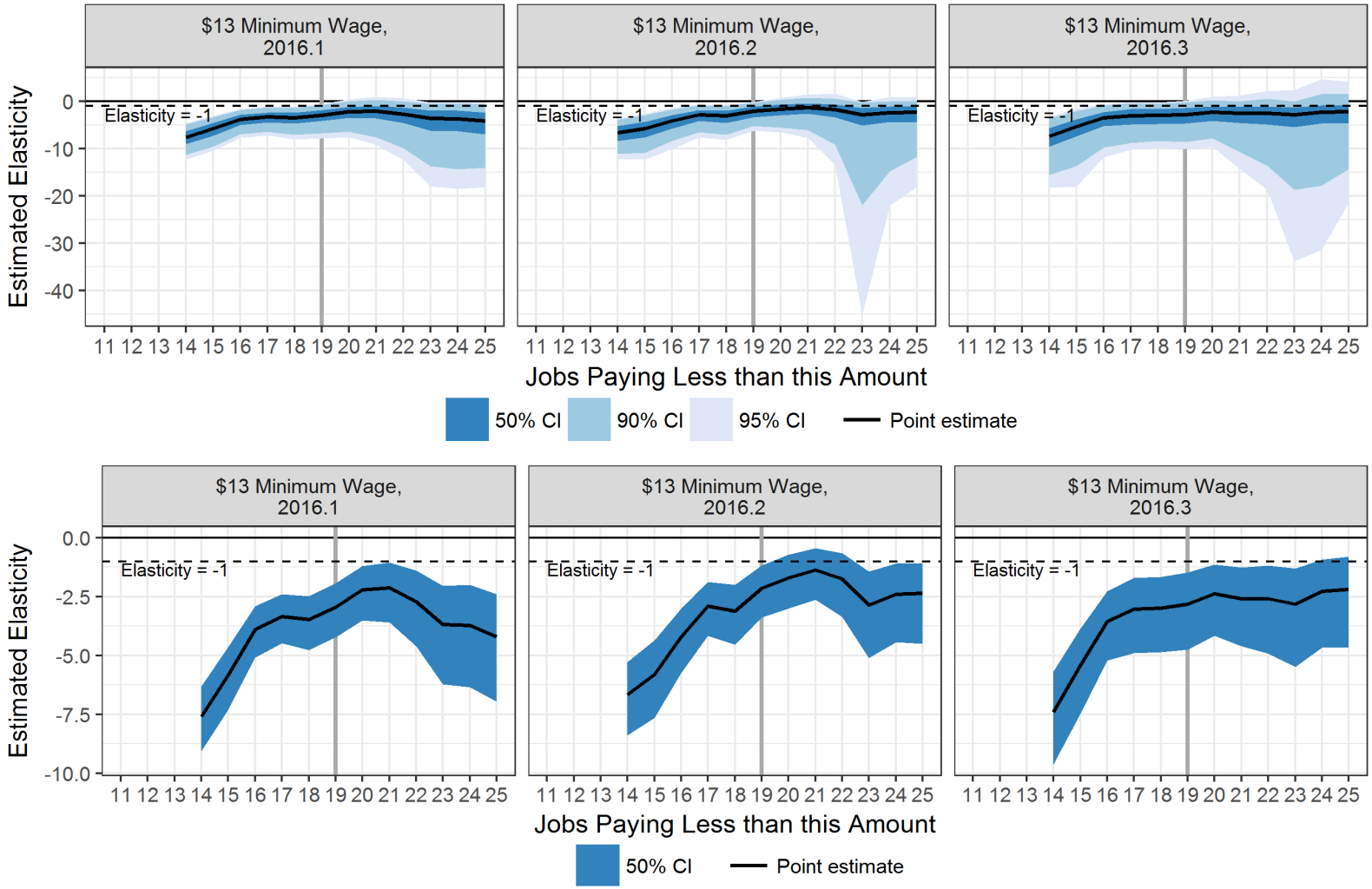
Notes: Source: UI records from WA. Sample: Workers at locatable firms. Wages have been adjusted for inflation using CPI-W. Separate impact estimates are derived for each wage bin. The "Cumulative Change in Hours" presents the sum of the impact estimates for each wage bin up to that bin.

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.

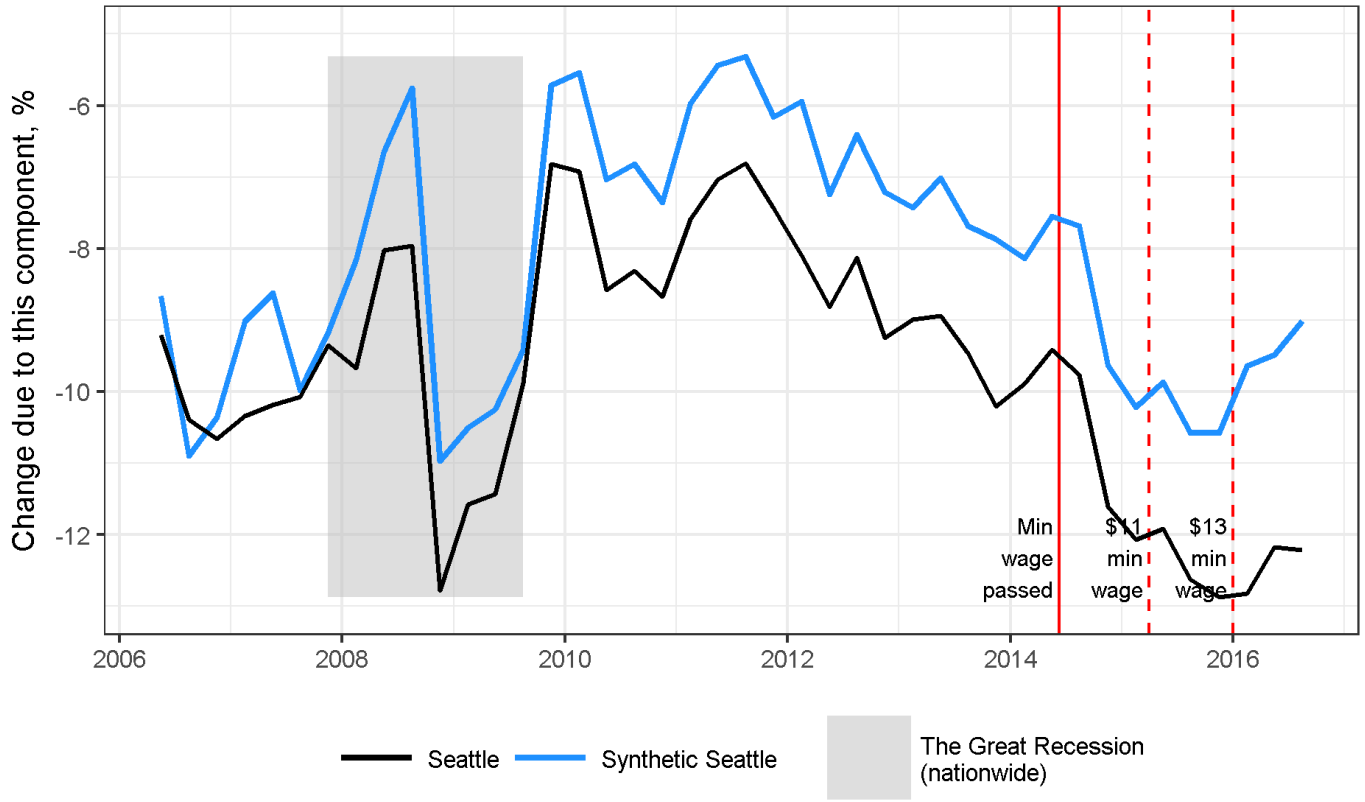
Appendix Table C1: Decomposition of the Effect on Hours Worked

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 statistically 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	0.002	0.002	0.004	-0.012	0.023	0.024**	0.003	0.035*
		[0.585]	[0.916]	[0.924]	[0.354]	[0.623]	[0.247]	[0.036]	[0.862]	[0.095]
2014.4	2	0.003	0.006	-0.002	0.013*	0.029	0.035	0.043***	0.039	0.065**
		[0.465]	[0.713]	[0.892]	[0.067]	[0.315]	[0.289]	[0.000]	[0.107]	[0.042]
2015.1	3	0.002	-0.018	0.007	0.010**	-0.043	0.004	0.02***	-0.02	0.028
		[0.598]	[0.336]	[0.659]	[0.037]	[0.286]	[0.890]	[0.017]	[0.624]	[0.364]
2015.2	4/1	0.011**	-0.006	-0.010	0.027***	-0.064*	-0.054	0.025***	-0.041	-0.015
		[0.029]	[0.756]	[0.549]	[0.000]	[0.057]	[0.119]	[0.000]	[0.213]	[0.632]
2015.3	5/2	0.016***	-0.027	-0.011	0.032***	-0.071*	-0.028	0.047***	-0.032	0.009
		[0.006]	[0.356]	[0.576]	[0.000]	[0.086]	[0.479]	[0.000]	[0.438]	[0.814]
2015.4	6/3	0.019***	-0.006	-0.033	0.036***	-0.106**	-0.097**	0.078***	-0.049	-0.032
		[0.000]	[0.894]	[0.391]	[0.000]	[0.043]	[0.042]	[0.000]	[0.361]	[0.511]
2016.1	7/4	0.030***	-0.087***	-0.038	0.066***	-0.121**	-0.104*	0.094***	-0.045	-0.014
		[0.000]	[0.005]	[0.293]	[0.000]	[0.039]	[0.069]	[0.000]	[0.465]	[0.793]
2016.2	8/5	0.031***	-0.066***	-0.052*	0.068***	-0.112	-0.118*	0.069***	-0.034	-0.015
		[0.000]	[0.022]	[0.076]	[0.000]	[0.150]	[0.072]	[0.000]	[0.701]	[0.800]
2016.3	9/6	0.033***	-0.092*	-0.072*	0.064***	-0.090	-0.078	0.081***	0.001	0.020
		[0.000]	[0.051]	[0.067]	[0.000]	[0.147]	[0.109]	[0.000]	[0.988]	[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 statistically significance using a two-tailed test with $p \leq 0.01$, 0.05, and 0.10, respectively.