

# Economic Shocks and Worker Inequality: Evidence from the Great Recession

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# Motivation

- Labor mkt. disparities between workers a clear public concern
  - particularly given backdrop of rising economic inequality
- Worker inequality studied extensively along several dimensions
  - worker productivity, unionization, skill-biased technical change, immigration, employment transitions

(e.g., Bound and Freeman 1992; Katz and Murphy 1992; Berman et al. 1994; Autor et al. 1998; Altonji and Blank 1999; Katz and Autor 1999; Card and DiNardo 2002; Autor et al. 2008; Bayer and Charles 2018)

- But less known about how employment by worker type affected by worker-firm matching, particularly during economic contractions
  - literature analyzing firm and worker contributions to earnings disparities does not focus on employment, short-run shocks, or inter-group inequalities

(e.g., Abowd, Kramarz and Margolis 1999; Card Heining Kline 2013; Barth et al. 2016; Bonhomme, Lamadon and Manresa 2019; Song et al. 2019)

## Motivation Cont'd

- Potentially important and unexplored driver of worker inequality: the resilience of firms to negative economic shocks
  - likely related to TFP, access to credit, and other unobs. factors
    - substantial variation in within-industry productivity across firms (see Syverson 2011 for overview)
    - likely for credit access too (e.g., minority-owned firms)
- In essence, given non-random distribution of workers across firms by resilience, those concentrated within weaker firms bear disproportionate share of employment decline from shock
- Key challenge: 'firm resilience' unobserved by econometrician
  - impossible to know extent to which potentially measurable covariates could explain total variation

## What We Do

- We uncover evidence of non-random worker matching by firm resilience, using the the Great Recession of 2007 to 2009
  - analyze employment changes by worker gender, race, education and age for jurisdictions with a higher proportion of establishment deaths during the recession
  - such deaths are used to shed light on unobserved firm resilience, mitigating the influence of other demand-side worker effects within firm or differential supply-side responses

# Exploiting Shock to Reveal Differential Matching

- Intuitively, the once-in-a-generation recessionary shock raised the failure point within the firm resilience distribution enough to detect evidence of differential worker effects
  - firm fragility likely to remain hidden during normal times
- Literature has used plausibly exogenous demand shocks (e.g., Bartik, trade, welfare, defense) to
  - identify labor mkt. primitives (e.g., elasticity of labor supply)  
(e.g., Bartik 1991; Blanchard and Katz 1992; Blau et al. 2000; Aizer 2010; Autor et al. 2013; Nakamura and Steinsson 2014; Bertrand et al. 2015; Pierce and Schott 2016, 2017; Goldsmith-Pinkham et al. 2018)
  - firm/establishment deaths (e.g., Yeaple 2005; Egger and Kreickemeier 2009)
- In both cases, little attention paid to worker inequality
  - especially by gender or race
- Our analysis brings together shocks, deaths and worker inequality for the first time

## Two Hypotheses

- We consider the effect of establishment deaths on worker inequality in light of two competing hypotheses for differential worker concentration by firm resilience
  - ① Positive sorting by worker skill and firm resilience
  - ② Labor market discrimination by more resilient firms
- Adapt standard procedure from literature to report death effects using both across- and within-industry variation
- Focus on within brings demand-side hypotheses to the fore
  - rules out effects being driven by correlation between industry vulnerability to shocks and industry-specific preferences
- Distinguish between hypotheses by considering
  - race results in light of education results
  - heterogeneous gender results by education and age

## Preview of Results

- Using employment data by industry, county and worker type, we find that establishment deaths during the recession had a pronounced impact on within-industry inequality
  - most adversely affected: female, black, Hispanic and young
- Estimates suggest important role for discrimination

# Remainder of Talk

Introduction

Data and Variation

Empirical Framework

LR Trends

GR and Employment Inequality

Conclusion

# Measure of Employment

- Quarterly Workforce Indicators (QWI)
  - employment aggregated by jurisdiction (county), industry (4-digit NAICS) and worker type from Longitudinal Employer-Household Dynamics (LEHD)
  - covers 95% of US private sector jobs
  - covers all but one state (MA) for 2007-2009
- Worker types ( $\tau$  vs.  $\tau'$ )
  - gender: male vs. female
  - race: white vs. black; white vs. Hispanic
  - education: college vs. no-college (HS or less)
  - age: older (55-64 or 45-54) vs. younger (35-44)

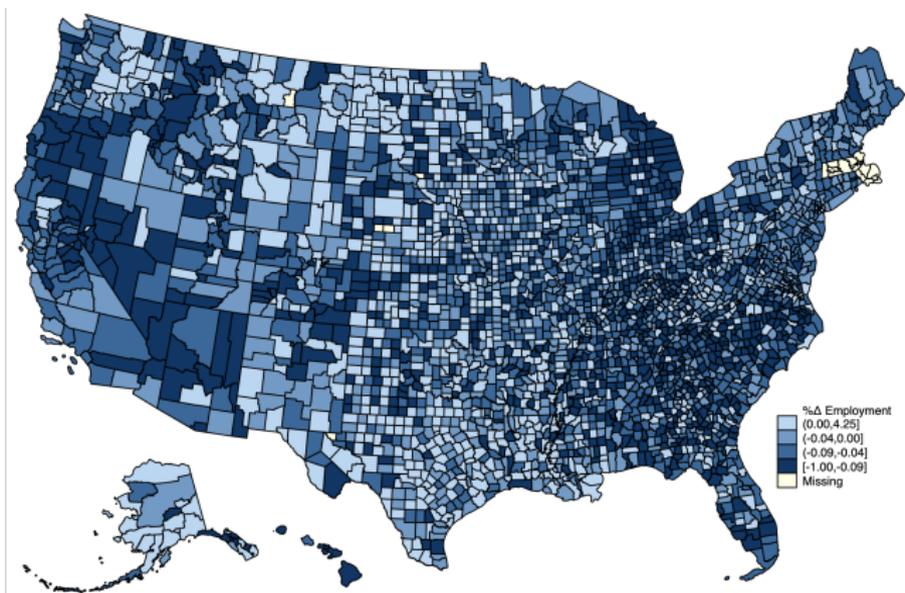
## Measure of Establishment Deaths

- Dynamic Business Information Tracking Series (BITS) from Statistics of U.S. Businesses (SUSB)
  - longitudinally tracks each est. in U.S. across successive Census Business Register records
  - annual count of est. deaths, births, contractions, expansions
  - by county and 6-digit NAICS industry level (use 4-digit)
  - focus on deaths and net est. changes (births - deaths)
- Earlier draft: County Business Patterns (CBP)
  - only able to compute net est. changes by county-industry, using year-to-year difference in est. counts (no longitudinal)
  - results qualitatively similar to SUSB-based analysis

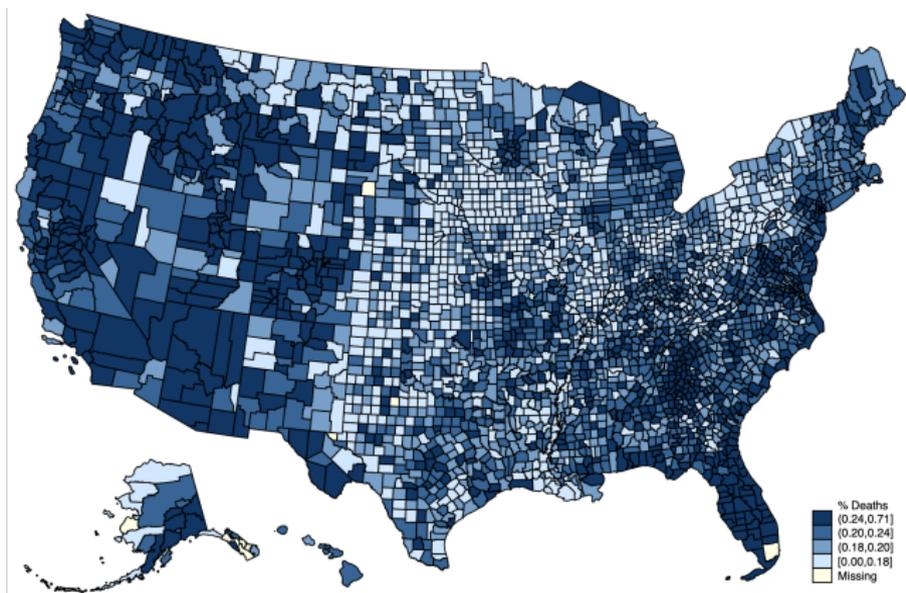
## Descriptive Statistics

	QWI	SUSB
Number of Jurisdictions	3128	3115
Number of Industries	312	289
Number of Jurisdiction-Industry Pairs	478,376	395,680
Number of Establishments		6,555,543
Number of Establishment Deaths		1,495,878
Net Change in Establishments		-208,829
Average Employment by Industry	391,245 (792,667)	392,666 (788,487)
Average Employment by Jurisdiction	39,024 (149,751)	36,430 (141,356)

# Geographical Variation – Change in Employment



## Geographical Variation – Establishment Deaths



- Correlation between employment change and establishment deaths:  $-0.26$

## Employment Gaps

- $E_{ijt}^{\tau}$ : employment for type- $\tau$  workers in industry  $i$ , jurisdiction (county)  $j$ , and time period  $t$
- Aggregate percent change in type- $\tau$  employment:

$$\theta^{\tau} \equiv \frac{\Delta E^{\tau}}{E_0^{\tau}} = \frac{\sum_i \sum_j \theta_{ij}^{\tau} E_{ij0}^{\tau}}{\sum_i \sum_j E_{ij0}^{\tau}}$$

- Our measure of change in employment gap:

$$\theta^{\tau} - \theta^{\tau'} = \frac{\Delta E^{\tau}}{E_0^{\tau}} - \frac{\Delta E^{\tau'}}{E_0^{\tau'}}$$

## Decomposition by Industry

- Within: variation from differences in growth rates within industry ( $\theta_i^\tau \neq \theta_i^{\tau'}$  for some  $i$ )

$$[\theta^\tau - \theta^{\tau'}]_W \equiv \sum_i (\theta_i^\tau - \theta_i^{\tau'}) \left( \frac{(E_{i0}^\tau / E_0^\tau) + (E_{i0}^{\tau'} / E_0^{\tau'})}{2} \right)$$

- how are  $\tau$ ,  $\tau'$  affected within a given industry?
- Across: variation from differences in industry concentration

$$[\theta^\tau - \theta^{\tau'}]_A \equiv \sum_i \left( \frac{\theta_i^\tau + \theta_i^{\tau'}}{2} \right) \left( \frac{E_{i0}^\tau}{E_0^\tau} - \frac{E_{i0}^{\tau'}}{E_0^{\tau'}} \right)$$

- how affected are the industries in which  $\tau$ ,  $\tau'$  are predominant?
- By construction, we have  $\theta^\tau - \theta^{\tau'} = [\theta^\tau - \theta^{\tau'}]_W + [\theta^\tau - \theta^{\tau'}]_A$

## Decomposition by Establishment Deaths

- Assume change in employment is linear in est. deaths:

$$\Delta E_{ij}^{\tau} = \alpha_i^{\tau} + \beta_i^{\tau} D_{ij} + \epsilon_i^{\tau}$$

- Change in group- $\tau$  employment explained by deaths is then

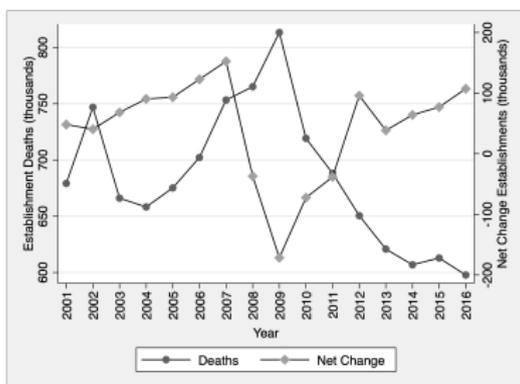
$$\widehat{\Delta E_i^{\tau}}|_D = \hat{\beta}_i^{\tau} \sum_j D_{ij}$$

- So deaths-predicted change in gap given by

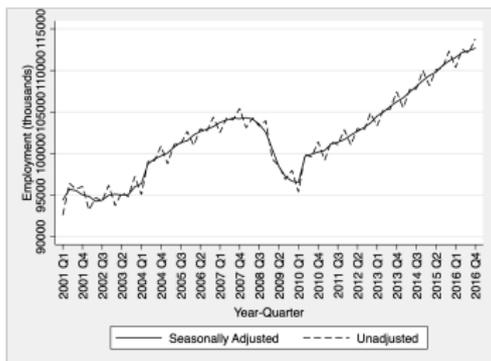
$$[\theta^{\tau} - \theta^{\tau'}]_{deaths} = \frac{\widehat{\Delta E_i^{\tau}}|_D}{E_0^{\tau}} - \frac{\widehat{\Delta E_i^{\tau'}}|_D}{E_0^{\tau'}}$$

- Can then decompose  $[\theta^{\tau} - \theta^{\tau'}]_{deaths}$  by across and within
- Interpretation: employment changes predictable from deaths
  - deaths only partially correlated with contractions, other sources of employment changes

# Long-Run Establishment Trends

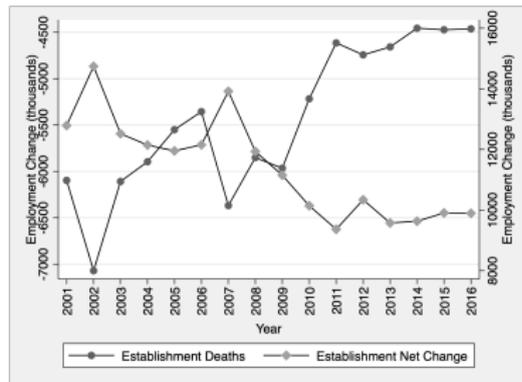


## Establishment Deaths



## Aggregate Employment

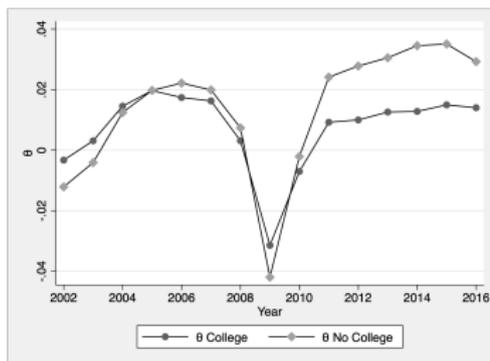
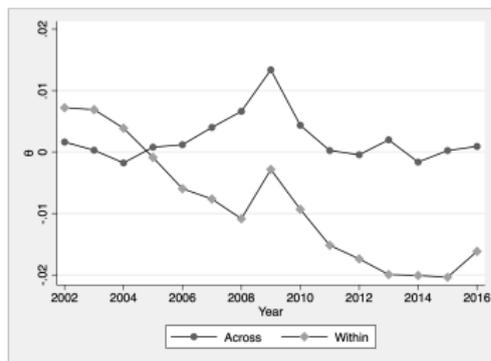
Macartney/Nielsen/Rodriguez



## Employment Loss due to Deaths

- Establishment deaths peak 2007-2009
- Employment losses due to deaths also peak during the same time period
- Aggregate employment declines dramatically

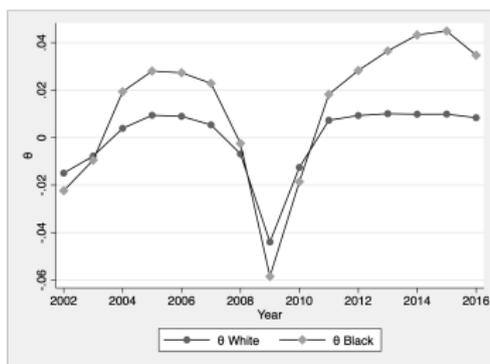
# Long-Run Employment Trends: Education


 $\theta^T$ 


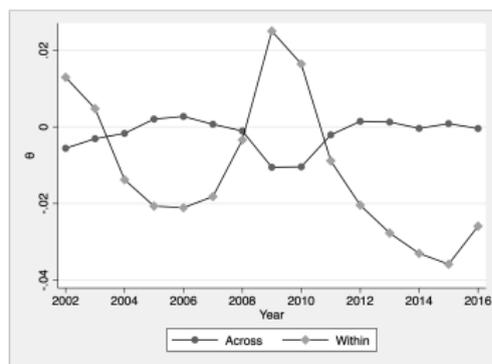
Across/Within

- Long-run trend of no college outgrowing college driven entirely by the within component
- No college temporarily falls more during GR
- Across component operative only during GR

# Long-Run Employment Trends: Race



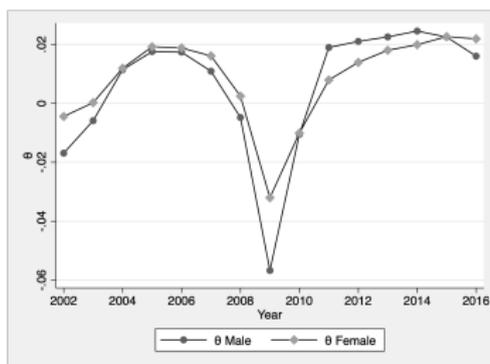
$\theta^T$



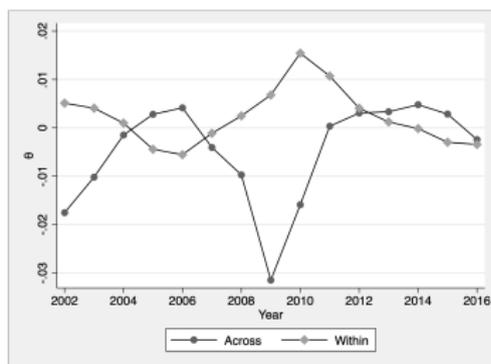
Across/Within

- Black workers lose more employment during GR
- Across component moves slightly in favor of black workers
- Within component moves strongly against black workers

## Long-Run Employment Trends: Gender



$\theta^T$



Across/Within

- Employment fell much more for men, then recovered more rapidly
- Overall changes driven by across-industry component
- Within component advantages men during GR

## Decomposition by Race

### White vs. Black

	All	Deaths
$[\theta^w - \theta^b]_A$	-0.011 <sup>***</sup> [-0.012,-0.009]	-0.016 <sup>***</sup> [-0.024,-0.010]
$[\theta^w - \theta^b]_W$	0.023 <sup>***</sup> [0.020,0.026]	0.030 <sup>**</sup> [0.010,0.048]

### White vs. Hispanic

	All	Deaths
$[\theta^w - \theta^h]_A$	0.012 <sup>***</sup> [0.010,0.015]	0.034 <sup>***</sup> [0.021,0.050]
$[\theta^w - \theta^h]_W$	-0.030 <sup>***</sup> [-0.036,-0.025]	0.092 <sup>***</sup> [0.004,0.120]

- Across industry: GR negatively affected white workers
  - more than black workers
  - less than Hispanic workers
- Within industry (overall): GR affected white workers
  - less than black workers
  - more than Hispanic workers
- Within industry (deaths): GR affected white workers
  - less than black and Hispanic workers
  - very large estimate for Hispanic vs. white

## Decomposition by Race Cont'd

- Within-deaths estimates consistent with both discrimination and positive sorting by worker skill and firm resilience
  - black/Hispanic workers have lower skill levels, and may thus be concentrated at less resilient firms
  - alternatively, resilient firms may be unwilling to hire such workers for discriminatory reasons
- Education decompositions suggest discrimination plays a role:
  - within effects suggest higher-education workers suffered more
    - could be due to age-education gradient
  - in any case, not consistent with skill differences playing a large role in explaining racial differences

# Decomposition by Gender

## Male vs. Female

	All Firms	Deaths
$[\theta^m - \theta^f]_A$	-0.045 <sup>***</sup> [-0.047,-0.042]	-0.068 <sup>***</sup> [-0.090,-0.050]
$[\theta^m - \theta^f]_W$	0.010 <sup>***</sup> [0.009,0.011]	0.013 <sup>**</sup> [0.004,0.025]

- Overall, men hit harder by GR than women
  - driven entirely by male concentration in heavily-affected industries
- Within-industry, women affected more than men
  - could again be due to discrimination or skill differences
- Evidence in favor of discrimination
  - men and women have similar education levels
  - more concretely: heterogeneous gender results (next)

# Heterogeneity in Gender Decomposition

## Within-Deaths by Education

College	0.003
No College	0.024**

## Within-Deaths by Age

55-64	0.003
45-54	0.010*
35-44	-0.005

- Heterogeneous within-deaths results suggest discrimination
  - education:
    - conditional on education, women concentrated in less resilient firms
    - particularly pronounced for less educated, but educated women disadvantaged as well (significantly using net changes)
  - age:
    - life-cycle considerations drive increasing skill differences into middle age (e.g., earnings and experience disparities)
    - yet no clear pattern emerges across age groups

# Conclusion

- Documented effect of the GR on employment inequality, according to worker gender, race, education and age
- Exploiting establishment deaths, within-industry evidence consistent with discrimination by more resilient firms
  - concentration of black and Hispanic workers in weaker firms, combined with small opposite sign education results
  - heterogeneous within-industry patterns for gender
- Results reveal that across-firm distribution of worker types is a key determinant of how shocks affect employment inequality
  - may have implications for future downturns

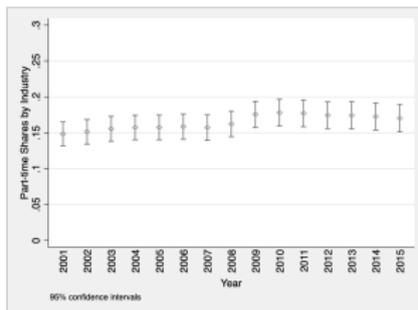


## Business Information Tracking Series (BITS)

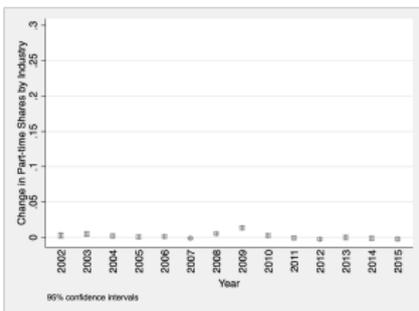
- Longitudinally tracks each establishment in the United States across successive Business Register records
  - establishments that have undergone no ownership or organizational changes are matched across years with their Census identifier
  - establishments that have changed over time are matched using Employer Identification Numbers, business names and addresses, and industry codes
- Establishment deaths are defined as the number of establishments that have positive employment in the first quarter of the initial year and zero employment in the first quarter of the subsequent year



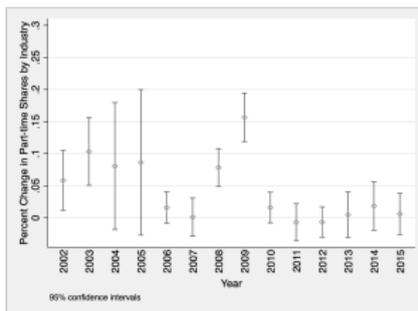
# Stability by Part-Time Status



Level

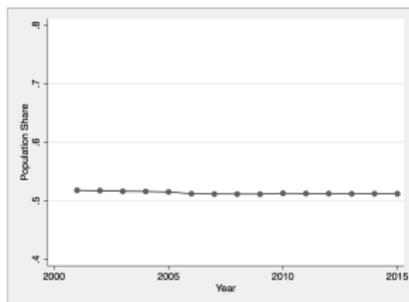


Change

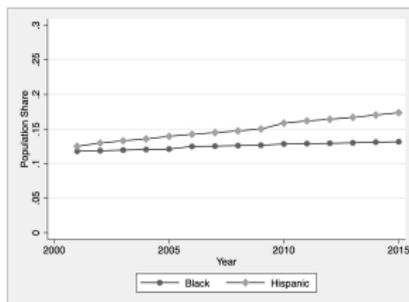


Percent Change

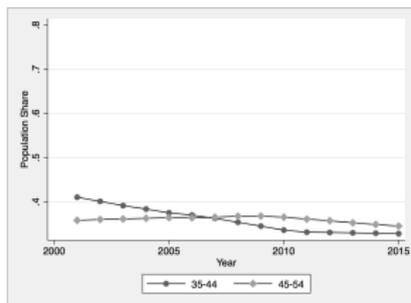
# Population Share by Type



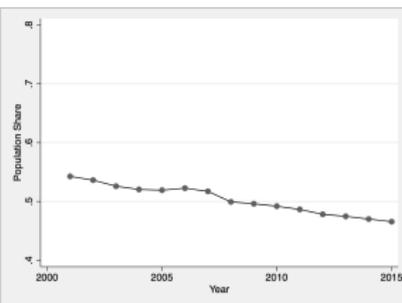
Female



Black and Hispanic

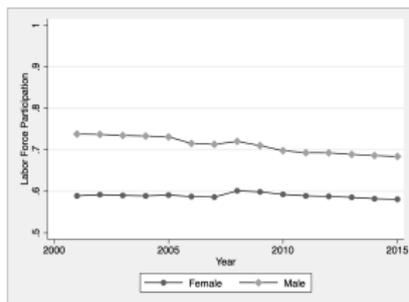


35-44 and 45-54

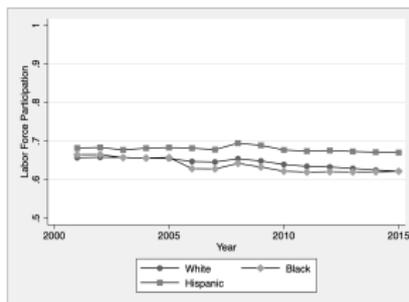


No College

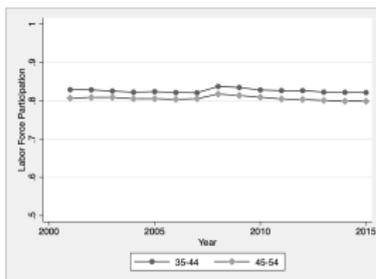
# Labor Force Participation by Type



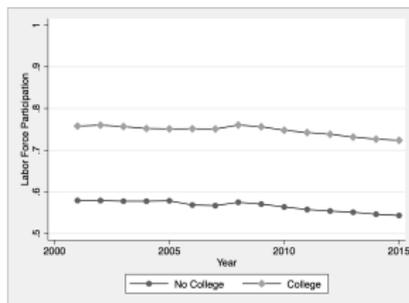
Male and Female



White, Black and Hispanic

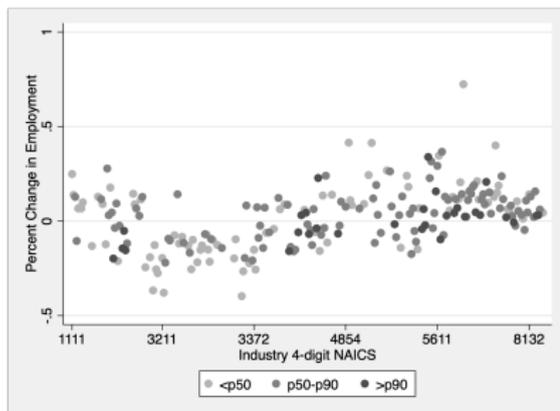


35-44 and 45-54

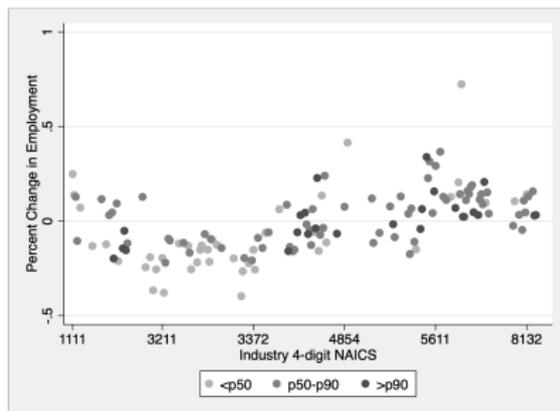


College and No College

# Percent Change in Employment by Industry (2007-2009)



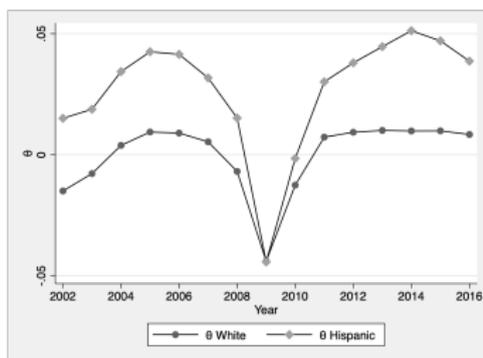
No Correction



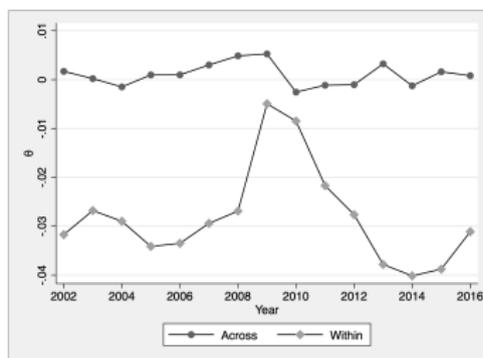
Holm Bonferroni



## Long-Run Employment Trends: Race – Hispanic



$\theta^T$



Across/Within

- Hispanic workers lose less employment during GR
- Little change in across component
- Within component moves strongly against Hispanic workers



# Employment Change by Worker Type

## Gender

	All	Deaths
$\theta^m$	-0.069*** [-0.072,-0.066]	-0.110*** [-0.124,-0.085]
$\theta^f$	-0.034*** [-0.037,-0.032]	-0.056*** [-0.063,-0.040]

Pop-adj m/f gap (2007): 0.986.

## Education

	All	Deaths
$\theta^c$	-0.033*** [-0.036,-0.031]	-0.058*** [-0.065,-0.043]
$\theta^n$	-0.043*** [-0.046,-0.039]	-0.069*** [-0.083,-0.042]

Pop-adj c/n gap (2007): 1.333.

## Race

	All	Deaths
$\theta^w$	-0.056*** [-0.058,-0.053]	-0.068*** [-0.083,-0.051]
$\theta^b$	-0.068*** [-0.072,-0.064]	-0.083*** [-0.095,-0.065]
$\theta^h$	-0.038*** [-0.044,-0.030]	-0.192*** [-0.218,-0.095]

Pop-adj w/b gap (2007): 0.977

Pop-adj w/h gap (2007): 1.037

## Age

	All	Deaths
$\theta^{55-64}$	0.035*** [0.032,0.038]	-0.015* [0.004,0.033]
$\theta^{45-54}$	-0.032*** [-0.035,-0.030]	-0.042*** [-0.049,-0.028]
$\theta^{35-44}$	-0.082*** [-0.084,-0.079]	-0.108*** [-0.122,-0.091]

Pop-adj 55-64/35-44 gap (2007): 0.763

Pop-adj 45-54/35-44 gap (2007): 0.989



# Decomposition by Education

## College vs. No College

	All Firms	Deaths
$[\theta^c - \theta^n]_A$	0.022 <sup>***</sup> [0.021,0.023]	0.036 <sup>***</sup> [0.026,0.048]
$[\theta^c - \theta^n]_W$	-0.012 <sup>***</sup> [-0.014,-0.011]	-0.025 <sup>***</sup> [-0.038,-0.019]

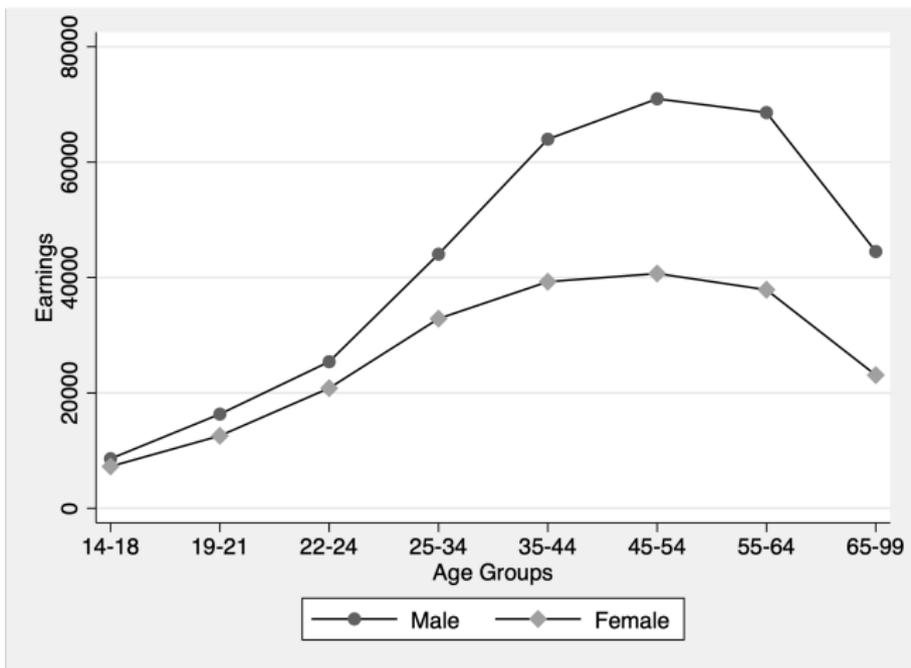
# Decomposition by Age

## Older vs. Younger

	All Firms	Deaths
$[\theta^{55-64} - \theta^{35-44}]_A$	0.006*** [0.006,0.007]	0.009*** [0.006,0.013]
$[\theta^{55-64} - \theta^{35-44}]_W$	0.110*** [0.109,0.112]	0.115*** [0.104,0.128]
$[\theta^{45-54} - \theta^{35-44}]_A$	0.001*** [0.000,0.001]	0.004*** [0.002,0.006]
$[\theta^{45-54} - \theta^{35-44}]_W$	0.049*** [0.047,0.050]	0.062*** [0.051,0.076]



# Earnings Across Gender and Age Groups



# Earnings Across Gender and Education Groups

