THE EFFECTS OF LARGE WILDFIRES ON LOCAL LABOR MARKETS

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US Wildfires

Suppression costs

- LT $400M/yr (1970-2000)
- GT $1B/yr (since 2000)

Fire Management

- 13% (1991) to 48% (2009) of USFS Budget

Large Wildfires (GT 300 acres)

- 1.4% of all wildfires generate 93.8% of suppression costs

Impacts of Wildfires to Communities

- **Community, individual, property, natural resources**

- **Labor market shocks**
  - People leave and visitors avoid visiting
  - Work stoppages and slowdowns
    - Natural resource sectors
    - Recreation and tourism
    - Service sectors
  - Fire suppression contracting & procurement

- **Suppression spending decisions matter!**

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Questions and Methods

Research Questions

- **What are the effects of large wildfires on local labor markets?**
- **Do fire suppression expenses mediate the effect of large wildfires on local economies and labor markets?**

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Methods

- Qualitative case study of Trinity County, CA
- Generalized model (GDD) of wildfire impacts on labor markets in western US

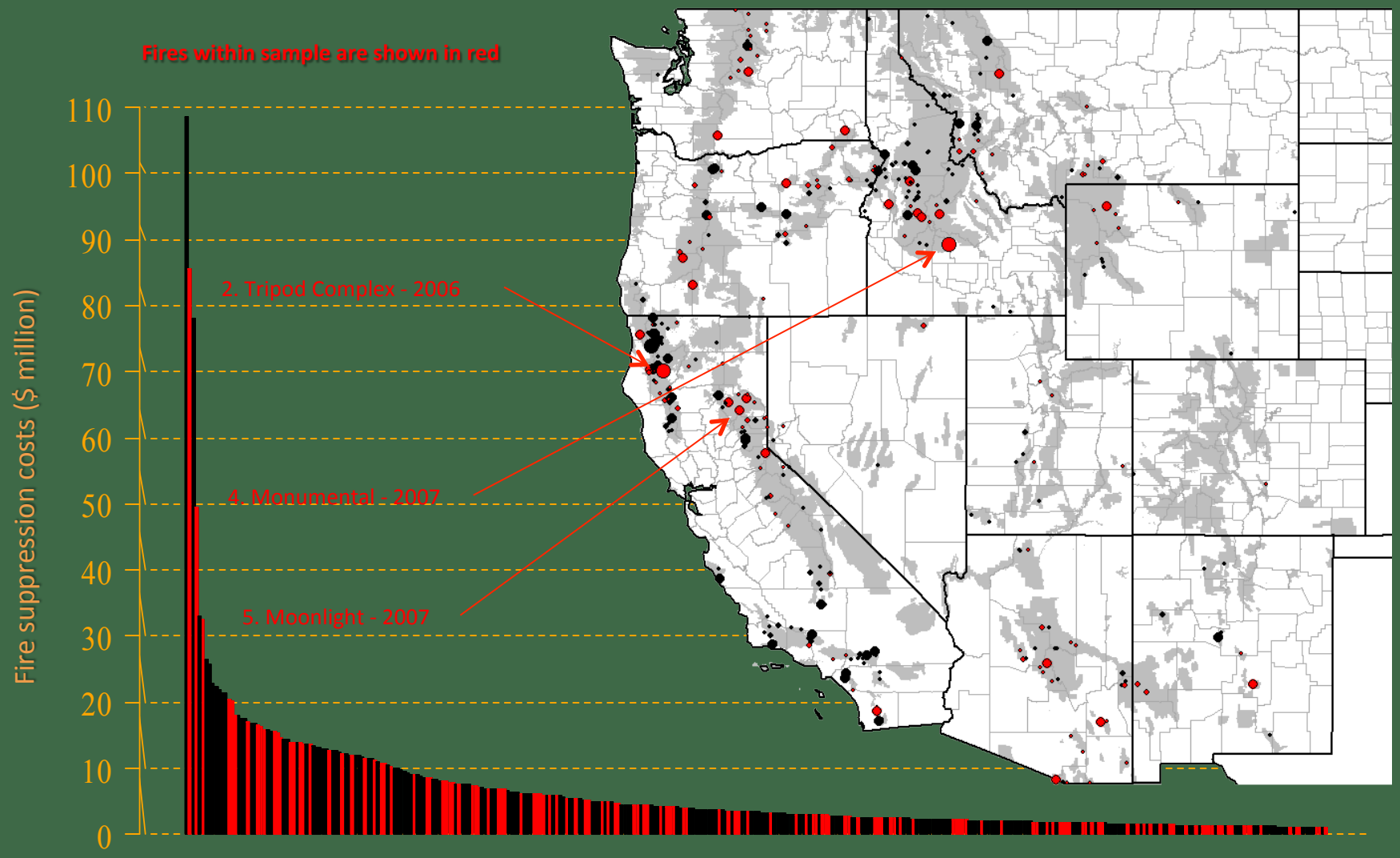
Generalized Economic Model of Wildfire Effects on Labor Market

- Labor supply likely to shrink
  - People displaced
- Labor demand likely to grow
  - Some business slows or ceases
  - Some work is displaced
  - Some firms grow to support the suppression effort
  - Some firms grow to support post fire recovery

H_1: Earnings increase during wildfire due labor constraint

H_2: Employment depends on whether more local people lose work than gain work

Large fires of the western US



Total expenditure between 2004 and 2008: $2.25 billion

A Road Map to Labor Market Impacts

Bureau of Labor Statistics

– Quarterly Census of Employment and Wages

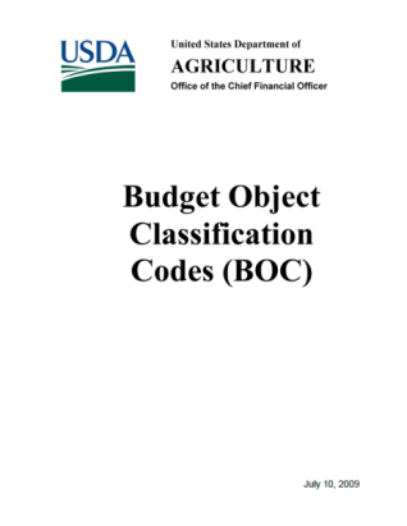
Western US Large Wildfire Panel

2004 – 2008

150 counties had large fires over 234 quarters

$2.4 Billion in suppression costs

155 fires sampled for transaction data*


USDA
United States Department of
AGRICULTURE
Office of the Chief Financial Officer

Budget Object Classification Codes (BOC)

July 10, 2009

Category	% Total	% Local
Contracted Suppression Services	47	7
Federal Personnel and Cooperative Agreements	37	5
Flying Contracts	9	0
Other	7	<1

Generalized Difference-in-Difference –

<u>Dependent variable</u>

For a county *i* in quarter *t*:

Difference in the change in **wages/employment** from the average change in wages/employment in the state

$$(\Delta \ln Y_{it} - \Delta \ln Y_t) = \alpha_1 \Delta F^D_{it} + \alpha_2 \Delta F^N_{it} + \boldsymbol{\alpha_3 Z_i} + \boldsymbol{\alpha_4 X_{it}} + \varepsilon_{it}$$

$$(\Delta \ln Q_{it} - \Delta \ln Q_t) = \alpha_1 \Delta F^D_{it} + \alpha_2 \Delta F^N_{it} + \boldsymbol{\alpha_3 Z_i} + \boldsymbol{\alpha_4 X_{it}} + \varepsilon_{it}$$

F^d_{it} = *County i is has a large fire in time t*

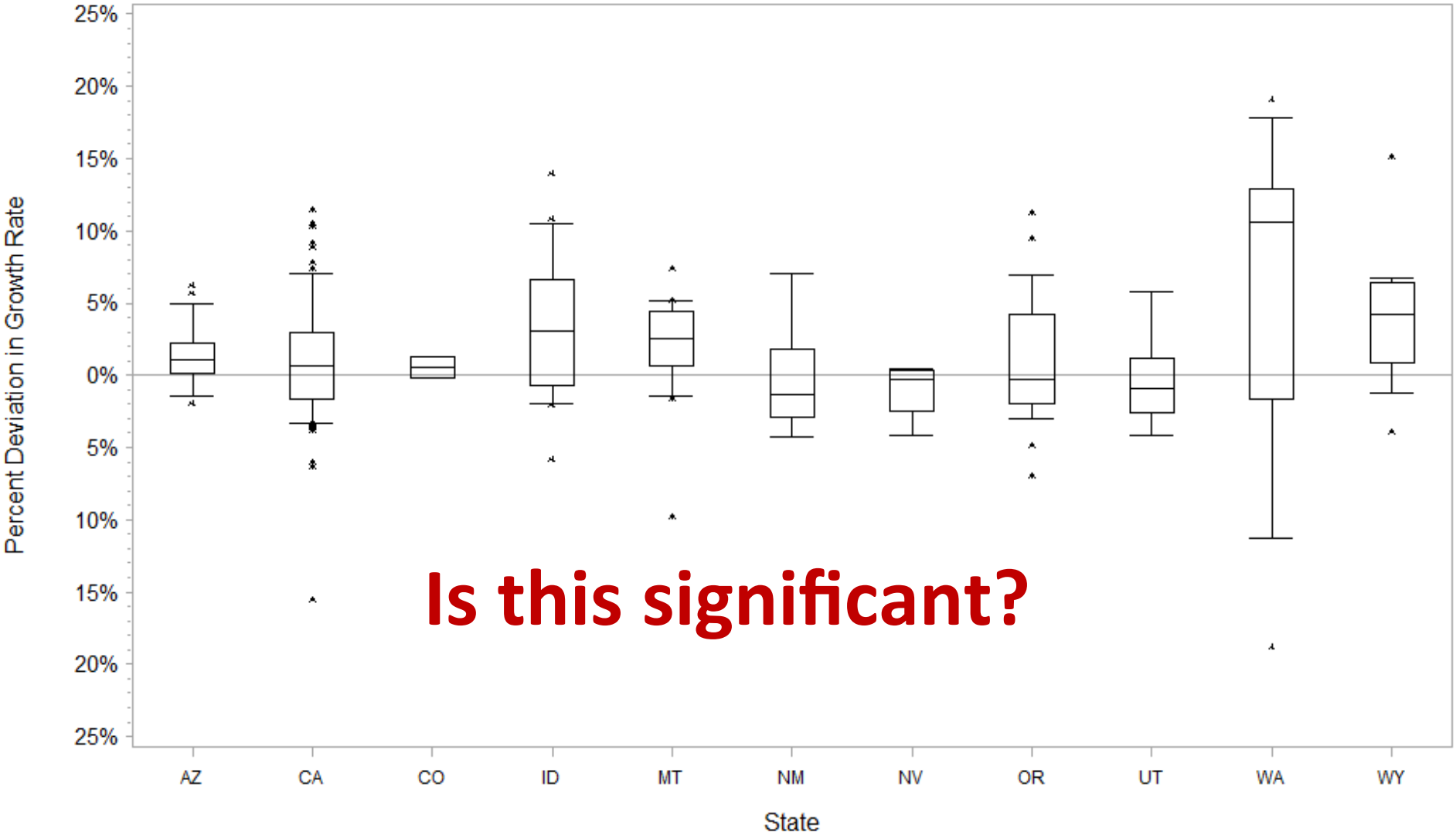
F^n_{it} = *County i is adjacent to a county with fire in time t*

X_{it} = *A matrix of time variant covariates*

Z_{it} = *A matrix of time invariant covariates (drops out of GDD model)*

Add lags to investigate temporal effects

Employment change during wildfires (n=234)



Wildfire effects on wages and earnings

- **H_1:** Increased Wages
  - Large wildfires increase wages by about 0.9%
  - Being near a wildfire increases wages by 0.5%

- **H_2:** Employment change
  - Large wildfires increase employment by 1.2%
  - 1.1% increase in neighboring county

Effects persist for up to 5 or 6 quarters following a wildfire

Do more expensive wildfires have bigger effects?

- **Minor effect from total suppression expenditures**
- Effect from wildfire suppression expenditures
  - **Employment:** ~1% per $100M
- Neighbor effect from wildfire suppression expenditures
  - **Wages:** ~1% per $140M

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Does local suppression spending have an effect on wages and employment?

- Local suppression expenditures
  - Per $1M local capture

0.9% growth in employment

0.4% less growth in wages

How do we increase local capture?

Do counties that have a history of doing work associated with large fires receive more contract dollars when large fires does occur than counties with less of a history.

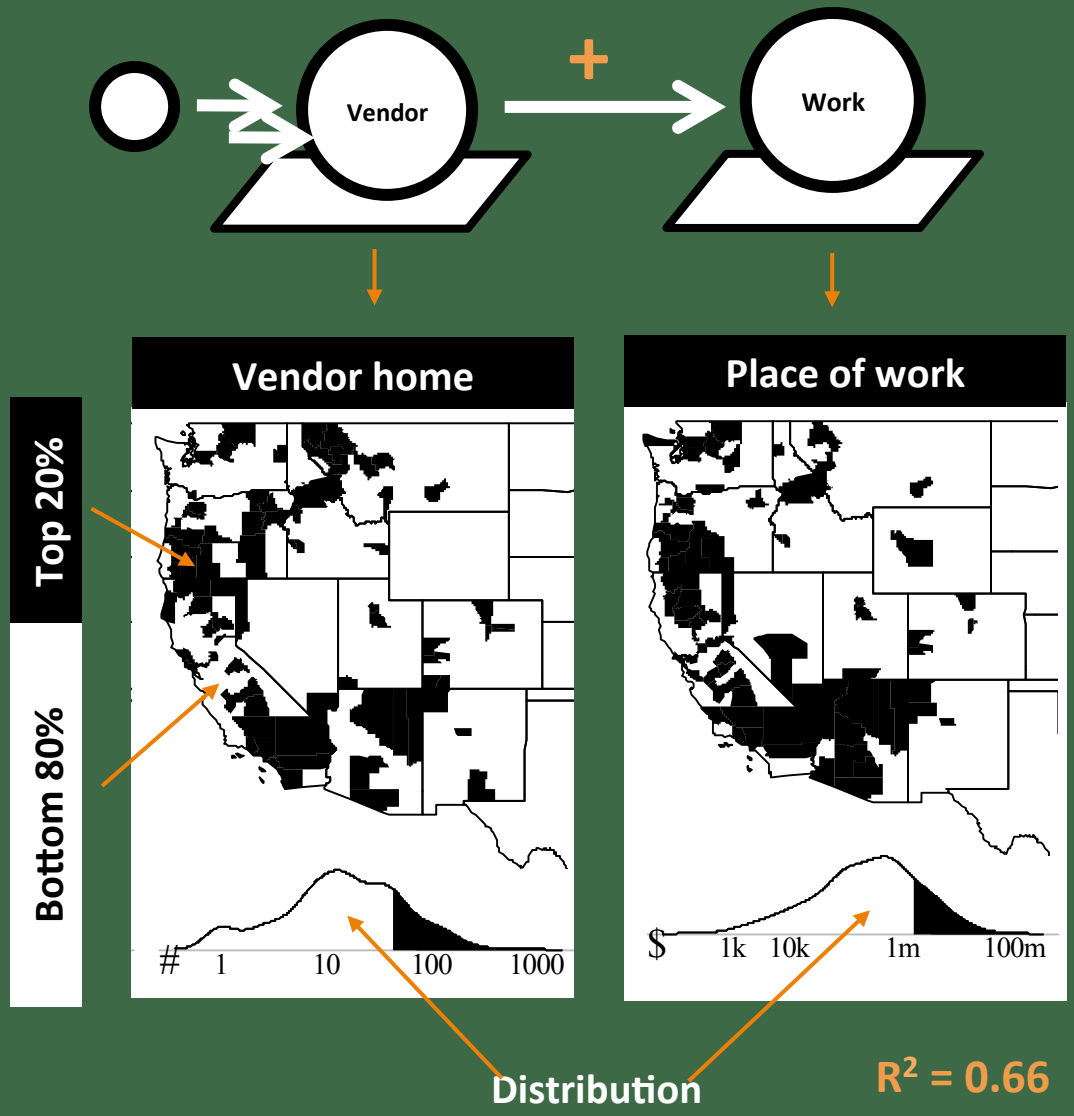
Difference between capture and capacity:

Capture: describes a discrete event

Capacity: a latent ability to capture over time

- EX: Jackson and Josephine counties of Southern Oregon have a greater capacity to assist in large fire suppression then neighboring counties.

Best model → Fuels Reduction



Which types of counties had highest capacity measures?

Both measures:

- Expensive fires
- Population > 50K
- Leveraged housing
- Stable or growing population
- Economies that are:
  - Are service-dependent
  - Aren't farming-dependent
  - Aren't mining-dependent

•THE NEW WEST?

Implications

- Wildfires appear to amplify seasonal trends in employment and wages.
- Temporal impacts appear demand driven.
- Local suppression spending acts to mitigate.
- Mitigating the employment and wage impacts of wildfire requires building local capacity during non-fire periods.

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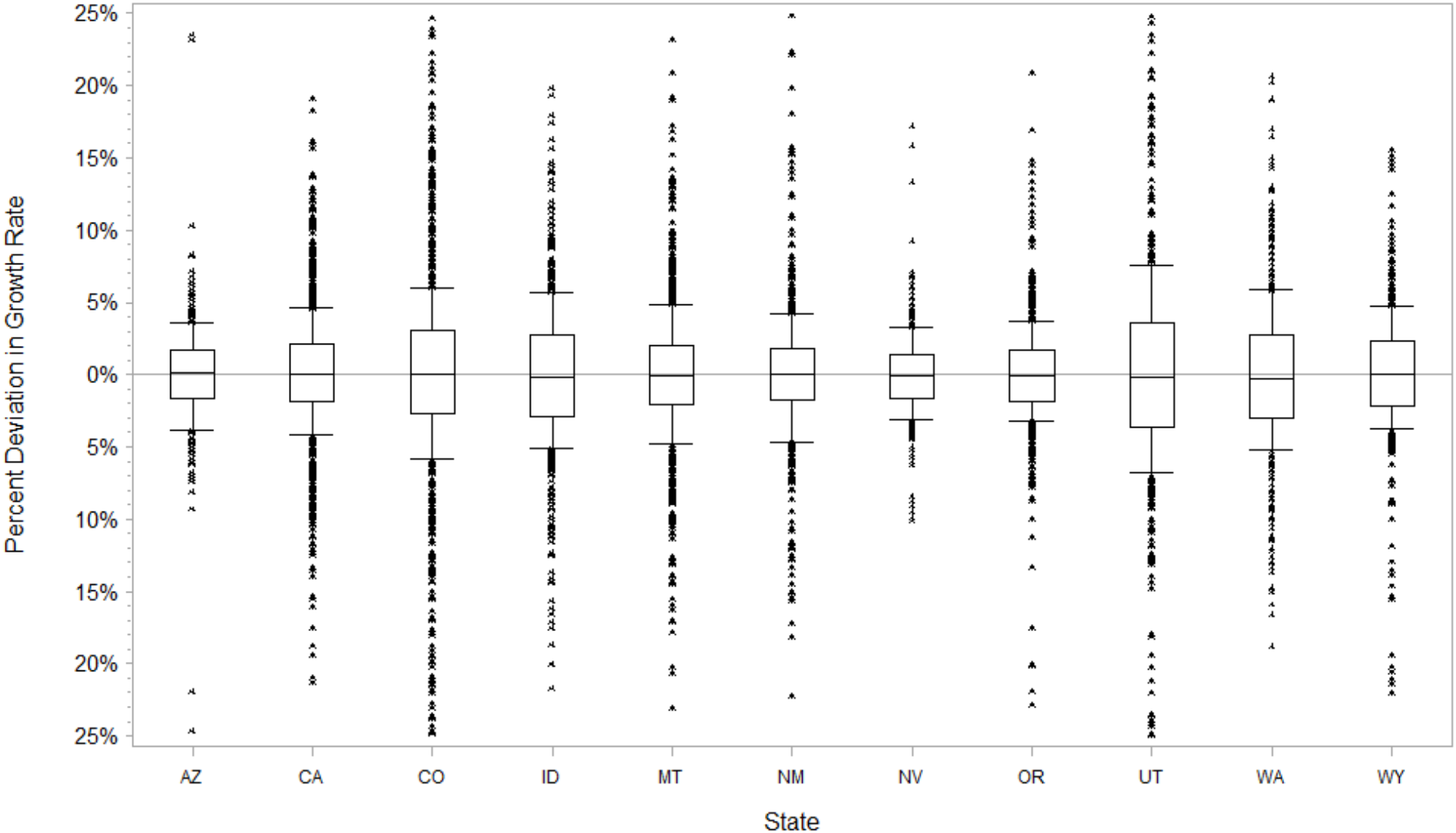
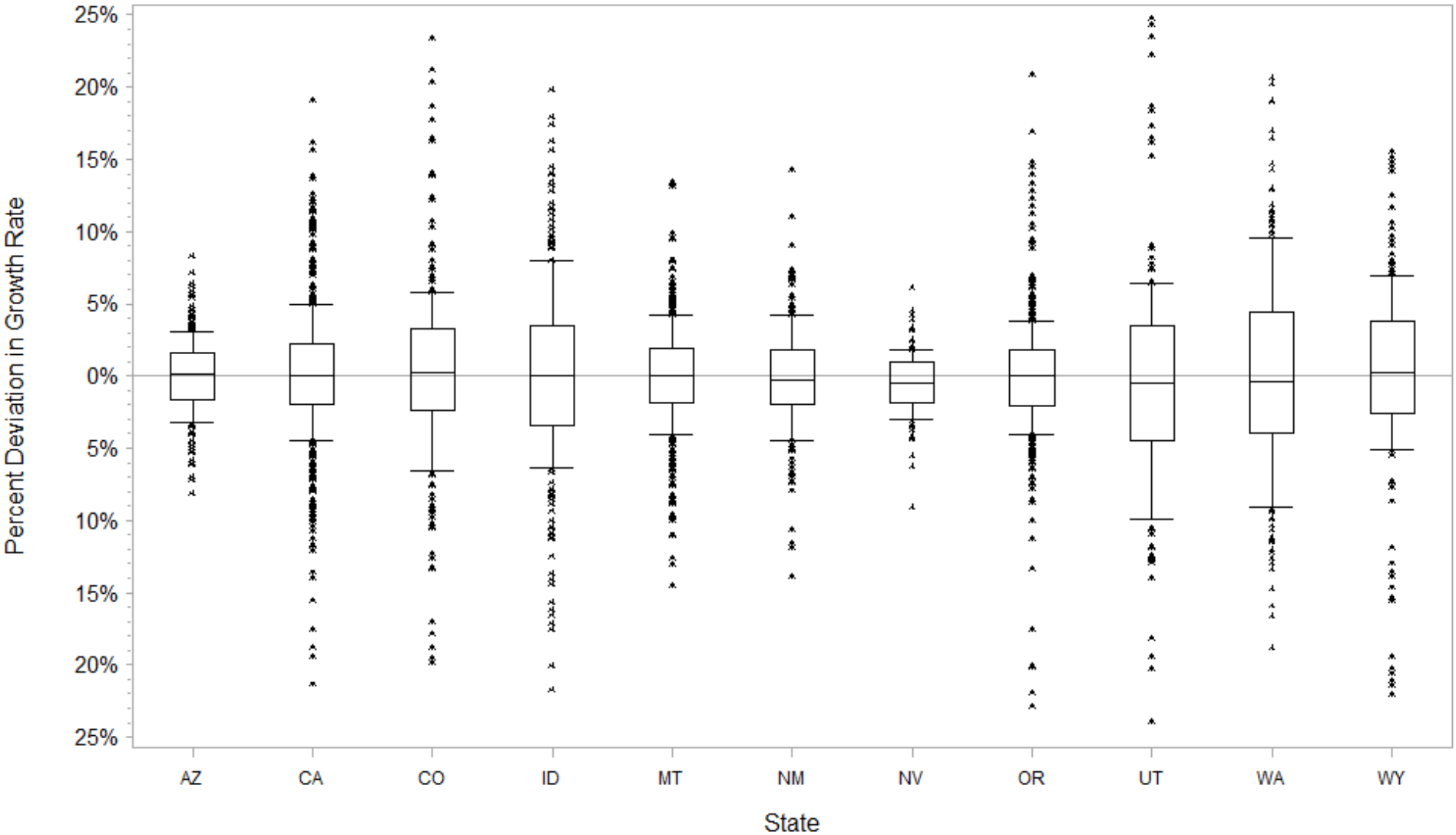
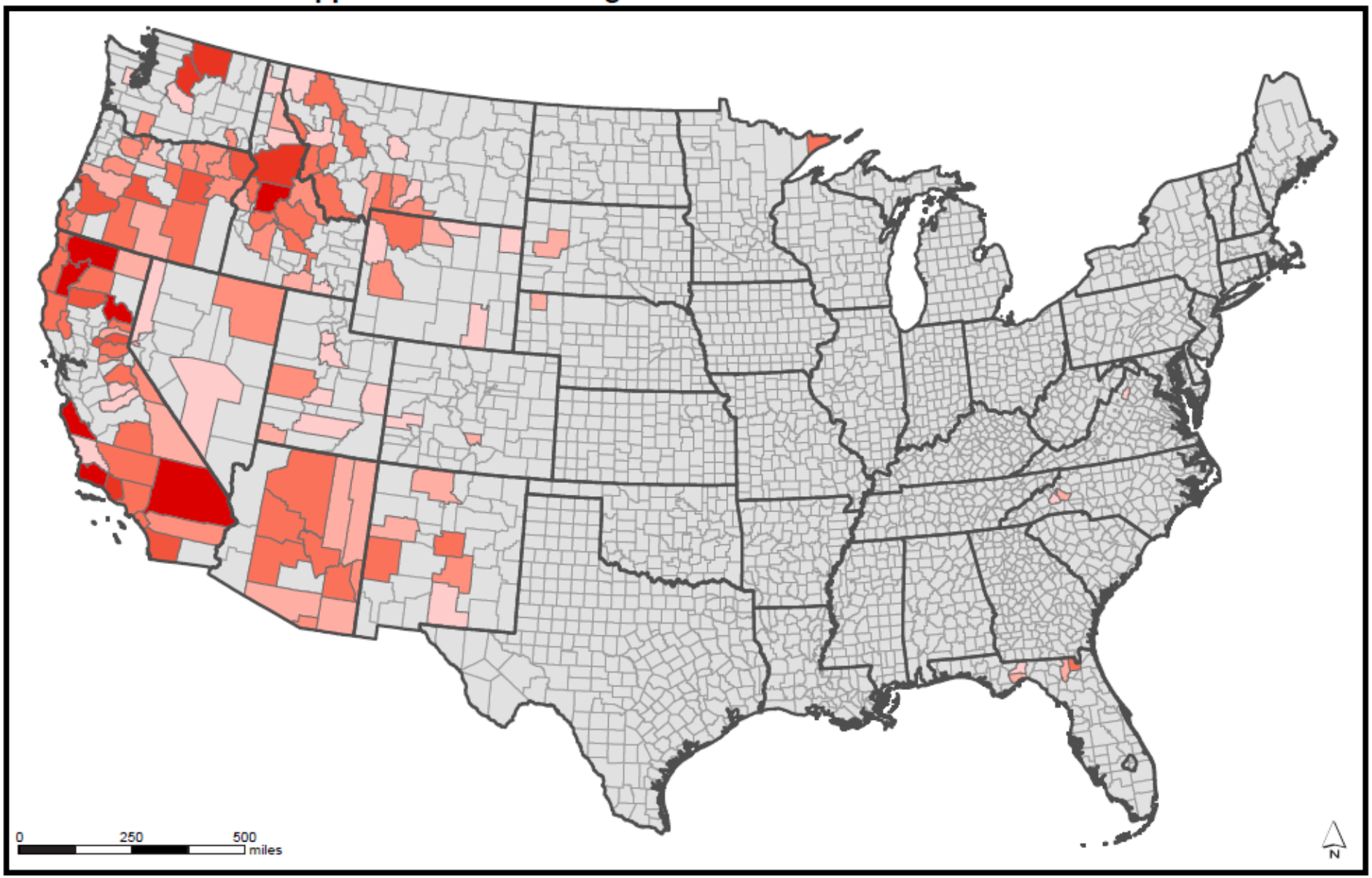
Employment change in 11 western states (n=413 counties over 20 quarters)



Employment change in wildfire counties (n=150 over 20 quarters)



Total Forest Service suppresion costs for large fires* in US counties between 2003 and 2008



*Large fires are defined as Forest Service suppression costs greater than $1 million dollars

Data Source: NIFMID

Total spent (in millions of dollars)

1 | 2.5 | 5 | 10 | 25 | 50 | 100 | 200.2

EWP

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