A Shock by Any Other Name? Reconsidering the Impacts of Local Demand Shocks

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Last decade produced a growing body of work on adjustment to local shocks in the US.

- Studies consider a growing set of measured local shocks.
  - Including: local trade shocks on import and export margins; deviations from predicted employment growth; mass layoffs; resource booms; and variation in the Great Recession's employment declines

- Typically described as "local demand shocks," considered in a spatial equilibrium framework.

- Findings sometimes used to support calls for investments in economically low performing places, or migration out of them.

How should we interpret body of results from these studies?

Potential for two concerns…

- Illusion of robustness: Similar findings in different empirical settings may be due to non-independence of the measured shocks.

- Importance of mediators: Varied outcomes following shocks may be due to heterogeneity in who, where, or when measured shocks hit.

Illusion of robustness? The many demand shocks in the literature may not be independent.

Time- and space-varying shift-share shocks: Industry level shifts, weighted by local industry employment in a base period.

- Dollars of Chinese imports per worker (ADH)
- Value of Chinese imports as a share of US demand (AADHP)
- Value of exports to ROW as a share of US production (FMX)
- Percentage points of employment growth, less local contribution (Bartik)
- Education specific pp of employment growth, less local contribution (Wozniak)
- Resource shocks (Wilson, Allcott et al.)
- Robot prevalence (Farber, Sarto and Tabellini)

Space-varying one-time shocks:

- Great Recession unemployment spikes (Yagan)
- Tariff gap with China in 2000 (Pierce & Schott)
- Mass layoffs (Foote & Huff-Stevens)

Role for mediators? Different migration following different shocks suggests this.

- Migration responses to shift-share employment growth shocks are substantial, i.e. Bartik shocks (Molloy and Wozniak 2011; Wozniak 2010; Blanchard and Katz 1992 (indirect))
- …but declining over time (Dao et al. 2017; Molloy and Smith 2019)
- No migration response to China import shocks (ADH 2013; also AADHP 2016)
- … or this response is very delayed (Greenland et al 2018)
- Migration response to export shocks not yet studied
- Substantial migration responses to mass layoffs (Foote et al. 2018)
- Substantial migration responses to natural resource booms (Black et al. 2005; Riley 2018)

Questions

- How similar are measured shocks to one another?
  - Timing, location
  - Magnitude of employment changes
- Given similar-sized but independent shocks, do population responses differ? If so, what explains this?

Today

- Analyzing shocks
  - Correlations, autocorrelations, heat maps
  - Rescale to put all shocks in common employment growth units
  - Event study approach to compare one-time vs recurring shocks.

- Building panel of harmonized shocks and using large IRS samples to analyze responses

- Migration responses

Data construction

Data construction

1. Harmonized CZ-level shocks
2. Population flows between CZs

Harmonized CZ-level shocks

- CZ-year level dataset containing shock measures from 1994-2016
- Reconstructed shock measures used previously in the literature from source data as much as possible
- Replicated literature's descriptive statistics as reported…
- …then converted to annual (and CZ-level) as needed and extended to current year
- Incorporating a range of CZ-level variables (additional covariates)

Overview of shock construction

Shocks are constructed as [time-varying] exposure to a shift at a higher level.

$$shock_{i[t]} = \sum_j \frac{L_{ij\bar{t}}}{L_{i\bar{t}}} \frac{shift_{j[t]}}{D_{j[t]}}$$

- i represents commuting zones, t denotes time period, $\bar{t}$ is a base period, and j denotes industry, and L is employed workers in the i-j-t unit
- *shift* is an industry-specific change j at the national level, often excluding i's contribution, D is a normalization factor to scale the shift across locations of different sizes
- In some cases, exposure is presumed uniform across *j* within *i*, and no scaling is required.

Comparing measured shocks

CZ-Year Shocks: Descriptive statistics

Shock	N	min	p10	p25	p50	p75	p90	max	p90p10
ADH	16721	−51.5	−0.6	−0.2	0.1	0.3	0.4	22.6	1.1
AADHP	16721	−107.1	−0.2	−0.1	0.1	0.1	0.2	6.5	0.4
FMX	16721	−34.2	−0.6	−0.2	−0.1	0.3	0.7	24.8	1.3
Bartik	16721	−7.2	−1.4	−0.3	0.2	0.6	0.9	10.7	2.3
Bartik, college	16721	−5.0	−1.6	−0.3	0.2	0.6	1.0	6.4	2.6
Bartik, no college	16721	−5.5	−1.4	−0.3	0.2	0.5	0.9	3.7	2.3
Tariff Gap	727	−4.0	−1.4	−0.6	0.1	0.7	1.1	2.0	2.5
Yagan	727	−3.9	−1.4	−0.7	0.1	0.7	1.2	2.0	2.6

- Annual shocks span 1994 to 2016
- Shocks normalized to z-scores and negative values correspond to adverse shocks

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Shock	N	min	p10	p25	p50	p75	p90	max	p90p10
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AADHP	16721	−107.1	−0.2	−0.1	0.1	0.1	0.2	6.5	0.4
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- Annual shocks span 1994 to 2016
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Correlations between measured shocks

Shock	ADH	AADHP	FMX	Bartik
ADH	1			
AADHP	0.65	1		
FMX	−0.33	−0.22	1	
Bartik	−0.08	−0.04	0.25	1
Tariff Gap	0.37	0.43	0.09	0.37
Yagan	−0.02	0.01	0.1	0.18

For non-time varying shocks, correlations reported are with three year average of time varying shocks centered on shock year.

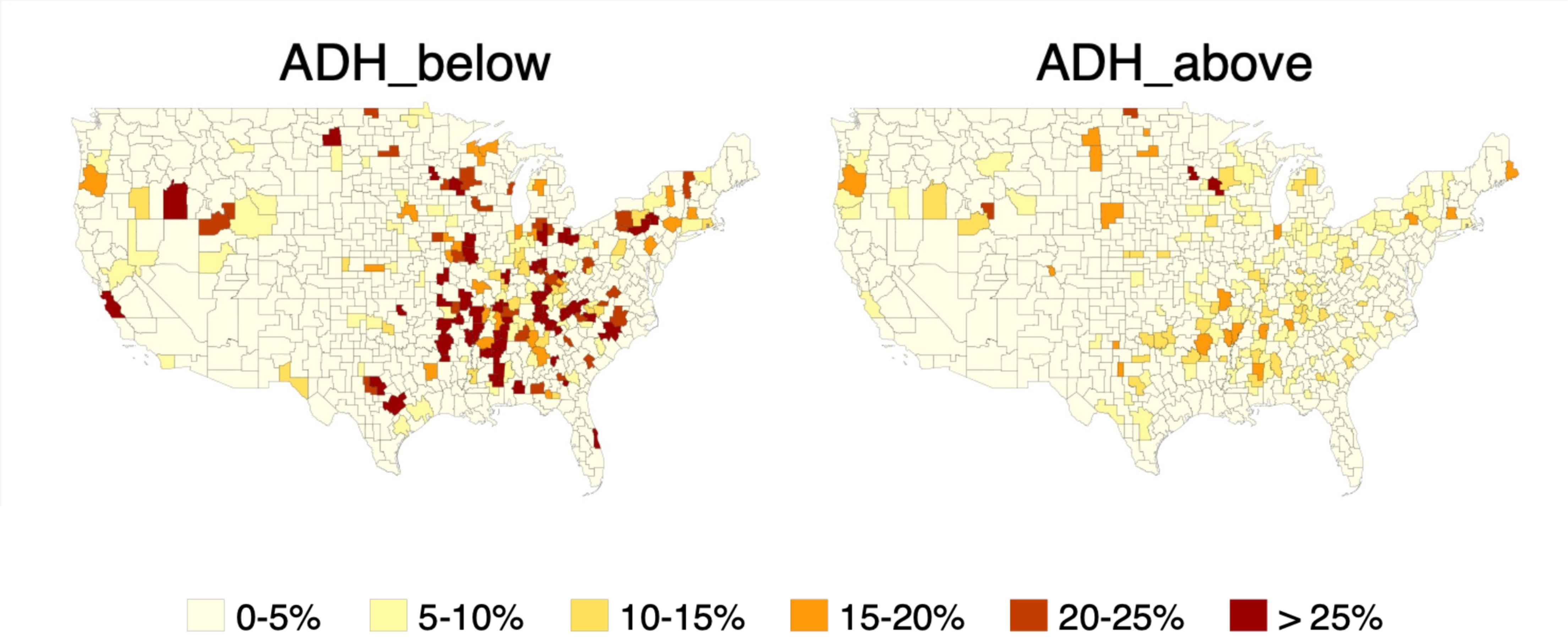
Correlations in regression framework

	ADH		Bartik		FMX	
	(1)	(2)	(3)	(4)	(5)	(6)
ADH			0.000272	-0.00132	-0.316***	-0.241***
			(0.112)	(0.0117)	(0.0531)	(0.0375)
Bartik	0.000258	-0.00461			0.221**	0.166*
	(0.106)	(0.0407)			(0.0955)	(0.0821)
FMX	-0.334***	-0.247**	0.247**	0.0489***		
	(0.0929)	(0.0985)	(0.113)	(0.0156)		
CZ & year FEs?	✗	✓	✗	✓	✗	✓
N	16721	16721	16721	16721	16721	16721
r2	0.112	0.256	0.0609	0.787	0.160	0.276

Persistence (auto-correlation) of local shocks

	(1) ADH	(2) Bartik	(3) FMX
Shock Lagged 1 Year	0.0374	0.156**	-0.0146
	(0.0648)	(0.0657)	(0.0752)
Shock Lagged 2 Years	0.0000104	0.0607	-0.0987
	(0.0294)	(0.0434)	(0.0642)
Shock Lagged 3 Years	-0.0504	-0.00437	-0.0526
	(0.0423)	(0.0305)	(0.0606)
Observations	14540	14540	14540
R^2	0.210	0.793	0.246

Share of years with shocks 1 SD above or below mean



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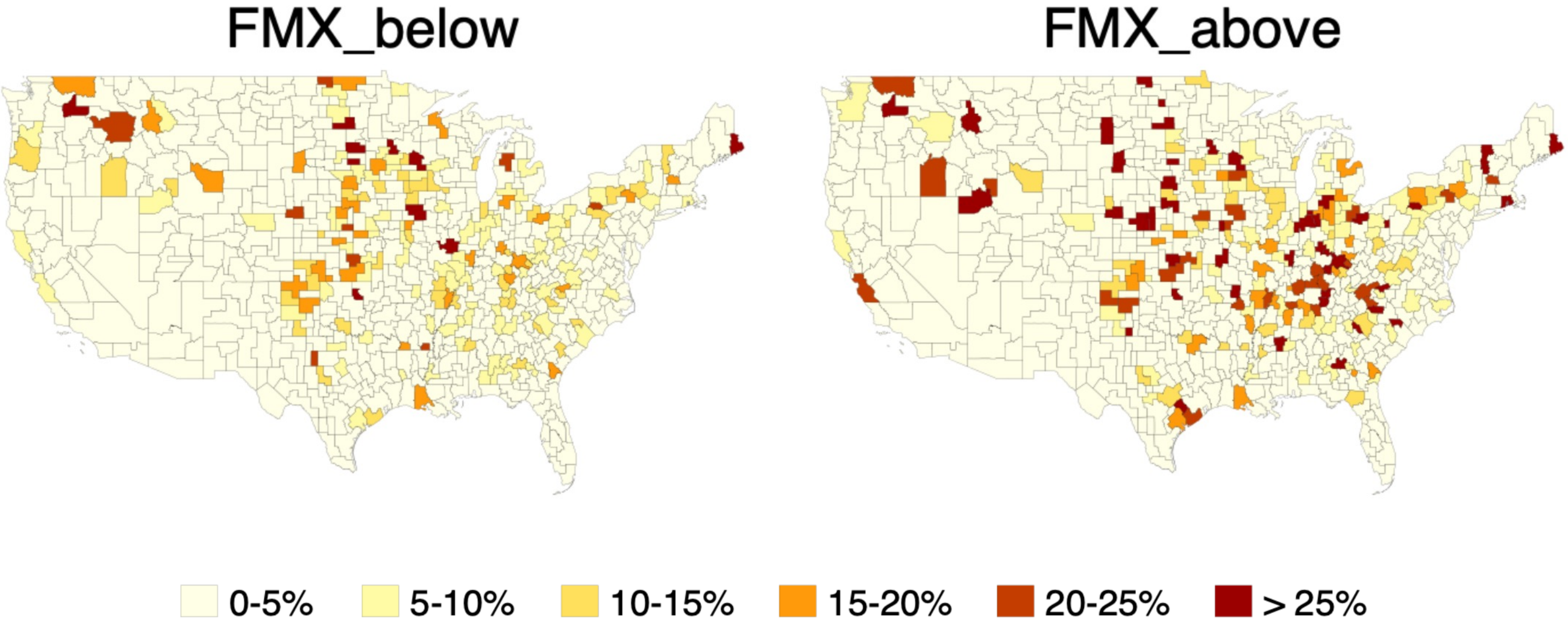

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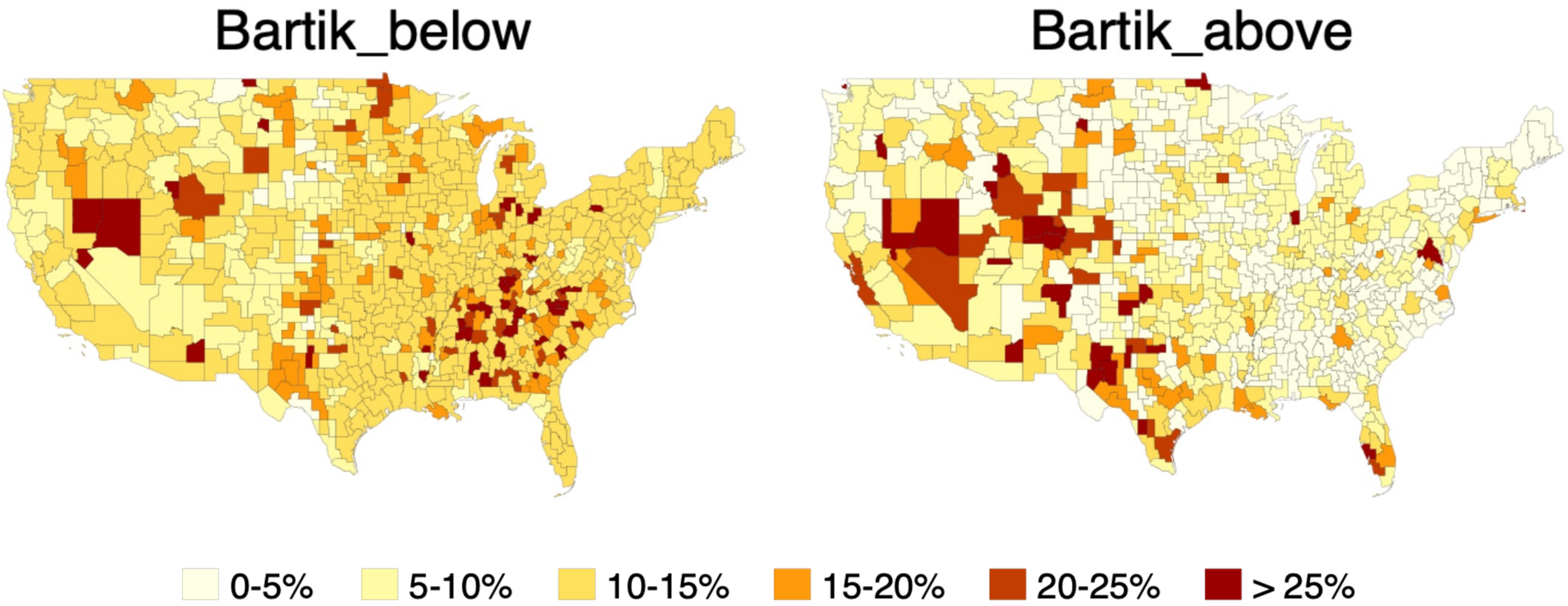

Summary I: Comparing shocks as used in the literature

- Trade-based shocks are characterized by a lot of mass at zero with large outliers on either side
- Import and export shocks negatively related to one another, but…
- Export shocks related to employment shocks while import shocks not
- No meaningful autocorrelation in any time-varying shocks (residuals)
- Nevertheless, recurring large shocks are spatially concentrated

Employment impacts

Comparing shocks using employment impacts

- Local demand shocks should affect local employment
- Literature tends to group shocks into positive and negative
- So far has given less consideration to other dimensions, like magnitudes of employment shifts, persistence, and composition of affected workers or industries
- We re-scale demand shocks to reflect their employment impacts and compare magnitudes and spatial distribution

Regression definition of employment impacts

- Define $g_{it} = \frac{n_{it} - n_{i,t-1}}{n_{i,t-1}}$ and run the following regression:

$$g_{it} = \beta \text{shock}_{it} + \Theta_t + \Theta_i + \epsilon_{it}$$

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- Define $g_{it} = \frac{n_{it} - n_{i,t-1}}{n_{i,t-1}}$ and run the following regression:

$$g_{it} = \beta \text{shock}_{it} + \Theta_t + \Theta_i + \epsilon_{it}$$

β = impact of 1 SD shock at t-1 on employment growth over t-1 to t

Impact of 1sd shock at t-1 on employment growth over t-1 to t

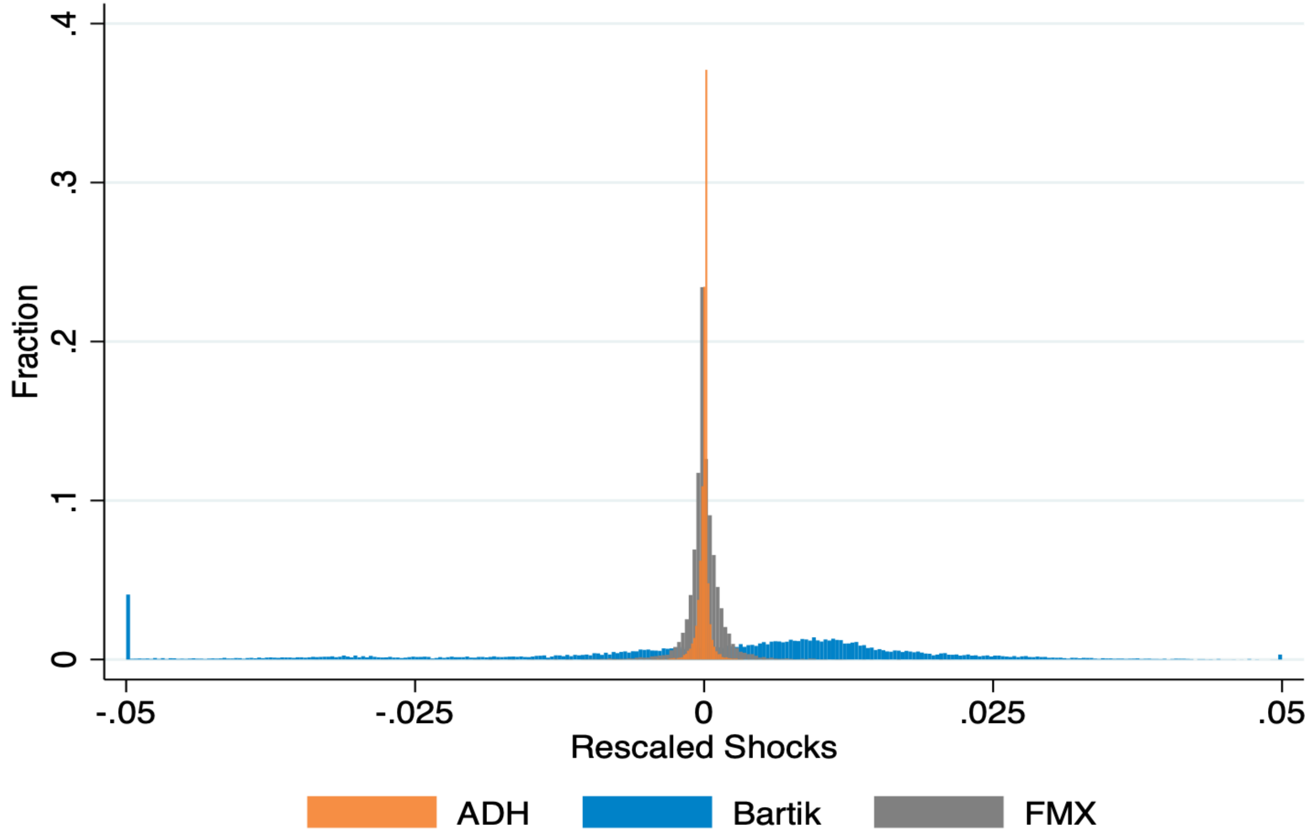
	(1) ADH	(2) AADHP	(3) FMX	(4) Bartik	(5) Bartik, College	(6) Bartik, No College
shock	0.0643*	-0.00986	0.204***	2.719***	1.606***	3.134***
	(0.0340)	(0.0134)	(0.0360)	(0.356)	(0.366)	(0.421)
Observations	13813	13813	13813	13813	13813	13813
R^2	0.557	0.557	0.559	0.602	0.578	0.587

Impact of 1sd shock at t-1 on employment growth over t-1 to t by quantile

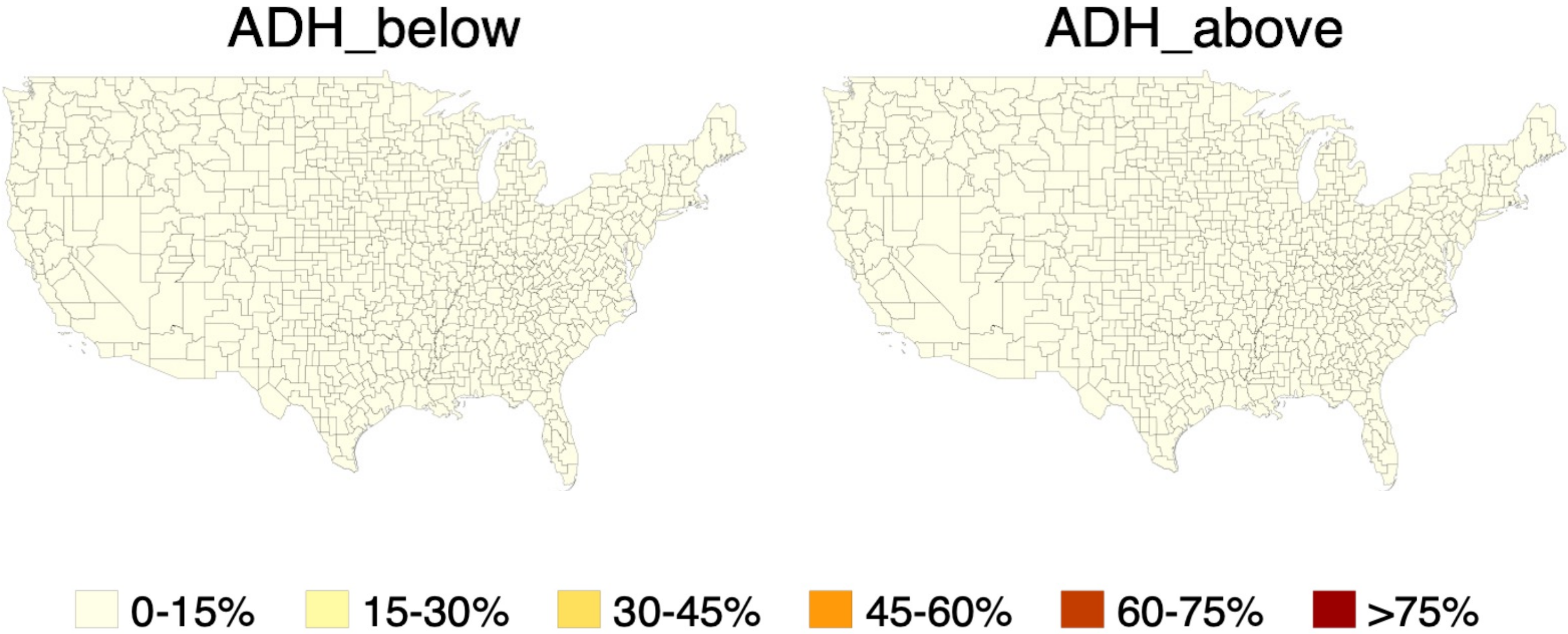
	ADH	AADHP	FMX	Bartik	Bartik, College	Bartik, No Coll.
Median	0.049*	–0.012	0.095**	2.251***	1.949***	3.231***
	(0.028)	(0.010)	(0.038)	(0.128)	(0.133)	(0.170)
10th percentile	0.023	–0.038**	0.134*	2.349***	1.993***	3.596***
	(0.053)	(0.019)	(0.071)	(0.234)	(0.249)	(0.318)
90th percentile	0.076	0.015	0.055	2.148***	1.905***	2.863***
	(0.054)	(0.019)	(0.073)	(0.248)	(0.250)	(0.323)
Mean	0.049	–0.012	0.095**	2.251***	1.949***	3.232***
	(0.040)	(0.035)	(0.039)	(0.085)	(0.128)	(0.143)

Each row corresponds to a separate regression. Table entries are the shock's coefficient and standard errors. Each regression is unweighted, and standard errors are not clustered.

Local shocks rescaled to employment basis



Share of years with shocks of +/- .5pp to employment growth



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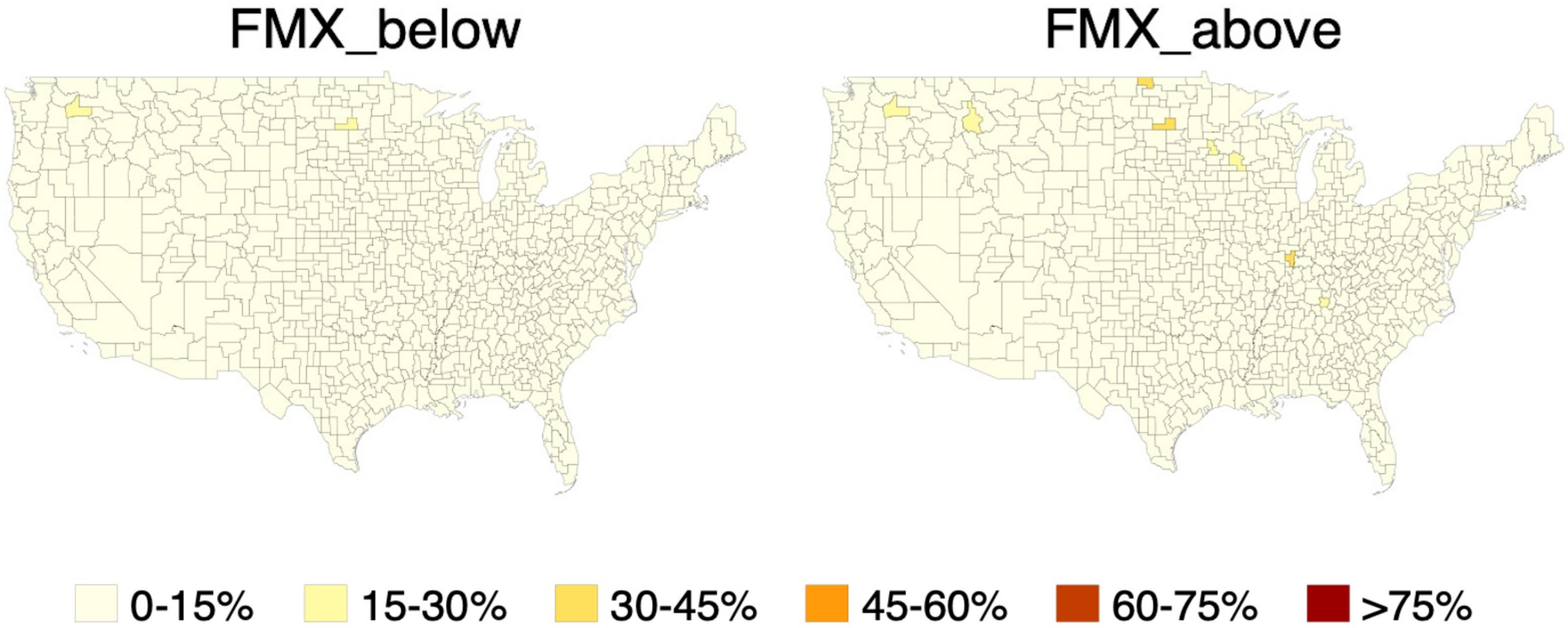

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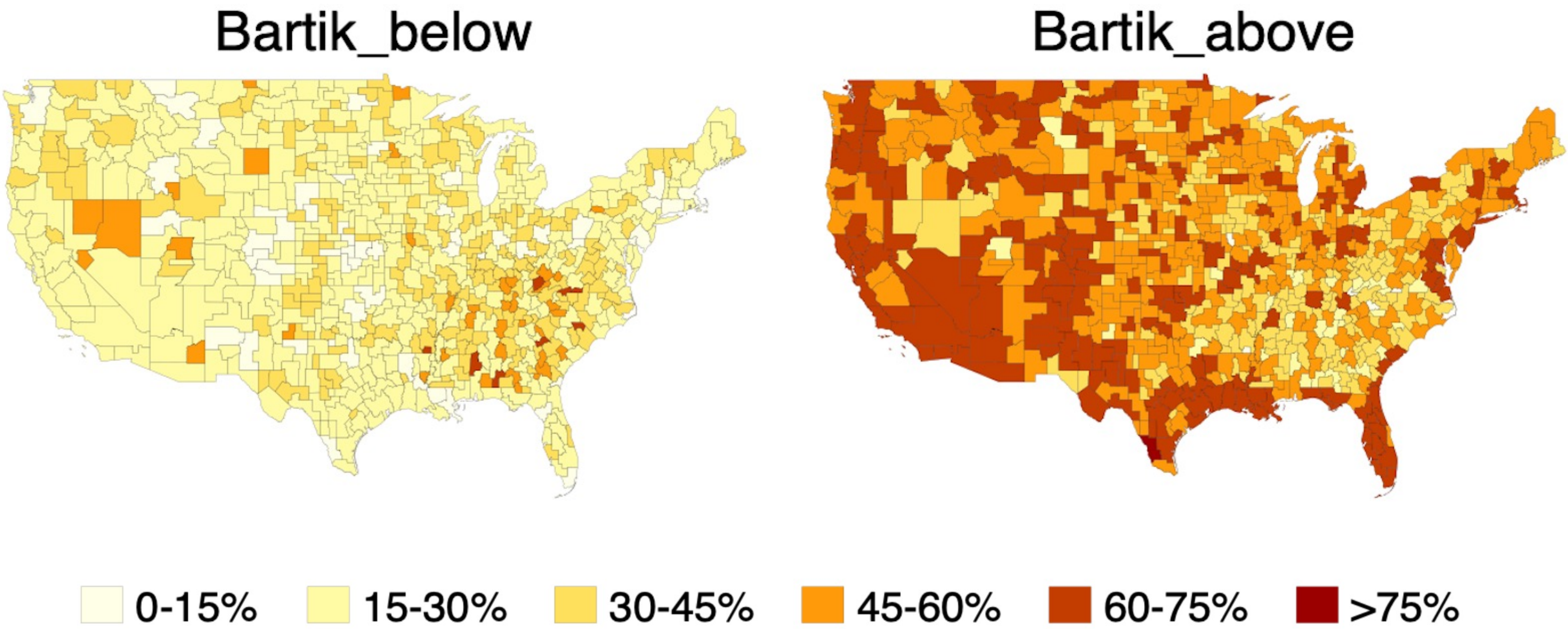


Employment impacts of time-varying shocks

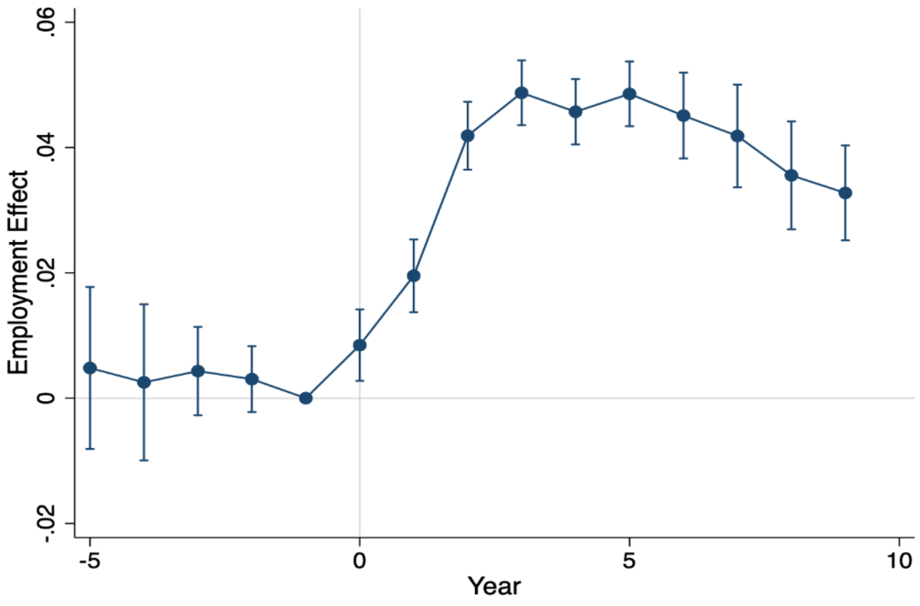
Generalizing dynamic employment impacts

- Define $y_{it} = \frac{n_{it} - n_{i,k-1}}{n_{i,k-1}}$ and run the following regression for any period before and after a shock at time k:

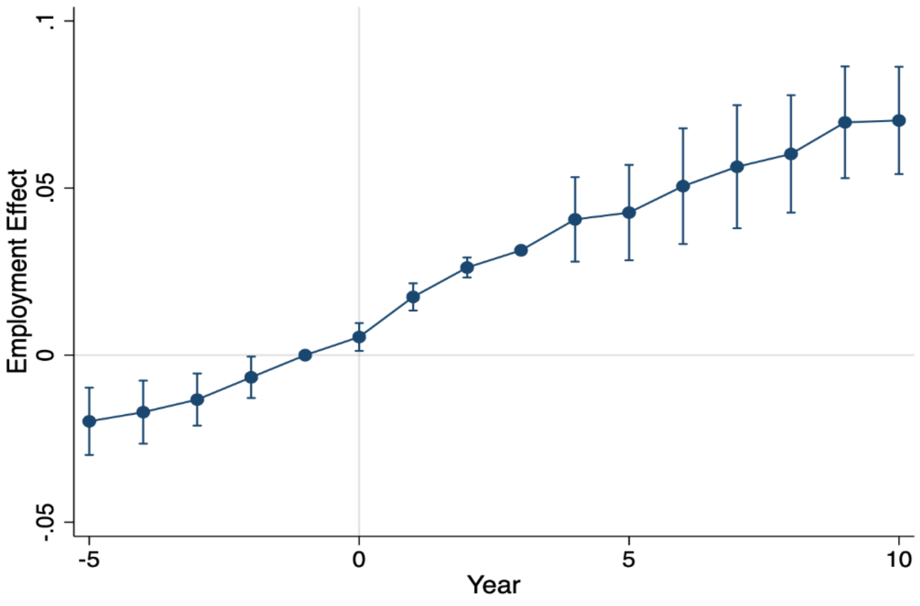
$$y_{it} = \sum_{h=-5}^{10} \delta_{kh} \mathbf{1}\{t = k + h\} shock_{ik} + \Theta_t + \Theta_i + \epsilon_{it}$$

Dynamic employment effects of one-time shocks

(a) 2007 Yagan Shock

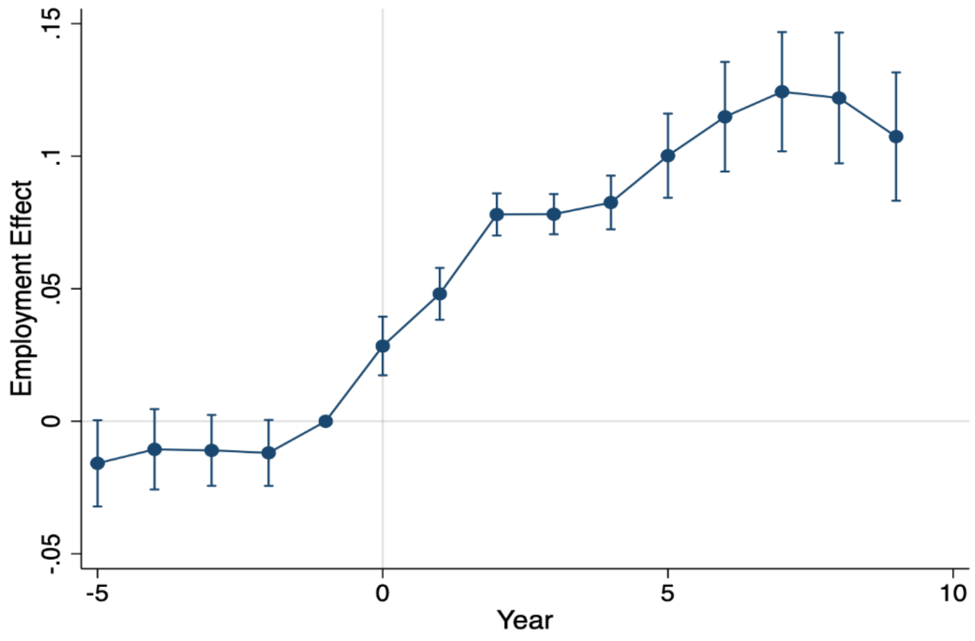


(c) 2000 Tariff Gap Shock

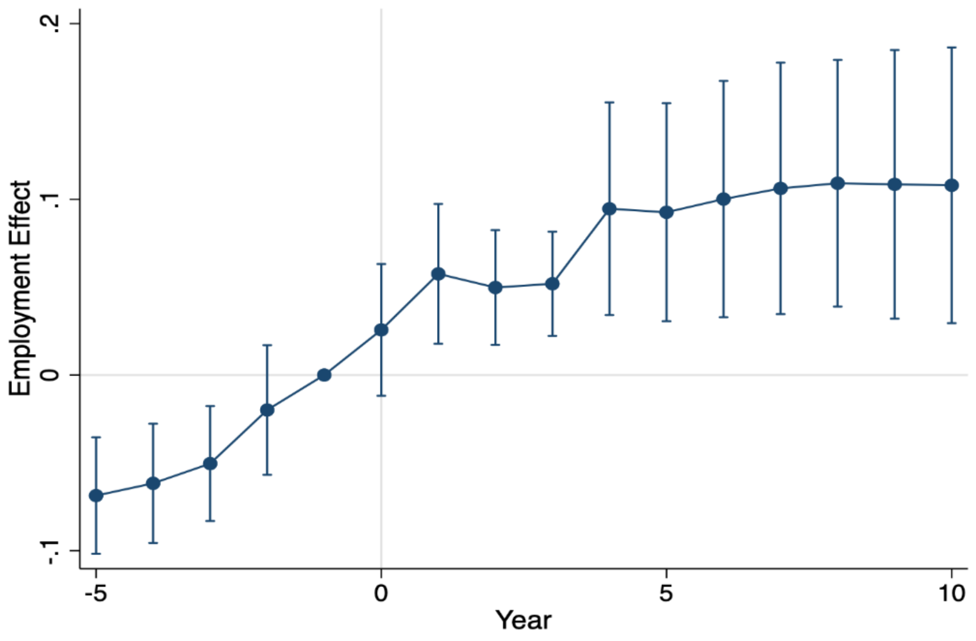


Dynamic employment effects of time-varying shocks

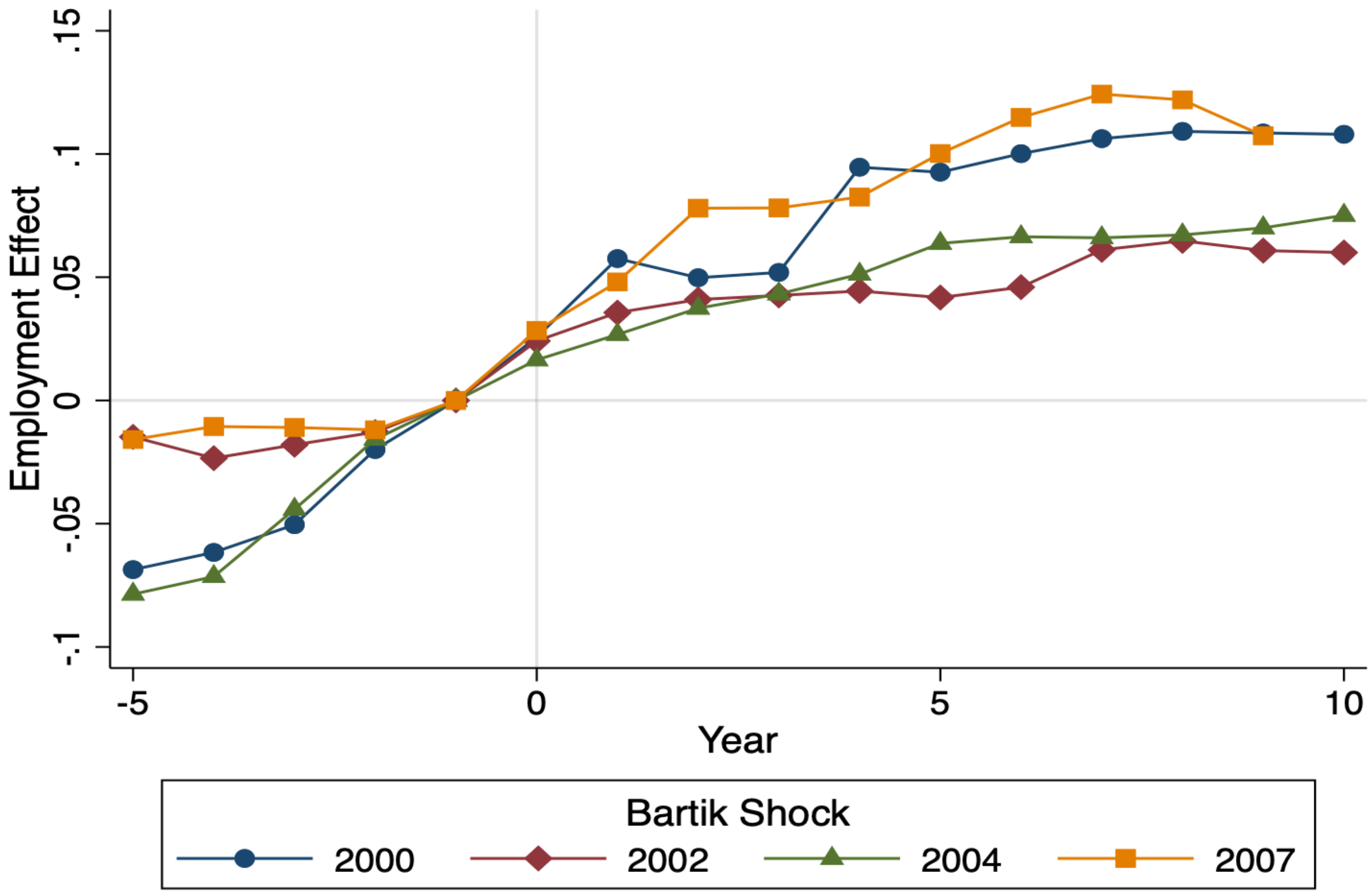
(d) 2007 Bartik Shock



(e) 2000 Bartik Shock



Dynamic employment effects of time-varying shocks



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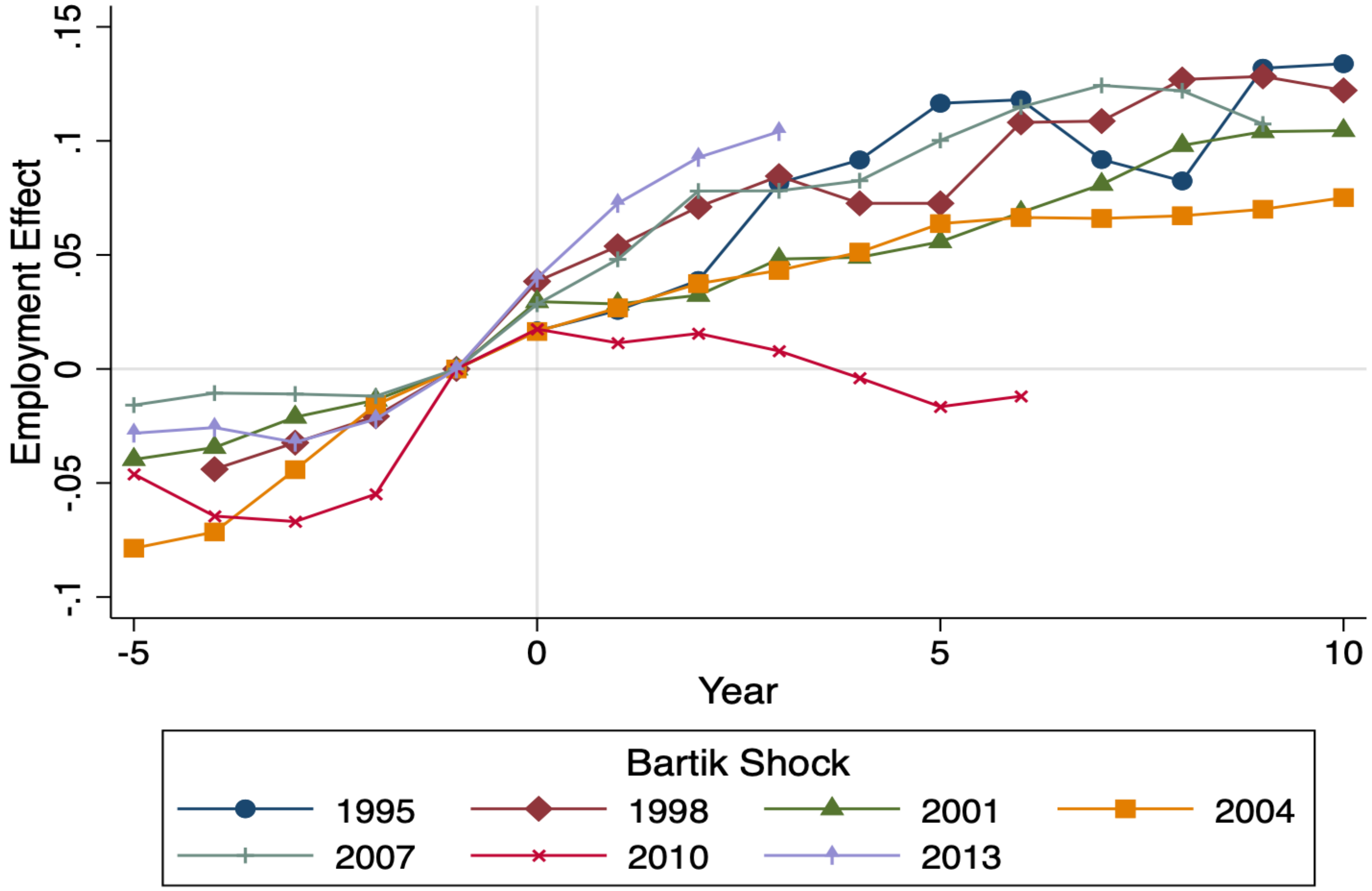

Summary II: Comparing shocks expressed as employment impacts

- Employment growth (Bartik) shocks have by far largest impact on CZ-level employment growth, 10-40x that of import/export shocks
- True across quantiles of shocks
- Although trade shocks have massive outliers, Bartik shocks have more dispersed central mass
- Once scaled to employment, there are essentially no large trade shocks
- Comparing dynamic effects of rescaled one-time and time-varying shocks, pre-trends are apparent for some shock years

Migration responses

Population flows between CZs

- Construct population flows from universe of 1040 tax filings from 1989, 1994, 1995, 1998-2017
- Longitudinal panel on filers with zip codes matched uniquely to CZ in most years (70%)
- Collapse by origin-destination pairs to flow size and mean characteristics

Matching filers to locations

	1994	1999	2004	2009	2014	2019
a. All Observations						
Total	140	147	149	150	148	148
Matched directly with zip	88	96	98	99	98	104
Matched directly with zip or MAF	95	103	106	108	106	112
Matched directly or imputable	99	106	109	110	108	114
Can not be matched	41	41	40	40	40	34
b. Observations Born in the US						
Total	112	116	116	115	114	112
Matched directly with zip	77	82	81	81	79	82
Matched directly with zip or MAF	84	89	89	89	86	90
Matched directly or imputable	87	91	91	91	88	91
Can not be matched	25	24	25	25	26	21

Characteristics of matched filers

- Compare shares of demographic characteristics for a birth cohort in filing data across bins of years observed (matched to CZ)
- And to ACS for the same cohort and age range
- Example: 1940s birth cohorts

Demographics (Percents)	Databank, Share of Years With Matched Commuting Zone										ACS
	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	
Female	48	46	50	51	51	53	55	56	54	53	51
Male	52	54	50	49	49	47	45	44	46	47	49
Gender Missing	0	0	0	0	0	0	0	0	0	0	0
White, non-hispanic	20	47	53	58	59	64	67	68	71	81	78
Black, non-hispanic	5	15	13	13	13	11	11	10	11	7	10
Asian, non-hispanic	3	3	4	4	4	4	5	5	4	3	3
Native American, non-hispanic	0	0	0	0	0	0	0	0	0	0	1
Hispanic	9	11	11	12	12	11	11	11	10	7	7
Other	1	2	2	2	2	2	2	2	2	1	1
Race Missing	63	21	17	12	10	7	5	4	3	1	0
North	10	14	14	15	15	16	16	17	18	22	21
South	22	31	32	32	32	32	31	31	30	28	30
Midwest	10	16	17	19	19	20	20	20	22	27	25
West	7	11	11	11	11	11	12	12	13	11	12
US Territories	8	2	2	1	1	1	1	1	1	1	1
International	44	26	24	23	22	20	20	20	16	11	11
Birth Region Missing	0	0	0	0	0	0	0	0	0	0	0
Avg. Annual Wage	52910	28860	37680	38410	45480	47870	52230	53060	56640	59170	27000
Avg. Share of Years with CZ	0	14	24	34	42	51	65	75	85	100	
Observations (thousands)	7111	313	463	408	294	1012	826	815	1185	18680	636

Outflows following shocks

	(1) ADH	(2) Bartik	(3) FMX
	Out-Migration Rate		
Shock to CZ	–0.007	–0.135**	–0.011*
	(0.008)	(0.047)	(0.006)
Shock to CZ, 1 year lag	0.001	–0.090*	–0.005
	(0.007)	(0.051)	(0.008)
Average shock to other CZs	–0.021	0.329	–0.071***
	(0.026)	(0.215)	(0.023)
Average shock to other CZs, 1 year lag	–0.050*	0.201	–0.070***
	(0.028)	(0.246)	(0.023)
Constant	3.720***	3.798***	3.694***
	(0.007)	(0.067)	(0.005)
N	12359	12359	12359
r2	0.8949	0.8958	0.8957

Inflows following shocks

	(1) ADH	(2) Bartik	(3) FMX
	In-Migration Rate		
Shock to CZ	0.017	0.153***	–0.004
	(0.013)	(0.031)	(0.009)
Shock to CZ, 1 year lag	0.011	0.190***	0.004
	(0.008)	(0.047)	(0.016)
Average shock to other CZs	–0.030*	0.103	0.000
	(0.017)	(0.084)	(0.012)
Average shock to other CZs, 1 year lag	0.003	0.196	0.023
	(0.022)	(0.132)	(0.017)
Constant	3.688***	3.793***	3.685***
	(0.006)	(0.034)	(0.003)
N	12359	12359	12359
r2	0.9323	0.9352	0.9322

Future study

- Explore asymmetry (positive/negative and quantiles) and role of CZ-level characteristics in population flows after shocks
- Analyze additional local shocks: oil shocks, plant closures

Conclusion

- We compare several commonly studied local demand shocks using a uniform empirical approach to defining shocks and measuring subsequent outcomes.
- We find:
  - Import shocks are small and spatially concentrated
  - Export shocks are larger but related to the common Bartik employment shock
  - Other issues: pre-trends in one time trade shocks, no response to trade shocks in high quality migration flows data
- Illusion of robustness? I'm a little concerned.

Thank you!

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What could account for these different migration responses?

- “Shocks” themselves are not equivalent as measured
  - Affect different workers
  - Affect different places
  - Differentially arbitrageable (industry vs local mix)
- Information frictions mean that the appropriate response to some shocks less clear than others
- Estimating frameworks or construction details are not equivalent
- Secular decline in migration responses driven by outside factor

Data goals

- Unified data set containing:
    1. Shocks as constructed in prior studies
    2. Rich information on location characteristics
    3. Outcomes for migrants and non-migrants, and rich characteristics on them

- Space and time coverage that allows:
    1. Aggregating over space and time to match prior studies
    2. Re-estimation of earlier specifications more limited on one or the other

Measured demand shocks in our CZ-year data

Time- and space-varying shift-share shocks: Industry level shifts, weighted by local industry employment in a base period.

- Dollars of Chinese imports per worker (ADH)
- Value of Chinese imports as a share of US demand (AADHP)
- Value of exports to ROW as a share of US production (FMX)
- Percentage points of employment growth, less local contribution (Bartik)
- Education specific pp of employment growth, less local contribution (Wozniak)
- Resource shocks (Wilson, Allcott et al.)

Space-varying one-time shocks:

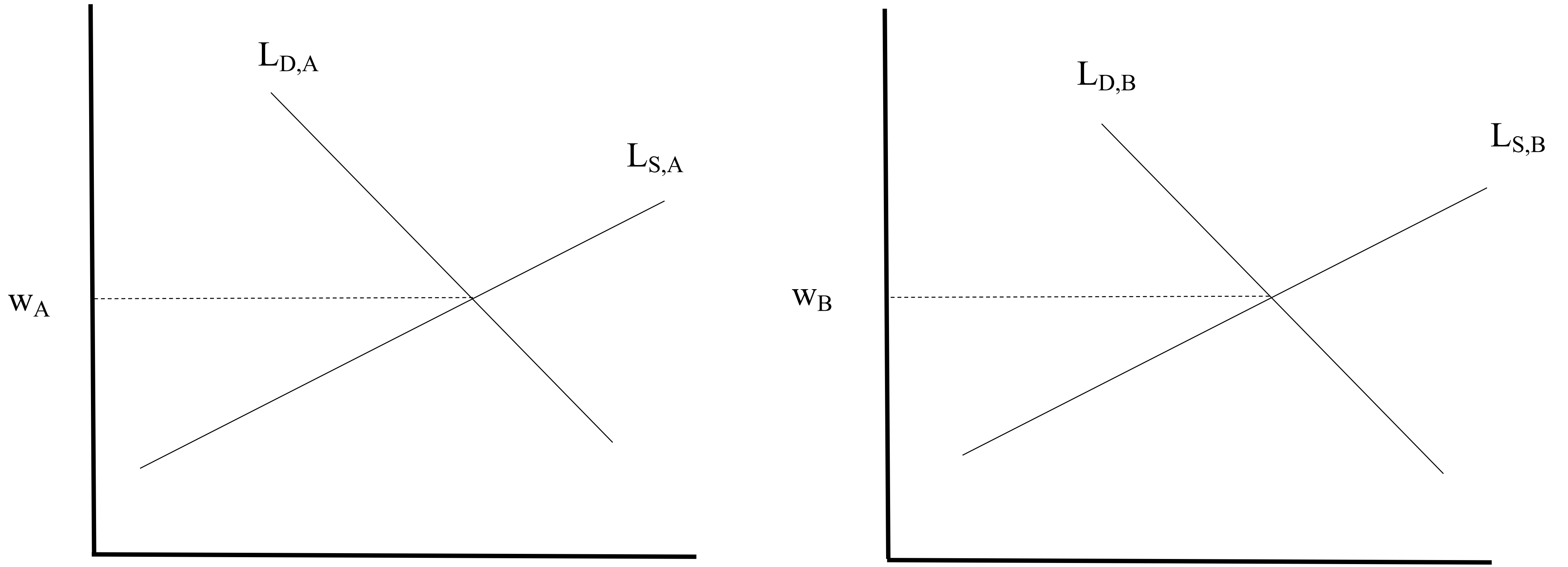
- Great Recession unemployment spikes (Yagan)
- Tariff gap with China in 2000 (Pierce & Schott)
- Mass layoffs (Foote & Huff-Stevens)

Shock definitions

Implicit expectations

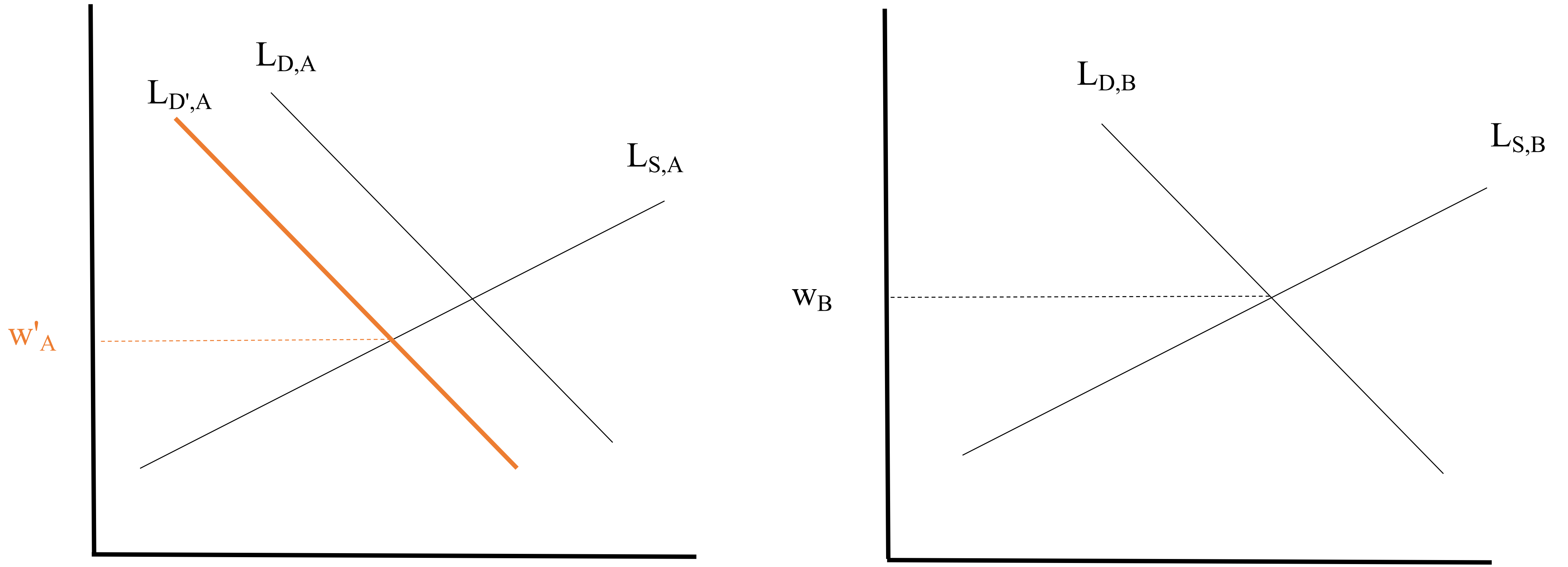
- Local shocks unrelated to one another across space and time
  - Correlations
  - Regression
- Limited persistence of shocks over time within place (no autocorrelation)
  - Regression
  - Heat map analysis of repeat shocks

Simple spatial equilibrium framework

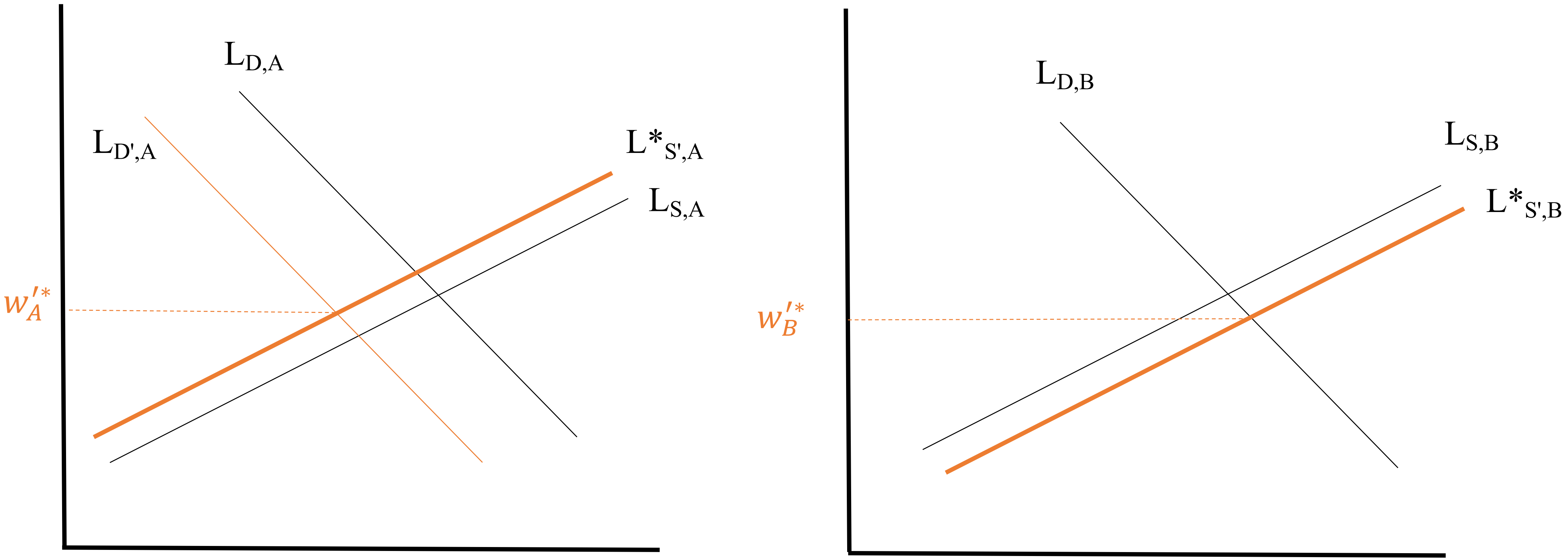


Equilibrium defined by $w_A / w_B = f(a_A, a_B, r_A, r_B)$

Simple spatial equilibrium framework



Simple spatial equilibrium framework



Such that $\frac{w_A'^*}{w_B'^*} = \frac{w_A}{w_B}$.

What actually happens

Known for some time that migration fails to fully equilibrate local shocks

- Older (Lkhagvasuren 2012)
- More recent (Amior and Manning forthcoming; Heise and Porzio 2019)

Also known for some time that migration is declining in the US

- Applies to migration in response to shocks (Partridge et al. 2008; Dao et al. 2017; Molloy and Smith 2019)

Learned recently but not as widely recognized

- Different shock measures followed by different migration responses
- Participation margin is important

Construction details could matter for different responses in the literature

- Annual versus decadal time periods
- Base periods
- Geographic aggregation
- Years of observation
- Logs versus levels

Open questions about when and how migration in response to local shocks occurs.

- **Why do different demand shock measures lead to different migration responses?**
- If we can generate a comparable set of shocks, is migration determined more by place factors or person factors, or secular changes?
- Is the decline in migration responsiveness to shocks explained by changes in the shocks themselves? Or something else?
- What happens to migrants after they move? Can we estimate a causal impact?
- More general equilibrium question: Would increasing migration enhance aggregate welfare?

Much recent concern about how to assist workers and families in economically low performing places.

- Brookings Institution. “Jobs for the Heartland: Place-Based Policies in 21st-Century America.” (Austin, Glaeser, Summers 2018)

- Upjohn Institution. “Should We Target Jobs at Distressed Places, and If So, How?” (Bartik 2019)
    - Frames the policy choice as “jobs-to-people or people-to-jobs”

- Richard Florida. “Don’t Move People Out of Distressed Places. Instead, Revitalize Them.” (2019)

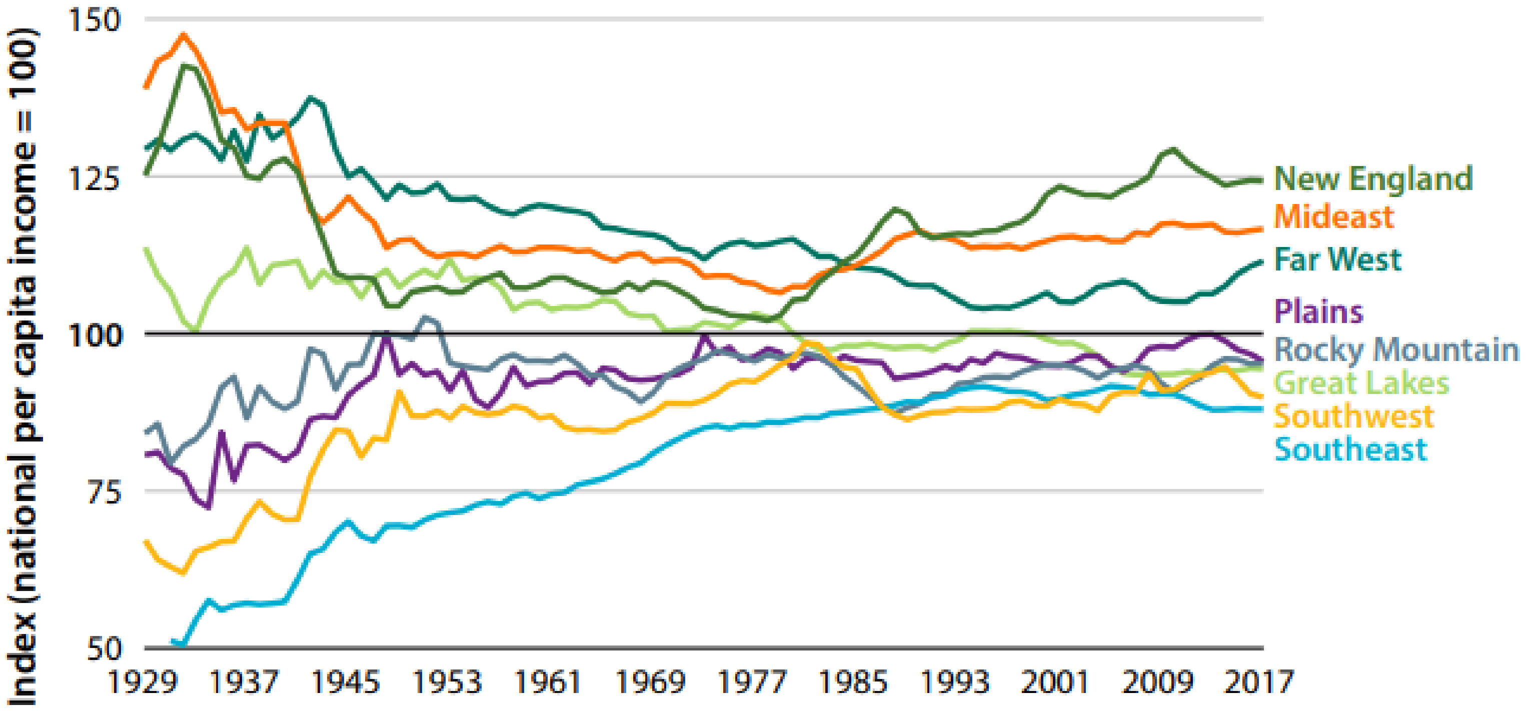
- 2017 TCJA created Opportunity Zones tax incentives for place-based investments in distressed areas.

This concern is motivated by two facts.

- Divergence in performance, growth across places (Moretti 2012)
- Documented large and persistent impacts of local economic shocks on later outcomes for residents (Schwandt and von Wachter 2019; Wozniak 2010)

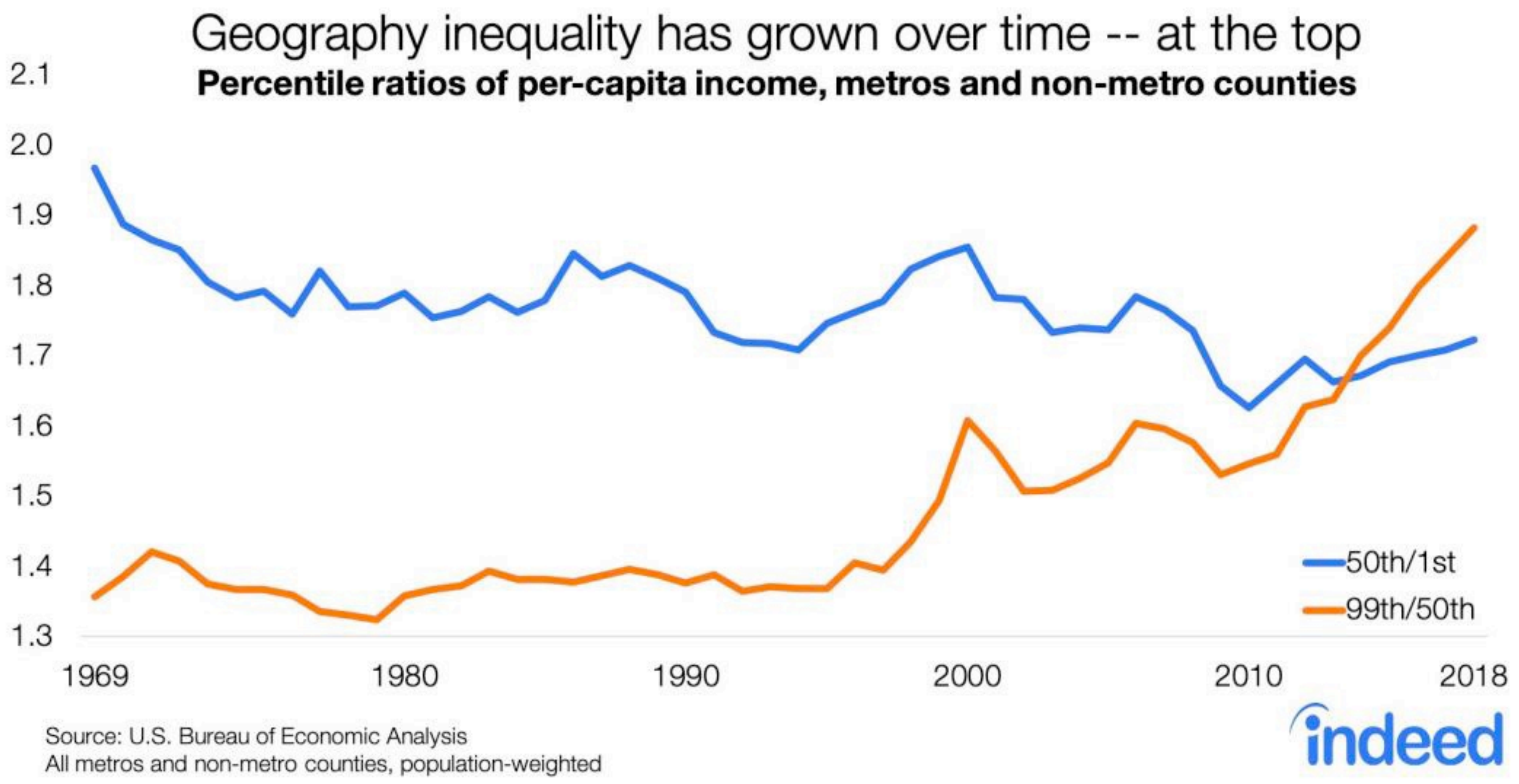
FIGURE 2.

Per Capita Income Relative to the National Average by Region, 1929–2017



Source: BEA 1929–2018; authors' calculations.

Note: Regions are BEA regional categories.



Geography inequality has grown over time -- at the top
Percentile ratios of per-capita income, metros and non-metro counties
2.1
2.0
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1969
1980
1990
2000
2010
2018
50th/1st
99th/50th
Source: U.S. Bureau of Economic Analysis
All metros and non-metro counties, population-weighted
indeed

Specifics of shock construction

Autor, Dorn, Hansen (AER 2013) dollars of Chinese imports per industry worker

$$\Delta IPW_{it} = \sum_j \frac{L_{ij\bar{t}}}{L_{i\bar{t}}} \frac{\Delta M_{jt}}{L_{jt}}$$

- M is the value of imports from China in industry j, L is employed workers in the i-j-t unit
- i represents commuting zones, t denotes time period, $\bar{t}$ is a base period, and j denotes industry

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Specifics of shock construction

Acemoglu, Autor, Dorn, Hansen, Price (2016) share of Chinese imports in value of total base period industry demand (consumption)

$$\Delta Ishare_{it} = \sum_j \frac{L_{ij\bar{t}}}{L_{i\bar{t}}} \frac{\Delta M_{jt}}{Y_{j91} + M_{j91} - X_{j91}}$$

- M is the value of imports from China in industry j, denominator is value of base period demand (Y + M – X) in the i-j-t unit
- i represents commuting zones, t denotes time period, $\bar{t}$ is a base period, and j denotes industry

Specifics of shock construction

Feenstra, Ma, Xu (2017) AADH ***plus*** share of ROW exports in value of total base period industry production

$$\Delta Xshare_{it} = \sum_j \frac{L_{ij\bar{t}}}{L_{i\bar{t}}} \frac{\Delta X_{jt}}{Y_{j91}}$$

- X is the value of exports to China in industry j, denominator is value of base period output Y in industry j
- i represents commuting zones, t denotes time period, $\bar{t}$ is a base period, and j denotes industry

Specifics of shock construction

Bartik (1991; plus many others thereafter) national component of local employment growth

$$\Delta emp\_growth_{it} = \sum_j \frac{L_{ij\bar{t}}}{L_{i\bar{t}}} \frac{\Delta \tilde{L}_{jt}}{L_{jt}}$$

- L is employed workers in the i-j-t unit, $\tilde{L}$ removes i's own contribution
- i represents commuting zones, t denotes time period, $\bar{t}$ is a base period, and j denotes industry

Specifics of shock construction

Education-specific Bartik (Wozniak 2010) national component of local employment growth, weighted by education group intensiveness of industry

$$\Delta edgroup\_emp\_growth_{kit} = \sum_j \frac{L_{kij\bar{t}}}{L_{ki\bar{t}}} \frac{\Delta \tilde{L}_{jt}}{L_{jt}}$$

- L is employed workers in the subscripted unit, $\tilde{L}$ removes i's own contribution
- K represents (2) education groups, i represents commuting zones, t denotes time period, $\bar{t}$ is a base period, and j denotes industry

Specifics of shock construction

Tariff Gap (Pierce and Schott 2016) Difference between normal trade relation and non-NTR tariff rate on Chinese imports

$$\Delta tariff\_gap_i = \sum_j \frac{L_{ij\bar{t}}}{L_{i\bar{t}}} (\tau_{NON} - \tau_{NTR})_j$$

- L is employed workers in the i-j-t unit, τ is the non-NTR or NTR (WTO status) industry tariff
- i represents commuting zones, t denotes time period, $\bar{t}$ is a base period, and j denotes industry

Specifics of shock construction

Yagan (2019) percentage point change in CZ unemployment rate over the Great Recession

$$\Delta unemp\_GR_i = u_{i,2009} - u_{i,2007}$$

- u is commuting zone level unemployment rate
- i represents commuting zones