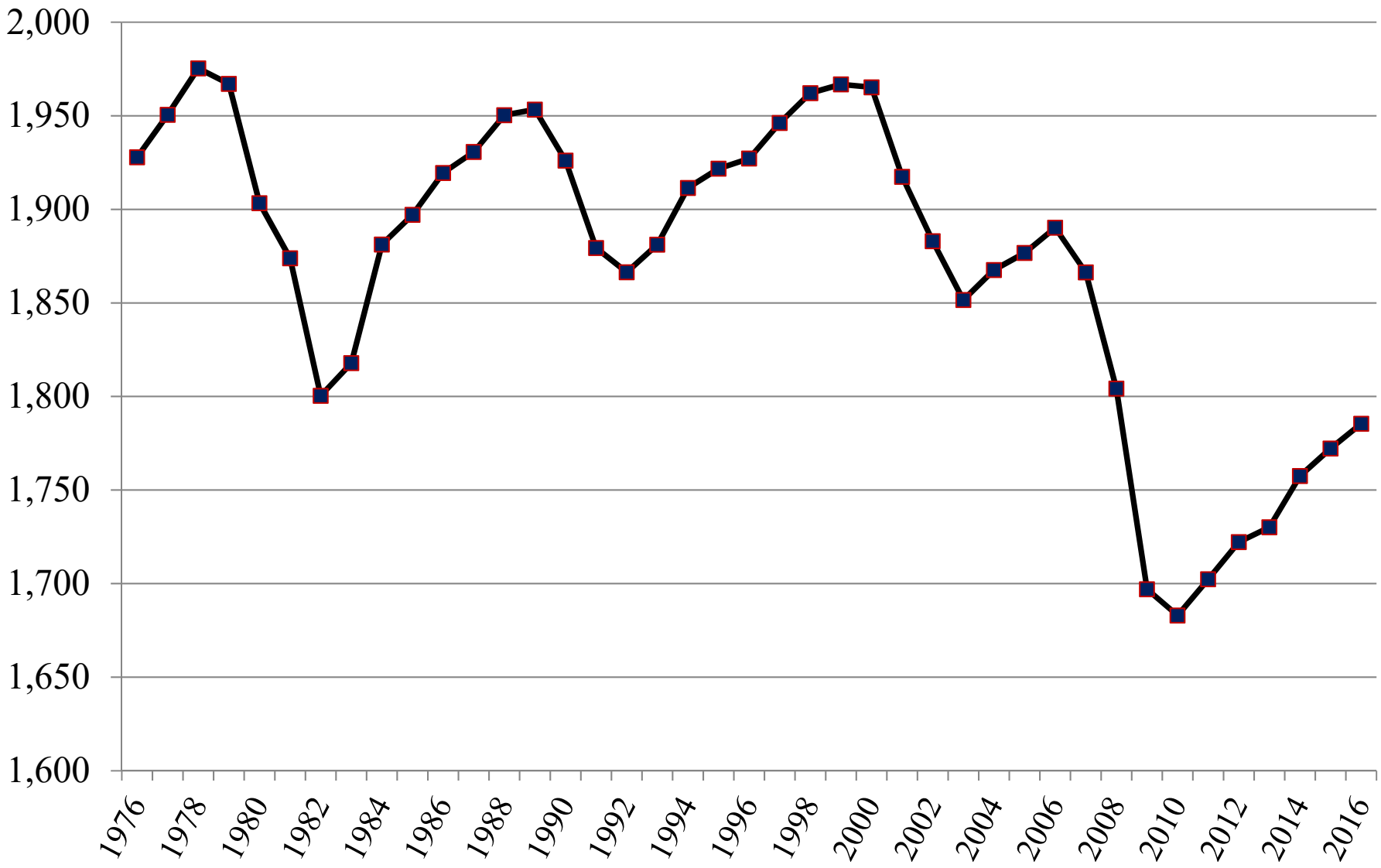
The Transformation of Manufacturing and the Decline in U.S. Employment

Kerwin Charles, Erik Hurst and Mariel Schwartz

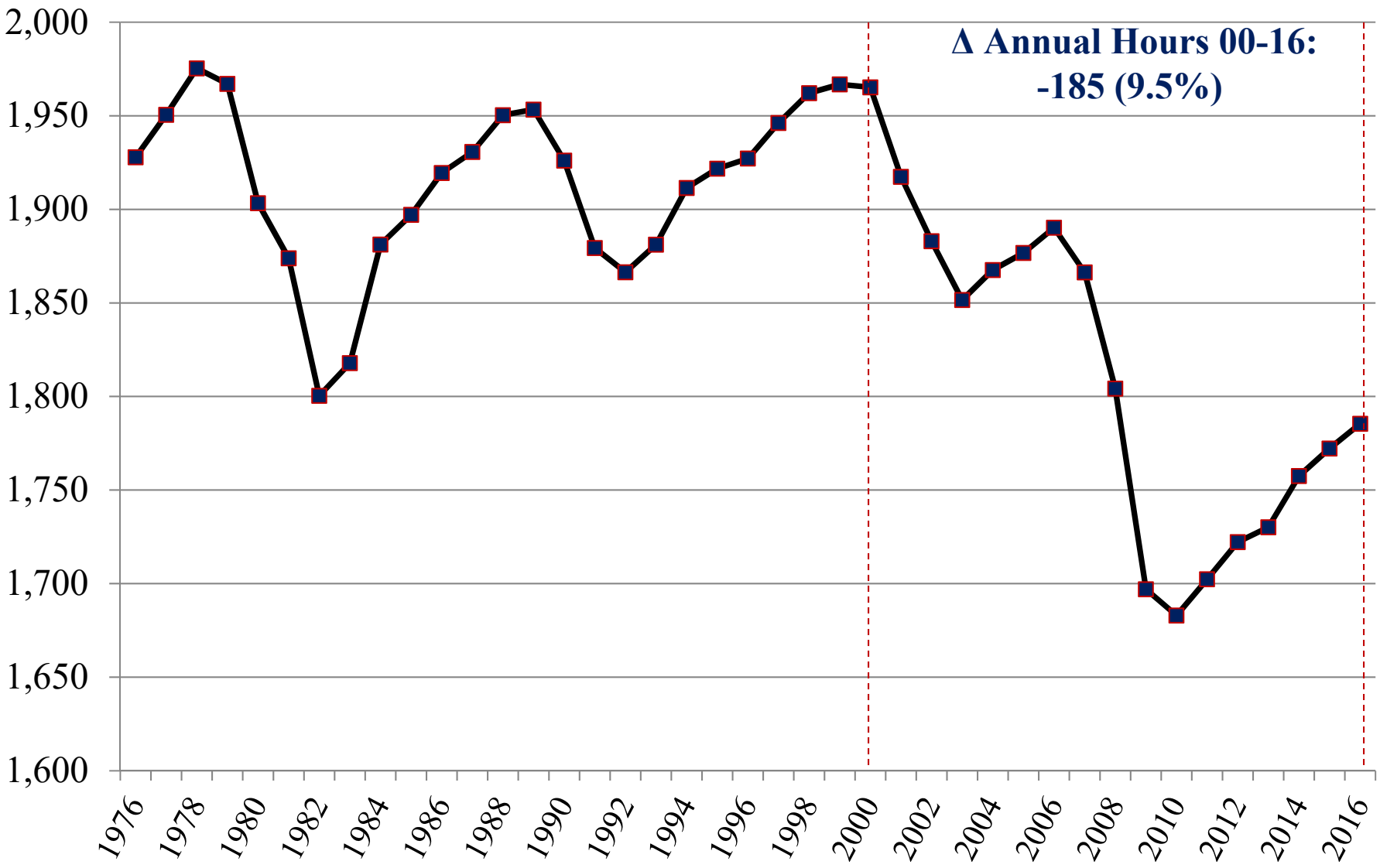
April 2018

2018 NBER Macro Annual Conference

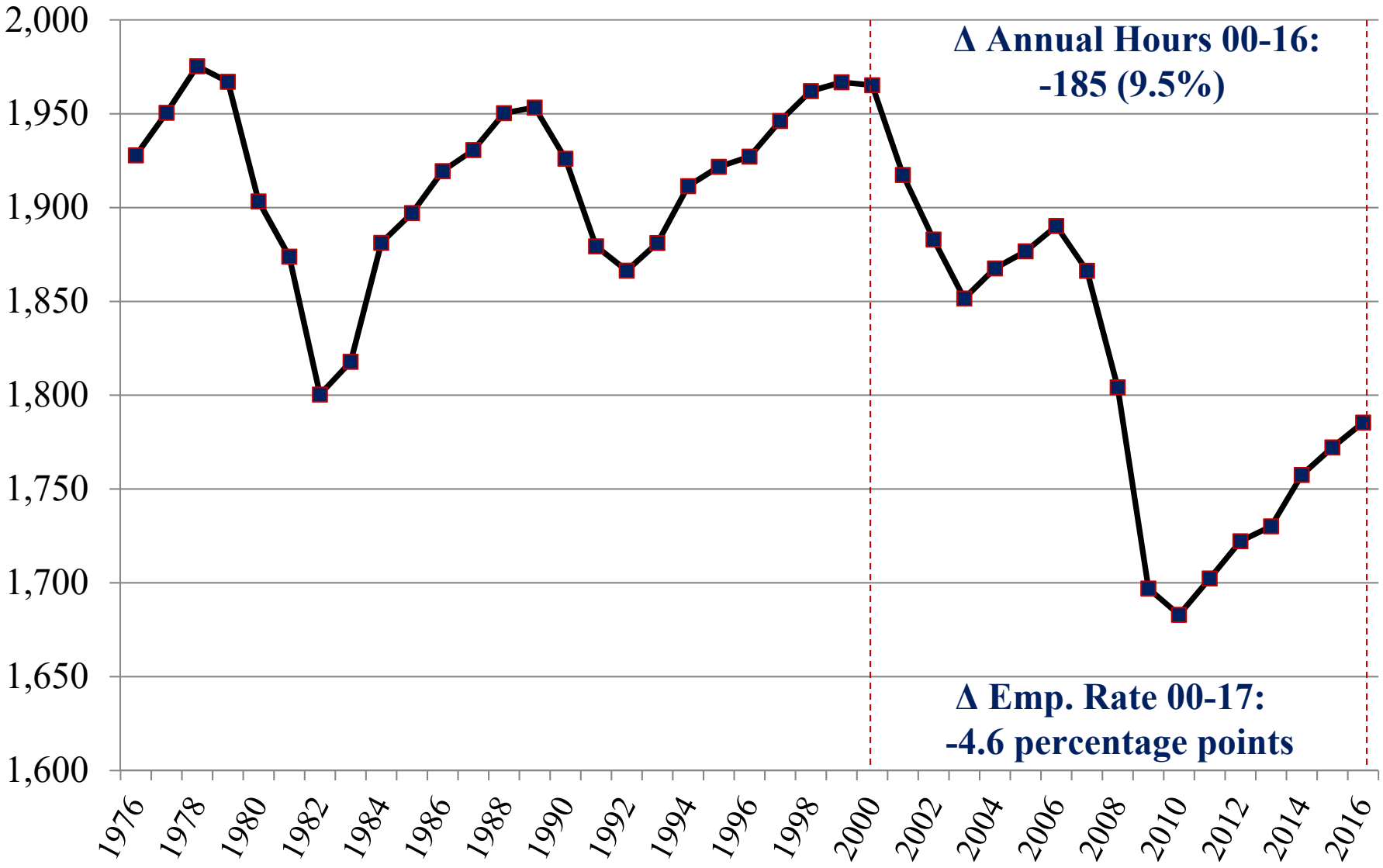
Annual Hours Worked, Male 21-55, Ed = All
March CPS, 1977 - 2017



Annual Hours Worked, Male 21-55, Ed = All
March CPS, 1977 - 2017



Annual Hours Worked, Male 21-55, Ed = All
March CPS, 1977 - 2017



This Paper

- **Examine the link between the transformation of the manufacturing sector and declining employment rates.**

- **Parts:**

  - Document facts about changes in manufacturing sector

  - Exploit regional variation to assess manufacturing effect on local employment changes.

  - Exploit regional variation to assess broader measures of well-being (wages, drug use, etc.)

  - Compare and contrast variation due to trade vs. other sources.

  - Assess potential reasons for sluggish employment response during the 2000s.

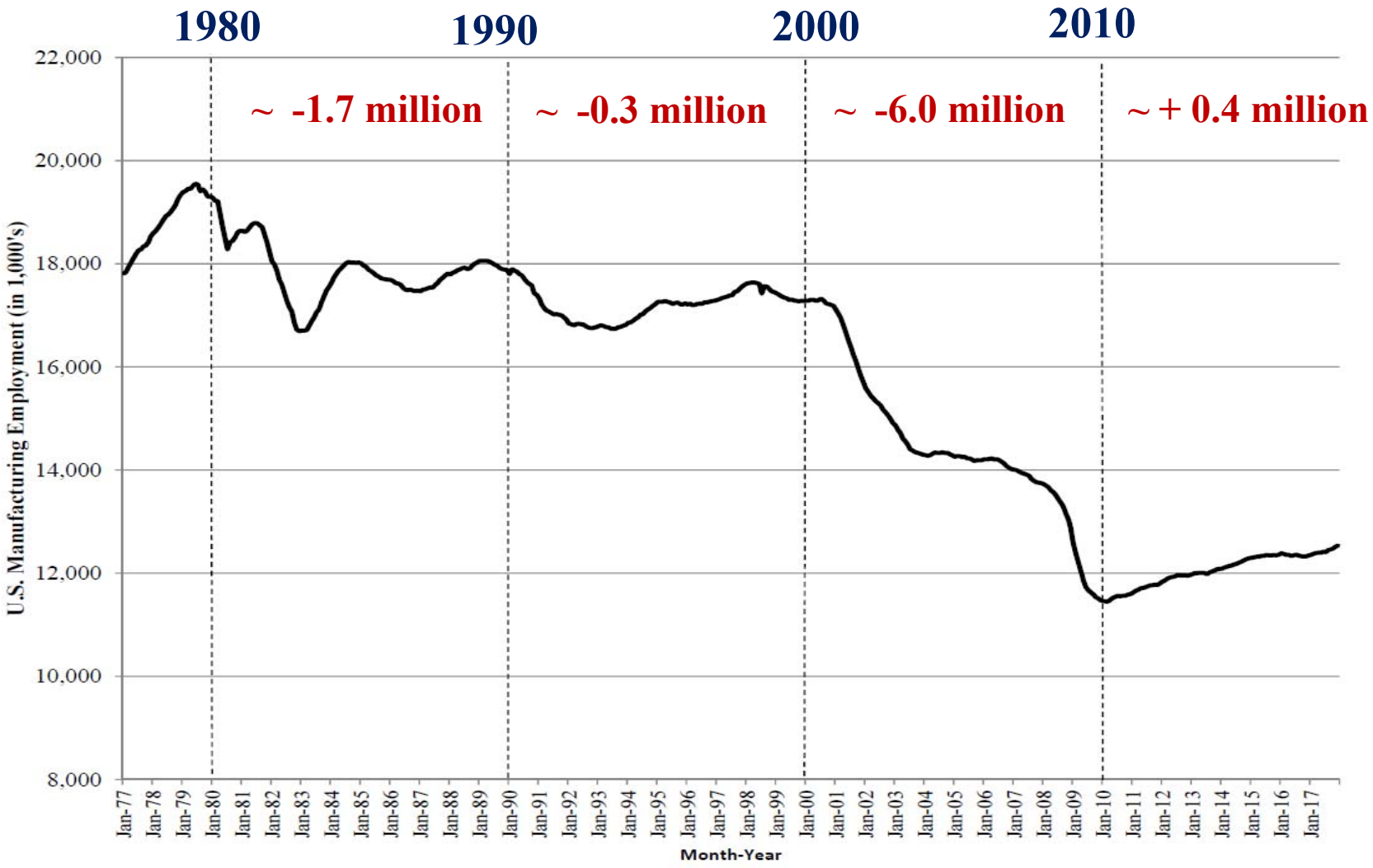
Why Focus on Manufacturing

- **Just another labor demand shock?**

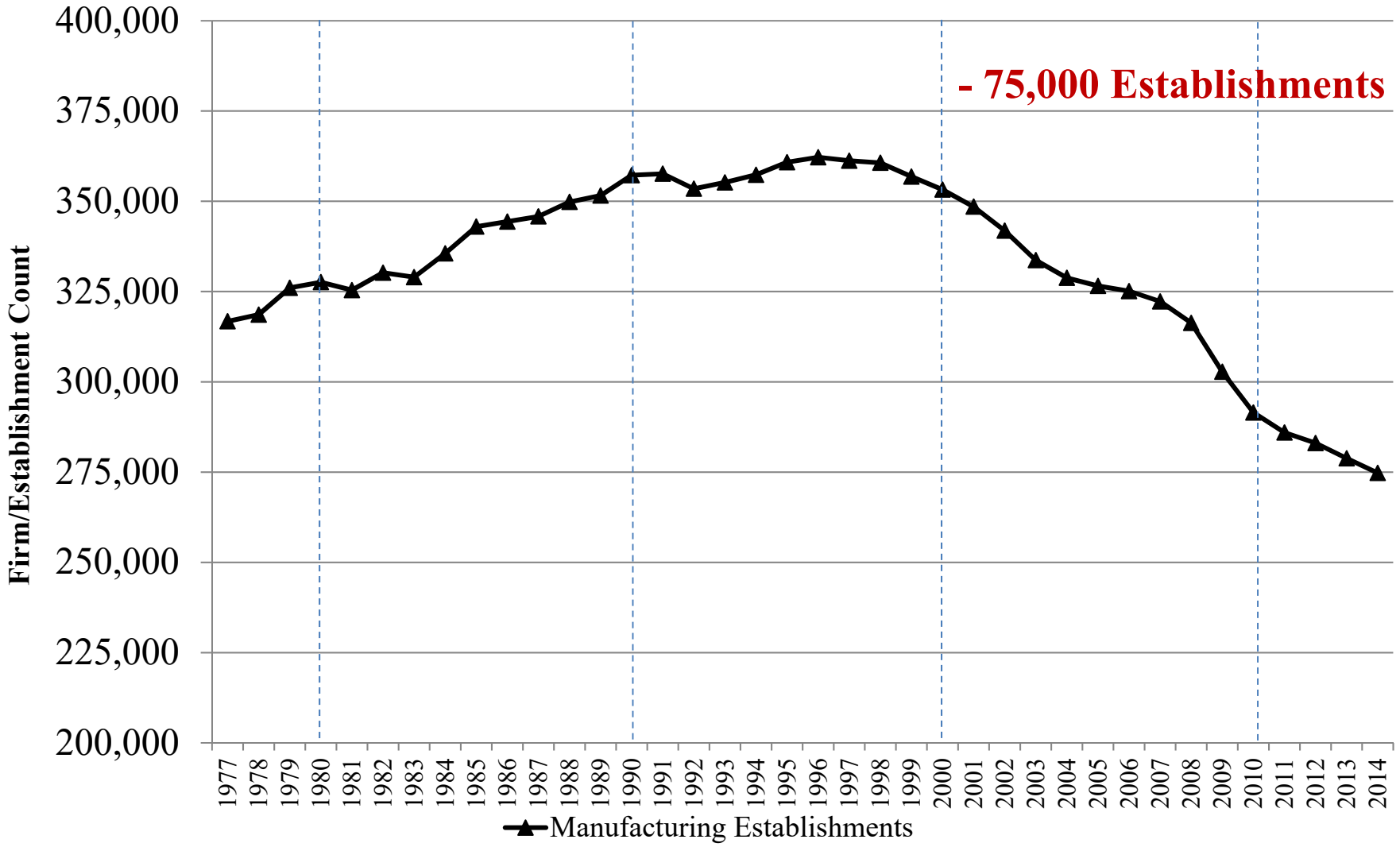
- **<u>Manufacturing</u>**:
  - Very large sector (one-fifth of all jobs in 1980)
  - Very important for less educated workers (one-third of such men worked in this sector in 1980)
  - Very spatially concentrated
  - Given the above, has become a large focus of recent policy discussions.

Part A:
The Transformation of Manufacturing

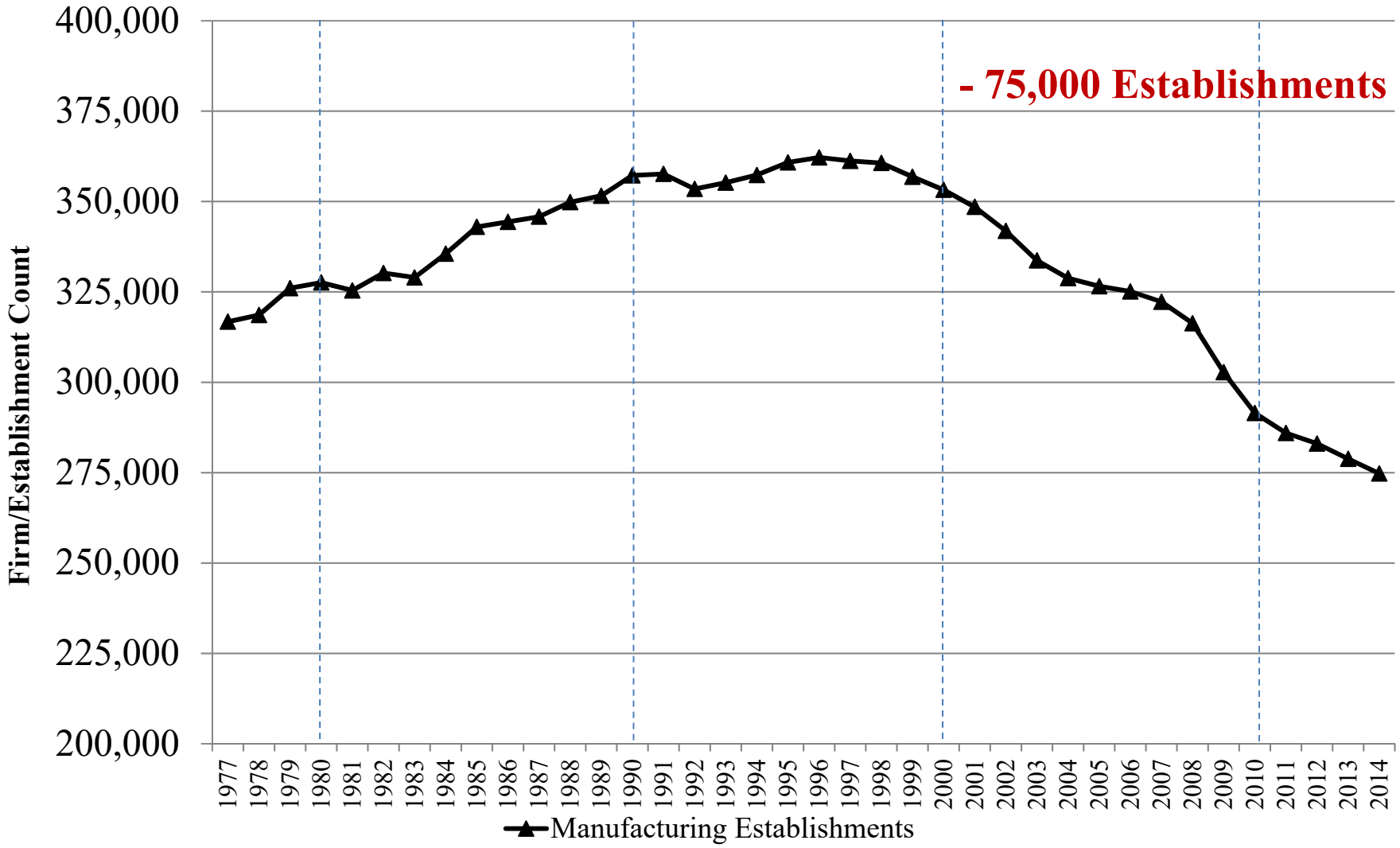
U.S. Manufacturing Employment, BLS



U.S. Manufacturing Establishments

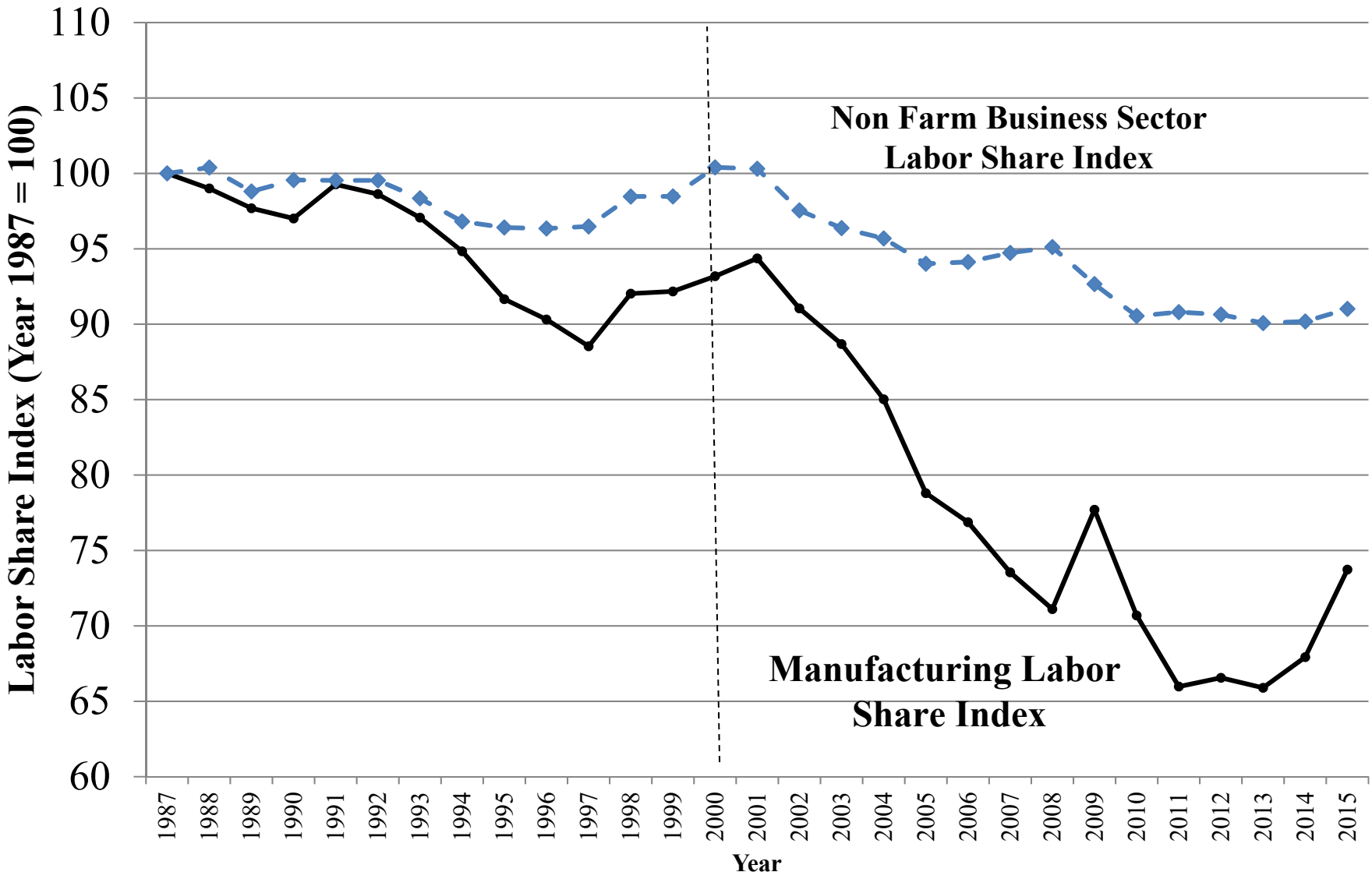


U.S. Manufacturing Establishments

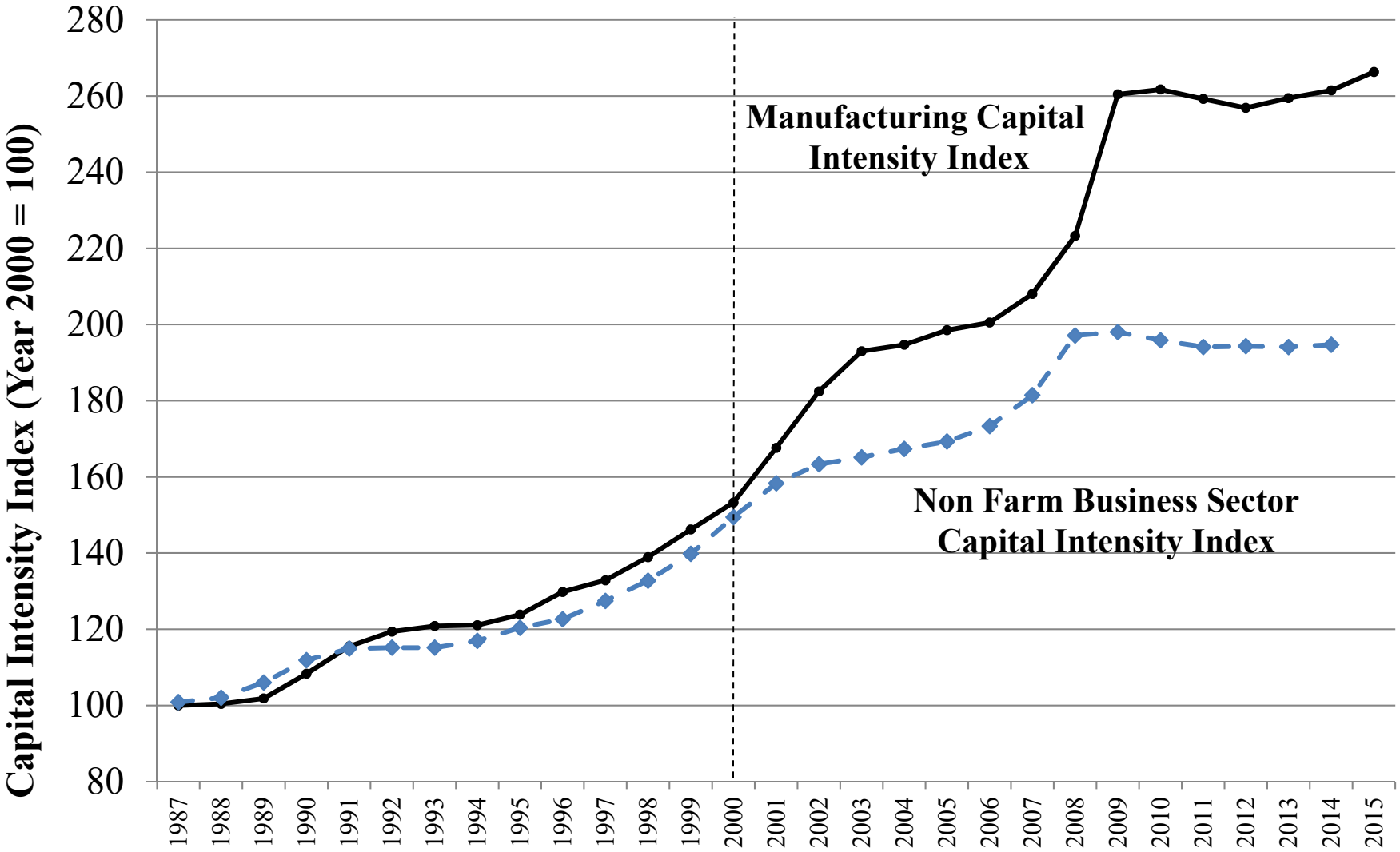


- **Despite falling employment and establishments, real manufacturing output rose slightly during 2000s (~7%)**

Labor Share Index (1987 = 100)



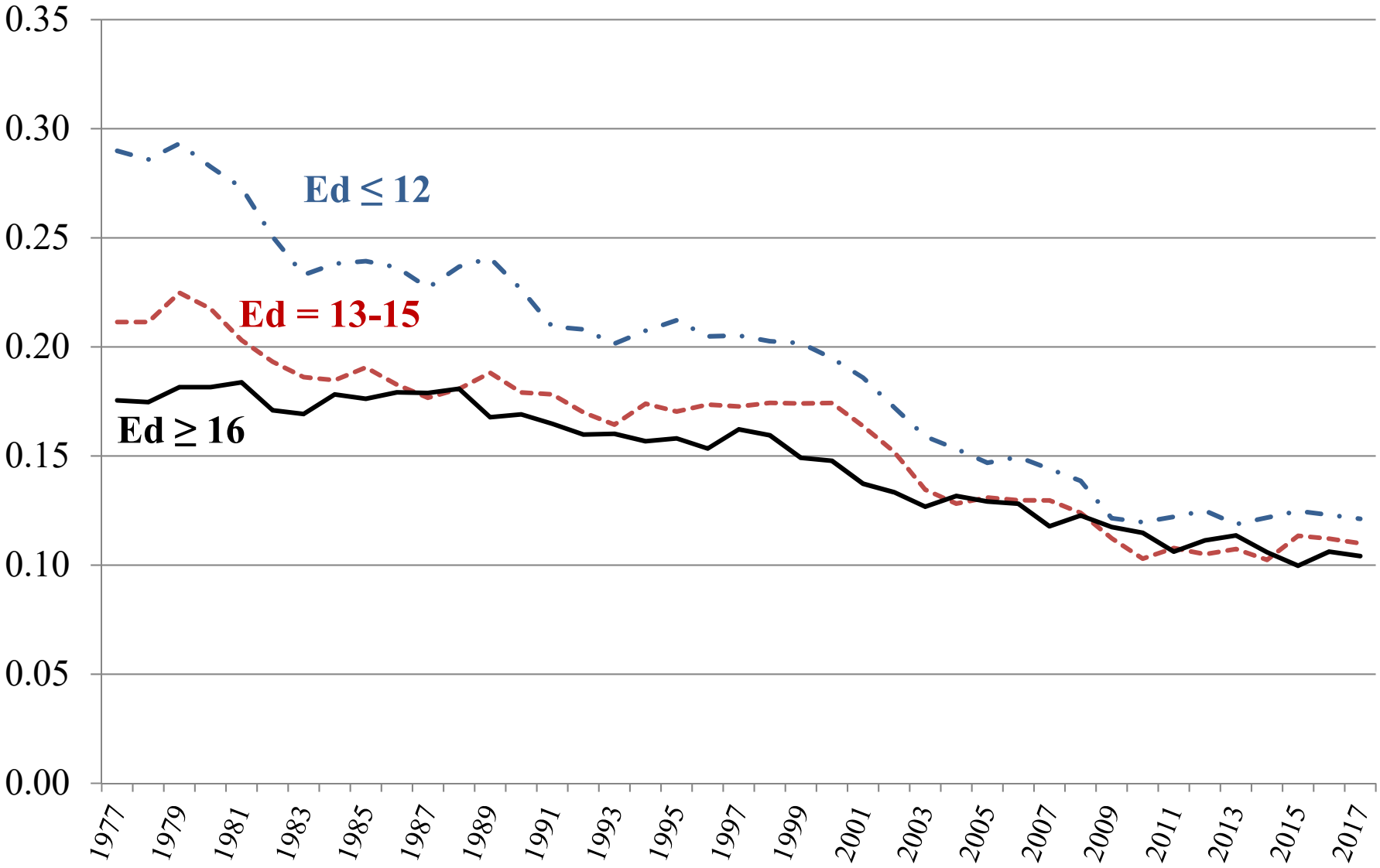
Capital Intensity Index (1987 = 100)



Ratio of capital services to hours worked in the production process.

Share of Production Workers in Manufacturing Industry: Age 21-55, CPS

Manufacturing Share of Population
Men Aged 21-55, By Education, March CPS



Bachelor Share of Manufacturing Workers

Table 8: Percent Bachelor's Degree or More By Industry Over Time, Men Aged 25-30

	1998-2001 Share	2014-2017 Share	Change in Share
All Men 25-29	26.5	31.9	5.4
Men 25-29 Working in Manufacturing	21.1	26.6	5.5
Men 25-29 Working Retail Trade	16.6	20.2	3.6
Men 25-29 Working in Construction	8.6	12.1	3.5

Note: Data from our CPS sample. We use the 1990 industry classification to define the Manufacturing, Retail Trade and Construction industries. Table shows the share of men aged 25-29 with at least a bachelor's degree in the total population (row 1), working in the manufacturing industry (row 2), working in the retail trade industry (row 3) and working in the construction industry (row 4) in different years.

Key Take Aways #1

- **Manufacturing employment and firms plummeted during the early 2000s.**
- **Declines where large relative to recent historical levels.**
- **Manufacturing is becoming more physical capital intensive during the 2000s (even relative to other sectors).**
- **Manufacturing is becoming more skill intensive during the 2000s (even relative to other historically low skilled sectors).**

Part B:
Exploiting Regional Variation

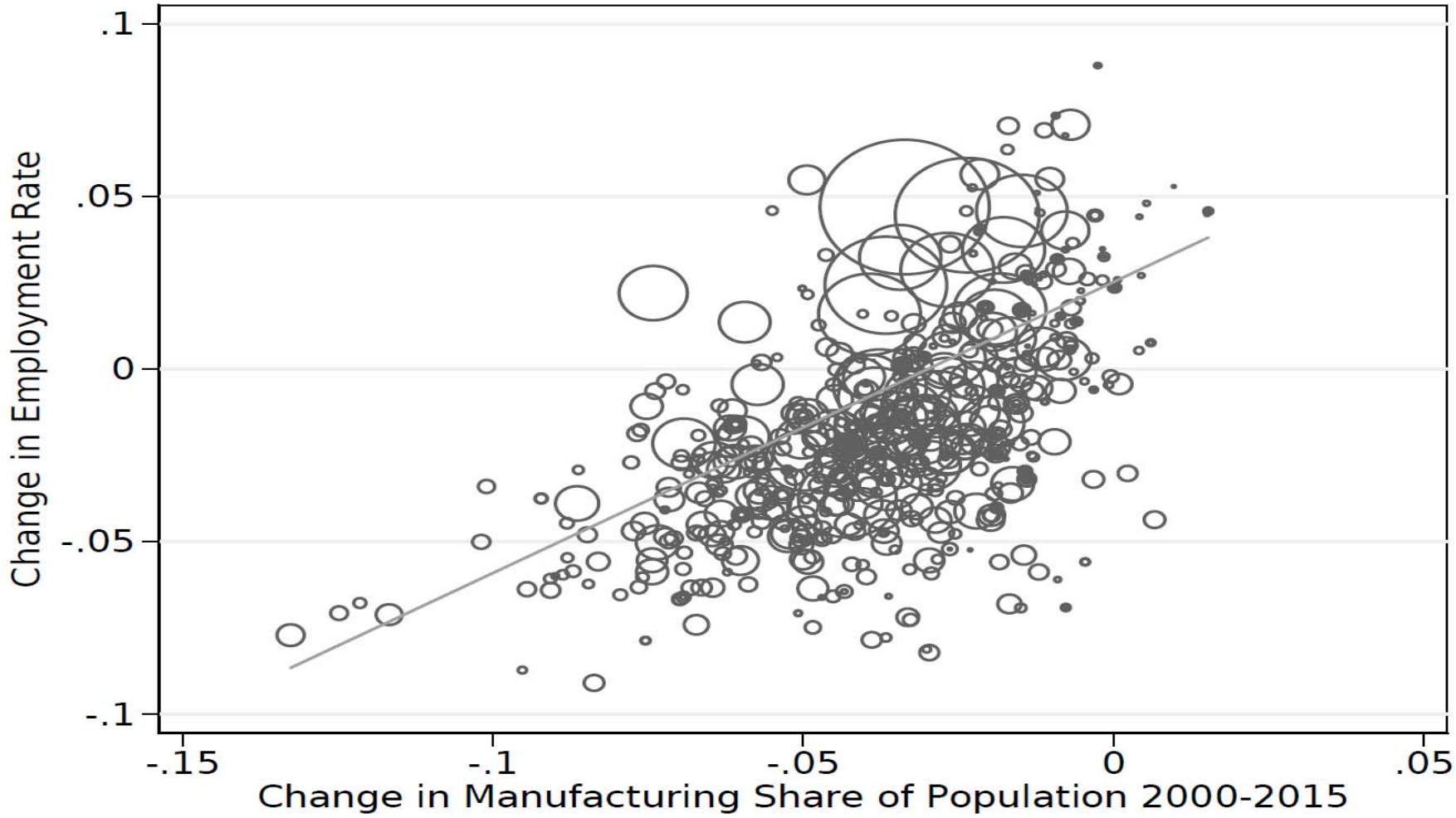
Next Steps

- Can we use regional variation to get causal estimates of the effects of local manufacturing declines on local labor market outcomes?

- Is such variation useful for thinking about aggregate trends?

▪ Unit of regional observation:	**Commuting zone**
▪ Time periods:	2000-2016 1980-1990
▪ Data Source	U.S. Censuses 1980, 1990, 2000 American Community Survey
▪ Sample	Age 21-55 Non-Military Non-Institutionalized

Change in Manufacturing Share vs Change in Employment Rate, Prime Age Men



Specification

$$\Delta L_{t+1}^{g,k} = \alpha^{g} + \beta^{g} \Delta Man_{t+1}^{g} + \Gamma^{g} X_{t}^{k} + \varepsilon_{t+1}^{g,k}$$

Why Instrument?

Local labor supply shocks?

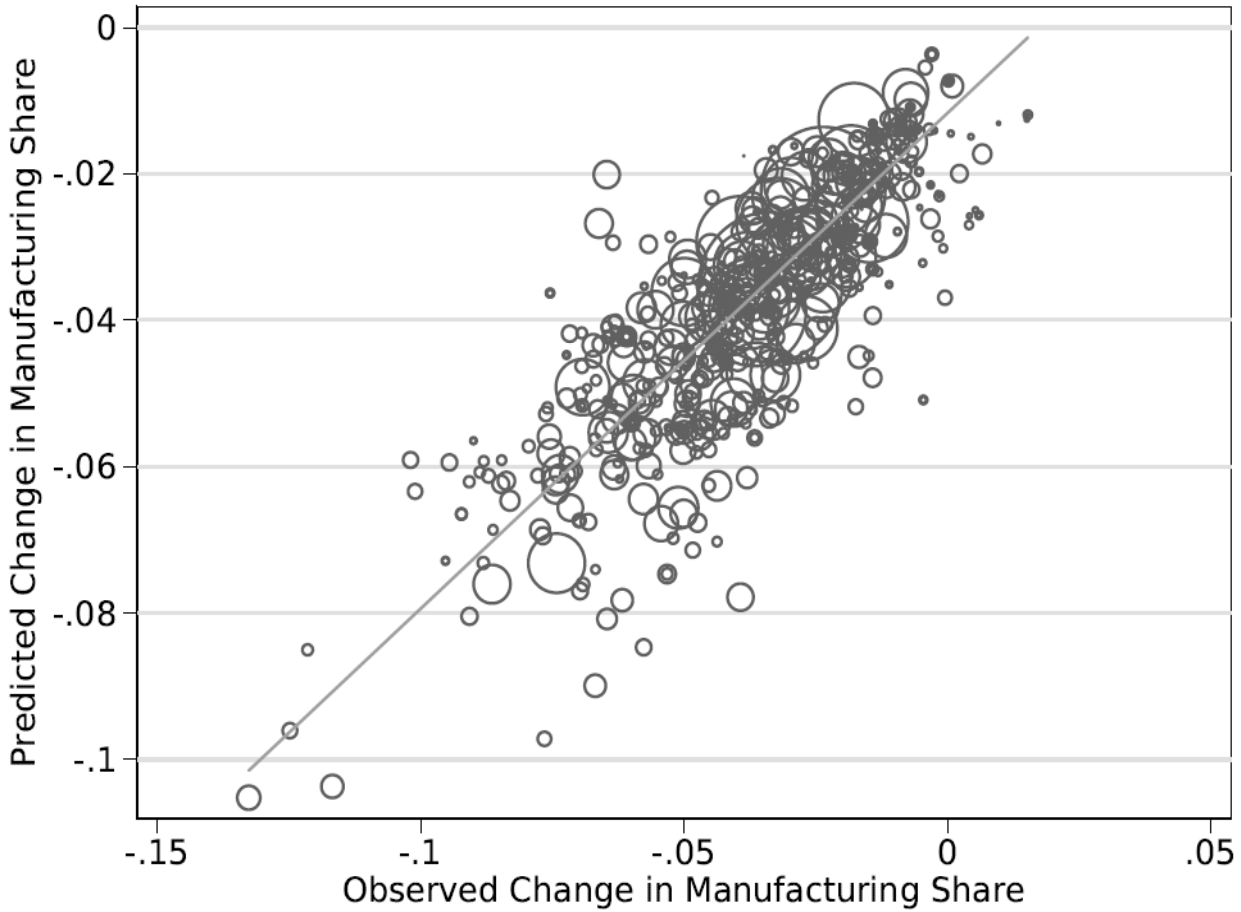
Other local labor demand shocks?

Shift Share Instrument

$$S_{t+1}^{k} = \sum_{n=1}^{J} \varphi_{\mathrm{j},2000}^{k} \left(Man_{j,2016}^{-k} - Man_{j,2000}^{-k} \right)$$

First-Stage

Figure 15: Predicted Change in Manufacturing Share 2000-2016 vs. Change in Manufacturing Share 2000-2016



Key Take Aways #2

- **A 5 percentage point decline in manufacturing share (about a 1 SD decline):**
  - Reduces annual hours of both prime age men and women by 2.7%.
  - Reduces employment rate of prime age men and women by 1.9 percentage points and 1.3 percentage points, respectively.
- **Effects are much larger for individuals with a high school degree or less.**
- **Naïve extrapolation from cross-region estimates:**
  - About half of aggregate declines in hours and employment rates for prime age workers can be attributed to manufacturing decline.
- **Naïve extrapolation misses all general equilibrium effects (Beraja et al. 2016). But, does give a sense of potential magnitudes.**

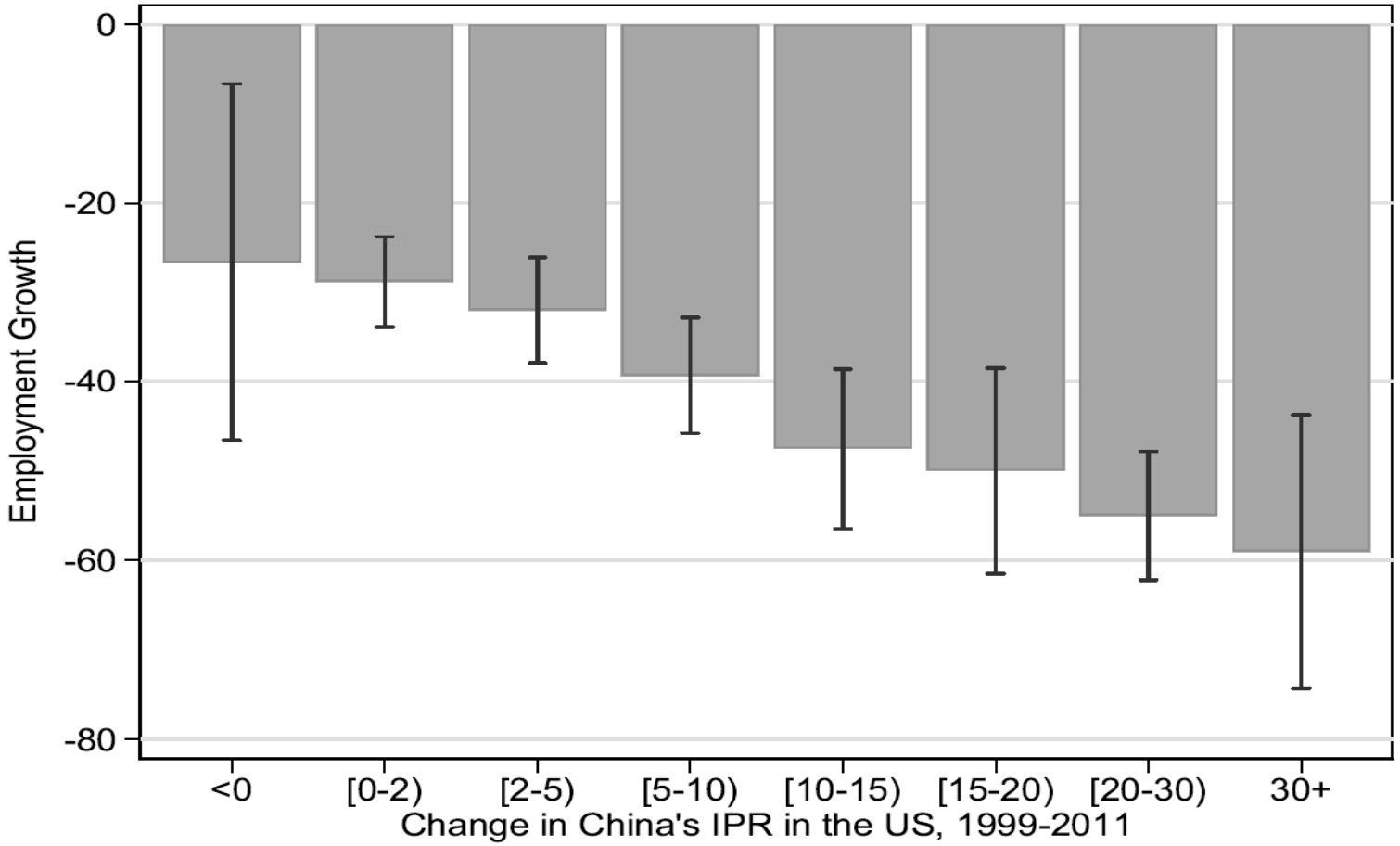
Key Take Aways #3

- **Manufacturing decline also affected broader measures of well-being.**
- **Using our shift share instrument, we also find:**
  - Manufacturing decline is associated with local wages falling (consistent with a shift in of the labor demand curve).
  - **Manufacturing decline is associated with increased opioid use and opioid deaths.**

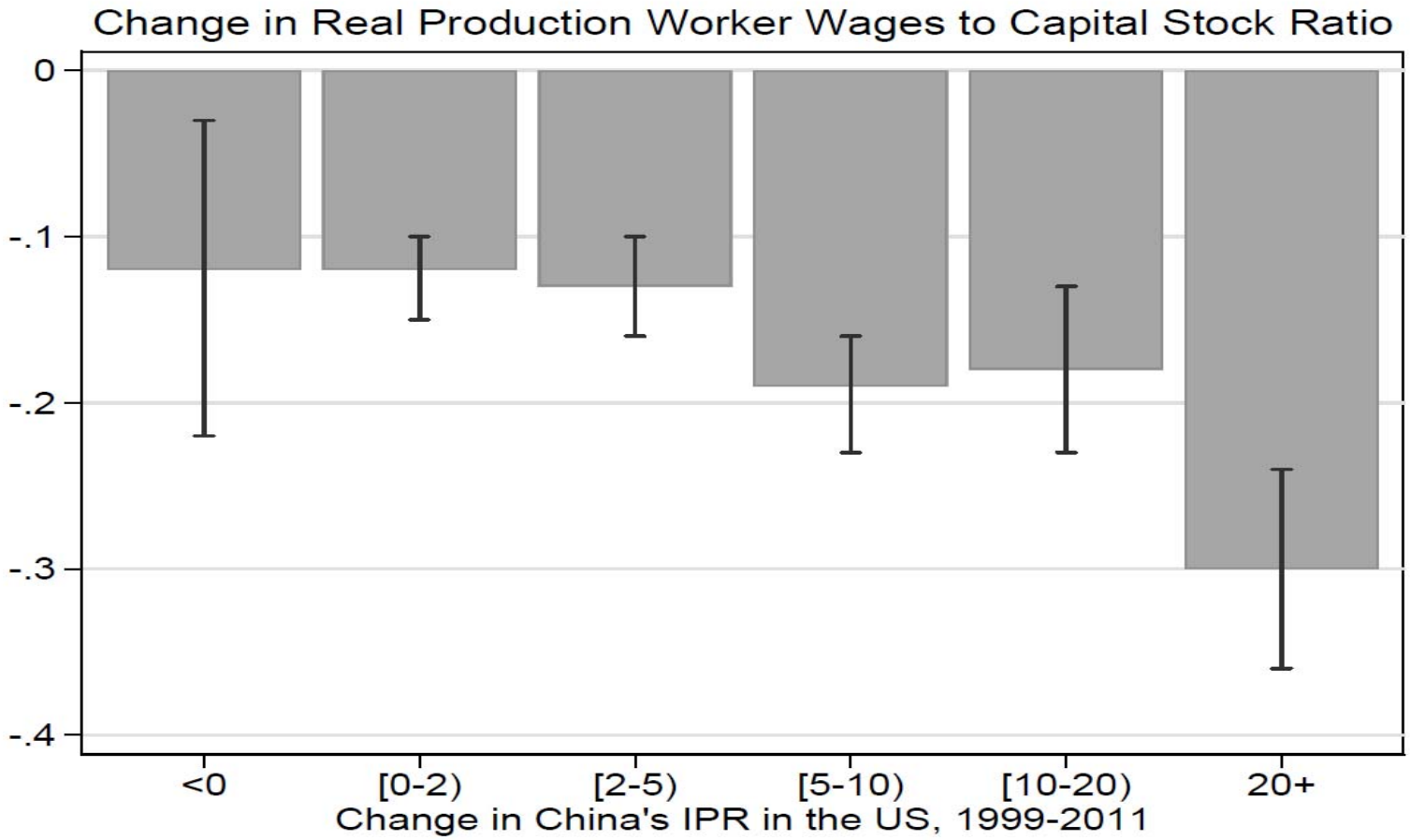
Part C:
Manufacturing and Trade

Employment Growth vs. Exposure to China Import Competition

Figure 16: Employment Decline and Import Competition

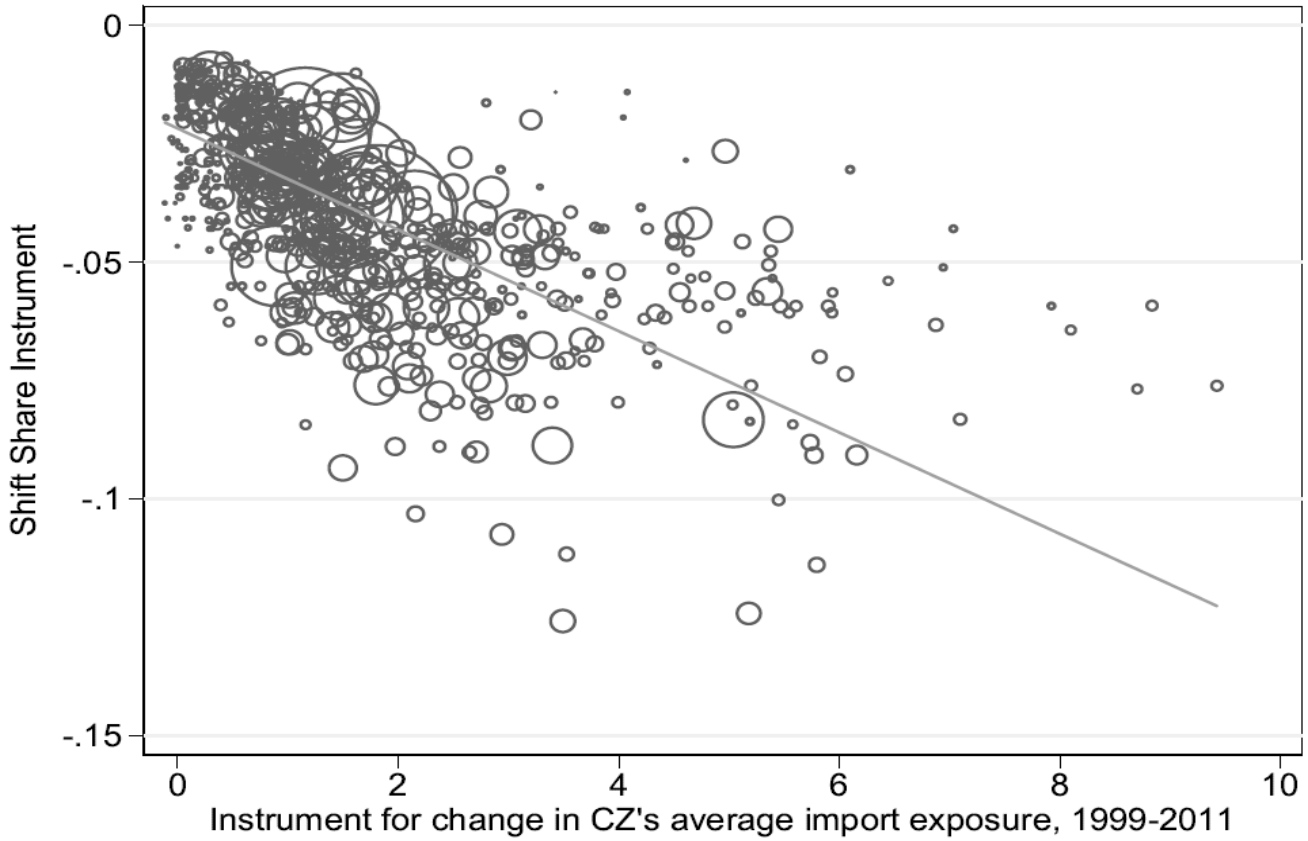


Labor to Capital Ratio vs. Exposure to China Import Competition



Our Shift Share Instrument vs. China Shock Instrument

Figure 17: Shift-Share Instrument and China Import Shock Instrument



Is the China Shock Inherently Different?

- Residualize our "Shift Share" instrument with respect to Autor-Dorn-Hanson "China Shock" instrument.
- Residualized "Shift share" instrument captures all predicted changes in manufacturing employment that are uncorrelated with China Shock.
- Include both instruments to predict changes in manufacturing employment in our local labor market regressions.

Is the China Shock Inherently Different?

- Residualize our "Shift Share" instrument with respect to Autor-Dorn-Hanson "China Shock" instrument.
- Residualized "Shift share" instrument captures all predicted changes in manufacturing employment that are uncorrelated with China Shock.
- Include both instruments to predict changes in manufacturing employment in our local labor market regressions.
- **Key Take Aways #4**
  - Nothing special about the China shock with respect to local labor market outcomes.
  - Estimated effect of manufacturing declines due to our residualized shift share instrument on local employment outcomes was roughly the same as effect of declines due to China shock on local outcomes.
  - **Manufacturing decline is important regardless of source.**

Part D:
Why Now?

Sectoral Shocks and Labor Market Outcomes

- U.S. has gone through sectoral change during the past (agriculture to manufacturing).
- U.S. has gone through manufacturing decline (to a smaller extent) during the 1980s.
- Factors that mediate the labor market effects of sectoral shocks
  - Sectoral switching
  - Inter-regional mobility
  - Skill upgrading
  - Public and private transfers

Key Take Aways #5

- **Mobility**
  - Mobility response is smaller in the 2000s than in the 1980s.
  - Cause of large employment effects or a symptom of something else?

- **Skill mismatch**
  - Manufacturing is becoming a higher skilled industry.
  - Manufacturers report struggling to hire workers with sufficient skill.
  - Question: Will individuals start skill upgrading?

- **Public and private transfers**
  - Some evidence of increased disability take-up, but effects are small.
  - No evidence of increased cohabitation among the young.

Conclusions

Putting It All Together

- **Manufacturing decline is an important contributor for declining employment rates of prime age workers during the 2000s – particularly for less educated workers.**

  - Manufacturing is becoming both more physical capital and human capital intensive over time.

  - Local effects are large. However, exact aggregate magnitude depends on general equilibrium effects.

- **May have had additional effects on individual well-being (e.g., drug use).**

- **Is the 2000 manufacturing decline different? No and Yes….**

- **Results suggest that policies to promote the manufacturing sector will have only modest effects on labor market outcomes of less educated workers.**

Putting It All Together

- **Manufacturing decline is an important contributor for declining employment rates of prime age workers during the 2000s – particularly for less educated workers.**

  - Manufacturing is becoming both more physical capital and human capital intensive over time.

  - Local effects are large. However, exact aggregate magnitude depends on general equilibrium effects.

- **May have had additional effects on individual well-being (e.g., drug use).**

- **Is the 2000 manufacturing decline different? No and Yes….**

- **Results suggest that policies to promote the manufacturing sector will have only modest effects on labor market outcomes of less educated workers.**