Applications in Labor Economics: Minimum Wage and Labor Demand

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Minimum Wage and Labor Demand

Theoretical Framework

- Neoclassical economic theory suggests that binding price floor policies, including minimum wages, should lead to a non-market equilibrium
  - Since workers' productivity does not change as minimum wage increases
  - But employers have to hire them with higher wage
  - Excess supply and diminished demand
- Some previous empirical studies have questioned the extent to which this prediction holds in the low wage labor market
  - Many estimates suggesting a negligible impact of higher minimum wages on employment

Minimum Wage and Labor Demand

Taiwan's Facts

- Minimum wage in 2023 is 176 NT$ per hour or 26,400 NT$ per month
- Government did not change minimum wage during 1997 to 2007
  - Hourly wage: 66 NT$ during 1997 to 2007
  - Monthly salary: 15,840 NT$ during 1997 to 2007
- Since 2010, almost every year government raises minimum wage
  - Hourly wage: 98 NT$ in 2010
  - Monthly salary: 17,880 NT$
  - Increase by about 80%

Minimum Wage and Labor Demand

Taiwan's Facts

- Huang and Chou (2019) examines the effect of increasing minimum wage during 2013-2018 on employment
  - Reduce the employment rate by 10%
  - Effects are larger for old workers (above age 55)

Empirical Example: Ekaterina Jardim et. al (2018)

Ekaterina Jardim, Mark C. Long, Robert Plotnick, Emma van Inwegen, Jacob Vigdor, and Hilary Wething (2018) "**Minimum Wage Increases, Wages, and Low-Wage Employment: Evidence from Seattle**" American Economic Journal: Economic Policy, vol. 14(2), pages 263-314

- The authors estimate the causal effect of minimum wage on wages and low-wage employment by using synthetic control method

Empirical Example: Ekaterina Jardim et. al (2018)

Motivation

- They use rich administrative data on employment, earnings, and hours in Washington State to re-examine this prediction
- Seattle increases minimum wage from $9.47 to as much as $11 in April 2015
    - Increases again to $13 in January 2016

Empirical Example: Ekaterina Jardim et. al (2018)

Motivation

- They examine the impact of a minimum wage increase for employment across **all categories of low-wage employees**
- Previous literature cannot observe wage directly
  - Focus on lower-wage industries, such as the restaurant sector, or on lower-productivity employees such as teenagers
  - May yield **attenuated estimates** of the effect as they blend workers for whom the minimum wage is binding with workers for whom it is not

Empirical Example: Ekaterina Jardim et. al (2018)

Motivation

- They examine both the extensive (employment) and intensive margins (hours of worked)
  - Prior studies commonly analyze only measures of "headcount" employment (extensive margin)
  - Ignoring the reality that most low-wage jobs are part-time in nature
  - The intensive margin may be a significant dimension of adjustment

Empirical Example: Ekaterina Jardim et. al (2018)

Policy Background

- In June 2014, the City of Seattle passed a minimum wage ordinance
  - Gradually increased the minimum wage within Seattle's city boundaries to $15
  - The phase-in rate differed by employer size, and offered some differentiation for employers who pay tips or health benefits
- They study the impact of the 2015 and 2016 minimum wage increases in Seattle

Empirical Example: Ekaterina Jardim et. al (2018)

Policy Background

Table 1: Minimum Wage Schedule in Seattle under the Seattle Minimum Wage Ordinance

	Large Employers[a]		Small Employers	
Effective Date	No benefits	With benefits[b]	No benefits or tips	Benefits or tips[c]
	Before Seattle Ordinance			
January 1, 2015	$9.47	$9.47	$9.47	$9.47
	After Ordinance			
April 1, 2015	$11.00	$11.00	$11.00	$10.00
January 1, 2016	$13.00	$12.50	$12.00	$10.50
January 1, 2017	$15.00[d]	$13.50	$13.00	$11.00
January 1, 2018	$15.45	$15.00[e]	$14.00	$11.50
January 1, 2019			$15.00[f]	$12.00
January 1, 2020				$13.50
January 1, 2021				$15.00[g]

Empirical Example: Ekaterina Jardim et. al (2018)

Data

- Administrative employment data from Washington State covering the period of 2005 through the third quarter of 2016
- Washington's Employment Security Department collects **quarterly payroll records** for all workers who received wages in Washington and are covered by Unemployment Insurance
- Employers are required to report actual hours worked
- They construct average hourly wage paid to each worker in each quarter by dividing total quarterly earnings by quarterly hours worked

Empirical Example: Ekaterina Jardim et. al (2018)

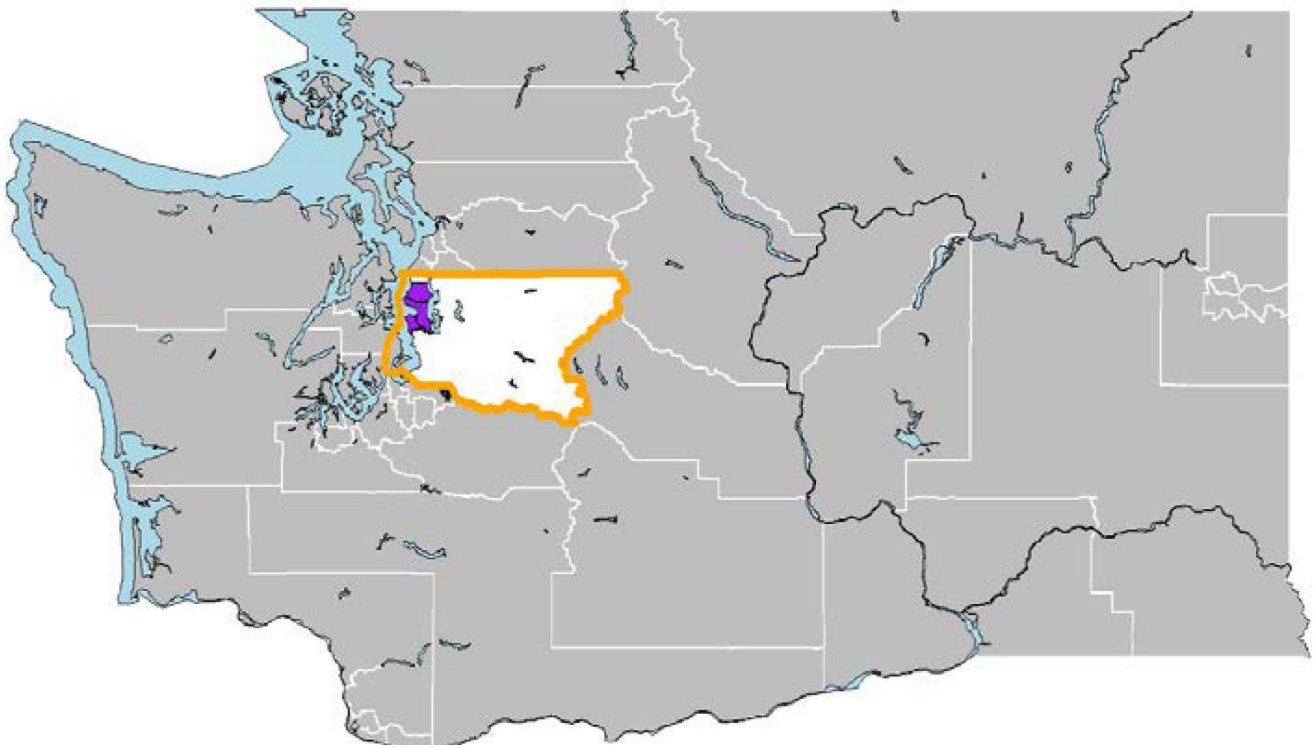
Research Design

- The unit of analysis is Public Use Microdata Areas (PUMAs) in Washington State
- A PUMA is a geographic unit defined by the U.S. Census Bureau with a population of approximately 100,000 people
- Seattle is composed of five PUMAs (treated regions)
- The remainder of Washington includes 40 PUMAs (control regions)

Empirical Example: Ekaterina Jardim et. al (2018)

Research Design

Figure 4: Synthetic Control and Interactive Fixed Effects Regions (Seattle and Public Use Microdata Areas Outside King County)



Empirical Example: Ekaterina Jardim et. al (2018)

Identification Strategy: SC

- SC uses pre-policy observations to find an optimal set of (weighted) control regions to match pre-policy trend in the treated region

$$\min_{w_r} \sum_{t=-33}^{0} (\Delta Y_{r=1,t} - \sum_{r=2}^{R} w_r \Delta Y_{rt})^2$$

- Subject to the constraints $\sum_r w_r = 1$ and $\forall r, w_r \geq 0$
- ΔY_{rt}: It represents year-over-year changes in each outcome in region r at period (year-quarter) t
  - $\Delta Y_{rt} = \frac{Y_{rt}}{Y_{r,t-4}} - 1$

Empirical Example: Ekaterina Jardim et. al (2018)

Identification Strategy: SC

- Given a set of weights $\hat{w}_r$, the impact of minimum wage increase in period (year-quarter) q is estimated as follows:

$$\beta_q^{synth} = \Delta Y_{r=1,q} - \sum_{r=2}^{R} \hat{w}_r \Delta Y_{rt}$$

- Note that they focus on low-wage jobs (i.e., those earning under \$19 per hour)

Empirical Example: Ekaterina Jardim et. al (2018)

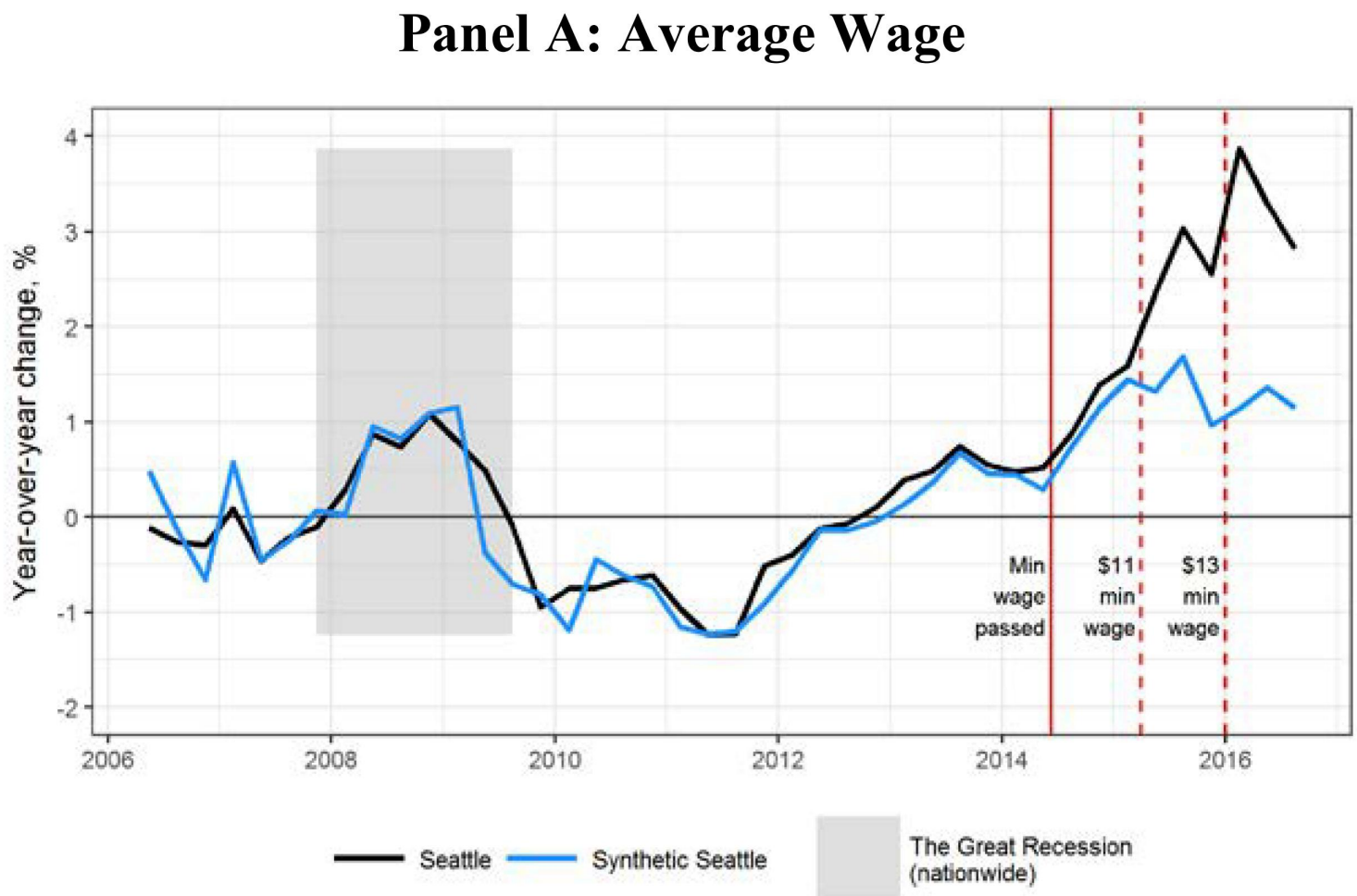
Results

Table 5: Effect on Wages of Low-Wage Jobs

Quarter	Quarters After Passage / Enforcement	Synthetic Control	Interactive Fixed Effects
2014.3	1	0.002	0.005
		[0.585]	[0.101]
2014.4	2	0.003	0.008***
		[0.465]	[0.013]
2015.1	3	0.002	0.009***
		[0.598]	[0.004]
2015.2	4/1	0.011**	0.016***
		[0.029]	[0.000]
2015.3	5/2	0.016***	0.022***
		[0.006]	[0.000]
2015.4	6/3	0.019***	0.019***
		[0.000]	[0.000]
2016.1	7/4	0.030***	0.032***
		[0.000]	[0.000]
2016.2	8/5	0.031***	0.031***
		[0.000]	[0.000]
2016.3	9/6	0.033***	0.034***
		[0.000]	[0.000]
R2			0.781
Pre-Policy RMSPE		0.003	
Obs.		1,890	1,890

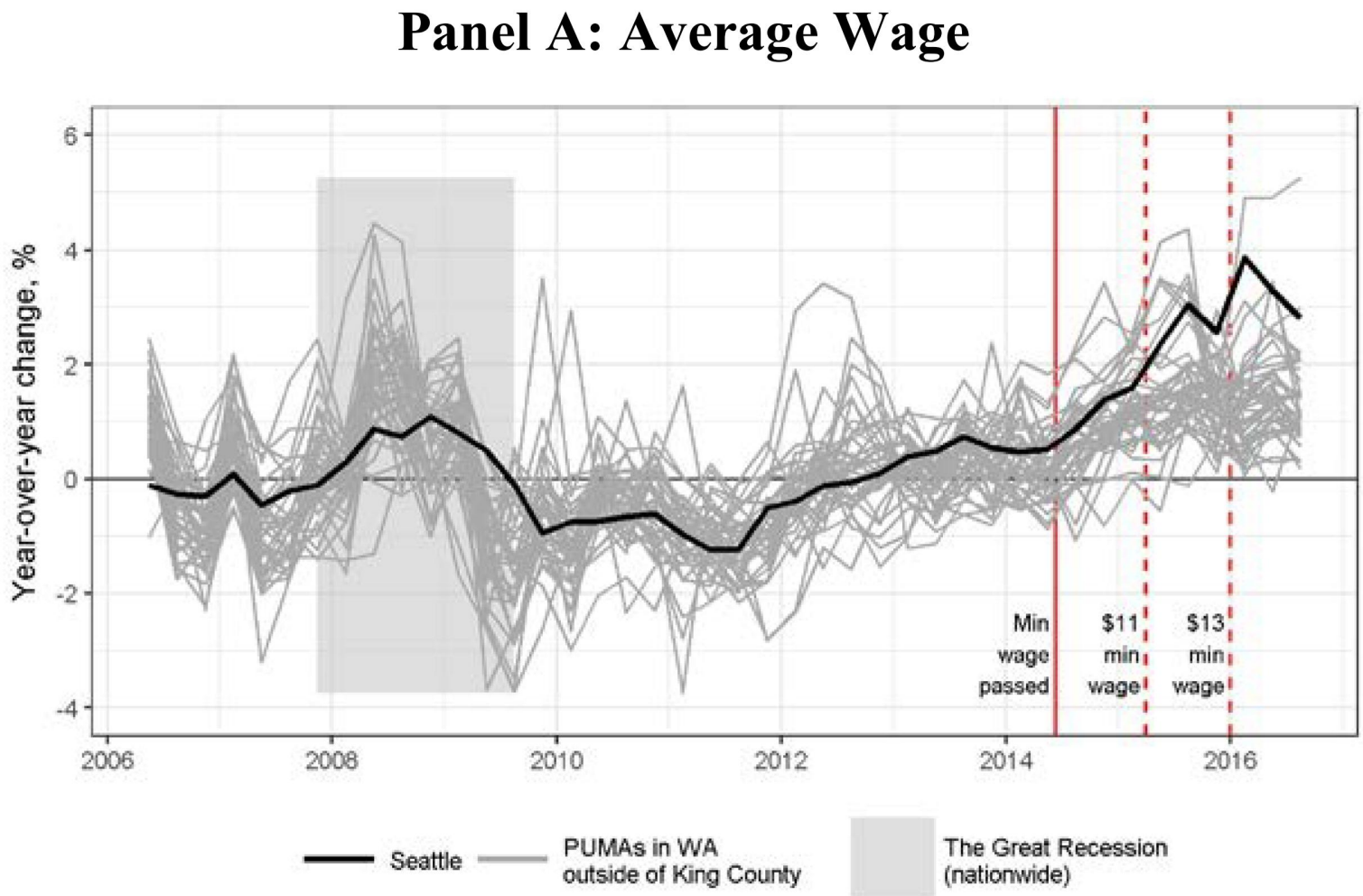
Empirical Example: Ekaterina Jardim et. al (2018)

Results



Empirical Example: Ekaterina Jardim et. al (2018)

Results



Empirical Example: Ekaterina Jardim et. al (2018)

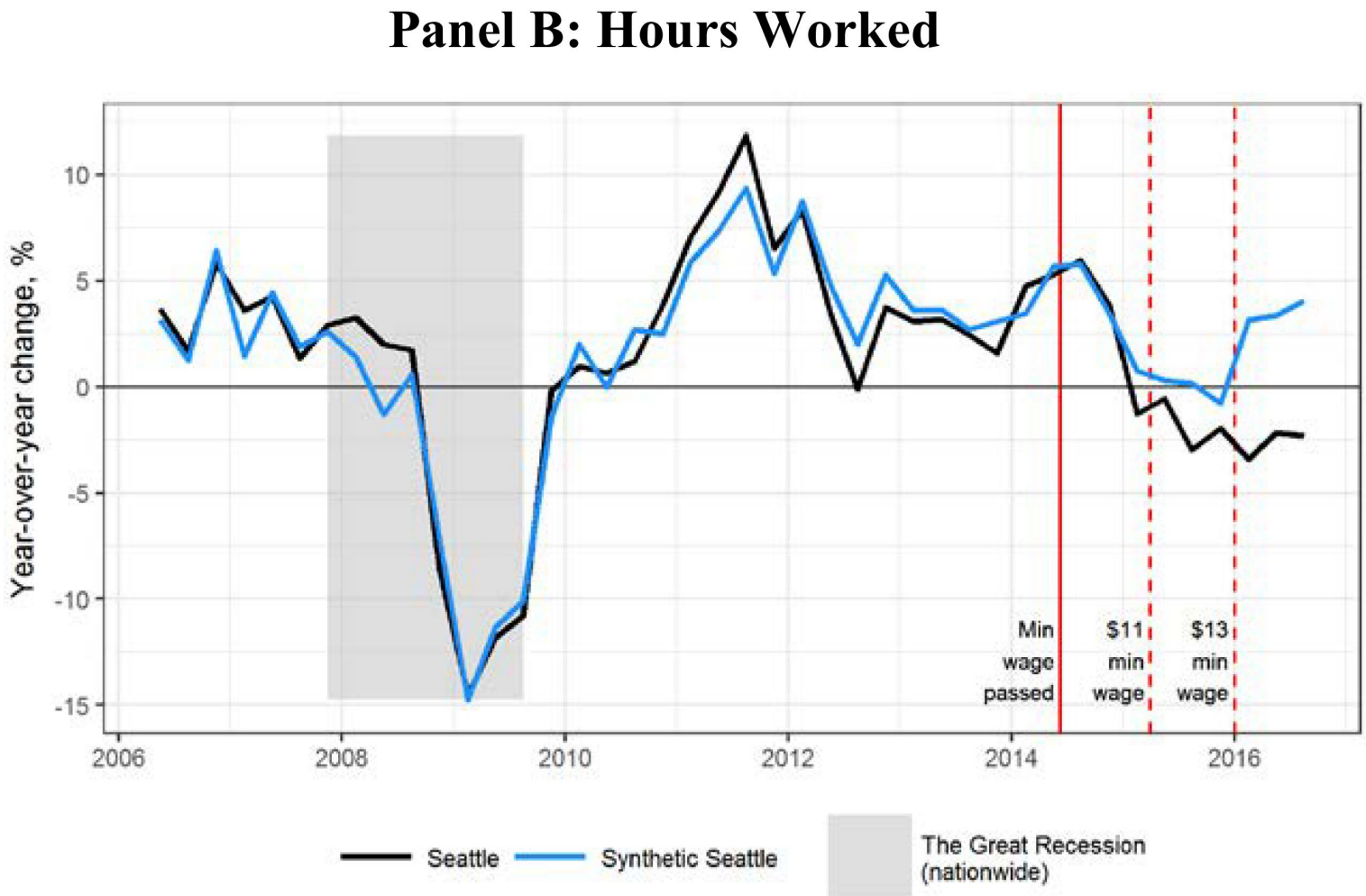
Results

Table 6: Effect on Low-Wage Employment

Quarter	Quarters After Passage / Enforcement	Hours		Jobs	
		Synthetic Control	Interactive Fixed Effects	Synthetic Control	Interactive Fixed Effects
2014.3	1	0.002	0.005	0.002	-0.003
		[0.916]	[0.766]	[0.924]	[0.842]
2014.4	2	0.006	0.000	-0.002	-0.014
		[0.713]	[0.975]	[0.892]	[0.357]
2015.1	3	-0.018	-0.015	0.007	-0.005
		[0.336]	[0.349]	[0.659]	[0.724]
2015.2	4/1	-0.006	-0.008	-0.010	-0.024
		[0.756]	[0.594]	[0.549]	[0.107]
2015.3	5/2	-0.027	-0.008	-0.011	-0.026
		[0.356]	[0.715]	[0.576]	[0.223]
2015.4	6/3	-0.006	0.008	-0.033	-0.035
		[0.894]	[0.735]	[0.391]	[0.109]
2016.1	7/4	-0.087***	-0.057***	-0.038	-0.032
		[0.005]	[0.014]	[0.293]	[0.146]
2016.2	8/5	-0.066***	-0.046*	-0.052*	-0.071***
		[0.022]	[0.052]	[0.076]	[0.001]
2016.3	9/6	-0.092*	-0.064***	-0.072*	-0.088***
		[0.051]	[0.023]	[0.067]	[0.001]
R2			0.791		0.718
Pre-Policy RMSPE		0.013		0.013	
Obs.		1,890	1,890	1,890	1,890

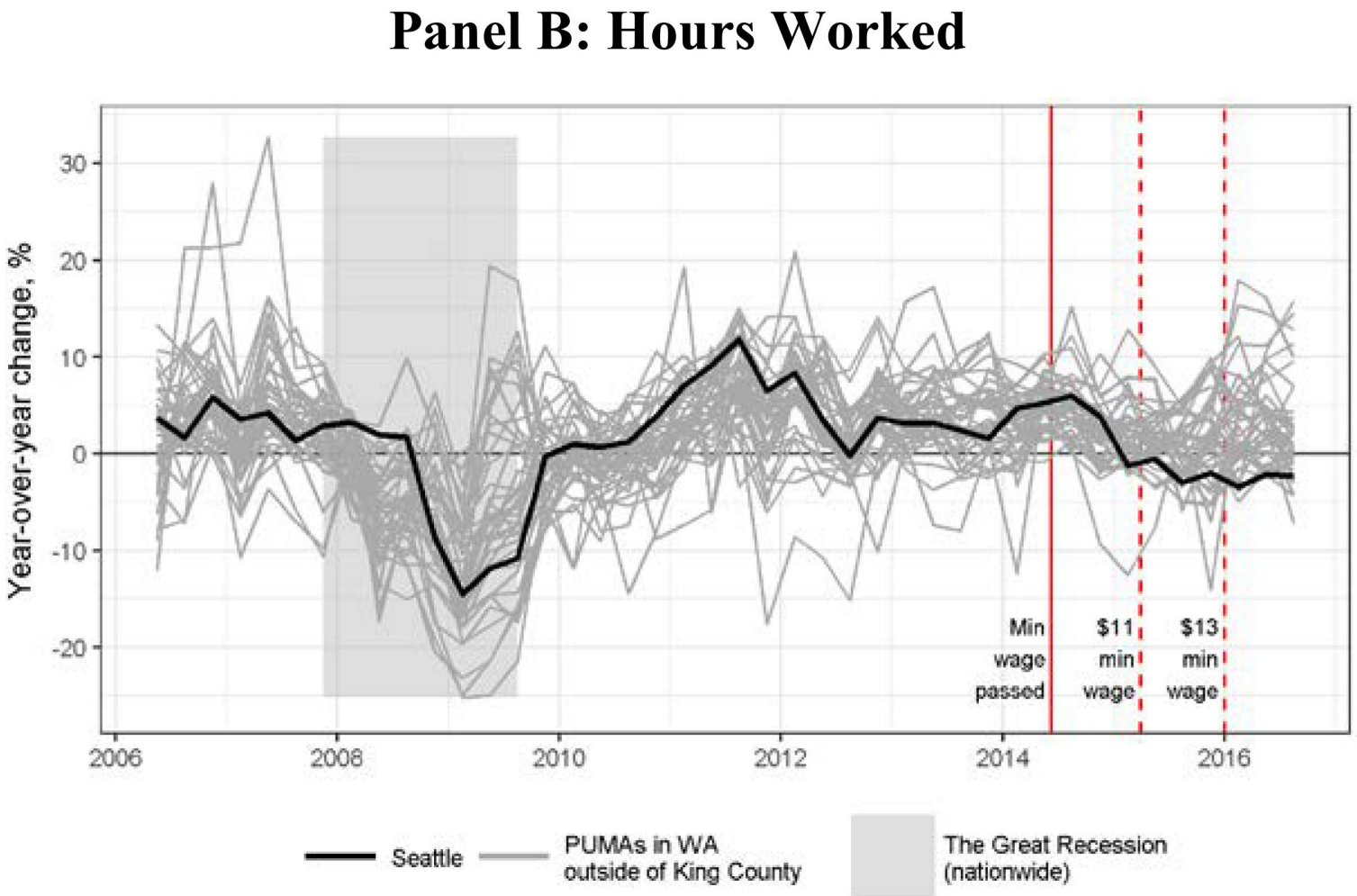
Empirical Example: Ekaterina Jardim et. al (2018)

Results



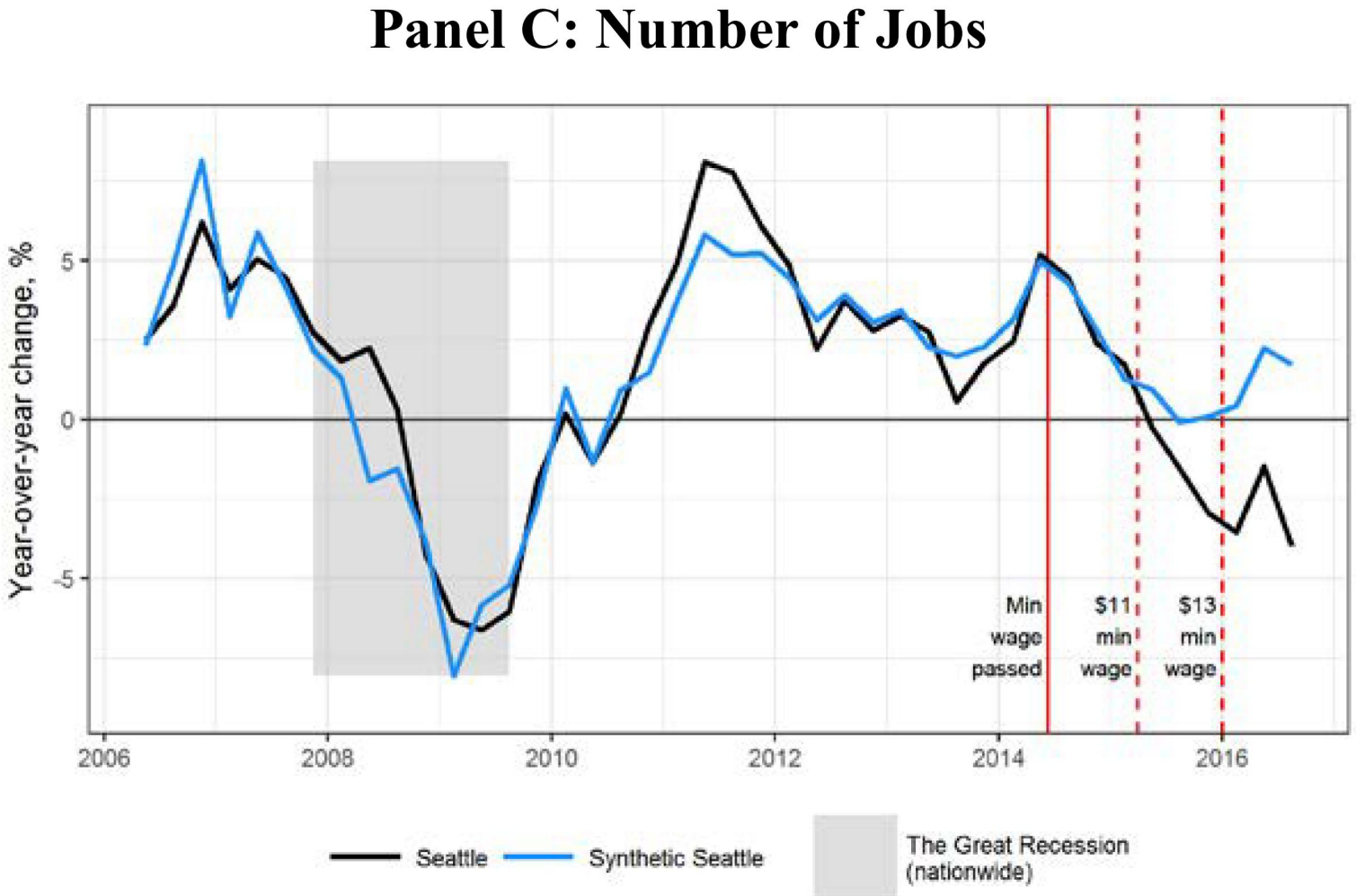
Empirical Example: Ekaterina Jardim et. al (2018)

Results



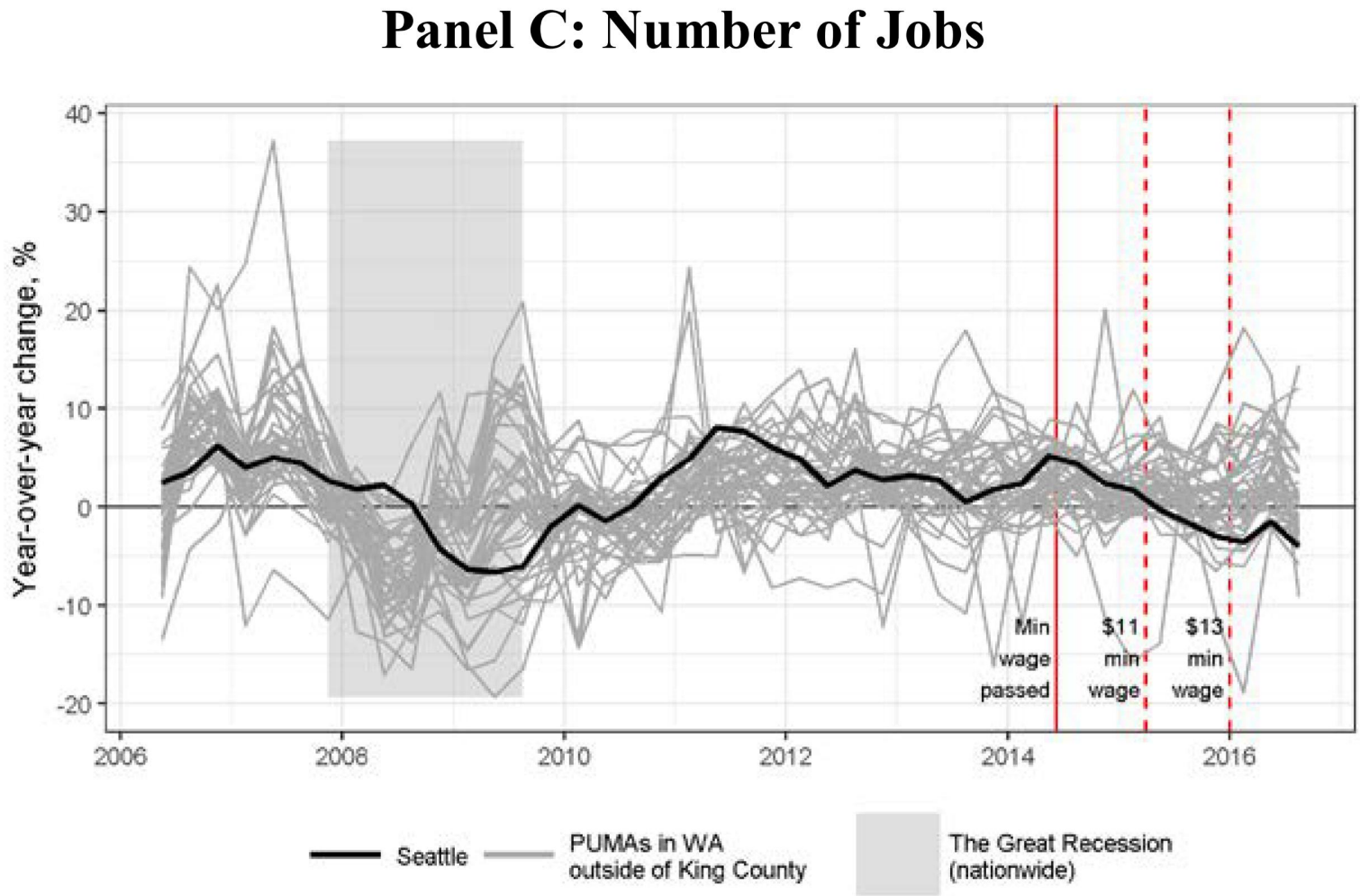
Empirical Example: Ekaterina Jardim et. al (2018)

Results



Empirical Example: Ekaterina Jardim et. al (2018)

Results



Empirical Example: Ekaterina Jardim et. al (2018)

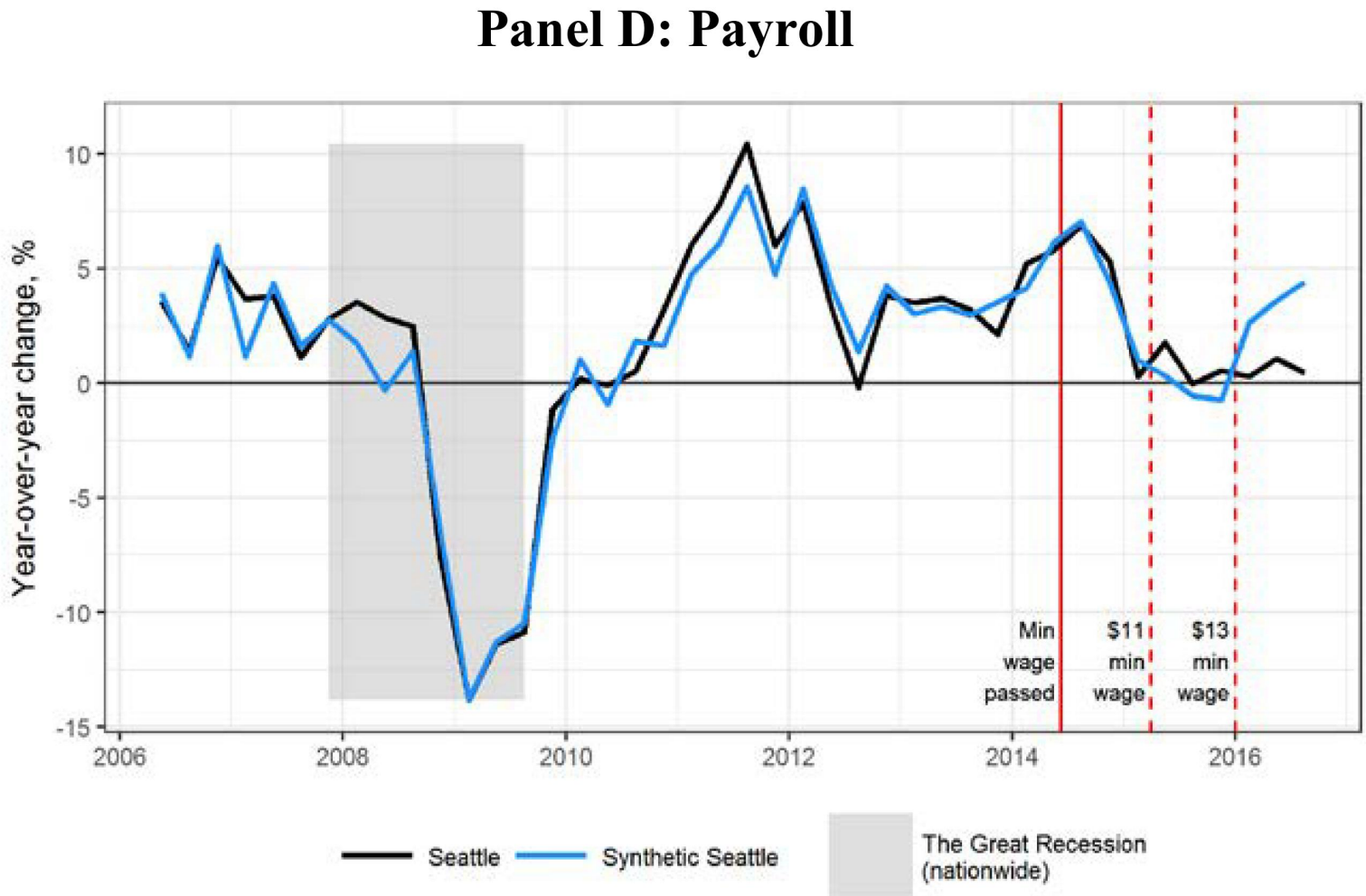
Results

Table 7: Effect on Payroll for Low-Wage Jobs

Quarter	Quarters After Passage / Enforcement	Synthetic Control	Interactive Fixed Effects
2014.3	1	-0.001	0.014
		[0.946]	[0.301]
2014.4	2	0.012	0.012
		[0.479]	[0.404]
2015.1	3	-0.004	-0.006
		[0.836]	[0.698]
2015.2	4/1	0.017	0.01
		[0.399]	[0.486]
2015.3	5/2	0.006	0.015
		[0.847]	[0.478]
2015.4	6/3	0.025	0.023
		[0.614]	[0.286]
2016.1	7/4	-0.032	-0.035
		[0.416]	[0.149]
2016.2	8/5	-0.013	-0.024
		[0.739]	[0.352]
2016.3	9/6	-0.037	-0.039
		[0.519]	[0.176]
R2			0.825
Pre-Policy RMSPE		0.012	
Obs.		1,890	1,890

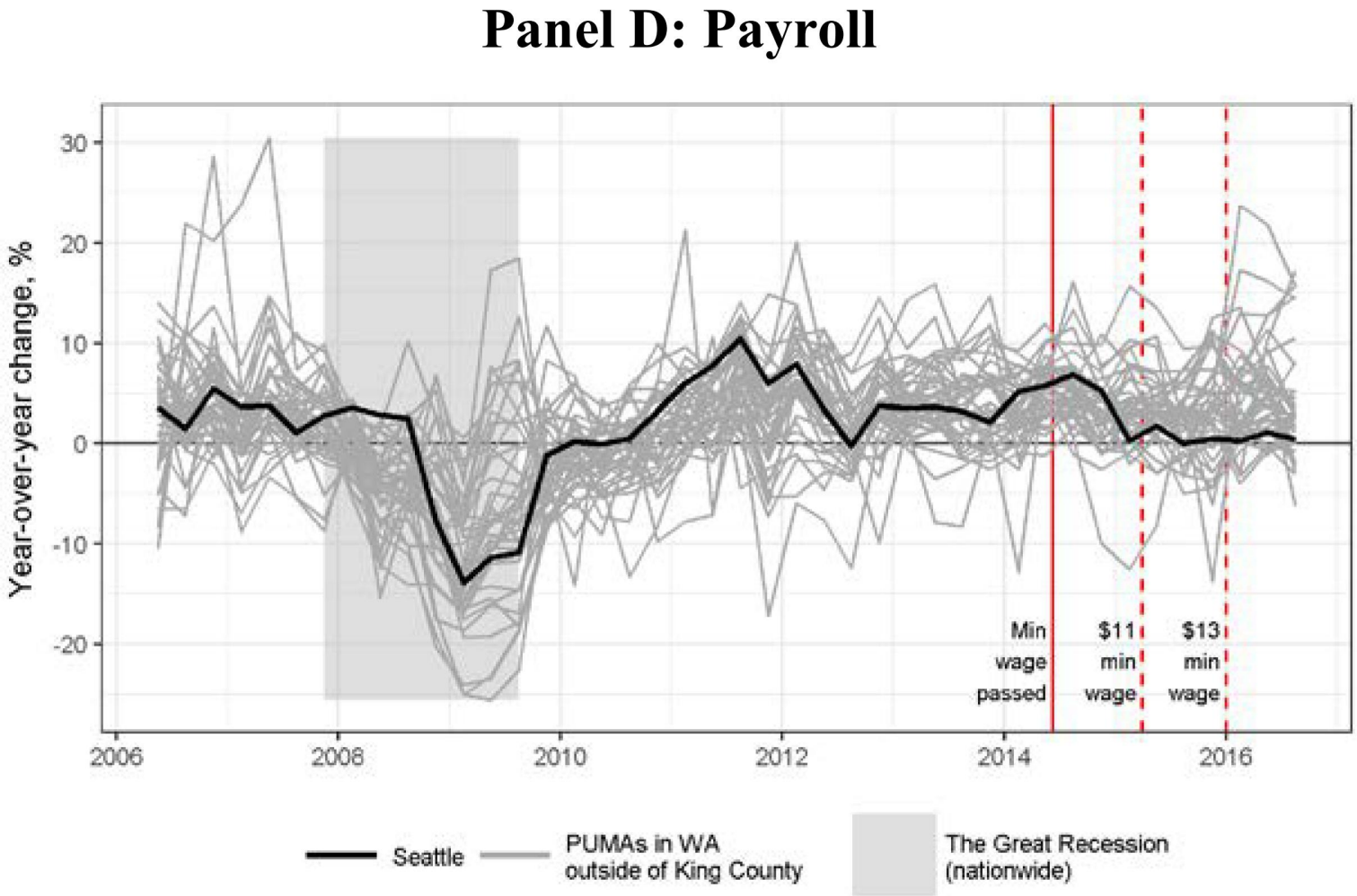
Empirical Example: Ekaterina Jardim et. al (2018)

Results



Empirical Example: Ekaterina Jardim et. al (2018)

Results



Empirical Example: Ekaterina Jardim et. al (2018)

Summary of Findings

- They conclude that the second wage increase to $13 reduced hours worked in low-wage jobs by 6.9%
- Hourly wages in such jobs increased by 3.2%
- Importantly, the **lost income associated with the hours reductions exceeds the gain associated with the net wage increase**
  - The average low-wage employee was paid $1,900 per month
  - The reduction in hours would cost the average employee $130 per month
  - While the wage increase would recoup only $56 of this loss
  - Leaving a net loss of $74 per month, which is sizable for a low-wage worker