

# Environmental Regulation and Labor Adjustment: An Application to the NO<sub>x</sub> Budget Trading Program

Mark Curtis

Georgia State University

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# Motivation

- Regulation induced job loss has been a primary concern of policy makers and economists
  - WSJ Editorial: “The Latest Job Killer from the EPA”
  - Kahn and Mansur (2013), Deschenes (2010), Berman and Bui (2002) Greenstone (2002)
- Recent work has emphasized costs to workers in form of lost earnings and social costs
  - Weber (2013), Borjas (2013)
- Not the number of jobs lost, but who loses them and how they are lost
  - Do firms really want to shed workers with skills and experience?
  - Is your old job off and a new one coming? Or are you just waiting for a higher wage job?

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# Firm Decision: Layoffs or Hiring Reduction?

- Dynamic Partial Equilibrium Model of Firm's Labor Adjustment Decision (Caballero and Engel (1993), Cooper and Willis (2009))
- Firm must decide how to arrive at new employment target

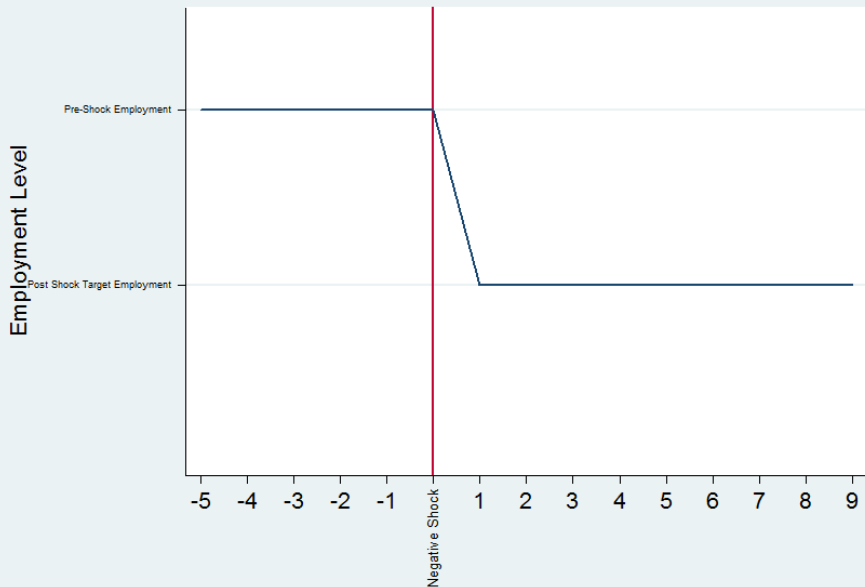
## Options

- 1 Adjust through layoffs
  - Cost: Adjustment Costs (Severance Packages,  $\uparrow$  UI tax)
  - Benefits: No "excess" labor
- 2 Adjust through natural separations (quits, retirements)
  - Cost: Wages of "extra" workers
  - Benefits: No adjustment costs

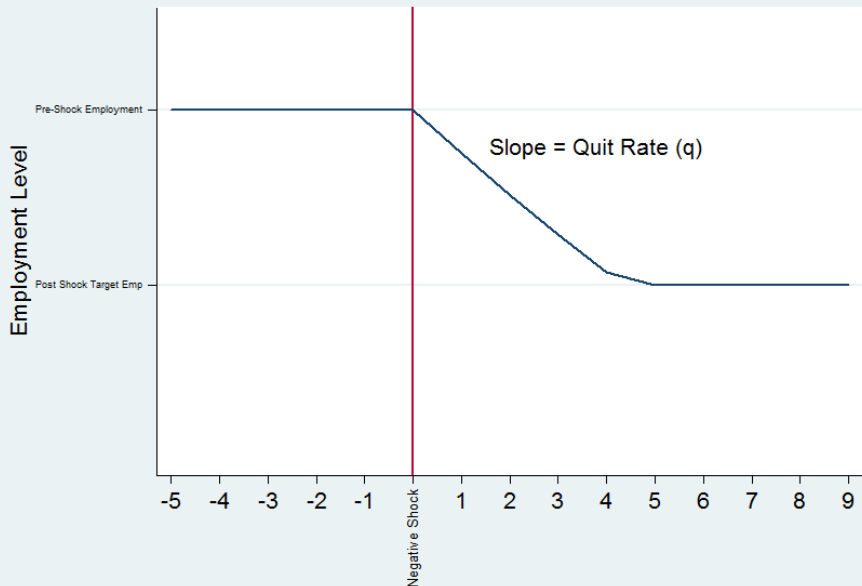
## Key Parameters for Labor Adjustment Decision

- 1 Quit Rate
- 2 Size of the shock
- 3 Size of Adjustment Costs

# Adjustment through Layoffs



# Adjustment through Natural Separations



- Impact of NO<sub>x</sub> Budget Trading Program on Workers
- State-Industry worker flow data from Quarterly Workforce Indicators
- Problem: No direct layoff variables. I observe: Employment, Hiring, Periods of Non-Employment and Change in Earnings for Separating Workers by demographic group
- If firms used natural seps, we expect to see
  - 1 Largest employment decline for young workers who have highest natural sep rates
  - 2 Decrease across the board in hiring
  - 3 No change in periods of non-employment for separating workers
  - 4 No change in earnings losses for separating workers

# Empirical Specification

$$y_{skt} = \beta_T (Post_{st} \times East_s \times EnInt_k) + \theta x_{skt} + \delta_{sk} + \xi_{kt} + \alpha_{st} + \epsilon_{skt} \quad (1)$$

## Variables

- $y_{skt}$ : outcome variable of interest [ln(emp), ln(hires), periods of non-emp for seps, change in earnings for seps] in state  $s$ , industry  $k$  in year  $t$
- $Post_{st}$ : = 1 for years 2005-2009 (= 1 for northeastern states in 2004)
- $East_s$ : = 1 for states impacted by the NBP
- $EnInt_k$ : =  $EnergyExpenditure_k / GrossOutput_k$

# Employment Results By Age

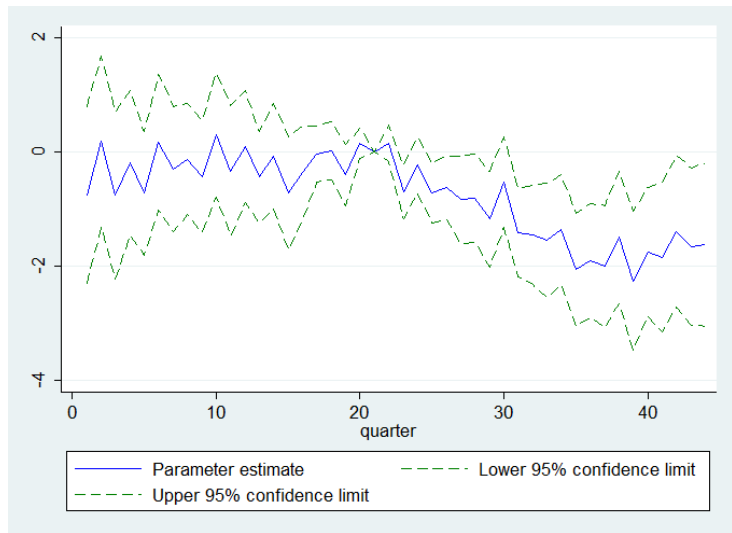
Table: Results

|            | (1)                  | (2)                  | (3)                   | (4)                      |
|------------|----------------------|----------------------|-----------------------|--------------------------|
|            | ln(Emp)              | ln(New Hires)        | Seps: Qtrs of Non-Emp | Seps: Change in Earnings |
| All        | -1.837**<br>(-1.99)  | -2.774**<br>(-2.32)  | -0.402<br>(-0.58)     | 1843.7<br>(1.00)         |
| Age: 19-21 | -2.215*<br>(-1.65)   | -3.195***<br>(-2.81) | 1.030<br>(1.23)       | 115.9<br>(0.22)          |
| Age: 22-24 | -3.348***<br>(-2.65) | -3.506***<br>(-3.33) | -0.405<br>(-0.48)     | 528.1<br>(0.81)          |
| Age: 25-34 | -3.010**<br>(-2.56)  | -2.927**<br>(-2.55)  | 0.167<br>(0.21)       | 1318.0<br>(1.29)         |
| Age: 35-44 | -1.553<br>(-1.38)    | -2.415**<br>(-2.11)  | 0.535<br>(0.73)       | 1970.1<br>(1.09)         |
| Age 45-54  | -1.358<br>(-1.21)    | -2.076*<br>(-1.73)   | 0.133<br>(0.14)       | -1125.9<br>(-0.33)       |
| Age 55-64  | -1.566<br>(-1.42)    | -1.244<br>(-0.96)    | 0.0806<br>(0.09)      | 5783.0<br>(0.87)         |
| Age 65-99  | -1.678*<br>(-1.67)   | -0.517<br>(-0.41)    | 1.490<br>(1.29)       | 10612.9<br>(1.55)        |

*t* statistics in parentheses

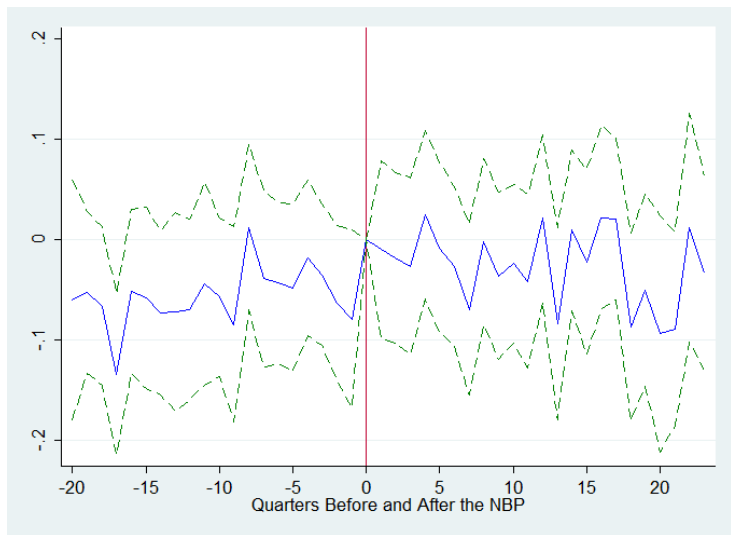
\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

# Event Study Plot: Employment Impact





# Event Study Plot: Periods of Non-Employment for Separators



# Discussion

- Employment decline is concentrated in groups with low job attachment, limited firm and industry specific capital
- Declines in young employment appears to be from quits and not layoffs
- These young workers are not impacted by the shock
- While NBP impacted employment levels, it had little to no impact on workers!!

- Labor markets have a built in mechanism to absorb shocks
- Regulations will cause the least harm to workers when:
  - Quit rate is high, employment level is stable or growing
  - They are employed by large firms
  - Regulations are implemented slowly with advance notice