

# Graduate Labor Economics

## Lecture 9: The Minimum Wage: Part I

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# Today's lecture

- Background on the minimum wage
- Brainstorming research questions
- Dube, Lester, and Reich (2010)
- Neumark, Salas, and Wascher (2014)

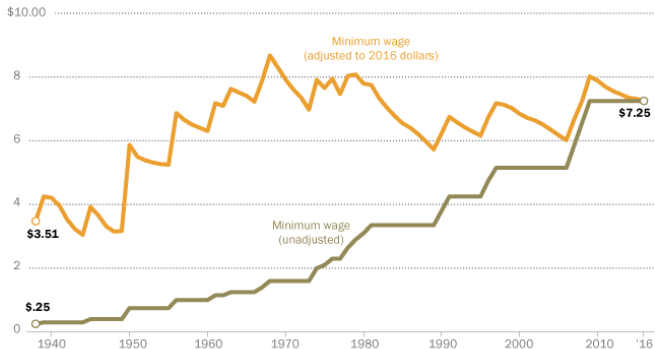
# The minimum wage, past and present

- First federal minimum wage: 1938 Fair Labor Standards Act
  - Initially 25 cents per hour, many sectors uncovered
  - Gradual expansions in coverage, periodic increases
  - Not indexed to inflation  $\implies$  declines b/w updates
- As of March 2019:
  - \$7.25 federal minimum wage
  - 29 states (+ DC) have higher minimums
  - City-wide minimum wages including \$15 in places
  - Sub-minimums for teenagers, tipped workers

# Sawtooth adjustment of the federal minimum wage

## Federal minimum wage, 1938-2016

*Shown in nominal (not adjusted for inflation) dollars and 2016 (inflation-adjusted) dollars*



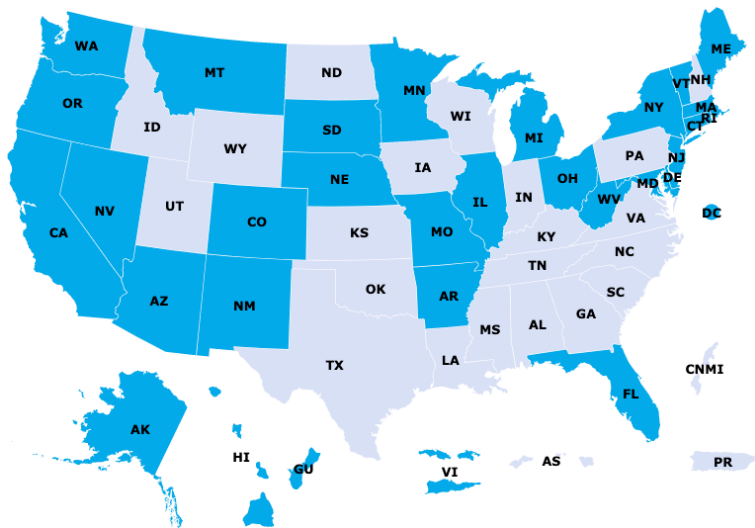
Note: Wage rates adjusted for inflation using implicit price deflator for personal consumption expenditures.

Sources: Bureau of Labor Statistics, Bureau of Economic Analysis, Pew Research Center analysis.

PEW RESEARCH CENTER

Pew Research Center (2017)

## Binding state minimums are spatially clustered



(Department of Labor, 2019: states with above-federal minimum wages)

# Gradual phase-in of California's \$15 minimum wage

**Schedule for California Minimum Wage rate 2017-2023.**

Date	Minimum Wage for Employers with 25 Employees or Less	Minimum Wage for Employers with 26 Employees or More
January 1, 2017	\$10.00/hour	\$10.50/hour
January 1, 2018	\$10.50/hour	\$11.00/hour
January 1, 2019	\$11.00/hour	\$12.00/hour
January 1, 2020	\$12.00/hour	\$13.00/hour
January 1, 2021	\$13.00/hour	\$14.00/hour
January 1, 2022	\$14.00/hour	\$15.00/hour
January 1, 2023	\$15.00/hour	

(CA Department of Industrial Relations)

# Research questions

- Central question: how does  $\underline{w}$  affect employment?
  - Does increasing  $\underline{w}$  increase earnings in affected population?
  - Does increasing  $\underline{w}$  create or reduce deadweight loss?
  - How does increasing  $\underline{w}$  affect *who* gets hired?
- Theory is ambiguous (see Brown 1999)
  - Competitive model: minimum wage reduces  $L^*$
  - Monopsony model: minimum wage *might* increase  $L^*$
  - Additional issues related to incomplete coverage, search
- Other angles?
  - Working conditions
  - On-the-job training
  - Compliance
  - Product prices
  - Political economy

# Three big issues in the literature on employment effects

1. Choosing the right target population
2. Constructing a valid counterfactual
3. Static vs. dynamic responses



# Defining the affected population

- Two populations typically studied:
  - Teenagers
  - Restaurant workers
- Why are these sensible groups to study?
  - Fraction affected by minimum wage
  - Data availability
  - Comparability with prior studies
- Why not just look at aggregate employment?
  - Overly broad populations dilute effects
  - Overly narrow populations miss labor-labor substitution
  - Chosen groups are (hopefully) a reasonable middle-ground

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# First generation: time-series evidence

- Aggregate time-series regression:

$$\ln y_t = \alpha + \eta \ln(\underline{w}_t) + x_t' \delta + \varepsilon_t$$

where  $y_t$  is teen employment,  $\underline{w}_t$  is the federal minimum

- Tends to yield negative effects
  - Demand elasticity  $\approx -0.1$  to  $-0.3$   
(Brown, Gilroy, and Kohen 1982)
- Problems?
  - Omitted variables bias
  - Measurement error due to state minimums
  - Serial correlation in the error term

## Second generation: state panel estimates

- Exploit cross-state variation in minimum wage
  - Changes in state minimum
  - Changes in federal minimum, differential “bite”
- Typical specification (Neumark and Wascher, 1992):

$$\ln y_{st} = \alpha + \eta \ln(\underline{w}_{st}) + x'_{st}\delta + \phi_s + \tau_t + \varepsilon_{st}$$

- Remaining concerns?
  - Differential trends
  - Dynamic effects
  - Spatial correlation

## Alternative approach: case studies

- Some prominent case studies:
  - New Jersey: Card and Krueger (1994)
  - San Francisco: Dube, Naidu, and Reich (2007)
  - Seattle: Jardim et al. (2017)
- Numerous disadvantages . . . what are the advantages?
  - Transparent, easy to explain
  - Easier to understand the policy context
  - Feasible to collect more-detailed data
- Card and Krueger study 1992 NJ wage hike from \$4.25 to \$5.05
  - Compare fast-food restaurants in NJ to eastern PA
  - Compare low to high-wage restaurants within NJ

# Card and Krueger (1994): the main result

TABLE 3—AVERAGE EMPLOYMENT PER STORE BEFORE AND AFTER THE RISE  
IN NEW JERSEY MINIMUM WAGE

Variable	Stores by state			Stores in New Jersey <sup>a</sup>			Differences within NJ <sup>b</sup>	
	PA (i)	NJ (ii)	Difference, NJ – PA (iii)	Wage = \$4.25 (iv)	Wage = \$4.26–\$4.99 (v)	Wage ≥ \$5.00 (vi)	Low- high (vii)	Midrange- high (viii)
1. FTE employment before, all available observations	23.33 (1.35)	20.44 (0.51)	–2.89 (1.44)	19.56 (0.77)	20.08 (0.84)	22.25 (1.14)	–2.69 (1.37)	–2.17 (1.41)
2. FTE employment after, all available observations	21.17 (0.94)	21.03 (0.52)	–0.14 (1.07)	20.88 (1.01)	20.96 (0.76)	20.21 (1.03)	0.67 (1.44)	0.75 (1.27)
3. Change in mean FTE employment	–2.16 (1.25)	0.59 (0.54)	2.76 (1.36)	1.32 (0.95)	0.87 (0.84)	–2.04 (1.14)	3.36 (1.48)	2.91 (1.41)
4. Change in mean FTE employment, balanced sample of stores <sup>c</sup>	–2.28 (1.25)	0.47 (0.48)	2.75 (1.34)	1.21 (0.82)	0.71 (0.69)	–2.16 (1.01)	3.36 (1.30)	2.87 (1.22)
5. Change in mean FTE employment, setting FTE at temporarily closed stores to 0 <sup>d</sup>	–2.28 (1.25)	0.23 (0.49)	2.51 (1.35)	0.90 (0.87)	0.49 (0.69)	–2.39 (1.02)	3.29 (1.34)	2.88 (1.23)

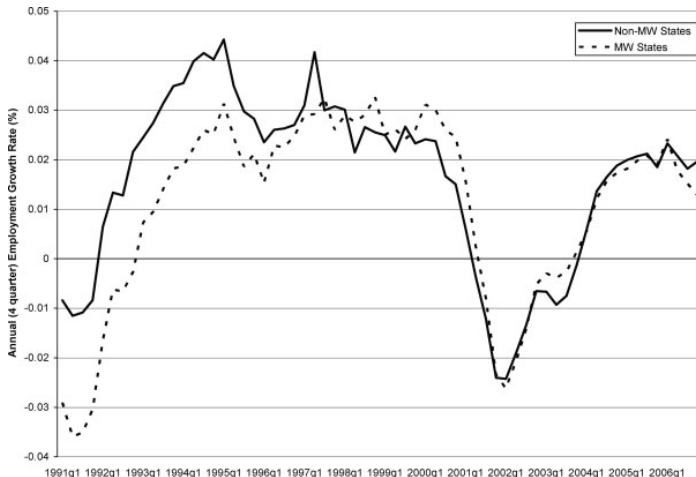
Card and Krueger (1994, Table 3)

# A unified framework for panel methods and case studies

- Dube et al. (2010) assess state panels vs. case studies
  - Nest both approaches in a common framework
  - Test sensitivity to controls, existence of pretrends
- County-level data on restaurant employment over 1990–2006
  - Quarterly Census of Employment and Wages (QCEW)
  - Robustness using County Business Patterns (CBP)
  - Weight all counties equally
- Complete data for 1,380 of 3,109 counties in the continental US
  - Sounds problematic
  - But these account for 250m people out of 280m total (US population in 2000)
- Striking substantive finding:  $\frac{d \log L^*}{d \log w} \approx 0$

# State minimum-wage policy correlated with growth rates

FIGURE 1.—ANNUAL EMPLOYMENT GROWTH RATE, MINIMUM WAGE STATES VERSUS NON-MINIMUM WAGE STATES



Dube et al. (2010, Figure 1)



# Fun with fixed effects ( $i$ county, $s$ state, $c$ Census division)

1. County/state  $\times$  year panel

$$\ln y_{it} = \alpha + \eta \ln(\underline{w}_{st}) + x'_{it}\delta + \phi_i + \tau_t + \varepsilon_{it}$$

2. Add Census division  $\times$  year effects

$$\ln y_{it} = \alpha + \eta \ln(\underline{w}_{st}) + x'_{it}\delta + \phi_i + \tau_{ct} + \varepsilon_{it}$$

3. Add state-specific trends

$$\ln y_{it} = \alpha + \eta \ln(\underline{w}_{st}) + x'_{it}\delta + \phi_i + \tau_{ct} + \xi_s l_s \cdot t + \varepsilon_{it}$$

4. Switch to MSA  $\times$  year effects

$$\ln y_{it} = \alpha + \eta \ln(\underline{w}_{st}) + x'_{it}\delta + \phi_i + \tau_{mt} + \varepsilon_{it}$$

# A border design

- Idea: compare treated counties to cross-border controls
  - Earlier example: Holmes (1998)
  - Pools many individual case studies
- Pros and cons:
  - +: transparency, explainability
  - +: soak up spatially concentrated shocks
  - -: smaller samples, less precision
  - -: worry about spillover effects
- Construct a set of “border pairs”  $p$ 
  - Contiguous counties in different states
  - Allow a county to appear in multiple pairs

# The border-pair specifications

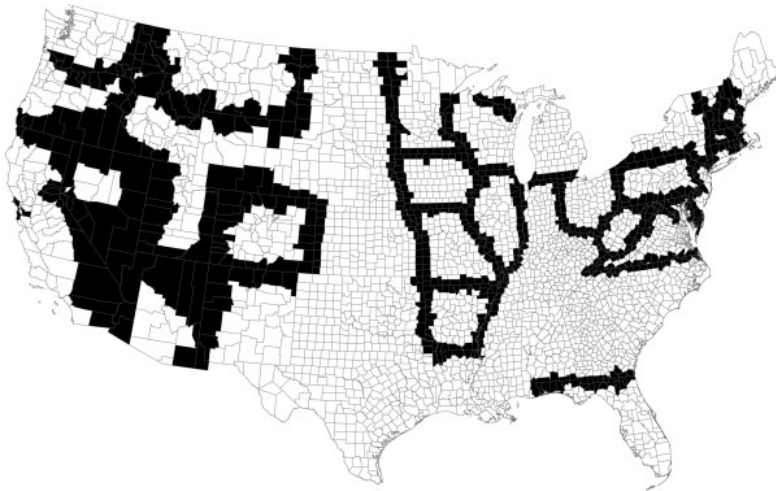
## 5. Traditional spec in border-pair sample

$$\ln y_{ipt} = \alpha + \eta \ln(\underline{w}_{st}) + x'_{it}\delta + \phi_i + \tau_t + \varepsilon_{ipt}$$

## 6. Preferred spec: border-pair $\times$ time effects

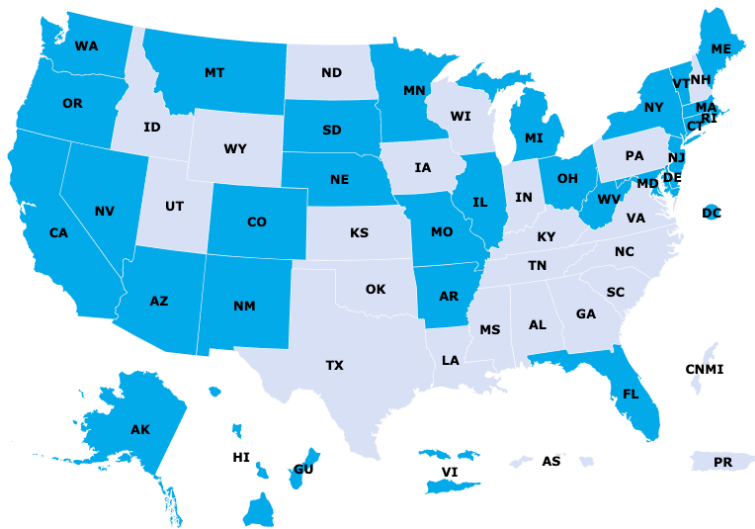
$$\ln y_{ipt} = \alpha + \eta \ln(\underline{w}_{st}) + x'_{it}\delta + \phi_i + \tau_{pt} + \varepsilon_{ipt}$$

## The border-pair sample



Dube et al. (2010, Figure 2)

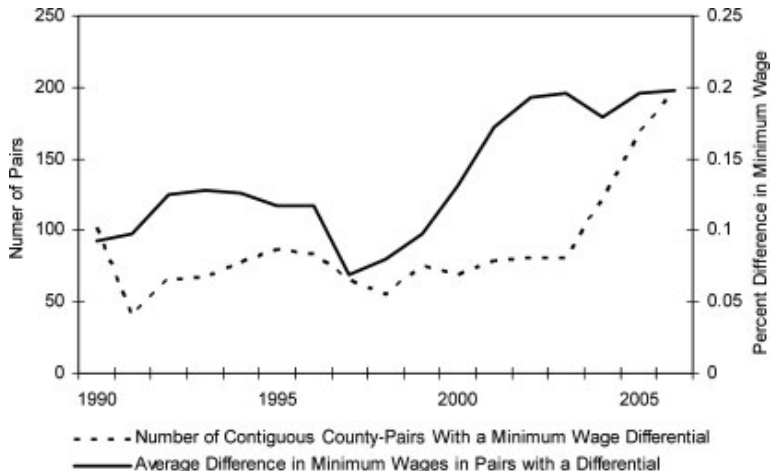
Notice the overlap with the map we saw earlier



(Department of Labor, 2019: states with above-federal minimum wages)

# Cross-border variation in minimum wages

(Always look for ways to show readers your identifying variation)



Dube et al. (2010, Figure 3)

# Progressive addition of finer spatial controls

TABLE 2.—MINIMUM WAGE EFFECTS ON EARNINGS AND EMPLOYMENT

	All-County Sample								Contiguous Border County-Pair Sample			
	(1)	(2)	(3)	(4)					(5)	(6)		
	<i>ln Earnings</i>											
<i>lnMWt</i>	0.224*** (0.033)	0.217*** (0.028)	0.204*** (0.038)	0.195*** (0.034)	0.219*** (0.037)	0.210*** (0.034)	0.153*** (0.030)	0.149*** (0.028)	0.232*** (0.032)	0.221*** (0.032)	0.200*** (0.065)	0.188*** (0.060)
	<i>Ln Employment</i>											
<i>lnMWt</i>	-0.211** (0.095)	-0.176* (0.096)	-0.028 (0.066)	-0.023 (0.068)	0.054 (0.055)	0.039 (0.050)	0.052 (0.084)	0.032 (0.078)	-0.137* (0.072)	-0.112 (0.076)	0.057 (0.118)	0.016 (0.098)
<i>lnpop or lnpop+lnintoprivatesector</i>	1.04*** (0.060)	1.05*** (0.058)	1.04*** (0.048)	1.05*** (0.043)	1.07*** (0.045)	1.05*** (0.039)	1.30*** (0.065)	1.21*** (0.048)	0.95*** (0.073)	0.97*** (0.073)	1.12*** (0.190)	1.11*** (0.189)
<i>P</i> values for H0:												
bs = b1 for s=2,3,4, bs = b4 for s=6				0.022		0.066		0.011				0.056
Labor demand elasticity		-0.787* (0.427)		-0.114 (0.332)		0.183 (0.219)		0.211 (0.507)		-0.482** (0.235)		0.079 (0.286)
<i>Controls</i>												
Census division × period dummies			Y	Y	Y	Y						
State linear trends					Y	Y						
MSA × period dummies							Y	Y				
County-pair × period dummies											Y	Y
Total private sector		Y		Y		Y		Y		Y		Y

Dube et al. (2010, Table 2)

# Three big issues in the literature on employment effects

1. Choosing the right target population
2. Constructing a valid counterfactual
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## Leads and lags: looking for pretrends

- These are “static” specifications
  - Can't assess pretrends
  - Can't assess speed of adjustment
- Why might effects take time to manifest?
  - Employers may shrink by attrition
  - Reductions in hiring, business creation
  - Increased rate of business closure
- Sidenote: Dube, Lester, and Reich (2016) analyze impacts on flows

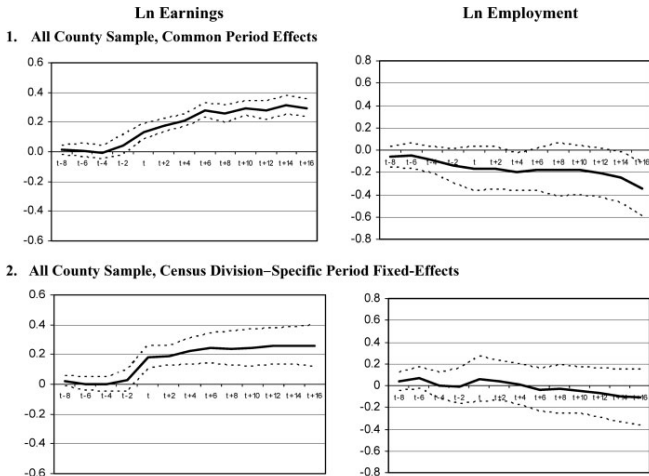
## Distributed-lag specification

- Explore time pattern using distributed lags
  - Loosely: generalized event study
  - Allows for many/overlapping events
- Include 8 quarters of leads and 16 quarters of lags

$$\ln y_{it} = \alpha + \sum_{j=-4}^7 (\eta_{-2j} \Delta_2 \ln(\underline{w}_{s,t+2j}) + \eta_{-16} \ln(\underline{w}_{s,t-16})) \\ + x'_{it} \delta + \phi_i + \text{time FEs} + \varepsilon_{it}$$

- Think through this carefully

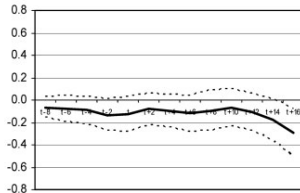
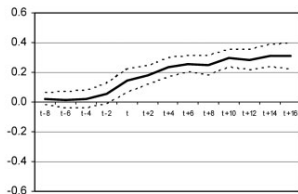
# Traditional specification exhibits employment pretrends



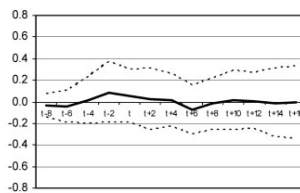
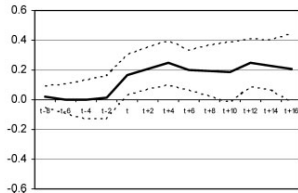
Dube et al. (2010, Figure 4)

# Border-pair effects (or other controls) kill the pretrends

## 5. Contiguous Border County-Pair Sample, Common Period Effects



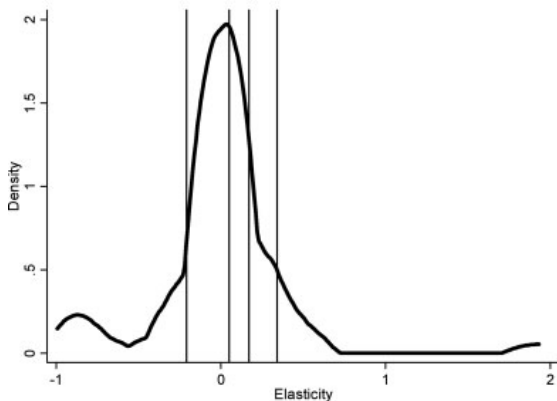
## 6. Contiguous Border County-Pair Sample, County-Pair Specific Period Effects



Dube et al. (2010, Figure 4)

# Individual case studies are imprecisely estimated

A. KERNEL DENSITIES WITH PREVIOUS ESTIMATES FROM INDIVIDUAL CASE STUDIES (NEW JERSEY–PENNSYLVANIA, SAN FRANCISCO NEIGHBORS)

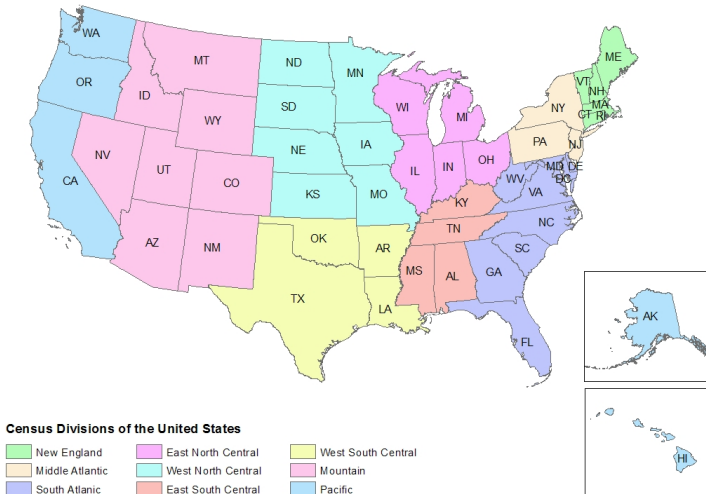


Dube et al. (2010, Figure 5)

# Critiques and counter-critiques

- Neumark et al. (2014) critique:
  - Dube et al. (2010) discard too much identifying variation
  - Census divisions are arbitrary, state trends are fragile
  - Synthetic control doesn't favor neighbors as controls
- Allegretto et al. (2017) counter-critique:
  - Synthetic control *does* favor local contrasts
  - NSW critique is sensitive to specification details
- One takeaway: we need a better understanding of local economic dynamics and spatial correlation

# Are Census divisions economically meaningful units?



## The next chapter: the \$15 minimum wage

- Current frontier: the \$15 minimum
  - Several cities adopting \$15 minimum
  - California by 2022
- Are existing estimates informative?
  - Out-of-sample prediction
  - General equilibrium effects
- Next class: Jardim et al. (2017)