# On the Persistence of the China Shock

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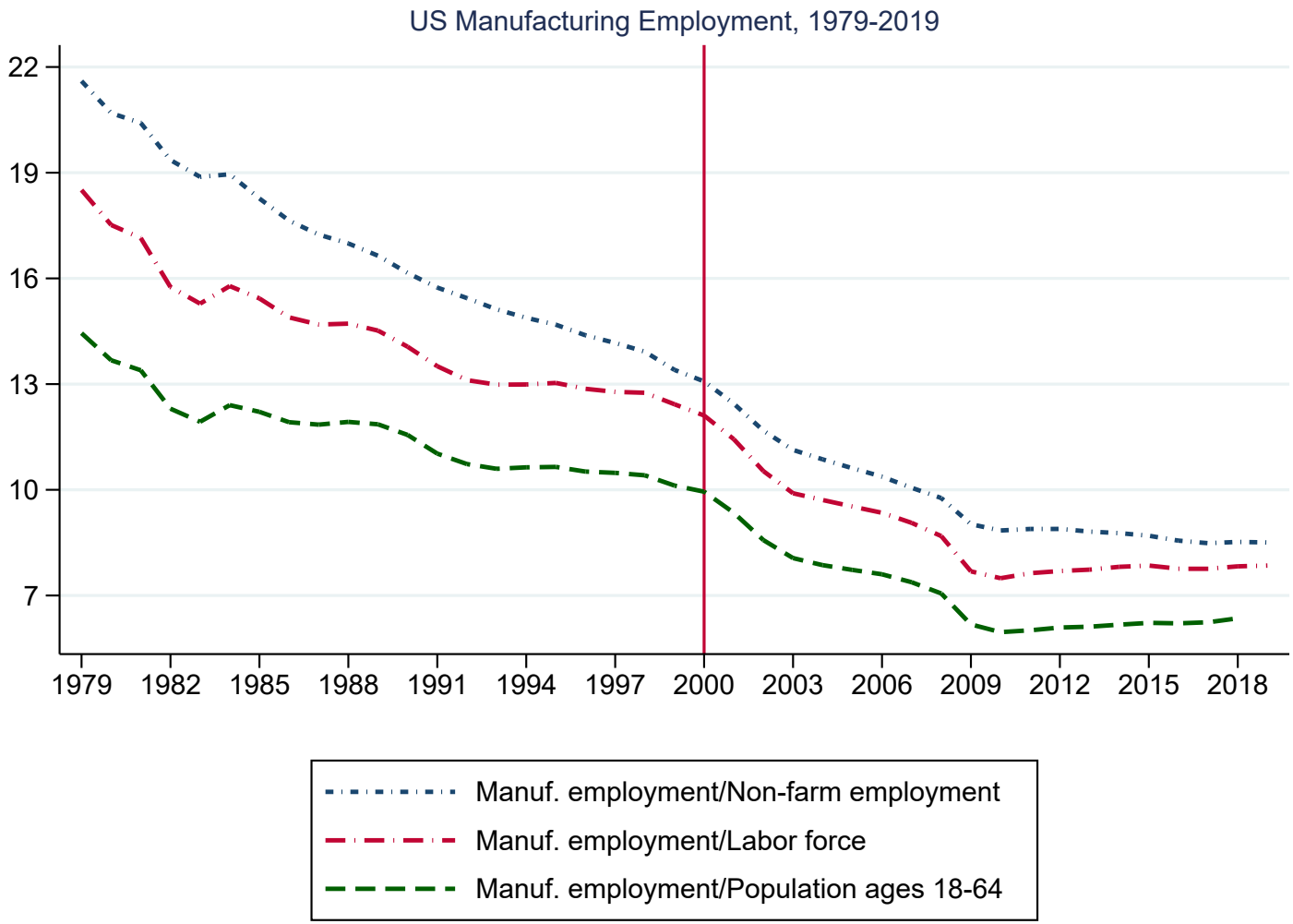
# Evolution of US Manufacturing Employment




Note: Employment is from CES; labor force is from CPS; population is from NVSS.

# What We've Learned from the China Trade Shock

- In regions subject to larger adverse trade shocks
  - Substantial (relative) declines in mfg employment
  - Little adjustment in non-mfg employment, population headcounts
  - Larger declines in relative earnings for low-wage workers
  - Greater takeup of government transfers
- Quantitative GE analysis
  - Positive but small ACR-type gains for US (<0.3%)
  - Aggregate job loss in US manufacturing
  - Number of regions that loose from China shock is small
- Social, political consequences
  - Greater social dislocation in more adversely affected regions
  - Stronger right-wing political shift in harder hit (white) areas

# Selected Literature on the China Trade Shock

- Regional employment, earnings, migration, public finance
  - ADH '13, '15, '19; Chetverikov et al '16; Greenland et al '16, '19; Feler Senses '17; Monte et al '18; Bloom et al '20; Pierce Schott '20
- Industries, innovation, product prices
  - Bernard et al '06; ADHS '14; Bloom et al '15; AADHP '16; Pierce Schott '16; Amiti et al '17; Handley Limão '17; Asquith et al '19; ADHPS '19; Erickson et al '19; Feenstra et al '19; Jaravel Sager '20
- Quantitative GE analysis
  - Hsieh Ossa '16; Caliendo et al '19; Adão et al '20; Galle et al '20; Kim Vogel '20; Rodriguez-Clare et al '20
- Political economy
  - Fiegenbaum Hall '15; Colantone Stanig '18a,b; Grossman Helpman '18; Gennaioli Tabellini '19; ADHM '20; Chen et al '20; Rodrik '20
- Identification and inference
  - Adão et al '19; Borusyak et al '20; Goldsmith-Pinkham et al '20

# Open Questions

- How permanent is job loss in harder hit regions?
  - Do mfg emp, emp-pop ratios, average incomes recover? Does non-mfg emp eventually expand? Do gov't transfers offset lost income?
    - *Indicates horizons over which different adj. mechanisms operate*
- How strong are (detectable) regional spillovers in shock impacts?
  - Do pop. headcounts ultimately decline in harder hit regions? Do shocks in other regions matter materially for local outcomes?
    - *Indicates extent to which US CZs approximate SOEs*
- How large is the regional variation in income changes?
  - Which moments should quant analysis target for counterfactuals?
    - *Indicates how well quant models capture distributional impacts*

# Other Issues (hidden slide)

- Its technology, not trade, that causes mfg job loss
  - Conditional CZ correlation in trade, tech shocks is small (ADH '15)
- The decline in mfg employment would have happened anyway
  - Scale, speed, and localization of job loss determines its scarring effects (Jacobson et al '93; Davis von Watcher '11)
- There's nothing special about job loss due to trade
  - Trade creates exposure to shocks than can have large, rapid, highly localized impacts (shock concentration, intensity matter for welfare)
- RF empirical analysis isn't informative about aggregate outcomes
  - RF analysis is informative (if not determinative) if regions approximate SOEs and variance in outcomes across regions is large

# Preview of Findings

- **Shock duration**
  - China trade shock plateaus around 2010, doesn't unwind
    - *We observe impacts for nearly decade past shock culmination*
- **Impact duration, adjustment mechanisms**
  - Declines in employment, personal income last to 2018, gov't transfer uptake is long-lasting but modest (mostly Soc Sec, Medicare)
    - *Even over long horizons, exit from work is primary adj. mechanism*
- **Spillovers, distributional impacts**
  - Population changes are null to 2018 (except for 25-39 age group), evidence of gravity-based spillovers between regions is weak, shock-induced regional variation in personal income is large
    - *Reduced-form variation in $\triangle$ income > quant analysis*

# Agenda

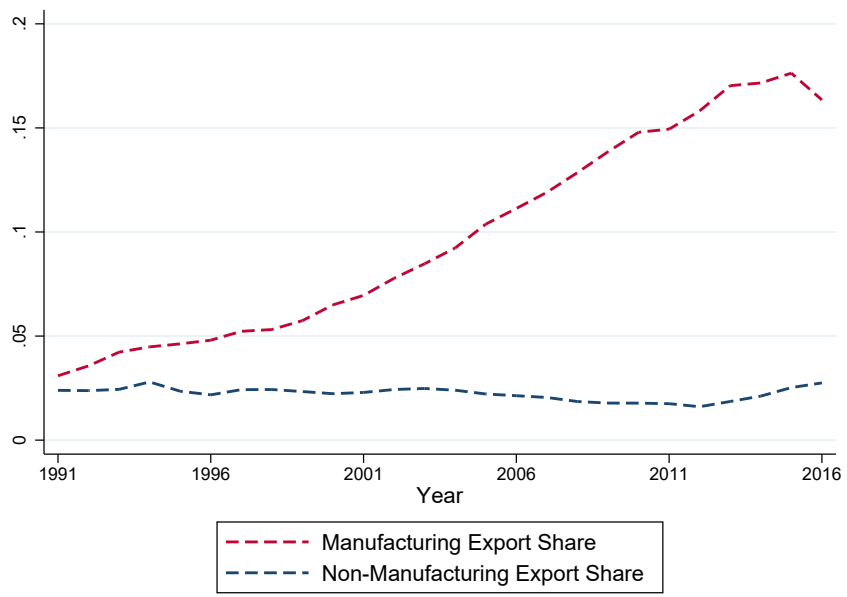
1. **Duration of China Trade Shock**
2. **Empirical Specification**
3. **CZ Level Analysis**
   - Employment/Working-Age Population
   - Log Population Head Counts
   - Income and Transfers per capita
   - Heterogeneity in CZ Adjustment
4. **Implications for Welfare**
5. **Conclusions**

# China Trade Shock from Beginning to End

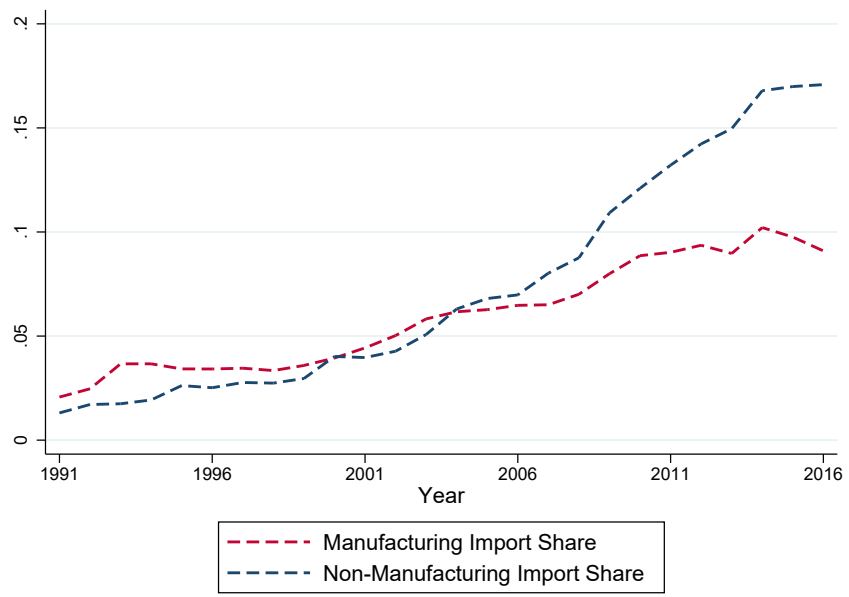
- **Initiation:** Deng's famous southern tour (Naughton, '07)
  - *Lowering input tariffs* (Yu '10; Brandt & Morrow '17)
  - *Reducing uncertainty* (Pierce & Schott '16; Handley & Limao '17)
  - *Removing export restrictions* (Bai et al. '17)
  - *Easing limits on FDI* (Feenstra & Hanson '05)
  - *Phasing out SOEs* (Khandelwal et al '13; Hsieh & Song '15)
  - *Migration, reduced spatial misallocation* (Brandt et al. '13; Fan '19)
  - *Yuan suppression* (Cheung et al. '07; Bergsten & Gagnon '17)
  - *Residual productivity growth* (Brandt et al. '17, '19; Liu & Ma '18)
- **Culmination, Regression:** The state strikes back (Lardy '19)
  - *End of transition-driven growth* (Song et al. '11)
  - *Hu, Xi rollback of reforms* (Naughton '17)

# Timing of the China Trade Shock: 1991-2001-2010

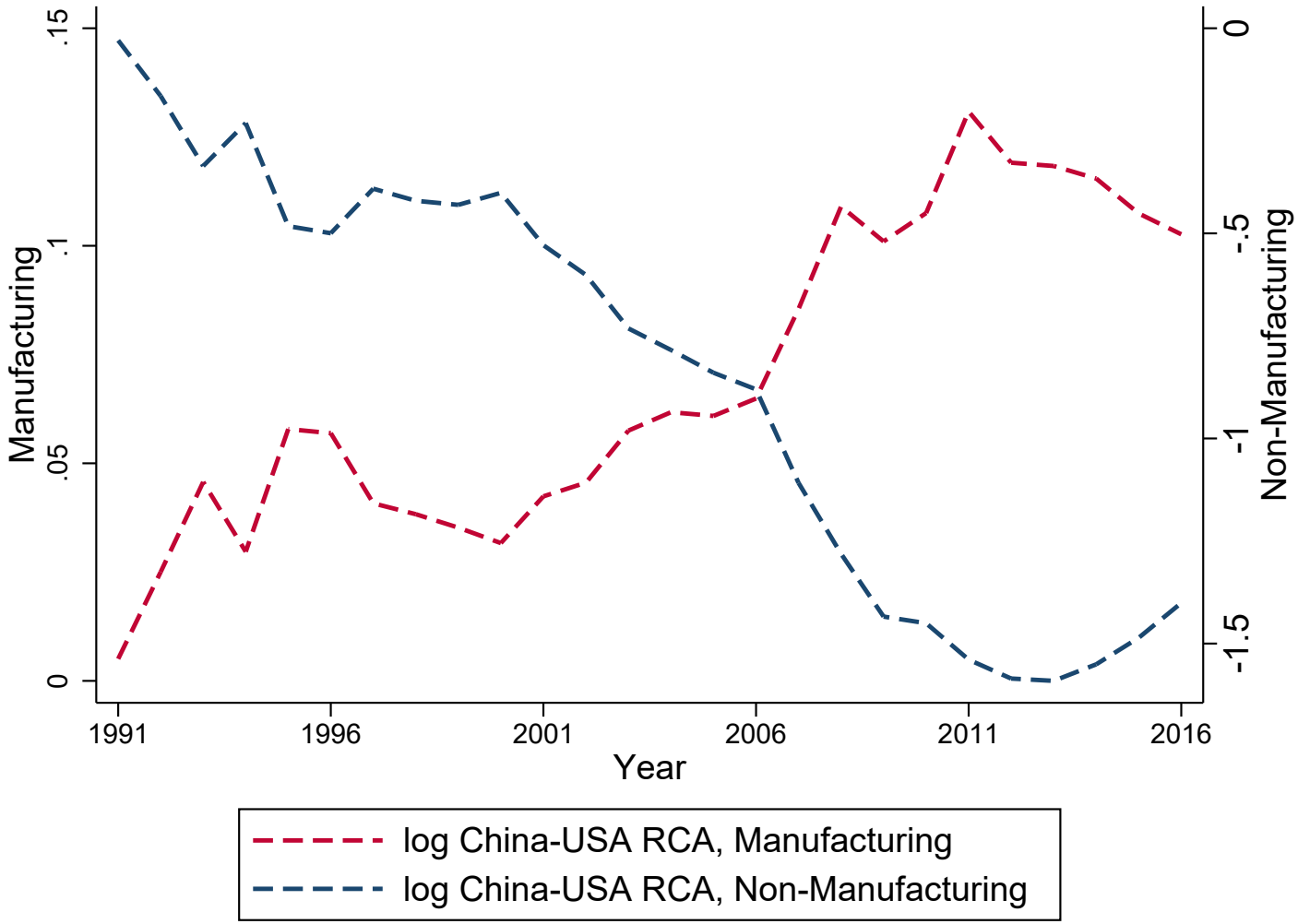
(a) China Share of World Exports




(b) China Share of World Imports



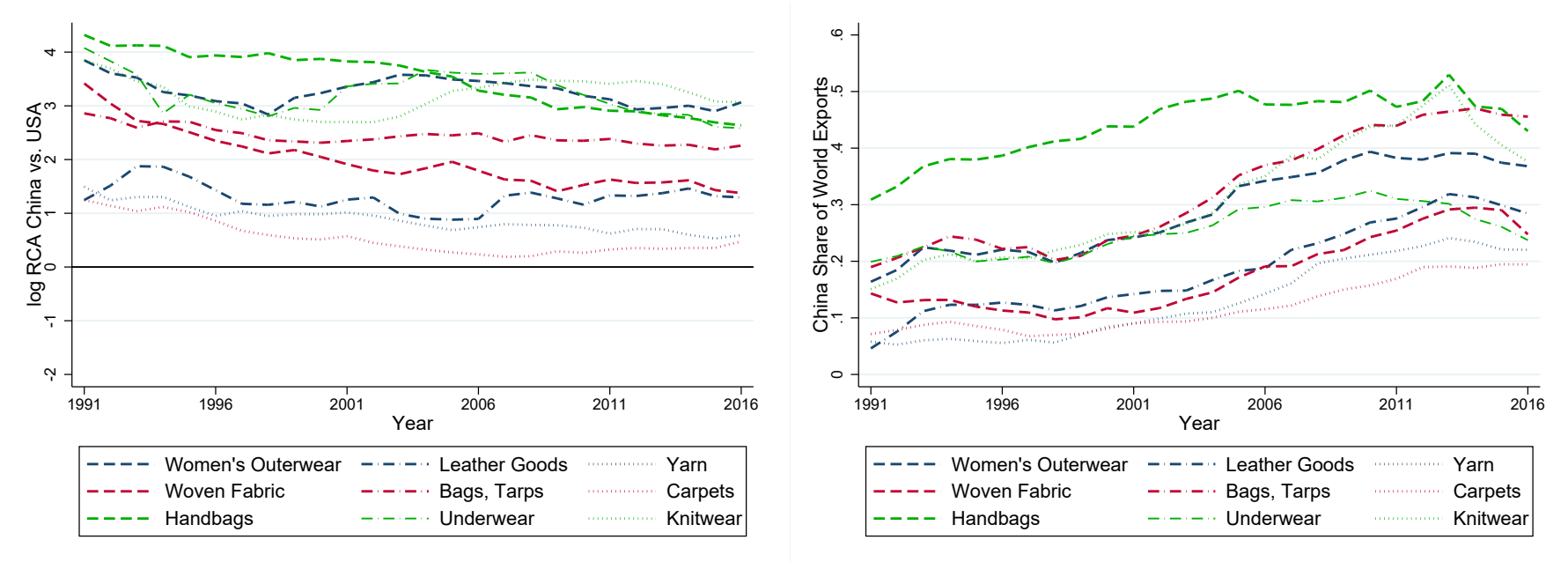
# Plateauing of the China Trade Shock: 2008-2012




Note: Revealed Comparative Advantage (RCA) is country share of world exports in sector/country share of world exports of all merchandise.

# Early Comparative Advantage Products

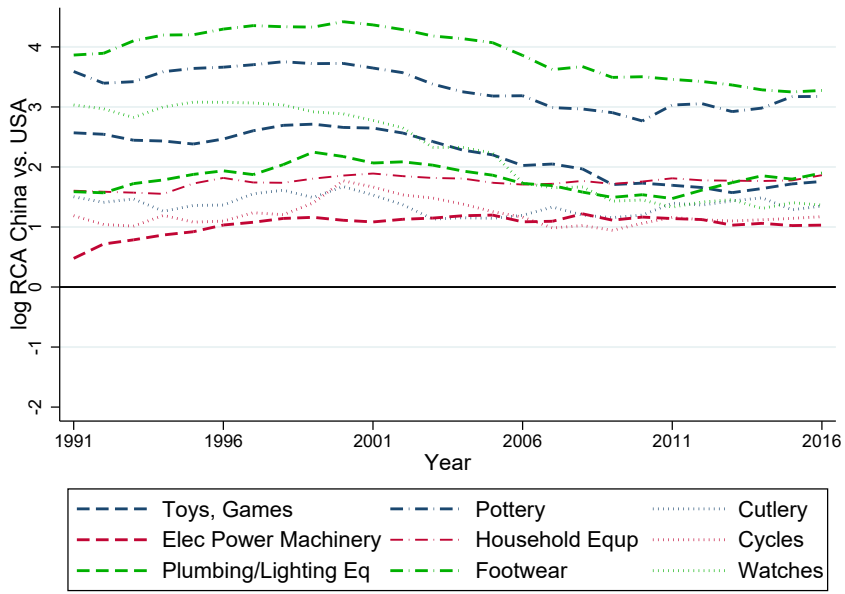
(a) China-US Log RCA (*decreasing*) (b) China share of World Exports (*slow rise*)



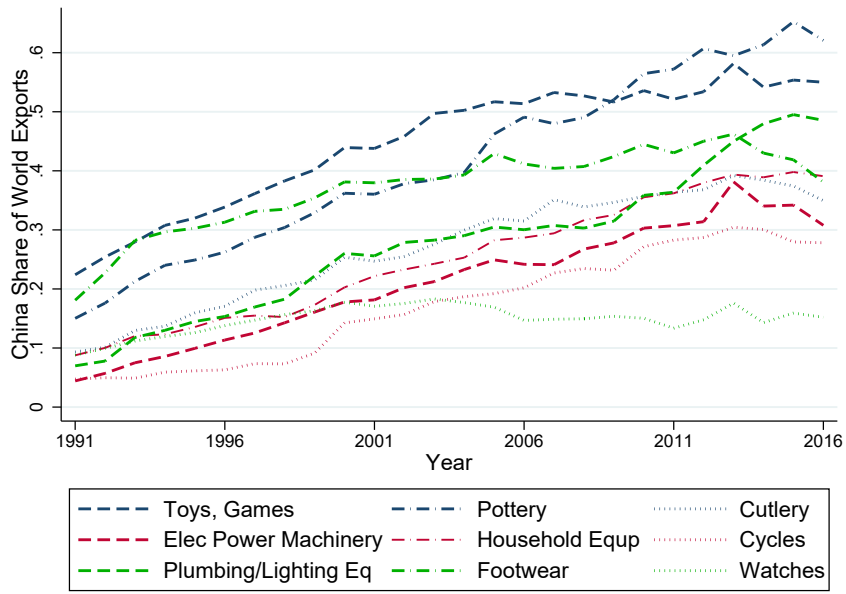

Note: Revealed Comparative Advantage (RCA) is country share of world exports in sector/country share of world exports of all merchandise.

# Middle Comparative Advantage Products

(a) China-US Log RCA (*stable*)



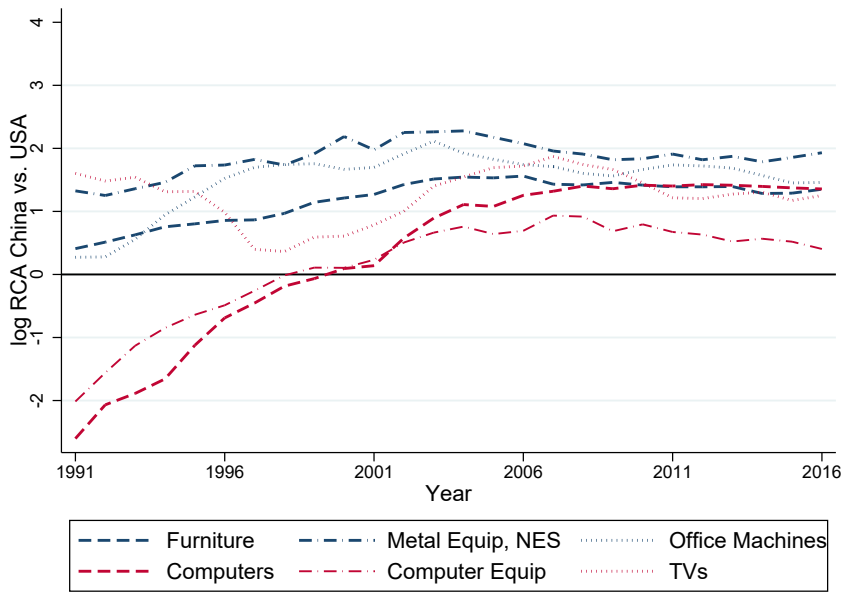

(b) China share of World Exports (*steady rise*)

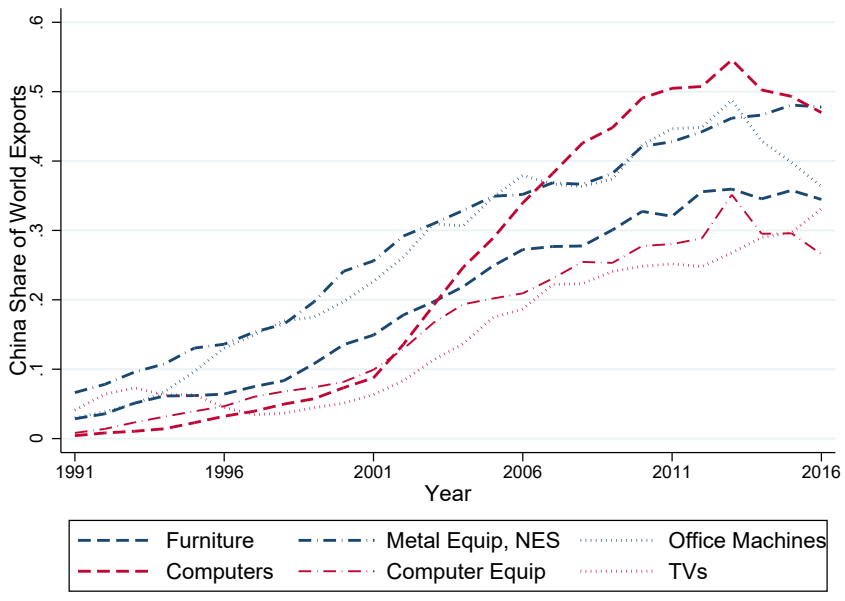



Note: Revealed Comparative Advantage (RCA) is country share of world exports in sector/country share of world exports of all merchandise.

# Late Comparative Advantage Products

(a) China-US Log RCA (*increasing*) (b) China share of World Exports (*sharp rise*)

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# CZ Level Analysis (varying time differences)

Commuting Zone $i$, initial period $t = 2000$, $h = 1, \ldots, 18$

$$\Delta Y_{it+h} = \alpha_t + \beta_{1h} \Delta IP_{i\tau}^{cu} + \mathbf{X}_{it}' \beta_2 + \varepsilon_{it+h},$$

- $\Delta Y_{it+h}$ = change in outcome (employment, population, income)
- $\Delta IP_{i\tau}^{cu}$ = change in import penetration over $\tau$ (2000-2012)
- $\mathbf{X}_{it}$ = initial-period controls
  - time trends for Census regions, period dummy
  - sum of CZ mfg industry employment shares
  - CZ routine-task intensity, offshorability, female emp. share, foreign-born pop. share, college-educated pop. share, non-white pop. share, ages 0-17, 18-39, 40-64 pop. shares

# (I) Defining Import Competition Shocks

**$\Delta$ import penetration from China for industry $j$ and CZ $i$**

$$\Delta IP_{j,\tau} = \frac{\Delta M^{cu}_{j,\tau}}{Y_{j,91} + M_{j,91} - E_{j,91}}, \qquad \Delta IP^{cu}_{i\tau} = \sum_j s_{ijt} \Delta IP^{cu}_{j\tau}$$

- $\Delta M^{cu}_{j\tau}$ is $\triangle$ in China imports over $\tau$ in US industry $j$
- $Y_{j,91} + M_{j,91} - E_{j,91}$ is industry absorption in '91 (pre-China shock)
- $s_{ijt} \equiv L_{ijt}/L_{it}$ is initial share of industry $j$ in CZ $i$'s employment

Change in import penetration (10 yr. equivalent)

| time pd. | mean | sd | p25 | p75 |
|---|---|---|---|---|
| '91-'00 | 0.953 | 0.609 | 0.570 | 1.225 |
| '00-'12 | 0.890 | 0.585 | 0.506 | 1.174 |
| Total | 0.921 | 0.598 | 0.525 | 1.174 |

# (II) Instrumental Variables Approach

## Instrumental variables approach

- IV for US imports from China using other DCs (Austria, Denmark, Finland, Germany, Japan, New Zealand, Spain, Switzerland)
- Assumption: Common component of $\Delta$ in rich country imports from China is China export supply shock

$$\Delta IP_{it}^{co} = \sum_{j} s_{ijt-10} \Delta IP_{j\tau}^{co}$$

where $\Delta IP_{it}^{co} = \Delta M_{j\tau}^{co} / (Y_{j,88} + M_{j,88} - E_{j,88})$ is based on change in imports from China in other high-income countries

# Identifying Restrictions (BHJ '20)

**For instrument $\Delta IP_{i\tau}^{co}$ to be orthogonal to residual $\varepsilon_{it+h}$:**

$$\mathbb{E}\left[\sum_j s_j \Delta IP_{j\tau}^{co} \bar{\varepsilon}_j\right] = 0, \text{ where } \bar{\varepsilon}_j \equiv \sum_i s_{ij80}\varepsilon_{it+h} / \sum_i s_{ij80}$$

Orthogonality achieved if $\mathbb{E}\left[\Delta IP_{i\tau}^{co} | \bar{\epsilon}_j, s_j\right] = \mu \; \forall \; j$, $\mathbb{E}[\sum_j s_j^2] \to 0$, and $Cov\left[\Delta IP_{j\tau}^{co}, \Delta IP_{k\tau}^{co} | \bar{\varepsilon}_j, \bar{\varepsilon}_k, s_j, s_k\right] = 0 \; \forall \; j, \; k \neq j$ (BHJ '20)

**Orthogonality obtains with exogenous shifts ($\Delta IP_{i\tau}^{co}$) or shares ($s_j$)**

- BHJ '19 results for ADH '13 are consistent w/ exogeneity of shifts
- GPSS '19 approach more logical when small no. of industries matter

# Standard Error Adjustments

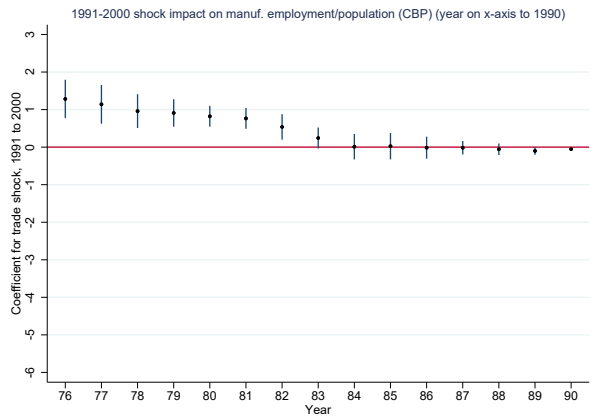
- If primary unobserved shocks are at national industry level:
  - CZ-level regression has industry-level representation (BHJ '20); re-weighted SEs for impact on mfg emp/wkg-age pop ($\beta = -0.596$)
    - ADH '13: $std.\ error = 0.099$
    - BHJ '20: $std.\ error = 0.114$
  - Challenges to inference in finite samples (AKM '19), where corrected confidence intervals may be asymmetric
    - ADH '13: 95% $CI = [-0.794, -0.398]$
    - AKM '19: 95% $CI = [-1.010, -0.360]$

# (III) Sensitivity, Falsification

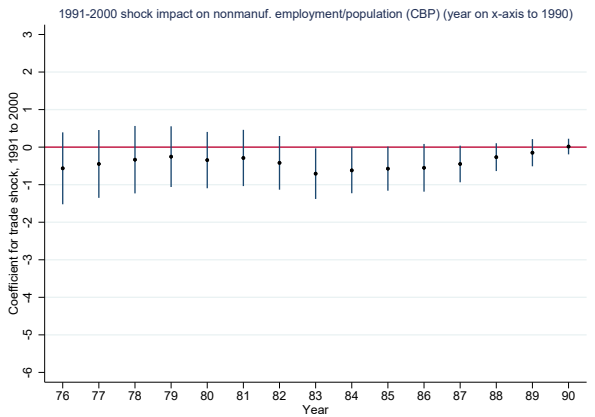
- Industry-level and pre-trend analysis, lagged controls (BHJ '19, '20)
- Gravity-based regional spillovers (AAE '20)
- Alternative controls for population dynamics (Greenland et al '19)
- Alternative definitions of shock period (Bloom et al '20)
- Alternative measures of employment (CBP, REIS, LAUS)

# Pre-Trends ( $T_0$-'91 changes on '91-'00 trade shock)

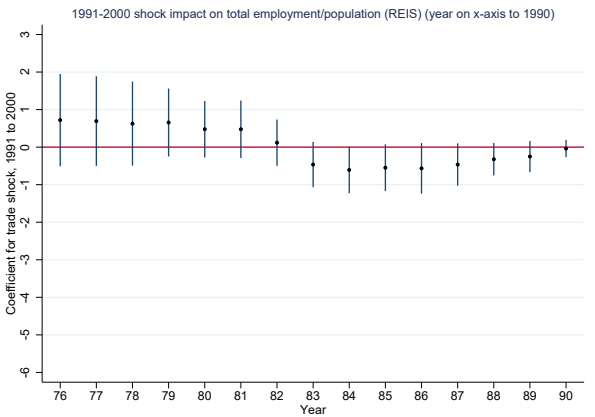
(a) Mfg emp/Working-age pop



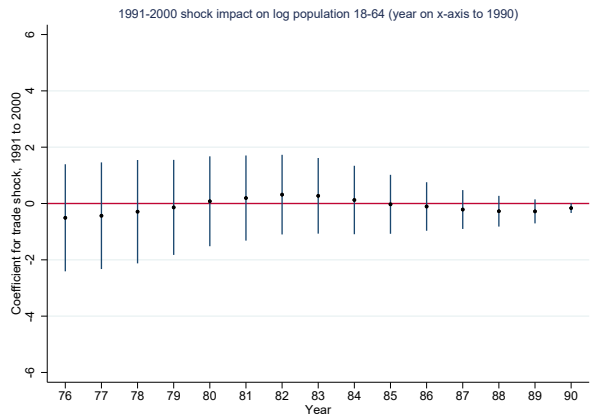

(b) Nonmfg emp/Working-age pop




(c) Total emp/Working-age pop

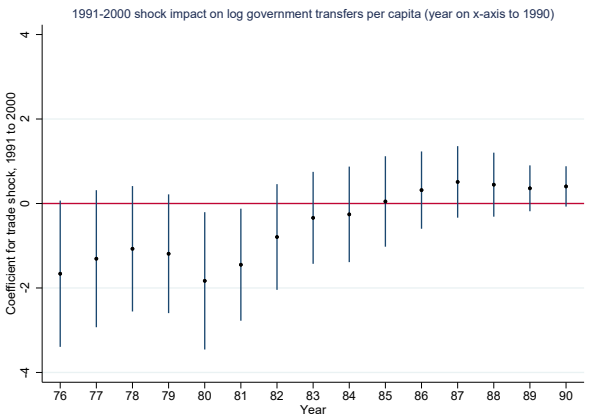



(a) Log working-age pop



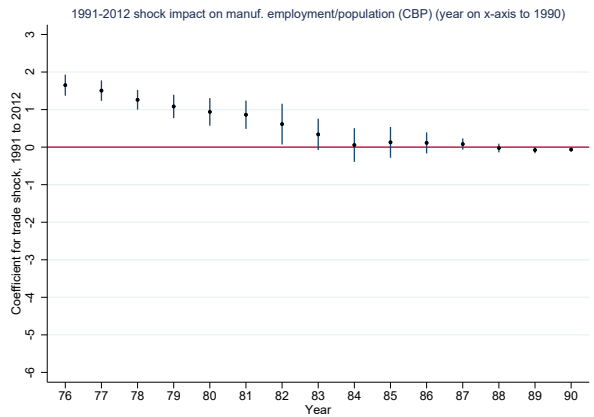

(b) Personal income per capita


(c) Gov't transfers per capita

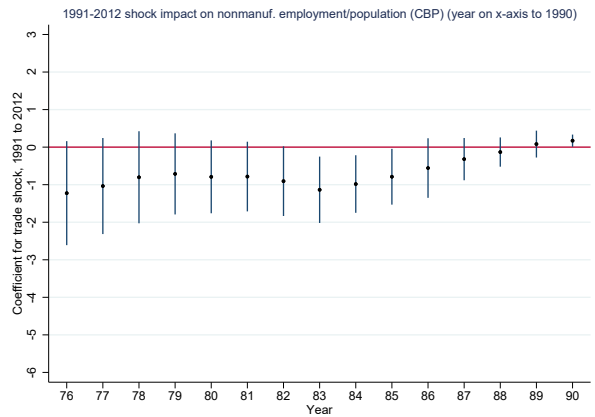


# Pre-Trends ( $T_0$-'91 changes on '91-'12 trade shock)

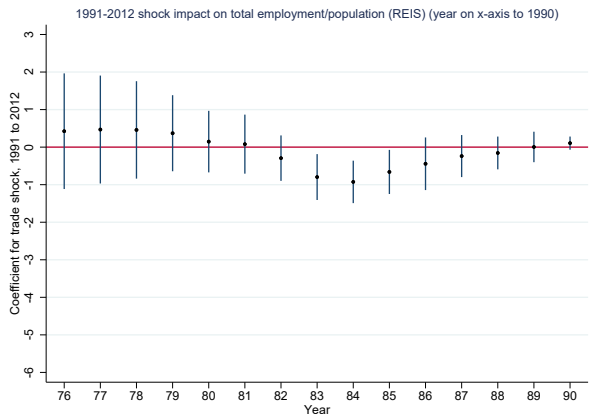
(a) Mfg emp/Working-age pop



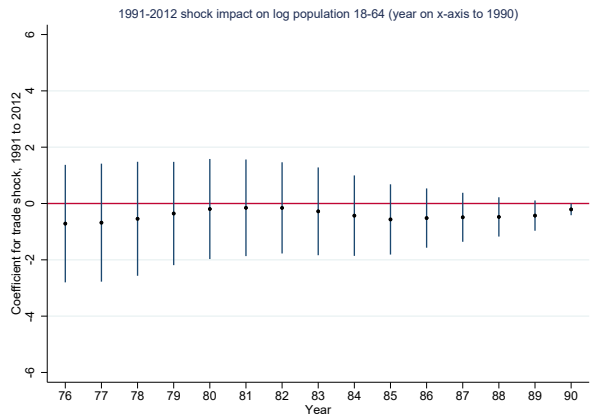

(b) Nonmfg emp/Working-age pop




(c) Total emp/Working-age pop

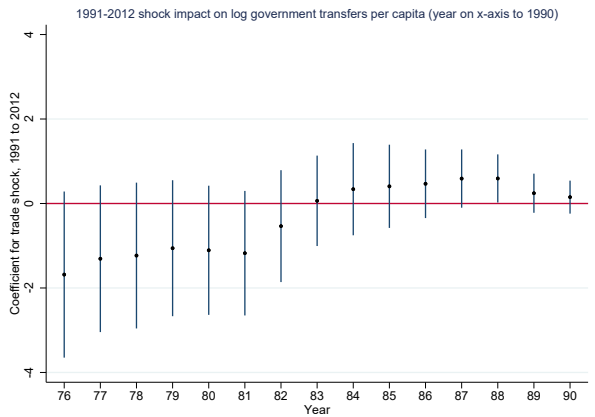



(a) Log working-age pop



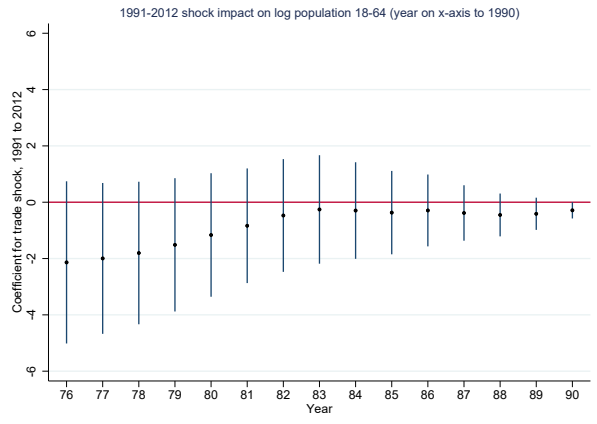

(b) Personal income per capita


(c) Gov't transfers per capita

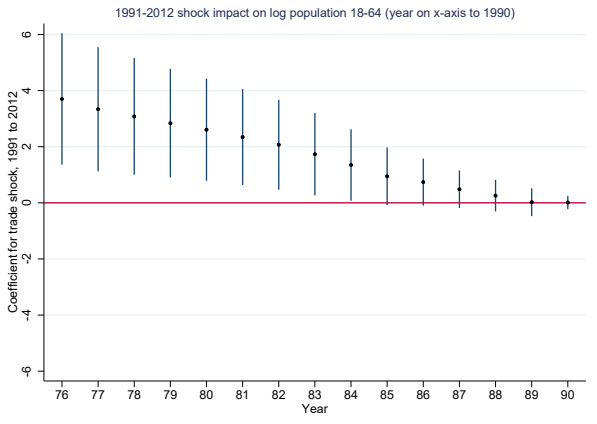


# Pre-Trends for Pop. Growth with Varying Controls

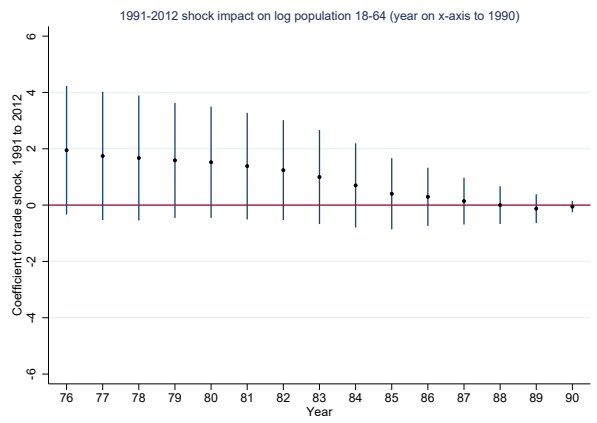
(a) No controls



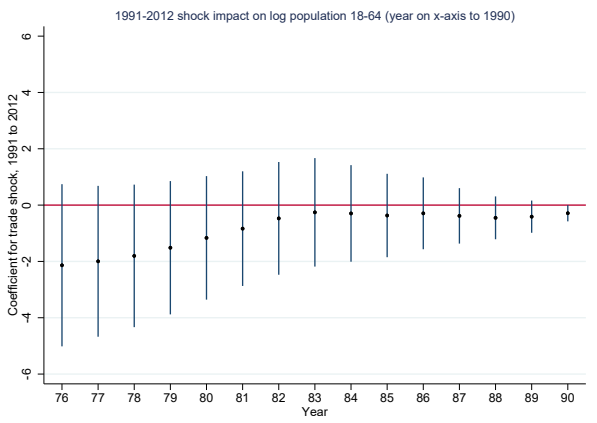

(b) Add initial mfg emp share




(c) Add region dummies




(b) Add lagged pop growth



# (IV) Dynamics of the China Trade Shock

Commuting Zone $i$, initial period $t$ ('00), $h = 1, \ldots, 18$

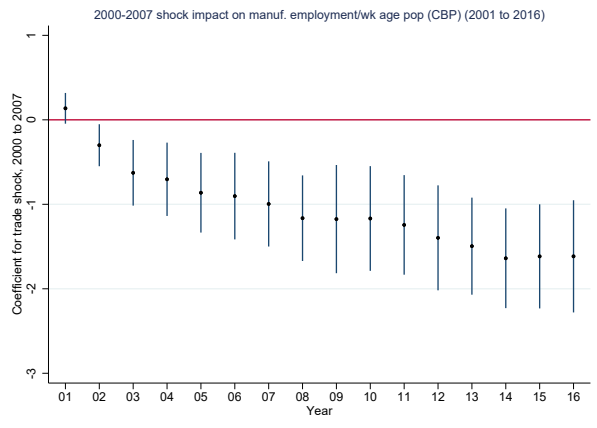
$$\Delta Y_{it+h} = \alpha_t + \beta_{1h} \Delta IP_{i\tau}^{cu} + \mathbf{X}_{it}' \beta_2 + \varepsilon_{it+h},$$

- Trade shocks and IVs are highly correlated across decades
  - $\Delta IP_{i\tau}^{cu}$ for '00-'12 and '91-'00 have correlation of 0.57
  - $\Delta IP_{i\tau}^{co}$ for '00-'12 and '91-'00 have correlation of 0.73
- Evaluate dynamics in CZ labor-market adjustment by regressing:
  - '00s outcomes on '90s shock
  - '00s outcomes on '00s and '90s shocks
  - '00s outcomes on '00s shock and '90s residualized shock
  - '00s outcomes on '90s shock and '00s residualized shock

# Dynamics in CZ adjustment (?)

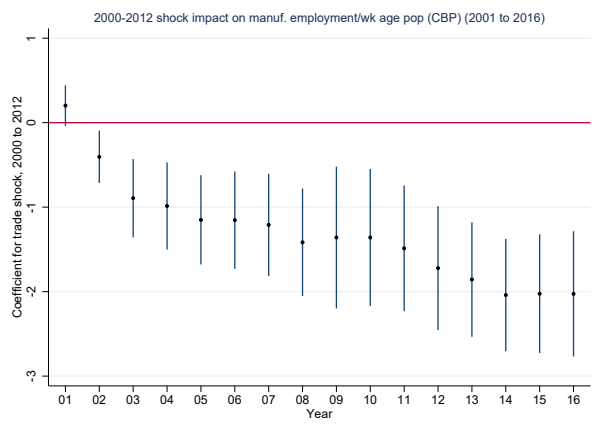
## Varying trade shock lengths on △ mfg emp/working age pop

(a) '00-'07 trade shock




(b) '00-'10 trade shock


(c) '00-'12 trade shock

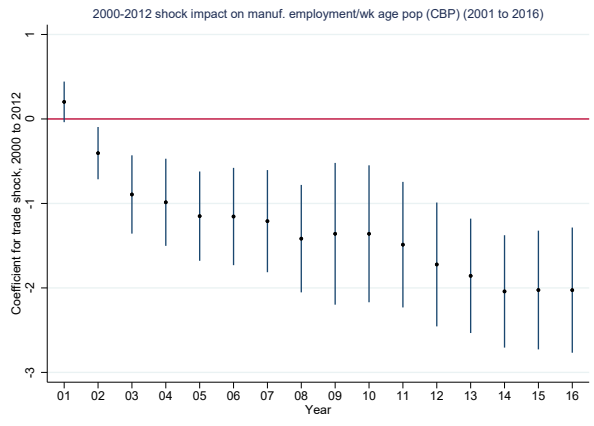



(d) '00-'14 trade shock

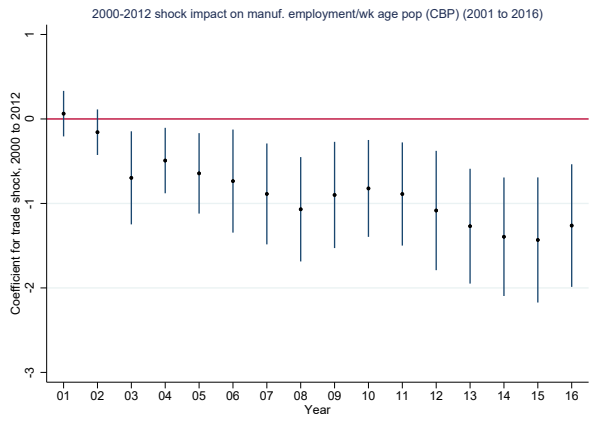
# Dynamics in CZ adjustment (?)

## Impact of '00-'12 trade shock on △ mfg emp/working age pop

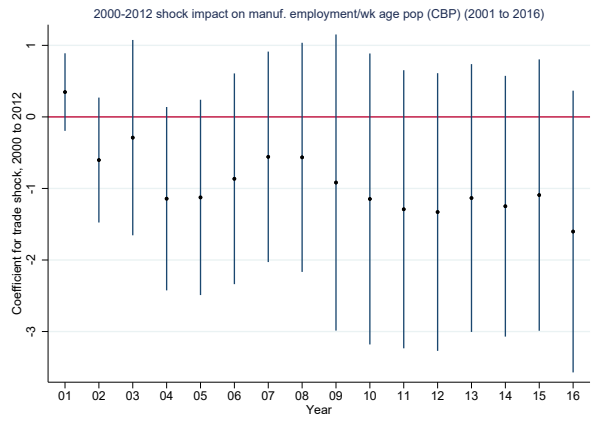
(a) '00-'12 trade shock



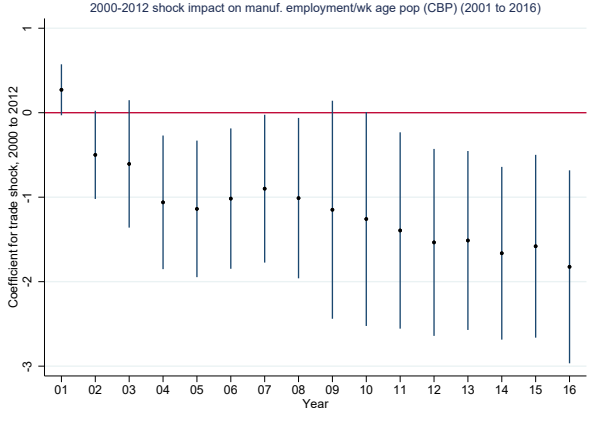

(b) '90-'00 trade shock



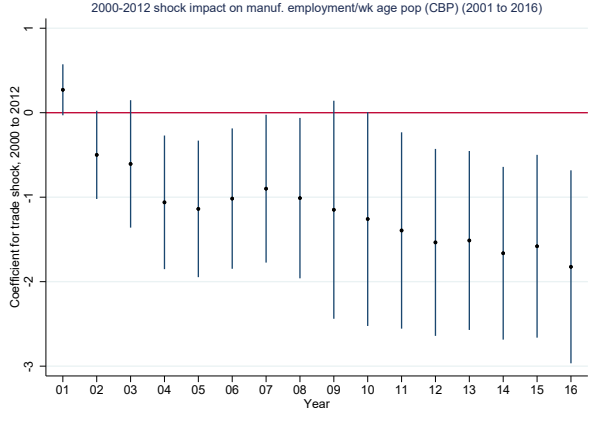

(c) '00-'12 & '90-'12 shocks




(d) '00-'12 shock & resid. '91-'00 shock




(e) '90-'00 shock & resid. '00-12 shock



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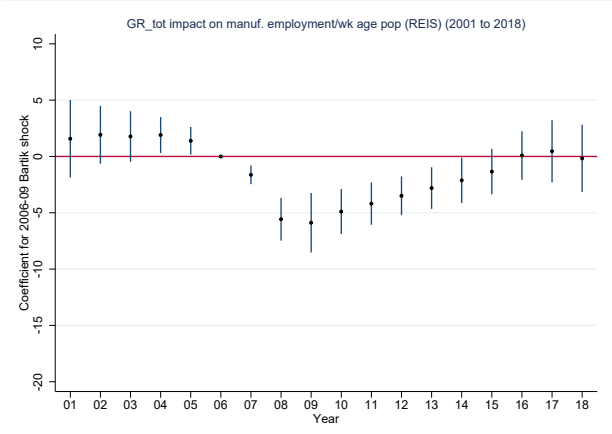
# Labor Market Outcomes

| '00-'16 change in: | mean | sd | p25 | p75 |
|---|---|---|---|---|
| mfg emp/pop | -3.86 | 2.03 | -4.82 | -2.49 |
| nonmfg emp/pop | 2.16 | 3.87 | 0.55 | 4.26 |
| tot emp/pop | -1.70 | 4.24 | -3.83 | 0.14 |
| unemp/pop | 0.61 | 0.58 | 0.18 | 0.99 |
| ln pop 40-64 | 19.69 | 12.61 | 12.73 | 27.72 |
| ln pop 18-39 | 5.83 | 11.89 | -1.90 | 14.18 |
| ln total pop | 12.66 | 12.07 | 4.78 | 20.47 |
| personal income/pop | $9,013.44 | $3,928.26 | $6,411.87 | $11,608.44 |
| labor comp/pop | $2,146.01 | $2,150.53 | $755.00 | $3,396.24 |
| gov't transfers/pop | $3,551.82 | $675.95 | $3,097.03 | $3,915.57 |
| TAA benefits/pop | -$0.88 | $3.32 | -$1.45 | $0.52 |
| UI benefits/pop | $2.30 | $36.58 | -$19.45 | $30.14 |
| SSA benefits/pop | $911.21 | $282.62 | $691.70 | $1,106.53 |
| Medicare benefits/pop | $1,030.95 | $241.75 | $883.41 | $1,178.03 |

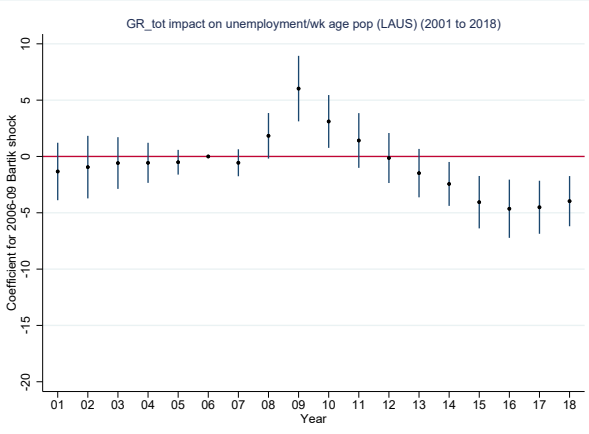
# What "Should" Labor-Market Adjustment Look Like?

## Adjustment to Bartik Employment Shock for Great Recession, '06-'09

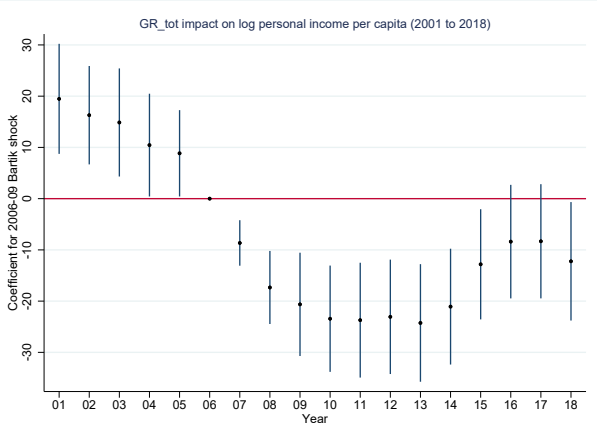
(a) Mfg emp/Wk age pop




(c)Unemployment/Wkg-age pop

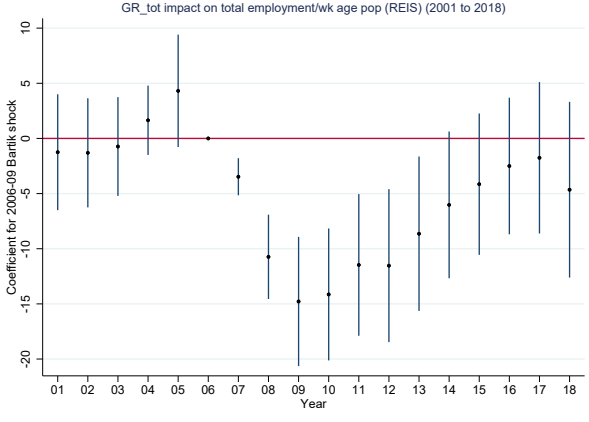



(e) Log personal income per capita

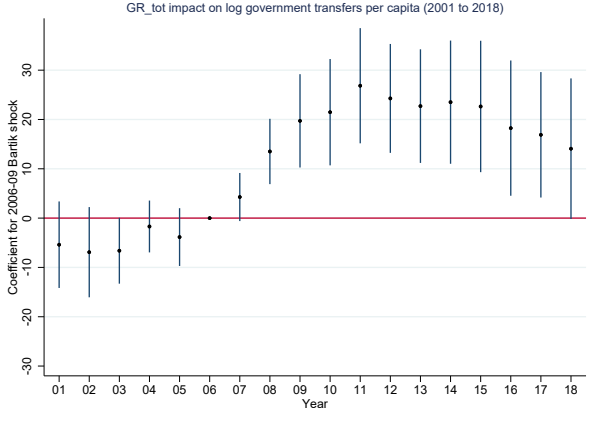



(b) Non-mfg emp/Wkg age pop.


(d) Total Emp/Wkg-age pop.



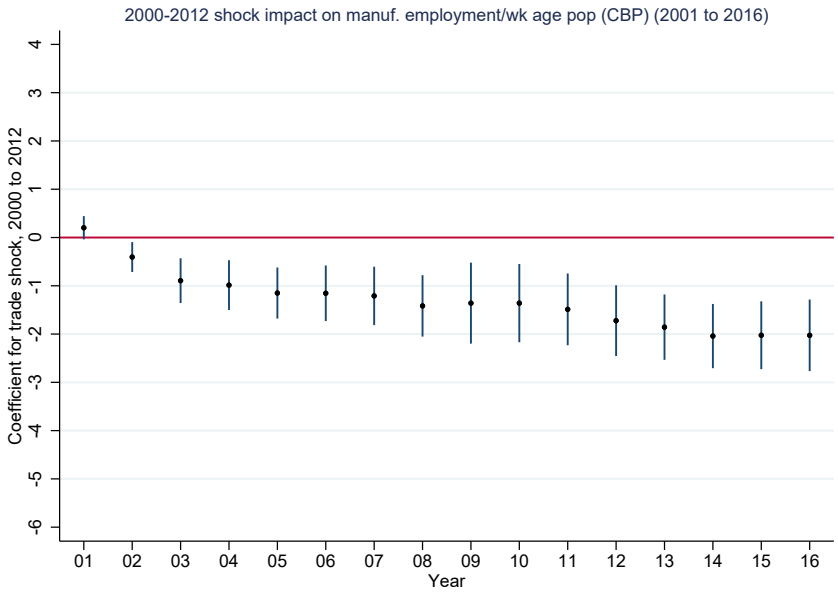

(f) Log gov't transfers per capita



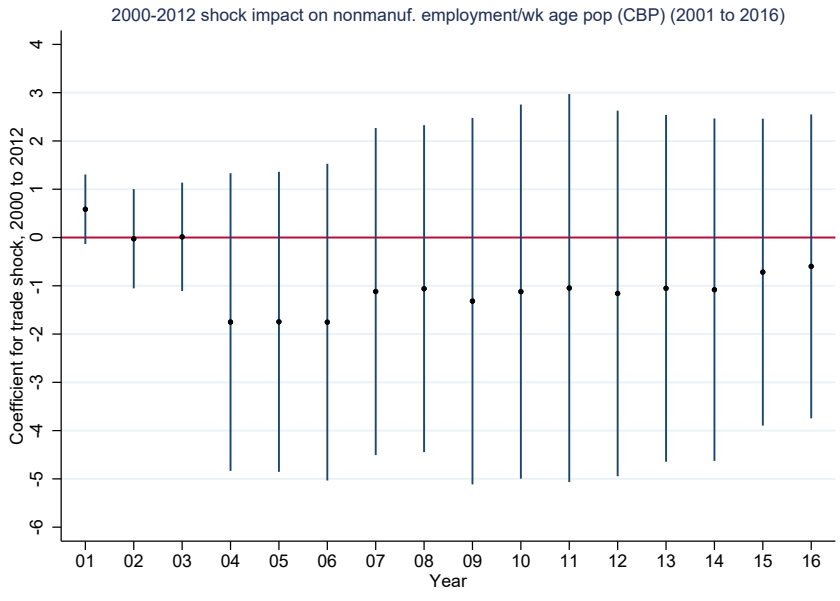
# Trade Shock Impacts on Mfg, Non-Mfg Employment (CBP)

## '00-'16: Decline in mfg emp, no increase in non-mfg emp

(a) Mfg emp/Working age pop




(b) Non-mfg emp/Working age pop

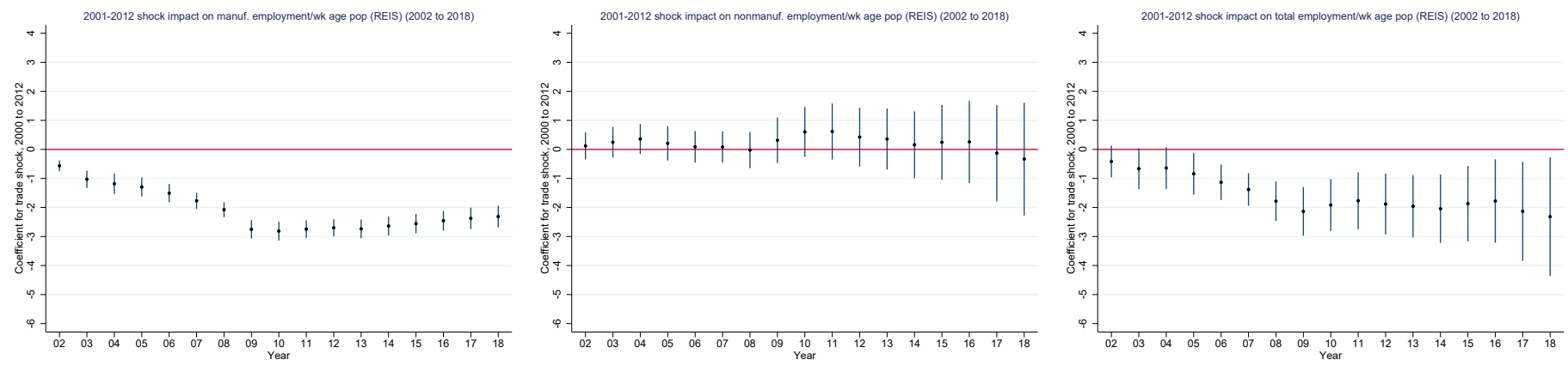



Note: Single time difference for '00-'16 (trade shock '00-'12).

# Impacts on Mfg, Non-Mfg Employment (REIS)

## Decline in mfg emp, no increase in non-mfg emp

(a) Mfg emp/Wk age pop (b) Non-mfg emp/Wk age pop (c) Total emp/Wk age pop



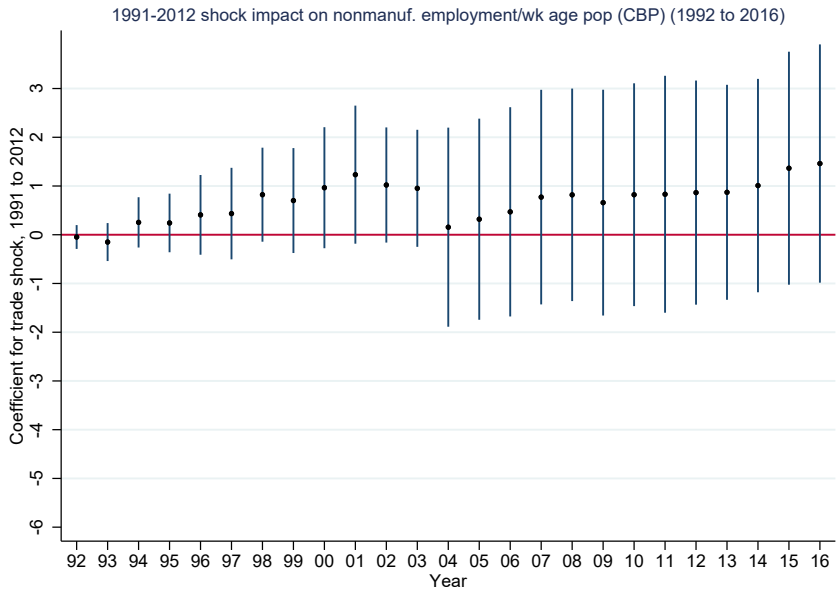

Note: Single time difference for '00-'18 (trade shock '00-'12). Non-mfg is private non-farm activity less manufacturing.

# Impacts on Mfg, Non-Mfg Employment (CBP)

**'91-'16: Decline in mfg emp, imprecise change in non-mfg emp**

(a) Mfg emp/Working age pop


(b) Non-mfg emp/Working age pop

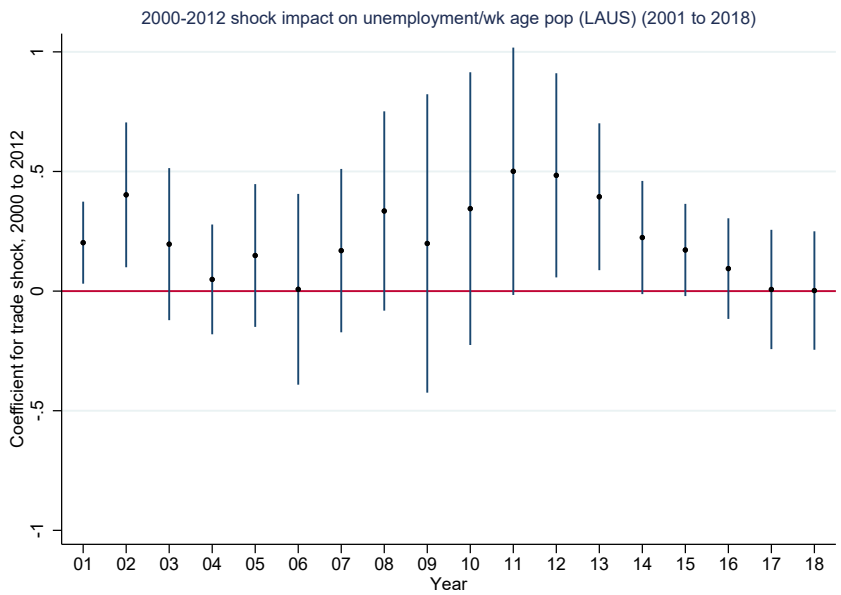



Note: Single time difference for '91-'16 (trade shock '91-'12).

# Impacts on Unemployment,Total Employment (LAUS, REIS)

## SR increase in unemployment, LR decrease in emp-pop ratio

(a) Unemployment/Working-age pop.



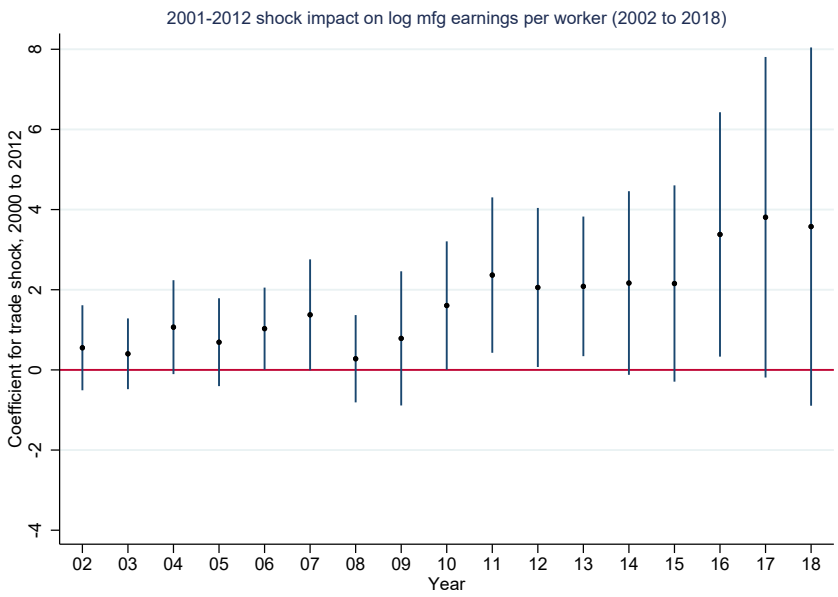

(b) Total Employment/Working-age pop.


Note: Stacked time differences for initial pds '91, '00; trade shock pds: '91-'00, '00-'12.

# Impacts on Mfg, Non-Mfg Earnings

## Mild positive selection of workers who stay employed in mfg

(a) Mfg earnings per worker (REIS)




(b) Non-mfg earnings per worker (REIS)


Note: Single time difference for '00-'16 (trade shock '00-'12). Non-mfg is private non-farm activity less manufacturing.

# CZ Level Analysis with Gravity Spillovers (AAE '20)

Commuting Zone $i$, initial period $t$ ('00), $h = 1, \ldots, 18$

$$\Delta Y_{it+h} = \alpha_t + \beta_{1h} \Delta IP^{cu}_{i\tau} + \beta_{2h} \sum_k z_{ikt} \Delta IP^{cu}_{k\tau} + \mathbf{X}'_{it} \beta_2 + e_{it+h}.$$

- $\Delta Y_{it+h}$ = change in outcome (employment, population, income)
- $\Delta IP^{cu}_{i\tau}$ = change in IP over $\tau$ ('91-'00, '00-'12), $z_{ikt} \equiv \frac{L_{kt} D_{ik}^{-\delta}}{\sum_h L_{ht} D_{ih}^{-\delta}}$
- $\mathbf{X}_{it}$ = initial-period controls

# Impacts of Gravity-based Spillovers on Mfg Emp (CBP)

## Local shock impact unchanged, no gravity shock impact

(a) Impact of Local Trade Shock

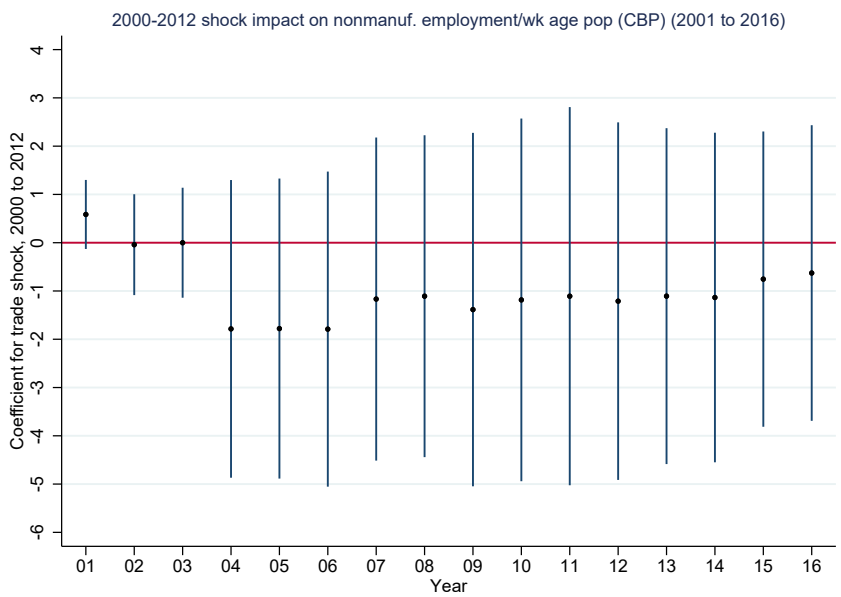

(b) Impact of Gravity-Based Trade Shock


Note: Stacked time differences for initial pds '91, '00; trade shock pds: '91-'00, '00-'12.

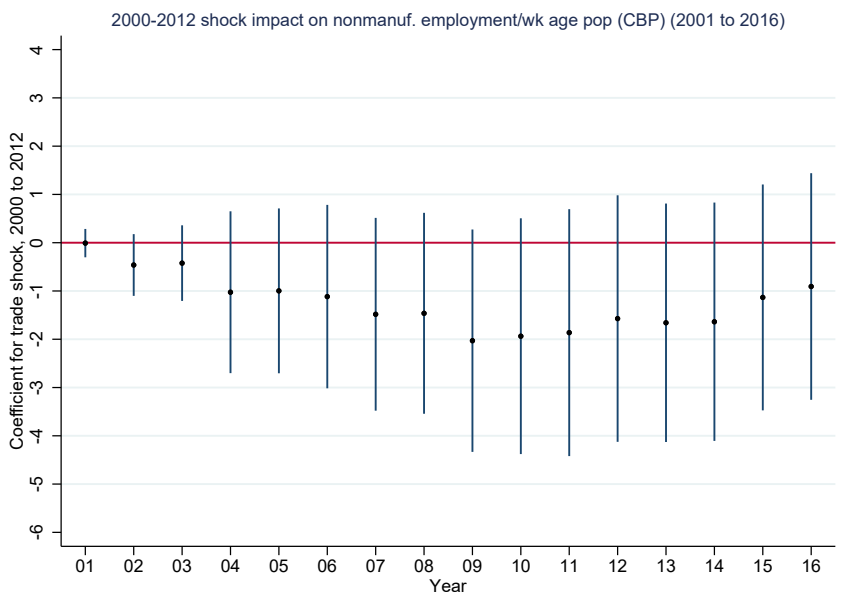
# Impacts of Gravity-based Spillovers on Non-Mfg Emp (CBP)

## Local shock impact unchanged, imprecise gravity shock impact

(a) Impact of Local Trade Shock




(b) Impact of Gravity-Based Trade Shock

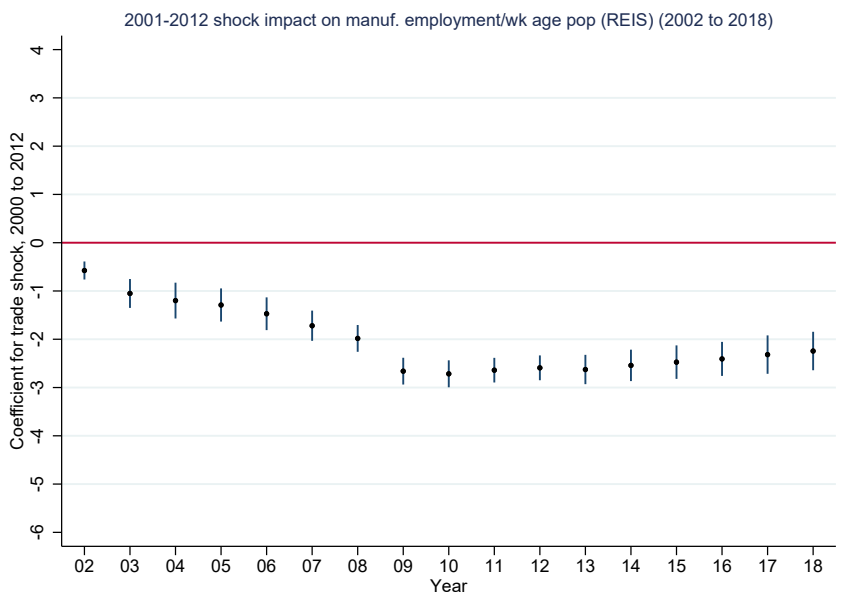



Note: Stacked time differences for initial pds '91, '00; trade shock pds: '91-'00, '00-'12.

# Impacts of Gravity-based Spillovers on Mfg Emp (REIS)

## Local shock impact unchanged, no gravity shock impact

(a) Impact of Local Trade Shock



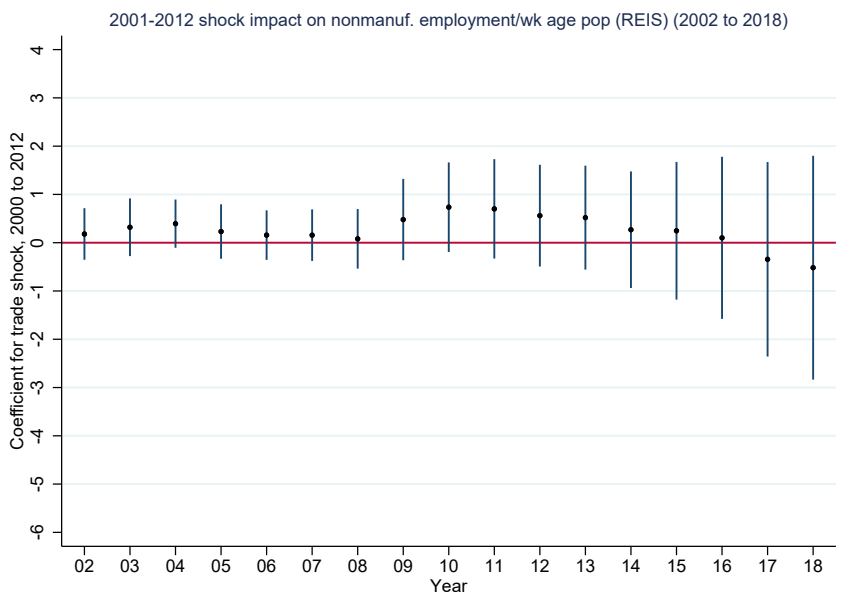

(b) Impact of Gravity-Based Trade Shock


Note: Stacked time differences for initial pds '91, '00; trade shock pds: '91-'00, '00-'12.

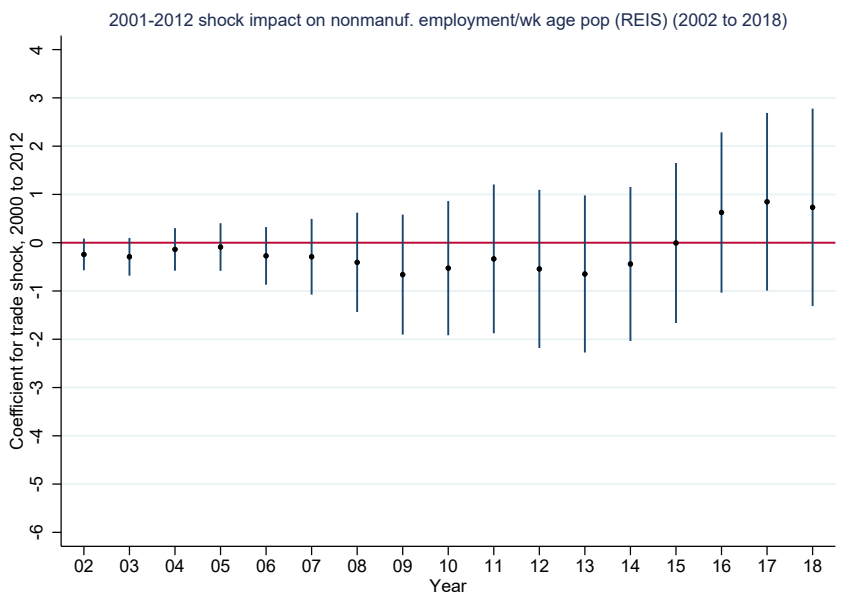
# Impacts of Gravity-based Spillovers on Non-Mfg Emp (REIS)

**Local shock impact unchanged, imprecise gravity shock impact**

(a) Impact of Local Trade Shock




(b) Impact of Gravity-Based Trade Shock



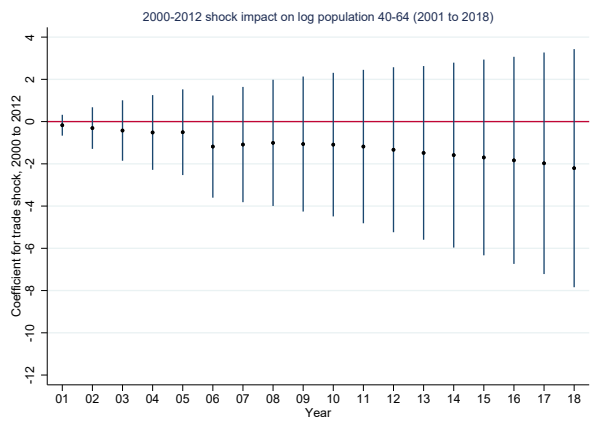

Note: Stacked time differences for initial pds '91, '00; trade shock pds: '91-'00, '00-'12.

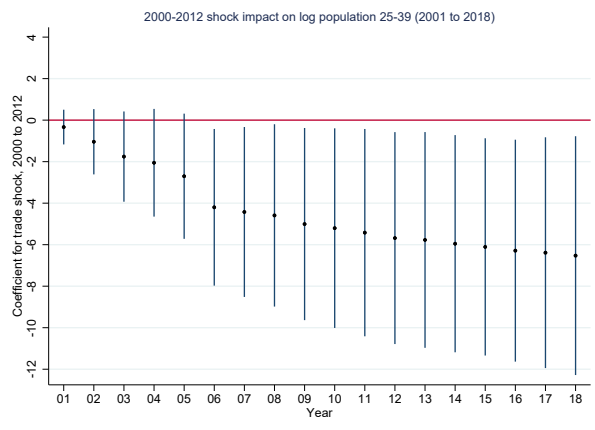
# Agenda

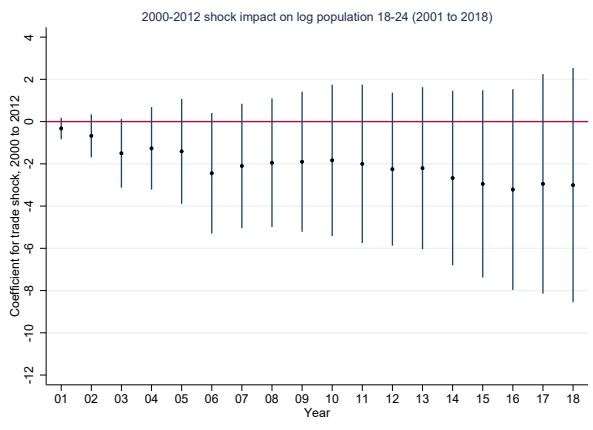
# Impacts on Population by Age (lagged pop. growth controls)

**Precise impacts only for 25-39 yr olds (36% wkg age pop in '00)**

(a) ln population 40-64 (b) ln population 25-39 (c) ln population 18-24



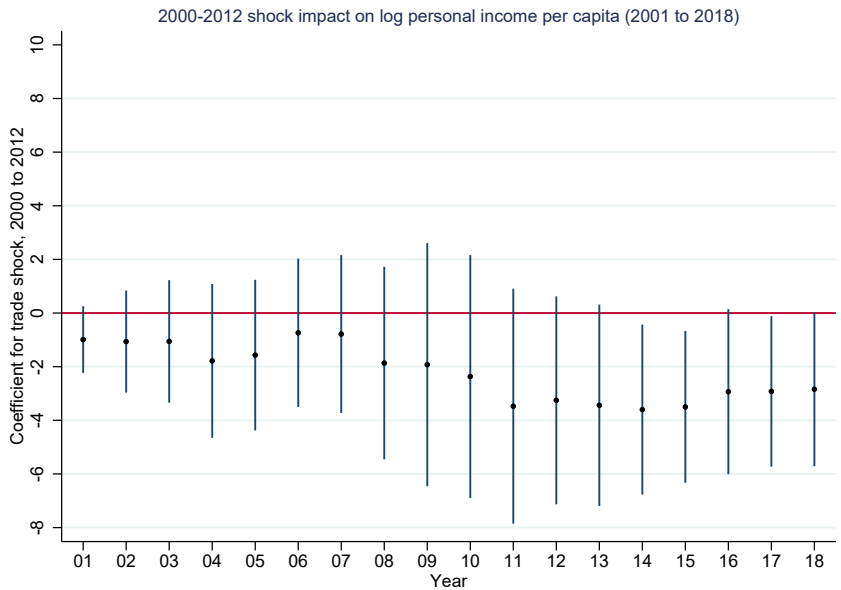

Note: Stacked time differences for initial pds '91, '00; trade shock pds: '91-'00, '00-'12; controls include CZ pop. growth '70-'90 (Greenland et al '19).

# Agenda

# Impact on Personal Income (USD '15) per capita

## Declines in personal income out to 2018

(a) Personal income



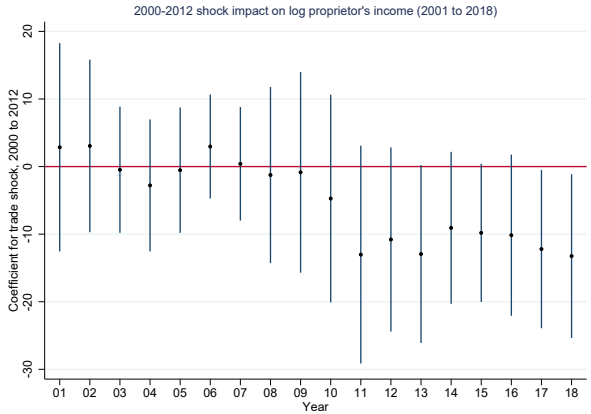

(b) Government transfers


Note: Stacked time differences for initial pds '91, '00; trade shock pds: '91-'00, '00-'12; personal income includes wages, salaries, bonuses, employer benefits, business income, financial returns (rent, interest, dividends, realized capital gains), and gov't transfers.

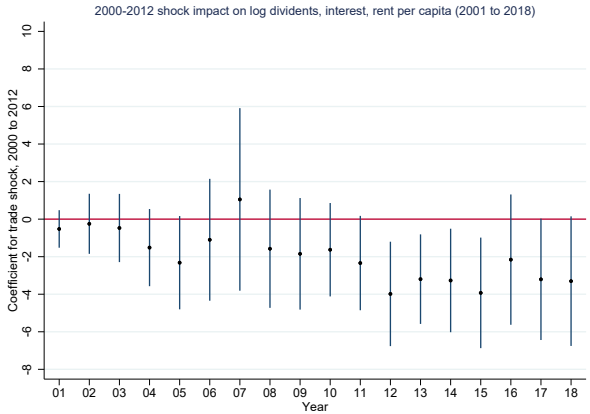
# Impact on Components of Personal Income per capita

(a) Wages, salaries, benefits

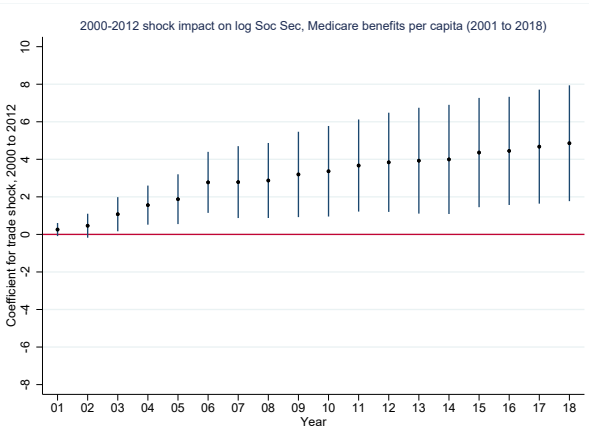

(b) Proprietor's income



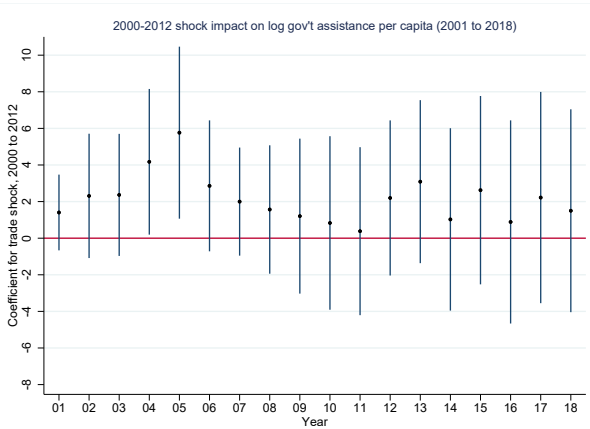

(c) Dividends, interest, rent




(d) Soc Sec, SSDI, Medicare

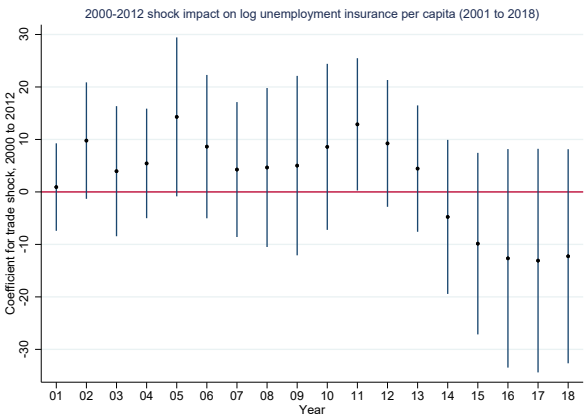



(e) Other Gov't assistance

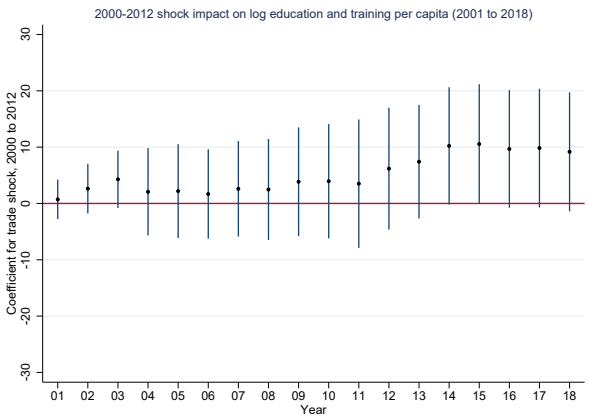


# Impact on Log Government Assistance per capita

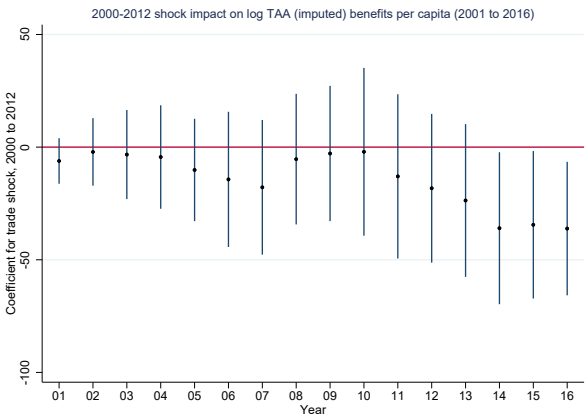
(a) UI benefits



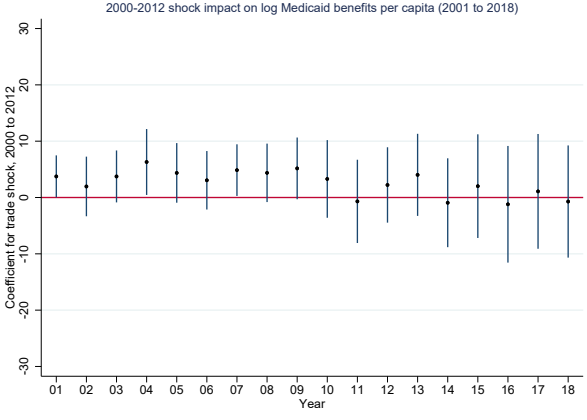

(b) Education & Training benefits



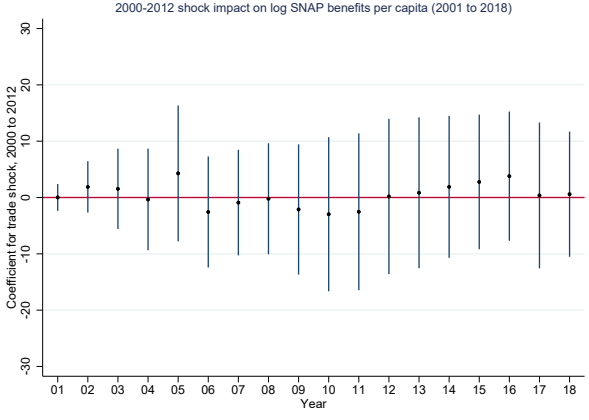

(c) TAA payments



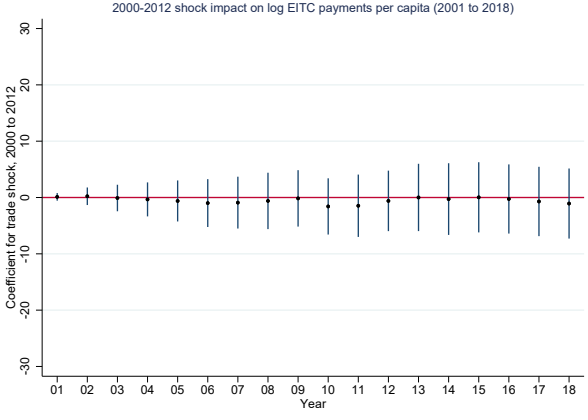

(d) Medicaid benefits




(e) SNAP benefits




(f) EITC benefits



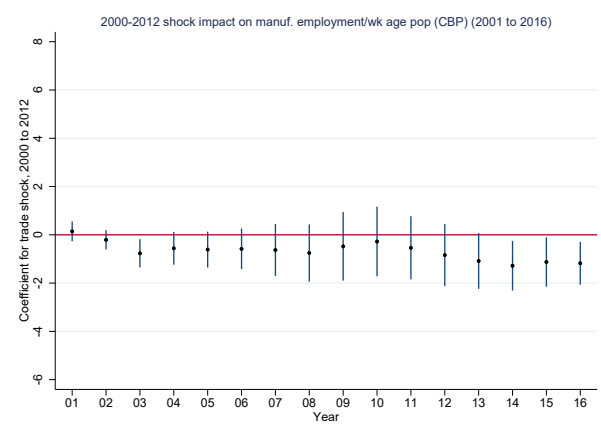
# Agenda

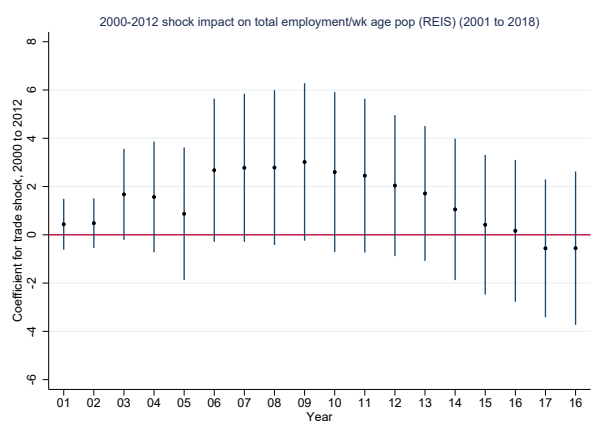
1. Duration of China Trade Shock
2. Empirical Specification
3. **CZ Level Analysis**
   - Employment/Working-Age Population
   - Log Population Head Counts
   - Income and Transfers per capita
   - Heterogeneity in CZ Adjustment
4. Implications for Welfare
5. Conclusions

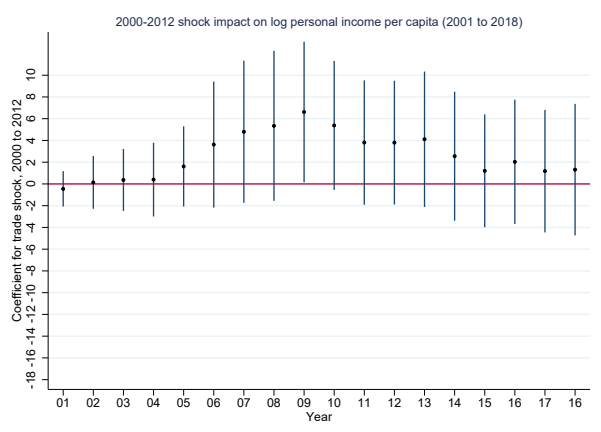
# Heterogeneity by Initial CZ Emp-Pop Ratio

**(A) Mfg emp/Wkg age pop** **(B) Total emp/Wkg age pop** **(C) Log personal income per capita**

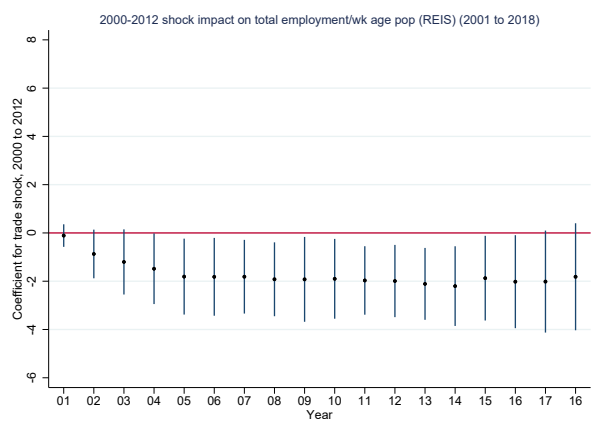
(I) Below median emp-pop ratio in 2000

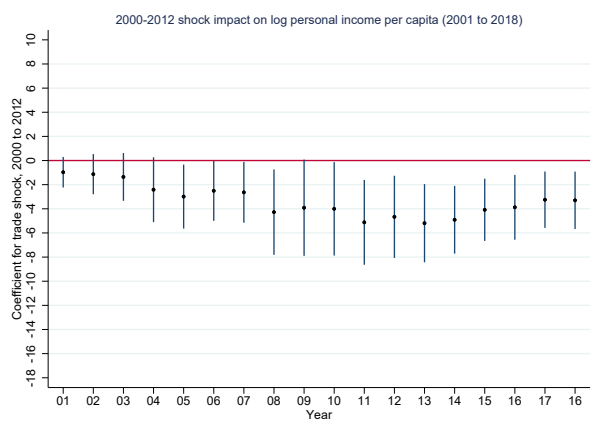



(II) Above median emp-pop ratio in 2000

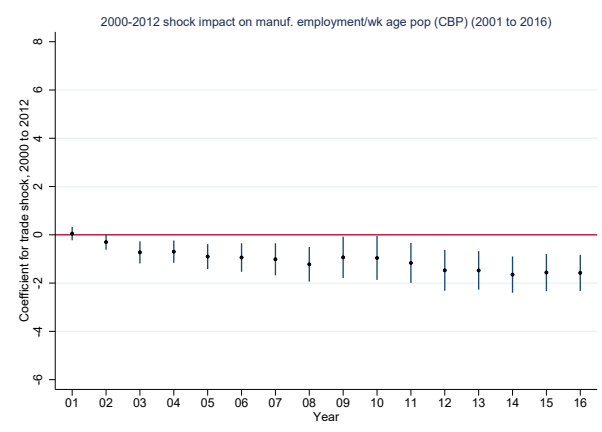



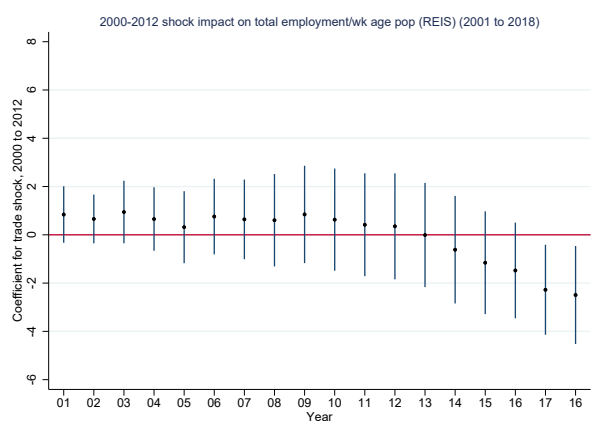



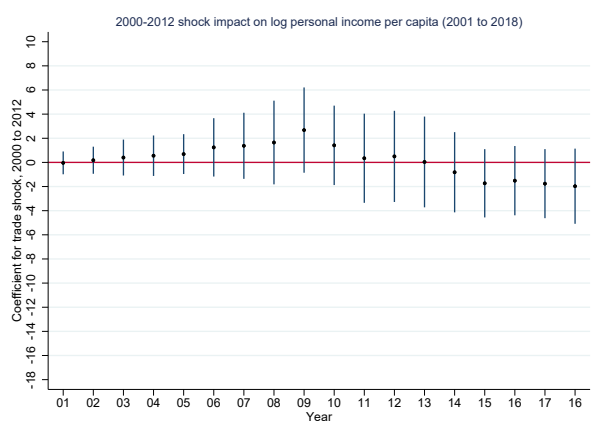
# Heterogeneity by Initial CZ College Share

**(A) Mfg emp/Wkg age pop** **(B) Total emp/Wkg age pop** **(C) Log personal income per capita**

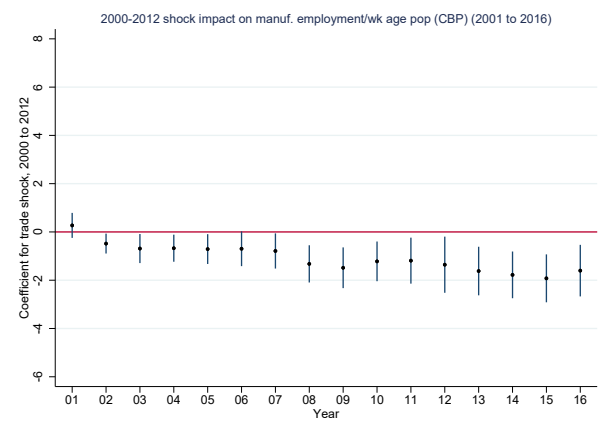
(I) Below median college educated share in 2000

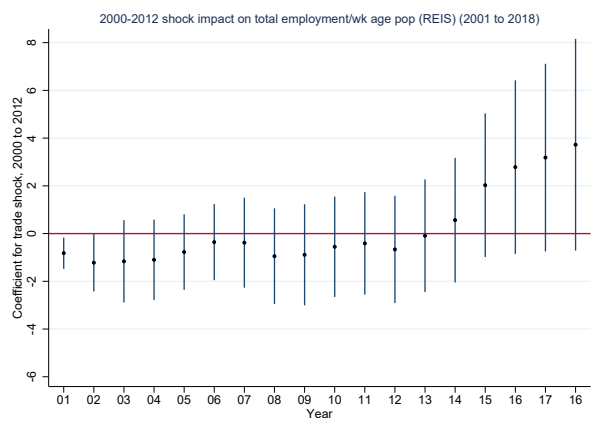


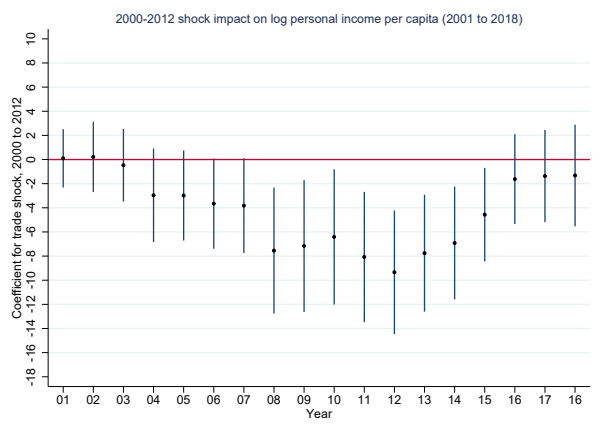




(II) Above median college educated share in 2000



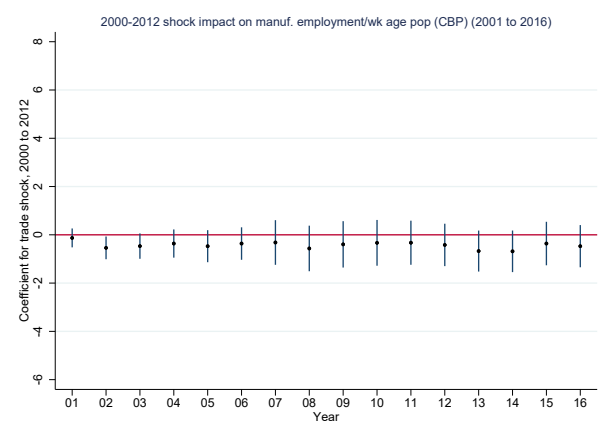



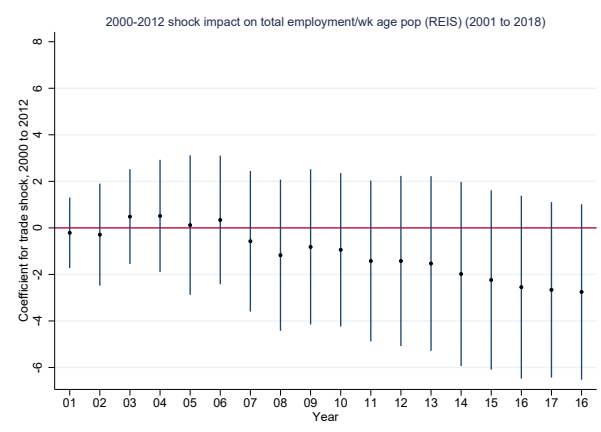



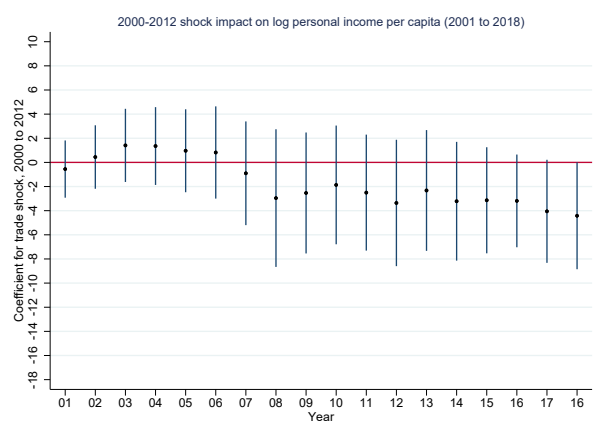
# Heterogeneity by Initial Occupational Specialization

**(A) Mfg emp/Wkg age pop** **(B) Total emp/Wkg age pop** **(C) Log personal income per capita**

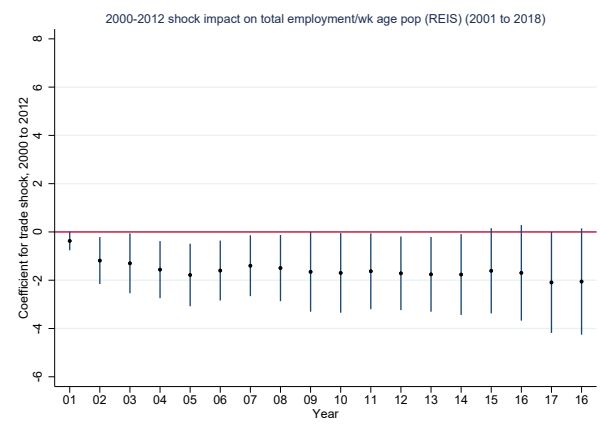
(I) Below median occupation specialization (HHI) in 2000

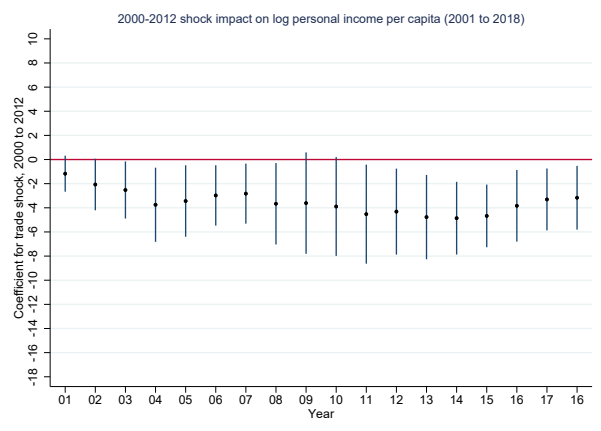



(II) Above median occupation specialization (HHI) in 2000

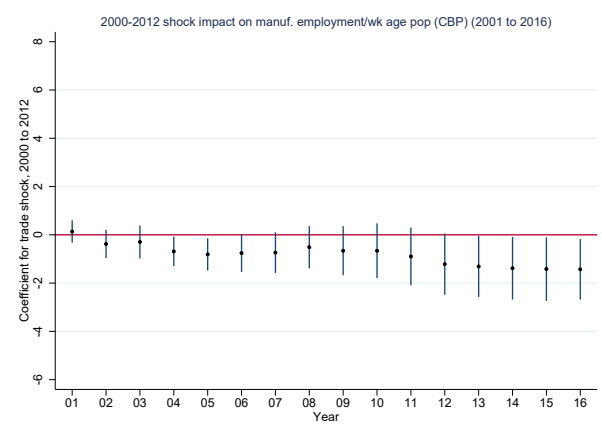



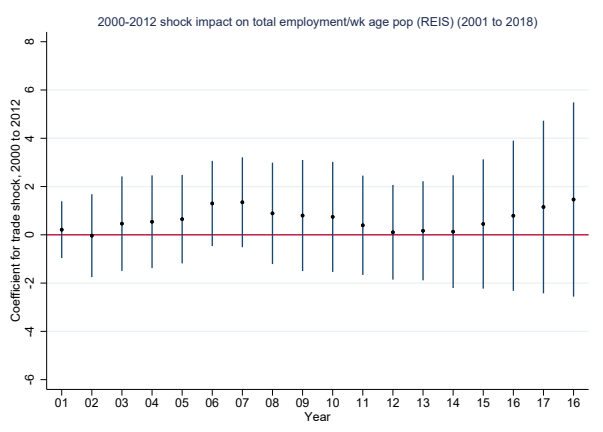



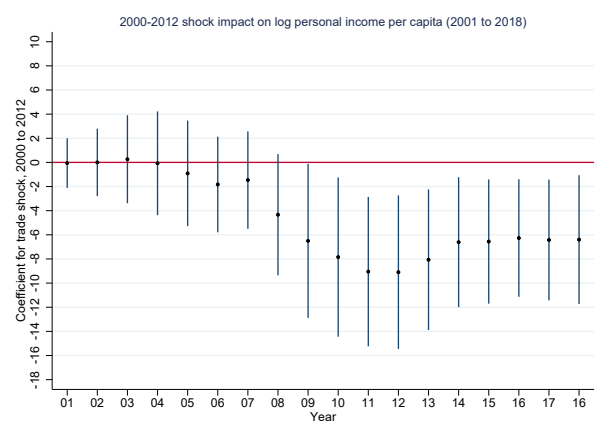
# Heterogeneity by Initial Industrial Specialization

**(A) Mfg emp/Wkg age pop** **(B) Total emp/Wkg age pop** **(C) Log personal income per capita**

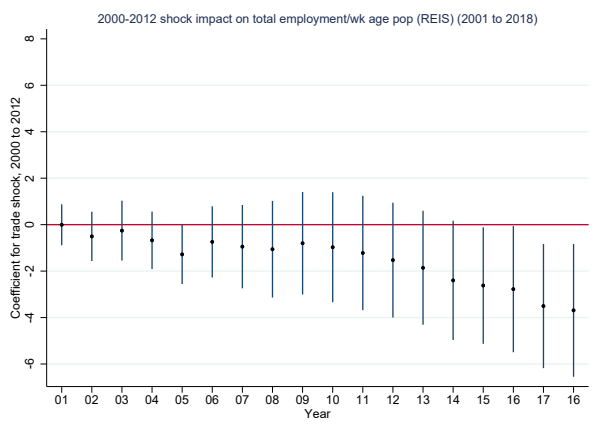
(I) Below median industry specialization (HHI) in 2000

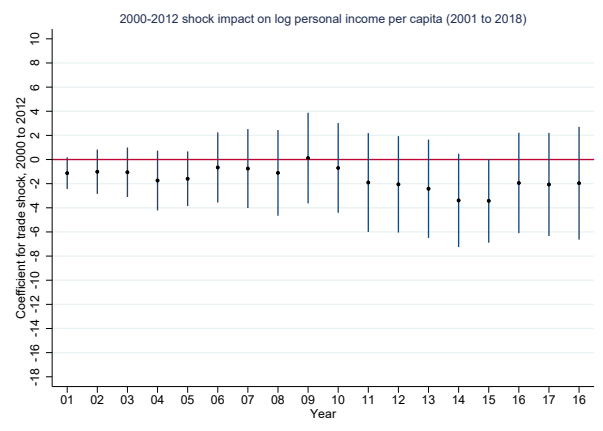



(II) Above median industry specialization (HHI) in 2000

# Agenda

1. Duration of China Trade Shock
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5. Conclusions

# Counterfactual Analysis of China Shock, 2000–2007

- **Caliendo et al '19: costly labor mobility**
  - Estimate mobility elasticity $\upsilon$ from $\mathrm{E}\left[\ln \mu_t^{j,k}/\mu_t^{j,j} \middle| \ln w_{t+1}^k/w_{t+1}^j\right]$
  - $\%\triangle \bar{W}\,(std.\,dev.) = 0.20\,(0.09)$ in long run (12 years)
- **Galle et al '20: specific factors**
  - Estimate labor specificity $\kappa$ from $\mathrm{E}\left[\ln \hat{y}_j \middle| \ln \hat{\pi}_{jNM}\right]$
  - $\%\triangle \bar{W}\,(std.\,dev.) = 0.22\,(0.25)$, similar w/ home prod., unemploy.
- **Adão et al '20: agglomeration effects**
  - Estimate agglom, employ elasticities $\psi$, $\phi$ from $\mathrm{E}\left[\ln \hat{w}_j, \ln \hat{L}_j | \hat{\eta}_j^P, \hat{\eta}_j^C\right]$
  - $\%\triangle \bar{W}\,(std.\,dev.) = 0.16\,(1.75)$
- **Related work:**
  - Rodriguez-Clare et al '20: Downward nominal wage rigidities
  - Kim & Vogel '20: Non-pecuniary losses from unemployment

# CZ Level Changes in Welfare (GRCY '20)

Change in welfare for region $i$ of US is product of standard ACR component and new Roy-Fréchet component (where $\hat{x} \equiv x_1/x_0$)

$$\hat{W}_i = \frac{\hat{Y}_i}{\hat{L}_i} \prod_j \hat{P}_j^{-\beta_j} = \prod_j \hat{\lambda}_j^{-\beta_j/\theta} \prod_j \hat{\pi}_{ij}^{-\beta_j/\kappa}$$

- $\hat{W}_i$ = change in real income in region $i$
- $\hat{P}_j$ = change in product price for industry $j$
- $\beta_j$ = Cobb-Douglas expenditure share for industry $j$
- $\hat{\lambda}_j$ = change in US expenditure share on its own $j$ goods
- $\hat{\pi}_{ij}$ = change in employment share of industry $j$ in region $i$

# Relative Changes in CZ Welfare

Trade-shock induced change in welfare for CZ $i$ (conditional on controls) relative to the population-weighted US mean:

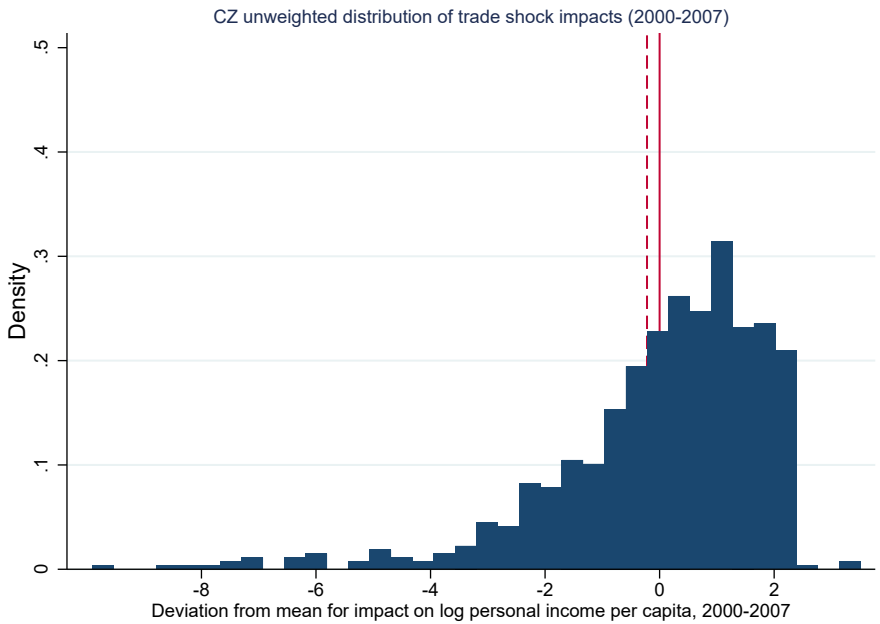
$$\begin{aligned} \ln \hat{W}_i - \sum_h s_h \ln \hat{W}_h &= \ln \hat{y}_i - \sum_h s_h \ln \hat{y}_h \\ &= \tilde{\beta}_{y\tau} \Delta \widetilde{IP}^{cu}_{i\tau} - \sum_h s_h \tilde{\beta}_{y\tau} \Delta \widetilde{IP}^{cu}_{h\tau} \end{aligned}$$

- $s_i$ = initial share of CZ $i$ in US population
- $\hat{y}_i$ = trade-shock induced change in income per capita in CZ $i$
- $\tilde{\beta}_{y\tau}$ = estimated impact coefficient for $\ln y$ over time interval $\tau$
- $\Delta \widetilde{IP}^{cu}_{i\tau}$ = exogenous component of trade shock for CZ $i$ (observed trade shock $\times$ $\hat{\beta}$ $\times$ adj. $R^2$ in $1^{st}$ stage regression)

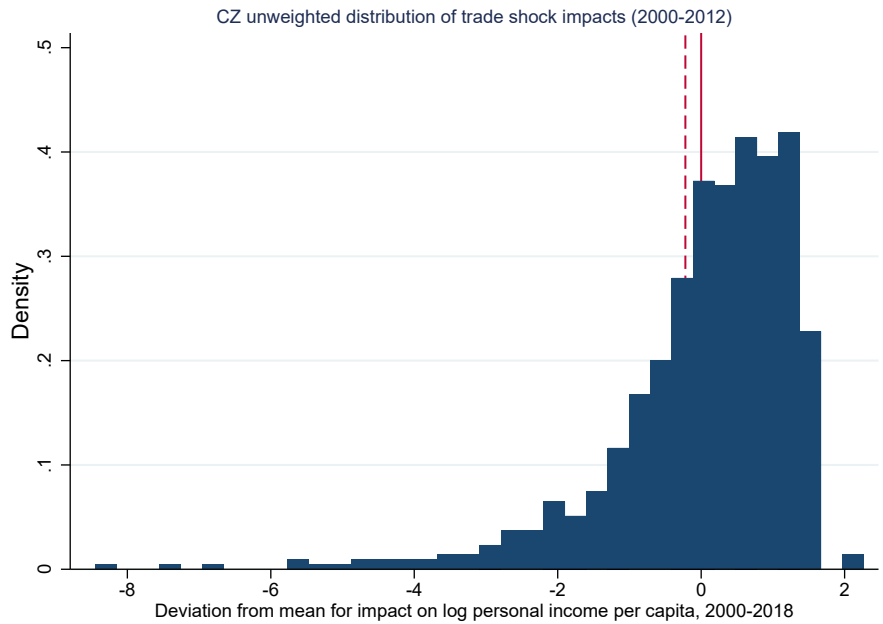
# Trade-shock-induced Variance in △ Income per capita

Unweighted distribution of CZ changes (deviation from pop.-weighted mean)

(a) 2000-2007 Trade Shock




(b) 2000-2012 Trade Shock




Note: Wted (unwted) std. dev. of shock impact: (a) 1.35 (2.15), (b) 1.30 (0.95); $N = 722$, 36 bins.

# Most Trade Impacted Commuting Zones, 2000-2018

| | | | 2000-2018 |
|---|---|---|---|
| Commuting Zone | Population 2000 (000s) | Manuf. emp. share 2000 (%) | Predicted Δ income per capita (%) |
| Sioux City, IA | 187.6 | 27.0 | -8.44 |
| Union County, MS | 54.4 | 50.1 | -7.32 |
| Meridian, MS | 156.9 | 26.5 | -6.82 |
| Hutchinson, MN | 73.0 | 41.5 | -5.73 |
| North Hickory, NC | 377.5 | 43.0 | -5.70 |
| Tupelo, MS | 198.1 | 43.7 | -5.34 |
| Martinsville, VA | 19.4 | 47.4 | -4.94 |
| Carroll County, VA | 27.5 | 45.1 | -4.71 |
| Lynchburg, VA | 112.4 | 26.9 | -4.62 |
| West Hickory, NC | 165.1 | 49.9 | -4.55 |
| Henderson County, TN | 44.9 | 45.9 | -4.35 |
| Crossville, TN | 104.5 | 35.6 | -4.15 |
| Raleigh-Cary, NC | 1,420.0 | 17.0 | -4.11 |
| Cleveland, TN | 203.7 | 39.9 | -3.75 |
| McMinnville, TN | 84.5 | 48.9 | -3.72 |
| Faribault-Northfield, MN | 110.1 | 32.9 | -3.67 |
| St. Marys, PA | 41.0 | 54.7 | -3.64 |
| Danville, KY | 86.7 | 38.3 | -3.44 |
| Quincy, IL | 152.3 | 23.8 | -3.37 |
| Greene County, GA | 35.5 | 41.1 | -3.16 |

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# Discussion

**Local impacts of exposure to import competition are long lasting**

- Declines in mfg, total employment persist for 16-18 years

**Primary means of labor-market adjustment is exit from work**

- Social insurance (pensions, disability) may contribute to this

**Regional variation in changes in income per capita is large**

- Gov't transfers do little to offset income losses

**To-be-examined adjustment mechanisms**

- Changes in housing prices (owners vs. renters), non-mfg exports