Area and shift-share approach

UniTo, Labor Economics Part II
Christoph Albert

Lecture 6

Agenda

Area and Shift-Share Approach

- Area approach
- Shift-share instrumental variables
- Recent methodological contributions on shift-share IVs

Area studies

Area approach: Many studies use areas (regions/states/cities/etc) as primary unit of analysis. Examples:

1. Blanchard and Katz (1992)
2. Card (1990)

Shift-share instruments: Often, this area approach is combined with "shift-share" or "Bartik" instrumental variables. We consider:

- Classic applications
- Recent methodological contributions

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Example: Blanchard and Katz (1992)

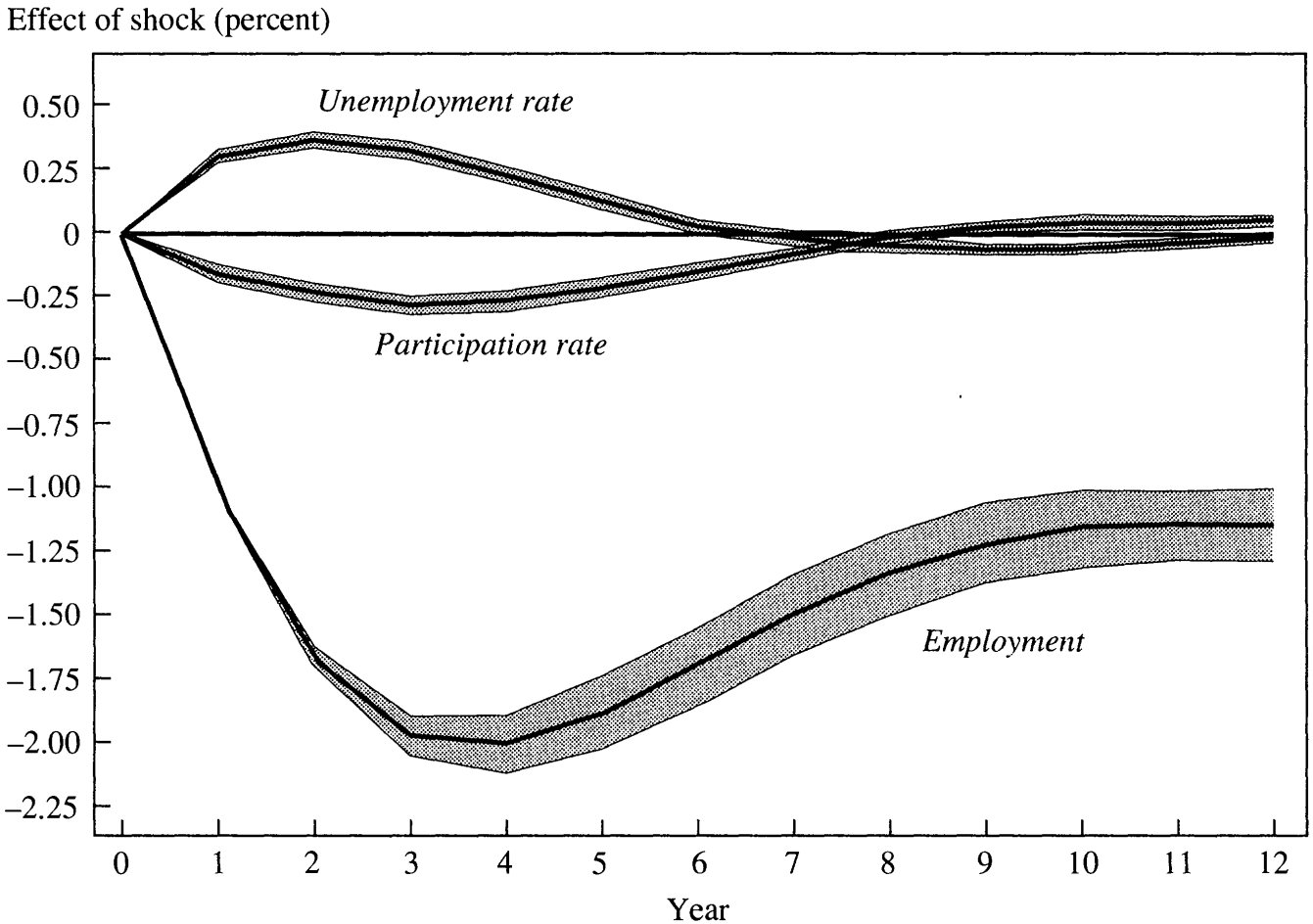
Blanchard, and Katz (1992), "Regional Evolutions." Brookings Papers on Economic Activity

- How do regions adjust to adverse economic shocks – more specifically, local *demand* shocks?
- Consider joint movement of employment, unemployment, wages and prices
- Assume that transitory variation in employment are primarily caused by shifts in labor demand ($\rightarrow$ no instrument needed)

Implementation: Vector auto-regressions (VAR) on state-year level ($\rightarrow$ lecture on labor demand shocks)

Example: Blanchard and Katz (1992)

Figure 7. Response of Employment, Unemployment, and Labor Force Participation to an Employment Shock



Source: Authors' calculations based on the system of equations described in the text, using data described in the appendix. All 51 states are used in the estimation. The shock is a −1 percent shock to employment. Bands of one standard error are shown around each line.

Example: The Mariel Boatlift

What is the impact of migration on native labor market outcomes?

- Difficult question, because immigrants tend to locate where the economy is doing well (reverse causality).

Card, D. (1990) "The Impact of the Mariel Boatlift on the Miami Labor Market." Industrial and Labor Relations Review

- In 1980, an unexpected change in political conditions led to a sudden emigration wave from Cuba (the "Mariel Boatlift"), raising Miami's labor supply by 7 percent.
- Difference-in-differences, comparing Miami to four comparison cities ($\rightarrow$ lecture on migration and labor supply shocks)

Example: The Mariel Boatlift

Table 3. Logarithms of Real Hourly Earnings of Workers Age 16–61 in Miami and Four Comparison Cities, 1979–85.

Group	*1979*	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*
Miami:							
Whites	1.85	1.83	1.85	1.82	1.82	1.82	1.82
	(.03)	(.03)	(.03)	(.03)	(.03)	(.03)	(.05)
Blacks	1.59	1.55	1.61	1.48	1.48	1.57	1.60
	(.03)	(.02)	(.03)	(.03)	(.03)	(.03)	(.04)
Cubans	1.58	1.54	1.51	1.49	1.49	1.53	1.49
	(.02)	(.02)	(.02)	(.02)	(.02)	(.03)	(.04)
Hispanics	1.52	1.54	1.54	1.53	1.48	1.59	1.54
	(.04)	(.04)	(.05)	(.05)	(.04)	(.04)	(.06)
Comparison Cities:							
Whites	1.93	1.90	1.91	1.91	1.90	1.91	1.92
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)
Blacks	1.74	1.70	1.72	1.71	1.69	1.67	1.65
	(.01)	(.02)	(.02)	(.01)	(.02)	(.02)	(.03)
Hispanics	1.65	1.63	1.61	1.61	1.58	1.60	1.58
	(.01)	(.01)	(.01)	(.01)	(.01)	(.01)	(.02)

Note: Entries represent means of log hourly earnings (deflated by the Consumer Price Index—1980 = 100) for workers age 16–61 in Miami and four comparison cities: Atlanta, Houston, Los Angeles, and Tampa–St. Petersburg. See note to Table 1 for definitions of groups.

Area studies: Methodological challenges

Many empirical literatures rely heavily on the area approach for causal identification.

They all face similar methodological challenges:

- How to isolate exogenous variation in the "treatment" of interest ($\rightarrow$ shift-share instrumental variables)?
- Spatial correlaction: How to account for spatial correlation of shocks
- Spillovers: local shocks might affect other regions because of population movements or other types of GE adjustments? $\rightarrow$ Lecture on Demand Shocks
- Aggregate impacts: How informative are local impacts about aggregate or national treatment effects?

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Quasi-experiments and shift-share instruments

One important development in empirical research is the increased popularity of "natural" or "quasi-experiments", in which we exploit a seemingly random event to learn about causal effects.

But:

- quasi-experiments, such as Card's *"Mariel Boatlift"*, are rare
- and often generate only limited variation

Can we isolate exogenous variation more systematically?

- Shift-share instruments are a specific class of instrumental variables, which can be constructed in many settings
- Shift-share IVs are popular but controversial

Shift-share variables

Consider regression

$$y_l = \alpha + \beta x_l + \varepsilon_l$$

where y_l is an outcome, x_l is a regressor of interest for area l.

Shift-share instruments combine "local shares" z_{lk} and "aggregate shifts" g_k,

$$z_l = \sum_k z_{lk} g_k$$

where l is typically location and k might be industry/demographic groups/ ...

Classic examples:

- "Bartik instrument" for labor demand shocks (Bartik, 1991)
- "Card instrument" for labor supply shocks (Card 2001)

The Bartik instrument for local demand shocks

Bartik (1991) predicts the area-level employment growth that we would expect given the area's industrial composition, had each industry grown at the national rate.

Bartik instrument for area l at time t

$$z_{lt} = \sum_k z_{lkt-1} g_{kt}$$

where k is industries or sectors, z_{lt} is (log) employment growth in location l and period t, z_{lkt-1} is local industry structure in the previous period, and g_{kt} is the national-level employment growth in industry k

The Card instrument for local supply shocks

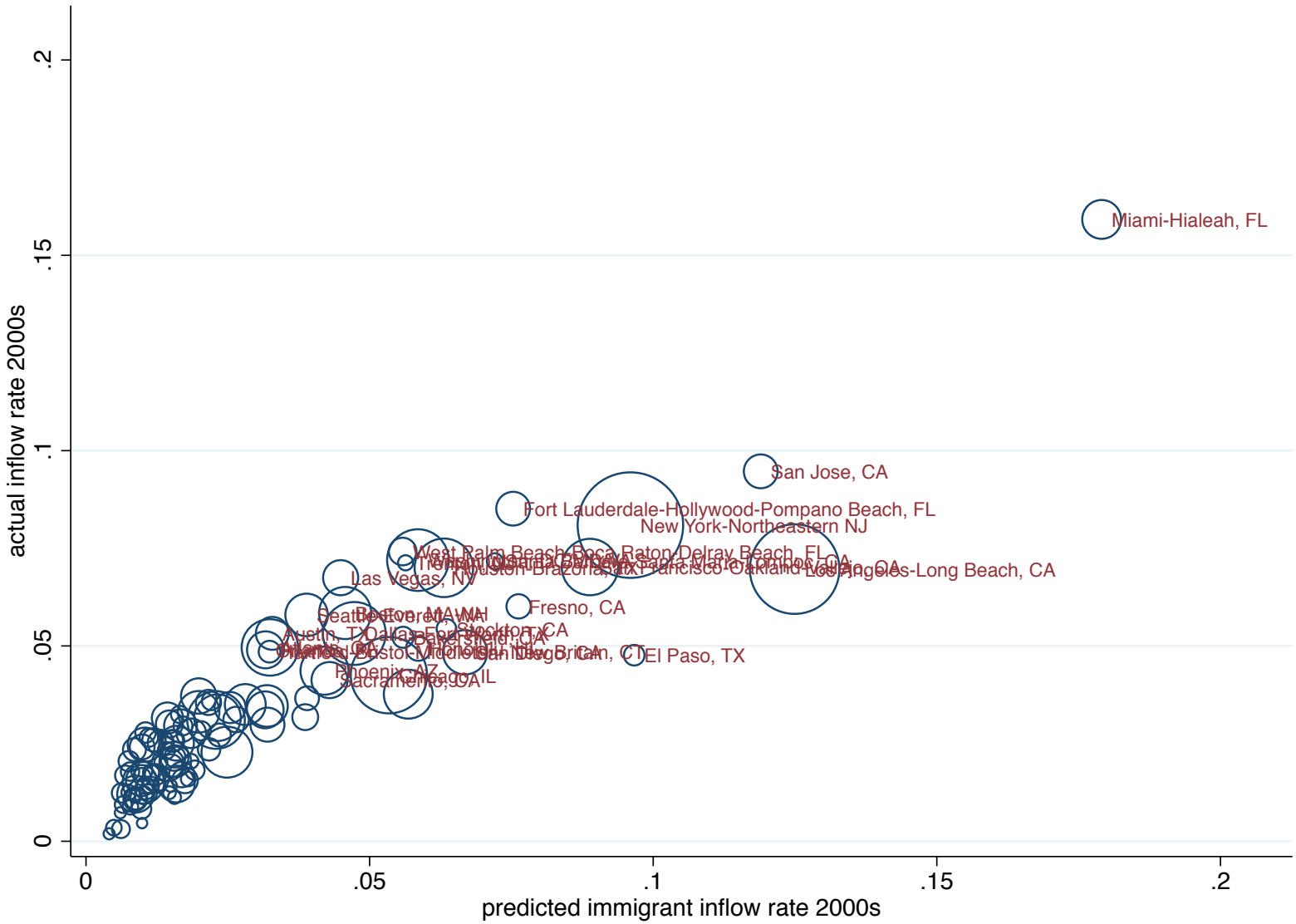
Card (2001) predicts the area-level immigrant inflow rate that would have occurred if new immigrant arrivals distribute according to their past distribution across locations.

Card instrument (or past settlement instrument, enclave instrument, etc) for area l at time t

$$z_{lt} = \left(\sum_k \frac{M_{lkt^0}}{M_{kt^0}} \Delta M_{kt} \right) / L_{lt-1}$$

where k is origin group (e.g. Cubans, Mexicans), t^0 is some base period (with $t^0 < t$), ΔM_{kt} is the number of new arrivals from origin group k on the national level, and $\frac{M_{lkt^0}}{M_{kt^0}}$ is their distribution across locations in the base period.

Figure: The past settlement IV in U.S. Census data (JRS, 2018)



Area and shift-share IV approach

"Shift-share" IV approach is becoming increasingly popular, partly because the "area approach" is increasingly popular:

- Sometimes, we are specifically interested in regions (e.g. in regional mobility, regional inequality ... $\rightarrow$ urban economics)
- But often, regional focus is just a workaround to achieve identification

Examples:

- Blanchard and Katz (1992) is primarily about regions. Main question is how regions adjust.
- Card (1990) is not primarily about regions. Main question is how immigration affects the overall economy.

Shift-share IV approach

Area and shift-share IV approach are becoming increasingly popular.

Why **shift-share instruments**?

- Straightforward way to isolate plausibly exogenous variation on the local level.
- Basic idea: Local areas are differently exposed to aggregate (national) shocks

Shift-share instruments becoming increasingly popular in many different literatures. Classic examples:

- Labor demand (Bartik (1991)
- Immigration and labor supply (Card 2001)

Shift-share IV approach: Some recent examples

- Trade reform (Kovak 2013)
- Foreign aid (Nunn and Qian 2014)
- Credit supply (Greenstone, Mas, and Nguyen 2015; Bentolila, Jansen, and Jiménez 2018)
- Portfolio allocation (Calvet, Campbell, and Sodini 2009)
- Market size (Acemoglu and Linn 2004)
- Judge leniency (Kling 2006)
- Import prices on firm level (de Roux et al. 2017, Piveteau and Smagghue 2017)
- Automatization of routine tasks (Autor and Dorn 2013)
- Robotization (Acemoglu and Restrepo 2017, Graetz and Michaels 2017)
- Local fiscal multipliers (Chodorow-Reich 2017)

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Area and shift-share IV approach

Despite their popularity, shift-share IVs remain controversial:

- Often vague motivation; "off-the-shelves" instrument, which researchers use when they don't have better ideas (?)

Recent methodological contributions on the shift-share approach:

1. Identifying assumptions [in static setting]
   - Goldsmith-Pinkham, Sorkin and Swift (2020)
   - Borusyak, Hull and Jaravel (2022)
2. Inference
   - Adão, Kolesár and Morales (2019)
   - Borusyak and Hull (2022)
3. Serial correlation in dynamic setting [in immigration context]
   - Jaeger, Ruist and Stuhler (2018)

Identifying assumptions

Under which conditions are shift-share instrument z_l valid?

If our regression of interest is

$$y_l = \alpha + \beta x_l + \varepsilon_l$$

we need exclusion restriction $E[z_l \varepsilon_l] = 0$. When is this condition satisfied? Two alternative motivations:

- Goldsmith-Pinkham, Sorkin and Swift (2020): "*Exogeneity of the shares*"
- Borusyak, Hull and Jaravel (2022): "*Exogeneity of the shifts*"

Goldsmith-Pinkham, Sorkin and Swift (2020)

Goldsmith-Pinkham, Sorkin and Swift (2020):
"Exogeneity of shares"

1. Argue that **each** of the industry shares must be exogenous (i.e. $E[z_{lk}\varepsilon_l] = 0$)
2. Propose to directly use industry shares as instruments instead of constructing conventional shift-share instrument

For example

- Share of Cuban immigrants uncorrelated with demand shocks
- Share of oil industry uncorrelated with local supply shocks

Exogeneity of shares assumption critizised by Bartik as well as Borusyak, Hull and Jaravel (2022)

Borusyak, Hull and Jaravel (2022)

Borusyak, Hull and Jaravel (2022) note that

- Exogeneity of shares is only a sufficient, not a necessary condition for instrument exogeneity
- Is not how we would motivate a shift-share instrument in most settings
- Shift-share instruments can be valid even if exogeneity-of-shares assumption fails ($E[z_{lk}\varepsilon_l] \neq 0$), if we have many aggregate shifts ("**exogeneity of shifts**").

Borusyak, Hull and Jaravel (2022)

However, the "exogeneity of shifts" argument by Borusyak, Hull and Jaravel (2022) relies on having "many shifts", while many applications are based on only a small number of shifts:

- E.g. certain industries in the Bartik IV case, or certain immigrant groups in the past settlement IV case
- For many literatures, neither the Goldsmith-Pinkham et al. nor the Borusyak et al. argument fit well

Focus on asymptotic consistency in GPSS '20 and BJL '22 might be overly ambitious:

- Do we really believe that our estimator converges to the true causal effect if the # of regions or # of shifts grow large?
- Alternative view: interpret applications as "case studies" and focus on unbiasedness rather than consistency?

Problem 2: Inference for shift-share IVs

Need to account for the clustered structure of the treatment:

- Often treatment varies on a more aggregate level than the outcome of interest
  Example: Mariel Boatlift
- Need to adjust standard errors for such "clustering"
  See Abadie, Athey, Imbens and Wooldridge (2017), "When should you adjust standard errors for clustering?", ArXiV Working Paper
- Straightforward when there are many clusters, but becomes trickier when there are few (treated) clusters
  Example: Mariel Boatlift = one treated cluster
- Shift-share instruments have a clustered structure as well

Problem 2: Inference for shift-share IVs

Adão, Kolesár and Morales (2019) note that shift-share instruments have inherently a clustered structure:

- For example, areas with a similar Bartik value have a similar industry structure, and areas with a similar predicted immigrant inflow have a similar demographic structure
- "Treated units" are therefore likely subject to other common shocks, apart from the shock of interest captured by the shift-share instrument
- Develop clustering methods to address this problem (available in Stata package *ivreg_ss*)

A related paper is Borusyak and Hull (2023, Econometrica), "Non-Random Exposure to Exogenous Shocks: Theory and Applications"

Problem 3: Shift-share IVs in dynamic setting

Jaeger, Ruist, Stuhler (2018) consider the use of shift-share instruments in **dynamic** settings:

(1) Shift-share instruments tend to be serially correlated, because

- Local shares are always highly serially correlated
- Require aggregate shock to break serial correlation

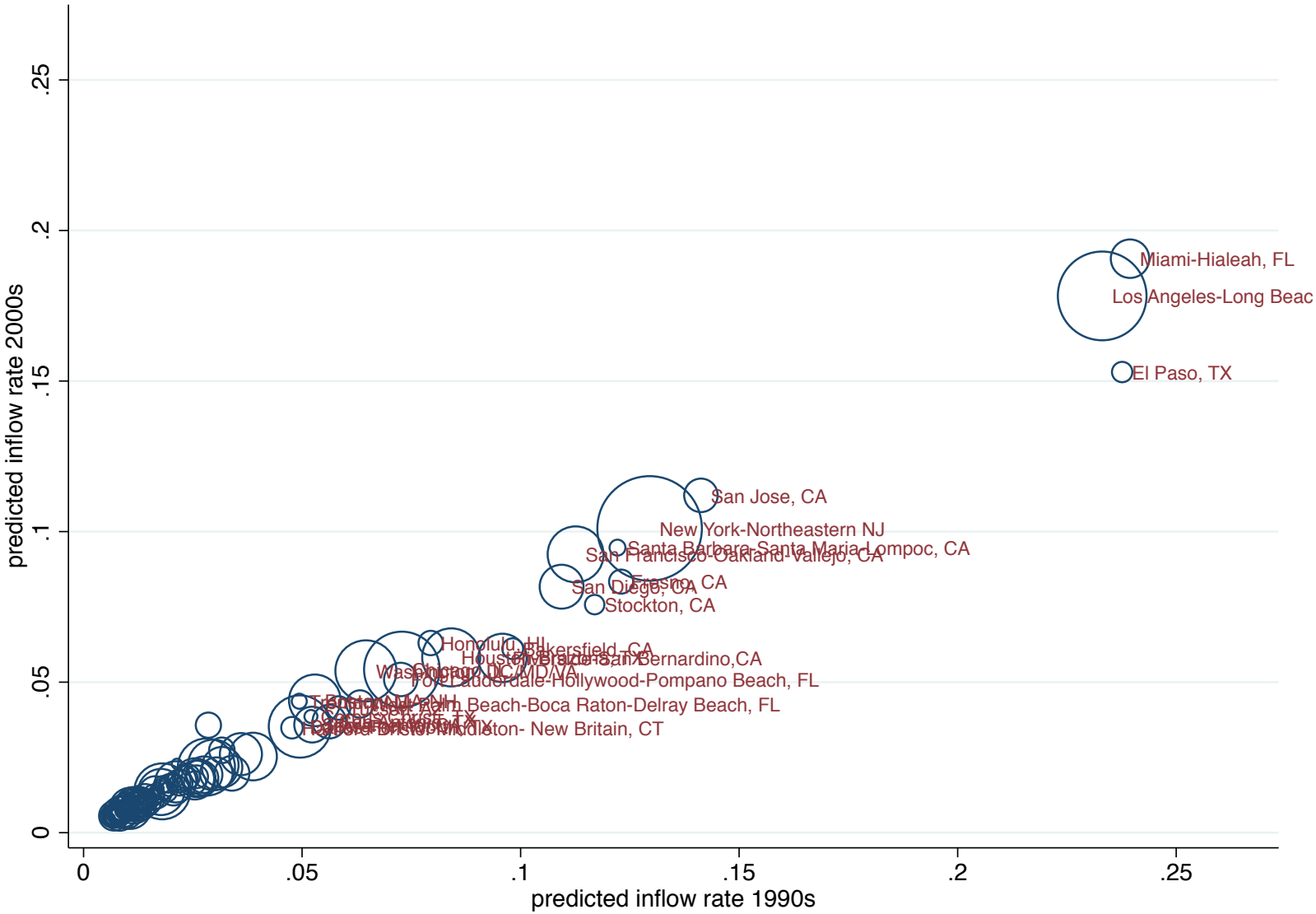
(2) Short-run $\neq$ long-run response ($\rightarrow$ dynamic treatment effect)

- Over time, local labor markets might adjust to demand/supply/trade-import shocks

Together, (1) + (2) invalidate conventional shift-share approach (in either GPSS or BJL setting). Example: Past settlement IV

$\rightarrow$ lecture on migration and labor supply shocks

Figure: The past settlement IV: 1990s vs 2000s



Readings

Recommended readings:

- Adão, Kolesár and Morales (2019)
- Bartik (1991), Appendix 4.2
- Amior and Manning (2018)