

GEQ1000  
Economics  
(Social Science)

# 1.5 Difference-in-differences

# A Hypothetical Example

In 2008, in City A, local politicians raised the aid to needy single mothers from \$5K to \$6K.

Q: By how much did the increased aid reduce hours worked by recipients?

**Treatment**

**Increase aid  
by \$1,000**

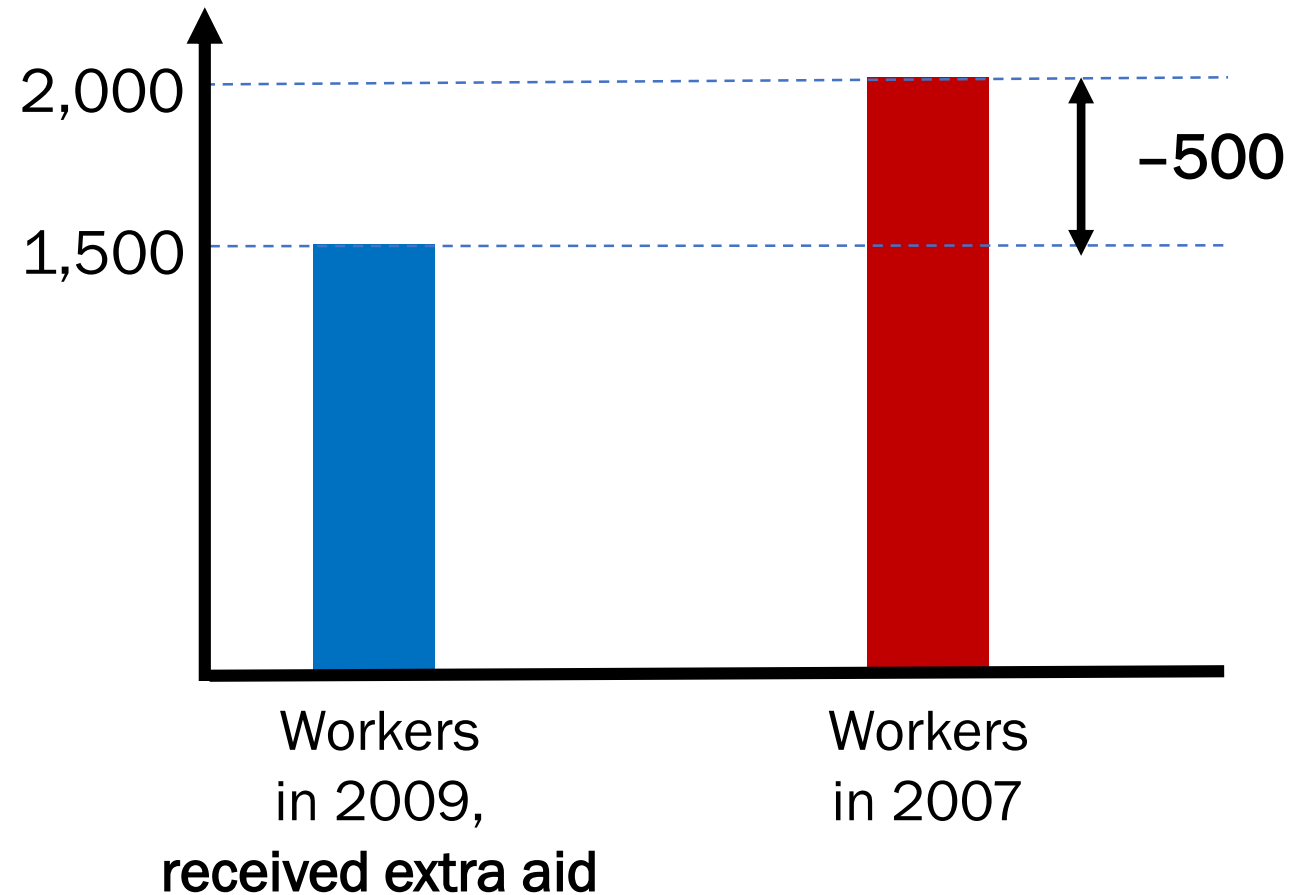
**Outcome**

**Hours worked  
by recipients**

# A naïve approach

Average work hours

City A



# A naïve approach

Assign

by  
observation  
time

Treatment group

Workers in 2009,  
Received extra aid



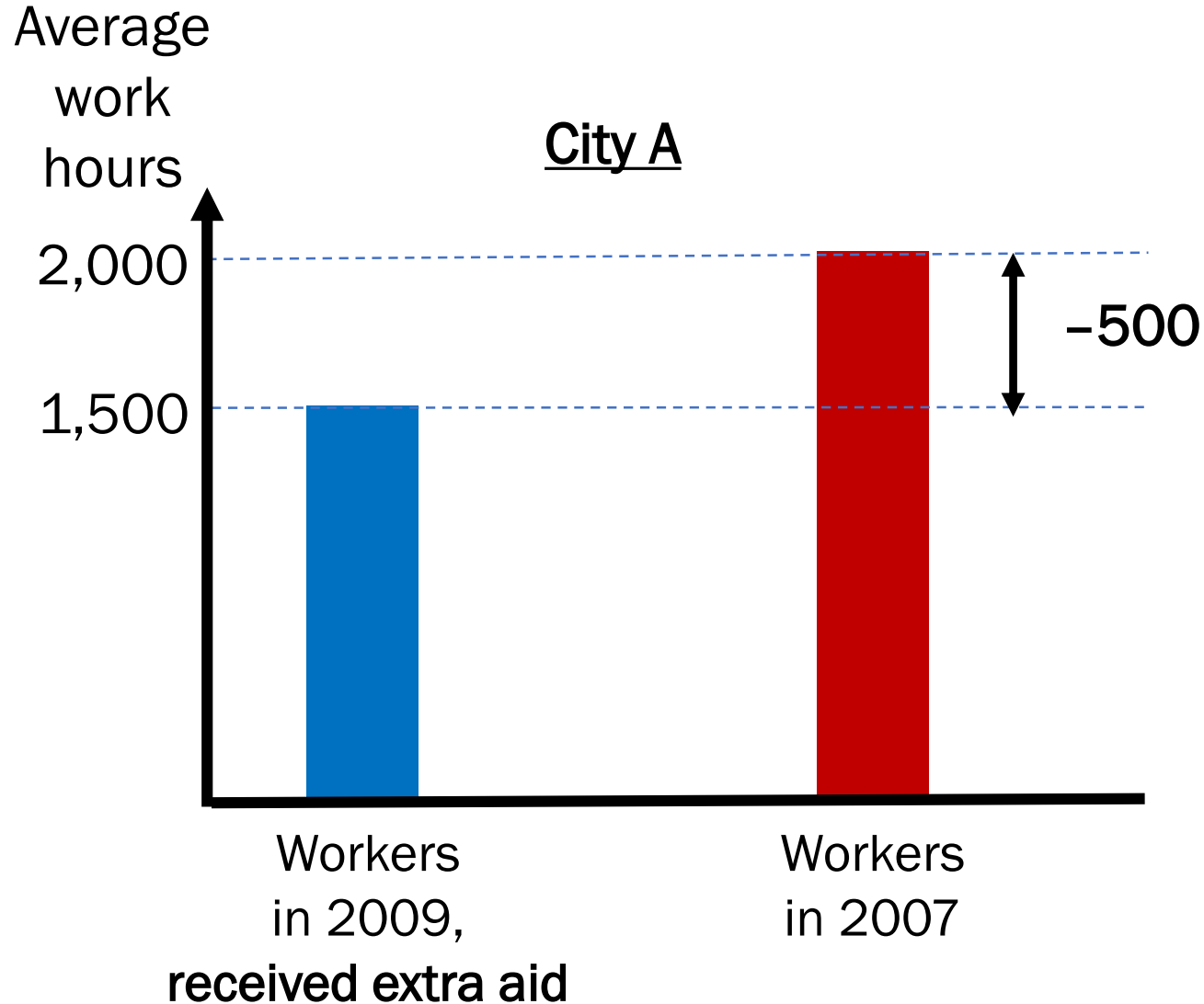
Control group

Workers in 2007,  
Not yet received extra aid



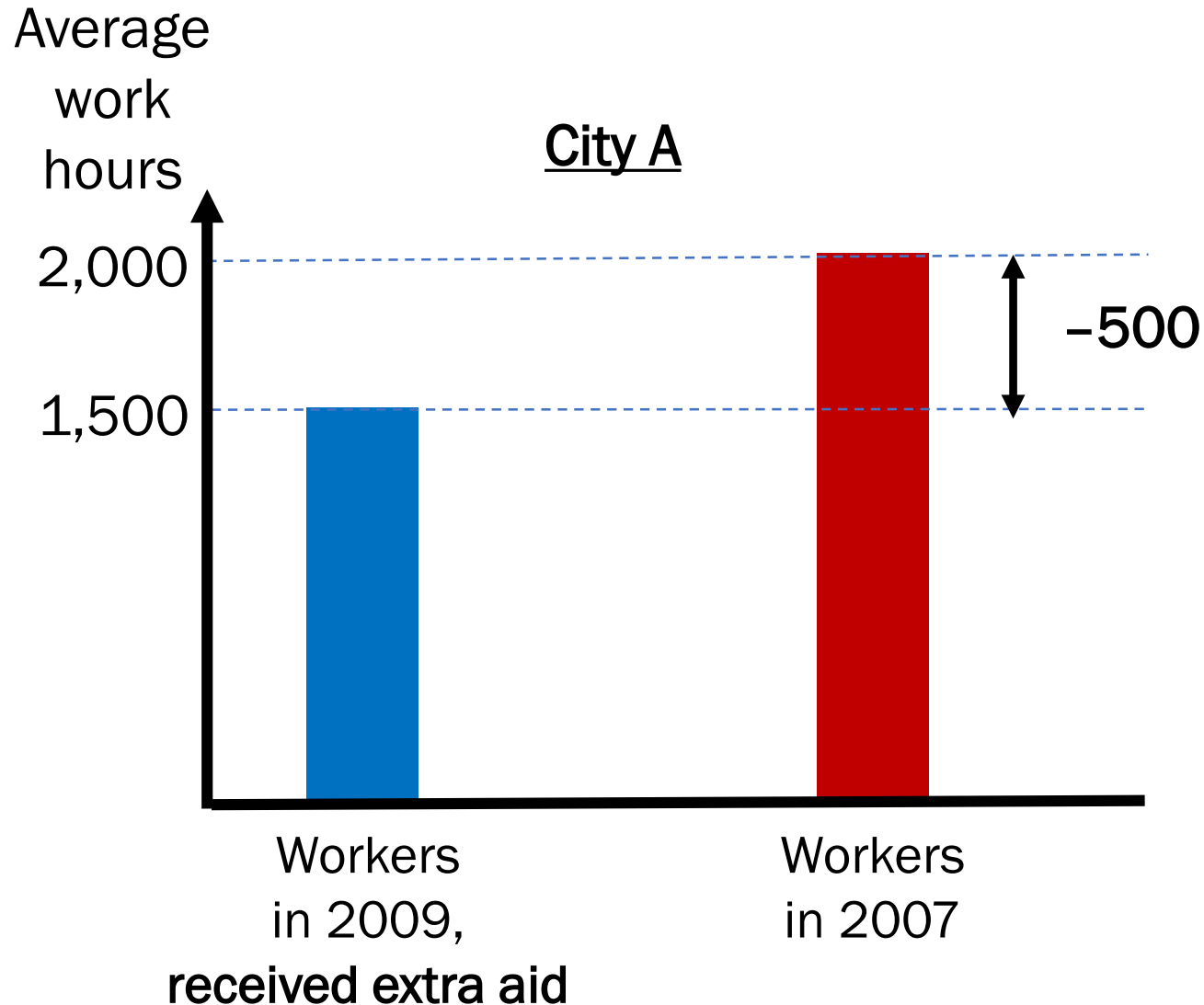
Problem: A lot happened between 2007 and 2009  
→ confounders!

# Confounder: a recession



A recession may have happened in 2008!

# Confounder: a recession



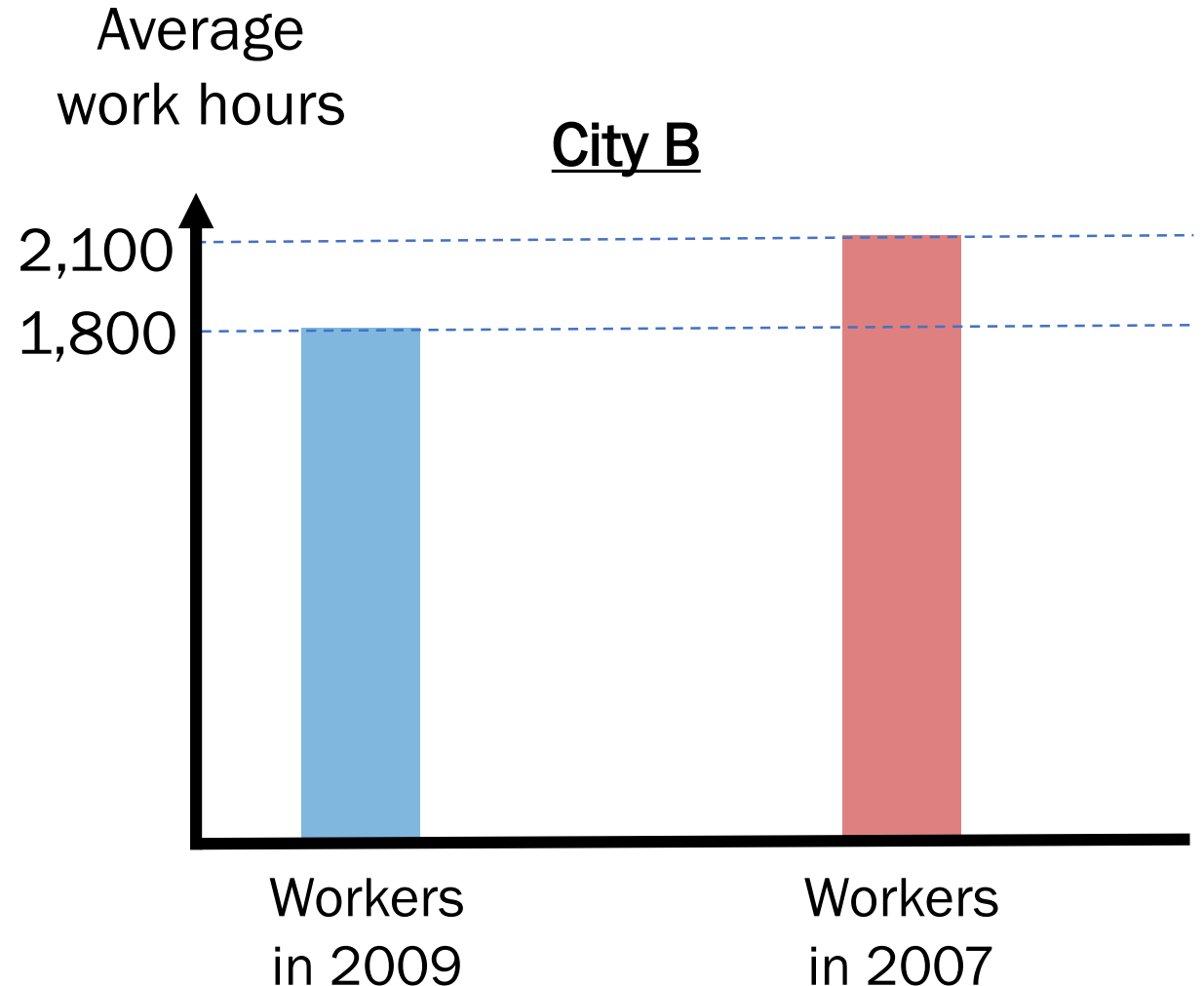
-500 hours is the  
**combined effect of  
the extra aid and the  
recession**

# Suppose there is a City B ...

## City B

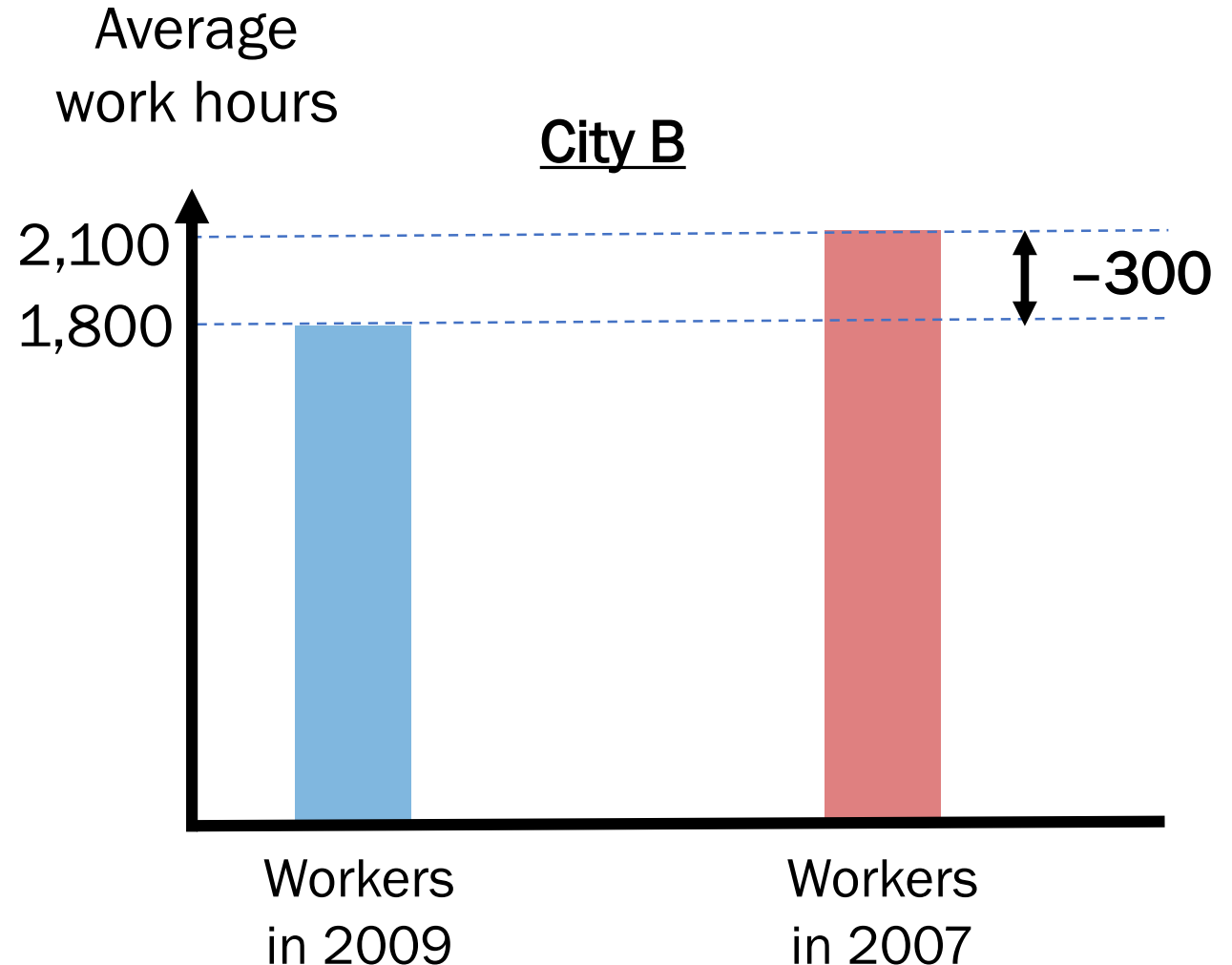
Has the same program  
but **did not increase aid**

City B is **also affected by  
the recession**



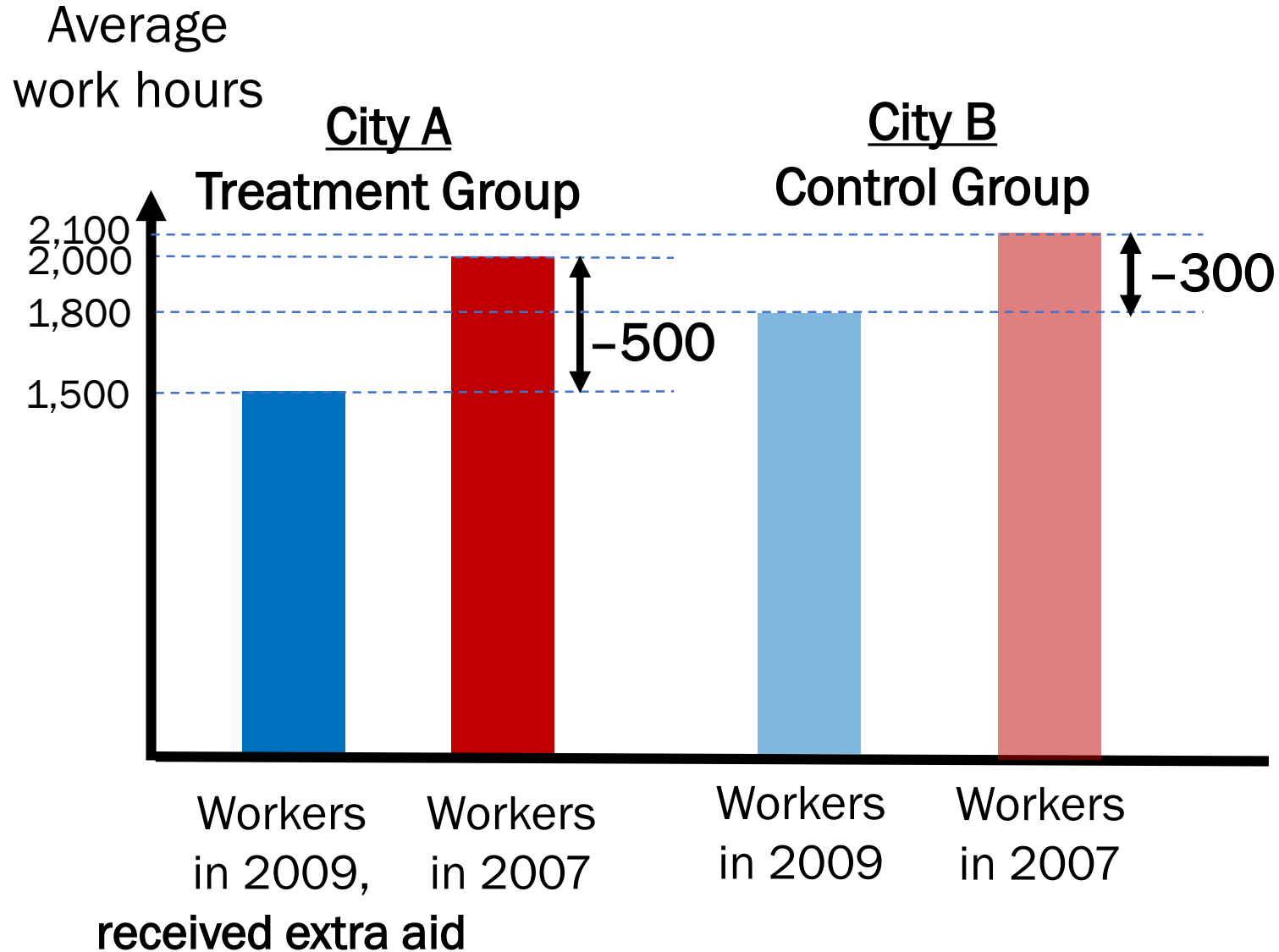
# Suppose there is a City B ...

Difference of -300  
hours measures  
**effect of recession**





# Difference-in-Differences



Estimate  
Treatment effect  
by taking the  
Difference-in-  
differences  
 $= -500 - (-300)$   
 $= -200 \text{ hours}$

## **Identification assumption: Common trend**

All other factors (e.g. recession) affecting employment between 2007 and 2009 have the same impact in both cities

## A Real Example: Minimum Wage and Employment

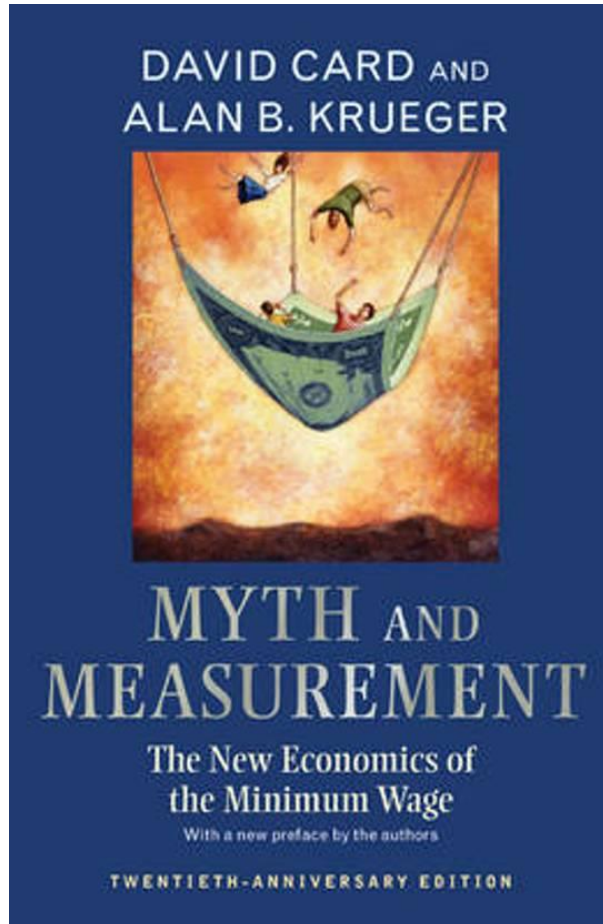
In 1992, in *the state of New Jersey*, local politicians raised the minimum wage from \$4.25 to \$5.05 per hour.

Economists expected a negative effect on employment

# Minimum wage and employment

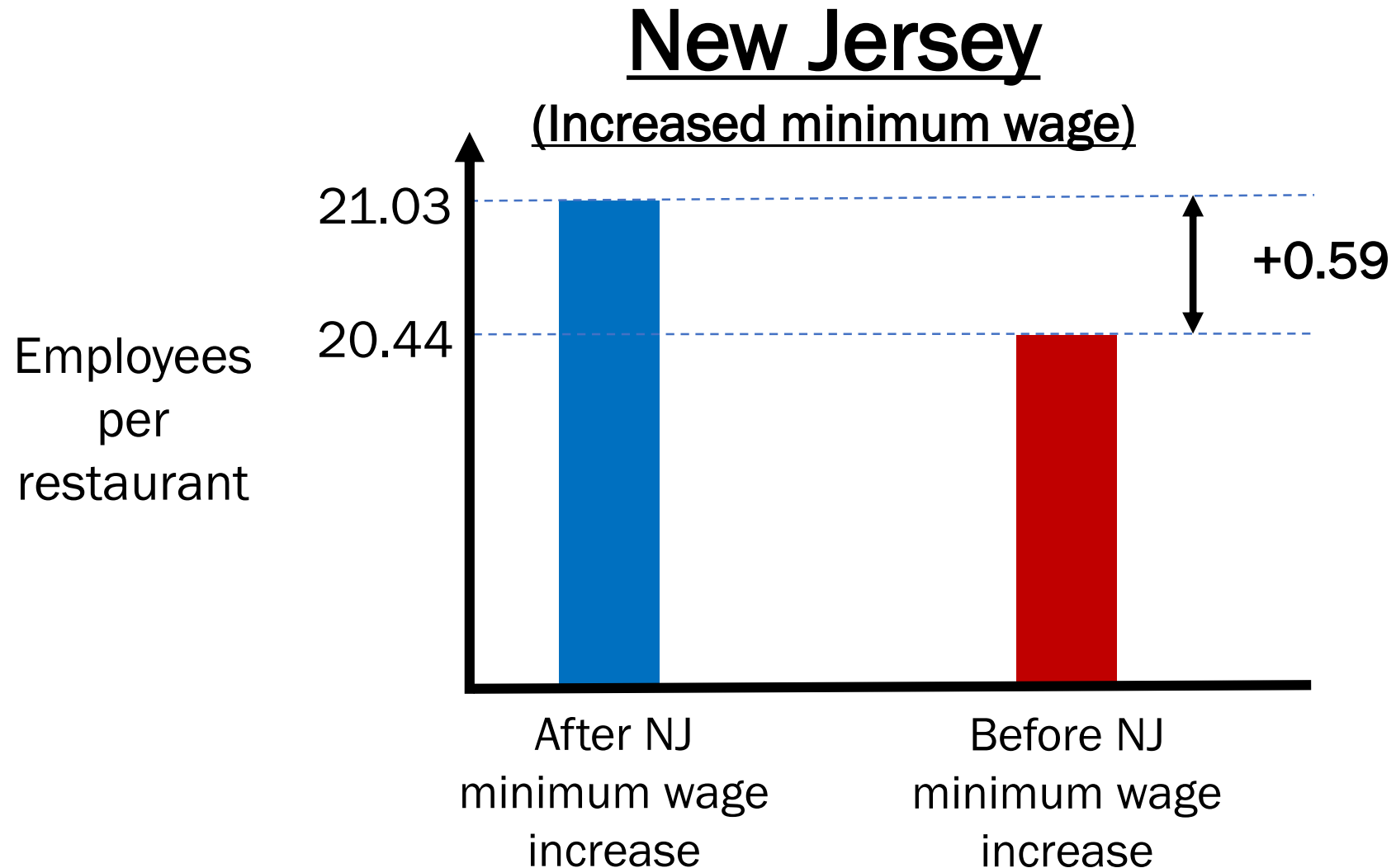


David Card



Alan Krueger

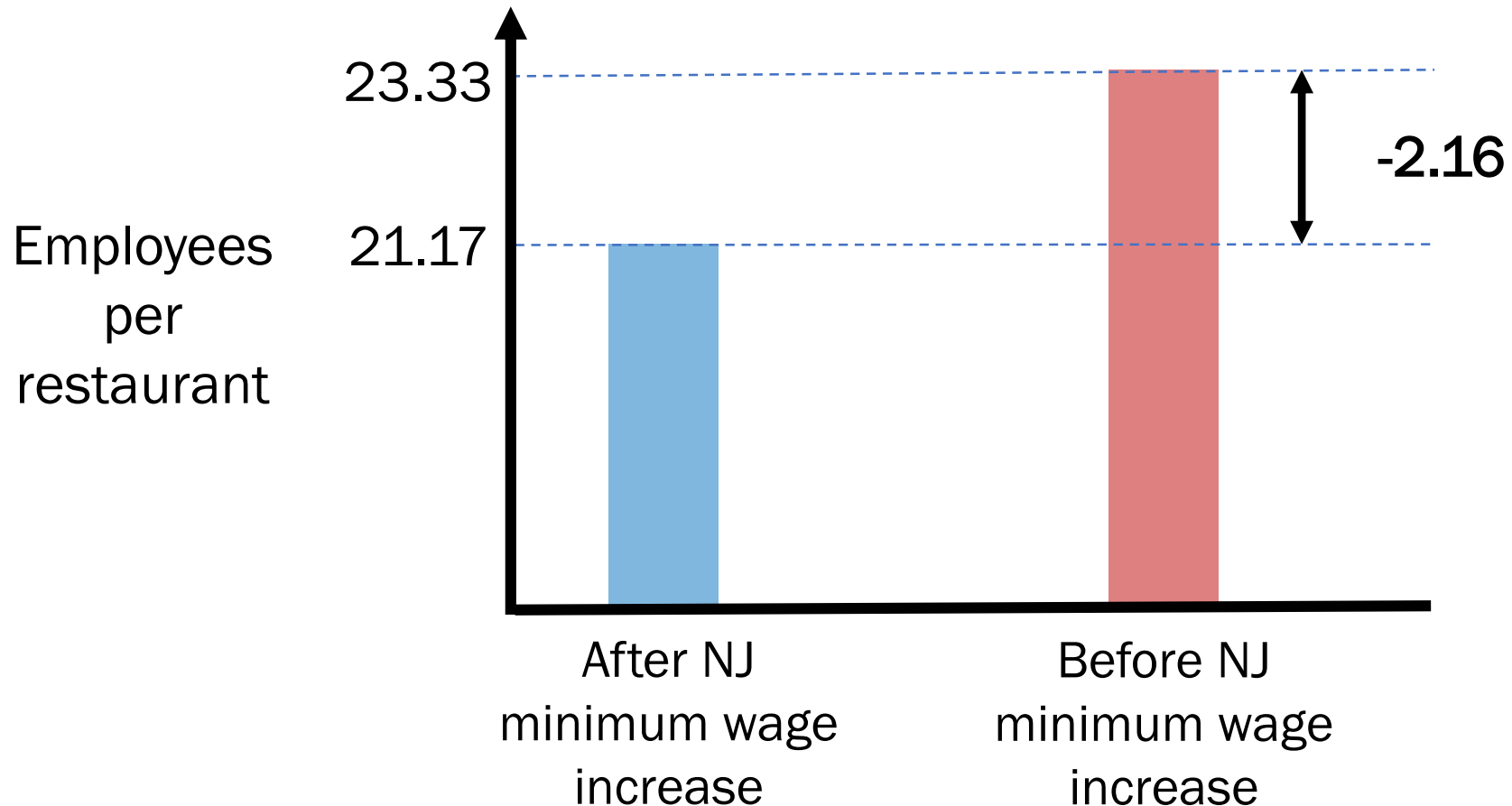
# Minimum wage and employment



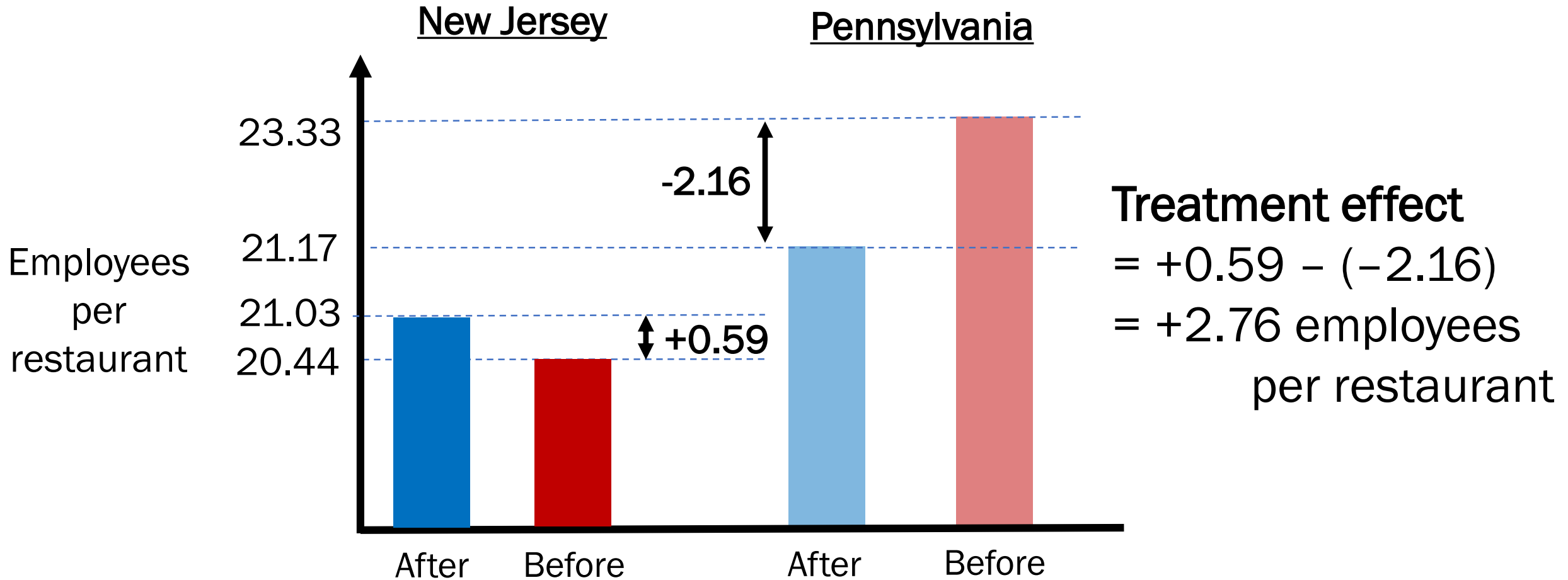
# Minimum wage and employment

## Pennsylvania

(Did not increase minimum wage)



# Minimum wage and employment





**Next up:  
Summary**