Ling, Wang, & Zhou

Granular Property Shocks and Commercial Real Estate Returns

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Chongyu Wang

The University of Hong Kong

Motivation

Private and public CRE returns

- Index level: Public → Private Nelling & Gyourko (1998)
- Firm level: Private → Public Ling et al. (2021)

Identification challenge

- *A causal relationship between returns in these two parallel markets?*

Overview

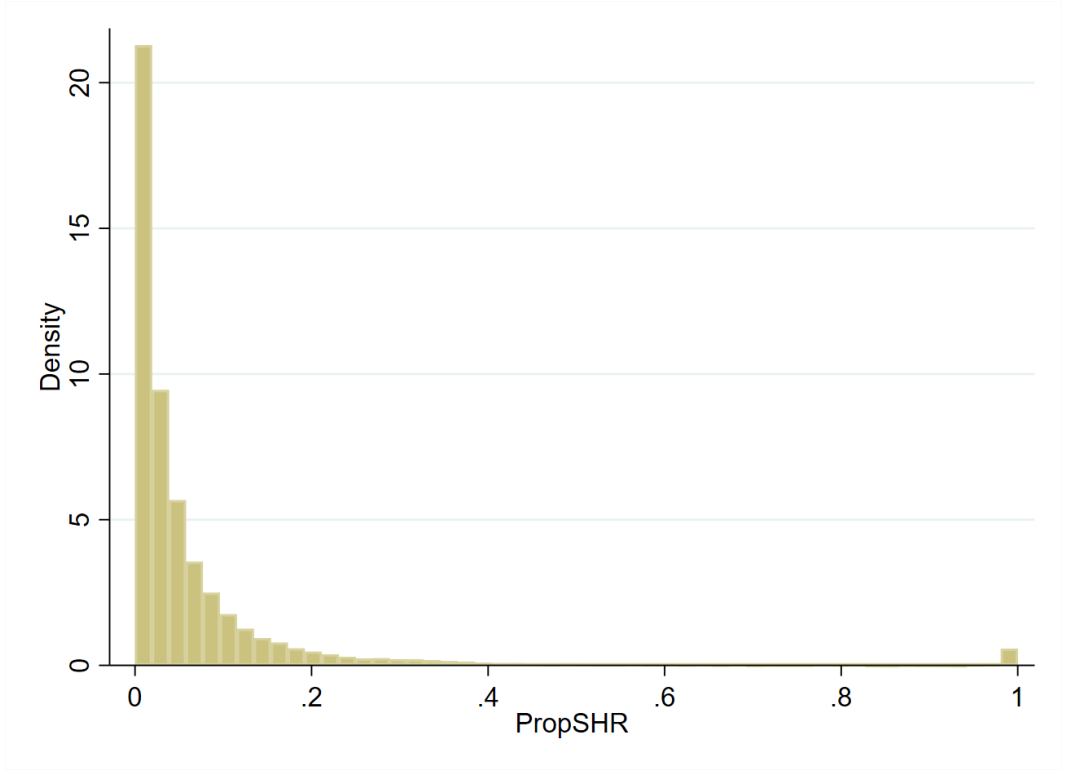
We develop a novel instrumental variable ("granular IV")

- Shocks to large markets may generate non-diversifiable "grains" Gabaix and Koijen (2020, 2021)

Instrumented private market shocks are associated with a rise in quarterly REIT returns

Granularity in CRE Markets, cont.

- A typical U.S. equity REIT invests 53% of its assets in its top-three MSAs
  - The MSA allocations of REITs are highly Skewed
  - Causing comovements in asset values and returns



Data

We combine quarterly data from several sources

(Time period: **2003** – **2018**)

1. **MSA-level analysis (4,051 obs)**
    i. NCREIF
    ii. BEA & BLS

2. **Firm-level analysis (3,423 obs)**
    i. S&P Global Real Estate
    ii. CRSP-Compustat Merged (CCM) database

MSA-level shocks (e_{izt})

MSA (z) level

$$NCREIF_{zt} = \beta' X_{zt} + \gamma_z + \delta_t + e_{izt}$$

- $NCREIF_{zt}$ Aggregate NCREIF NPI
- X_{zt} Time-varying controls (GMP growth, Income growth, etc.)
- γ_z & δ_t MSA FEs and time (quarterly) FEs
- e_{izt} "Idiosyncratic MSA shock"

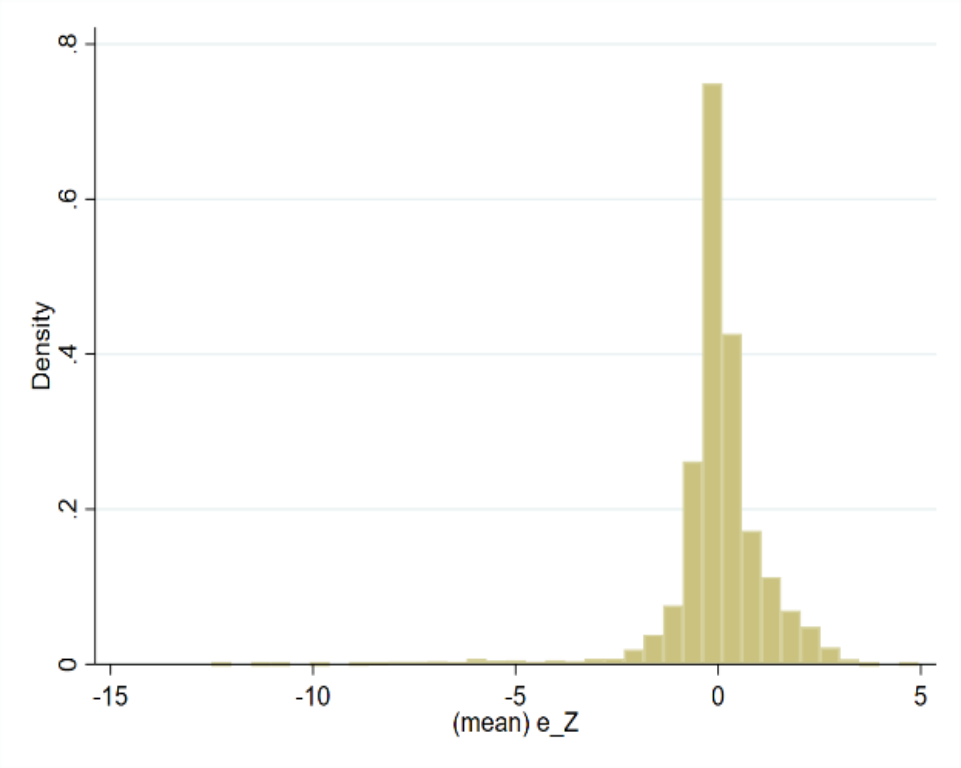
MSA-level Shocks, cont.

MSA-level shocks, e_{izt}

= Residuals from MSA-level regressions

MSA-level shocks are highly Skewed!

Large mass in the left tail

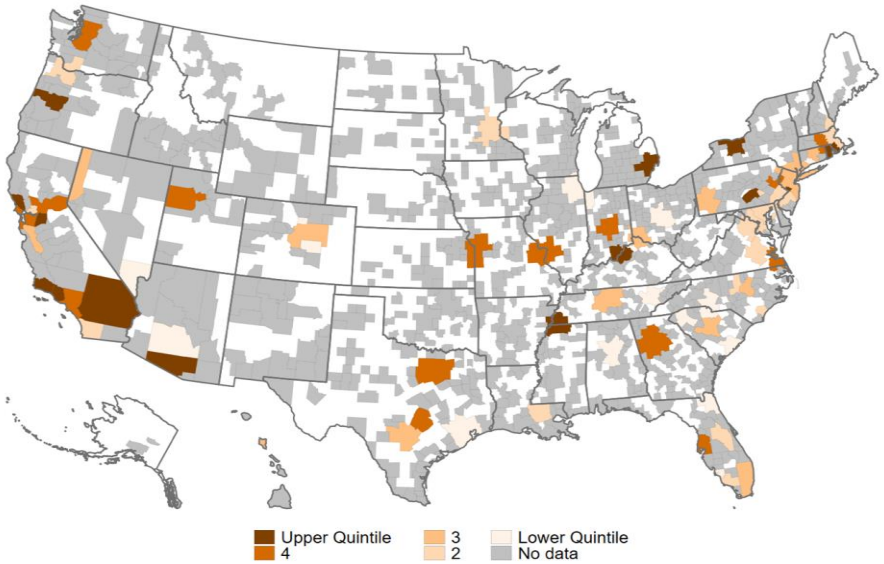


MSA-level Shocks, cont.

MSA-level shocks, e_{izt}

= Residuals from MSA-level regressions

Figure 3 highlights the importance of a few, large markets to REITs



Naïve Granular Property Shock (GPS)

- i: Firm 
- ~~Z: MSA~~
- t: Time 

Naïve GPS, cont.

- The average of MSA-level shocks (e_{izt})
  - Across all MSAs in which a REIT owns properties
  - Weighted by *PropSHR*, % Properties invested in MSA *z* (s_{izt})

- ***Naïve GPS*** $= \Sigma_z s_{izt} e_{izt}$

Naïve GPS, cont.

Firm (*i*) level

$$R_{it} = \boldsymbol{\beta Naïve\ GPS_{it}} + \alpha_i + \gamma_t + \delta' X + \boldsymbol{v_{it}}$$

- R_{it} Stock return
- X Return predictors (Size, B/M, etc.)
- α_i & γ_t Firm (or property type) FEs and time (quarterly) FEs
- $\boldsymbol{v_{it}}$ "Idiosyncratic firm shock"

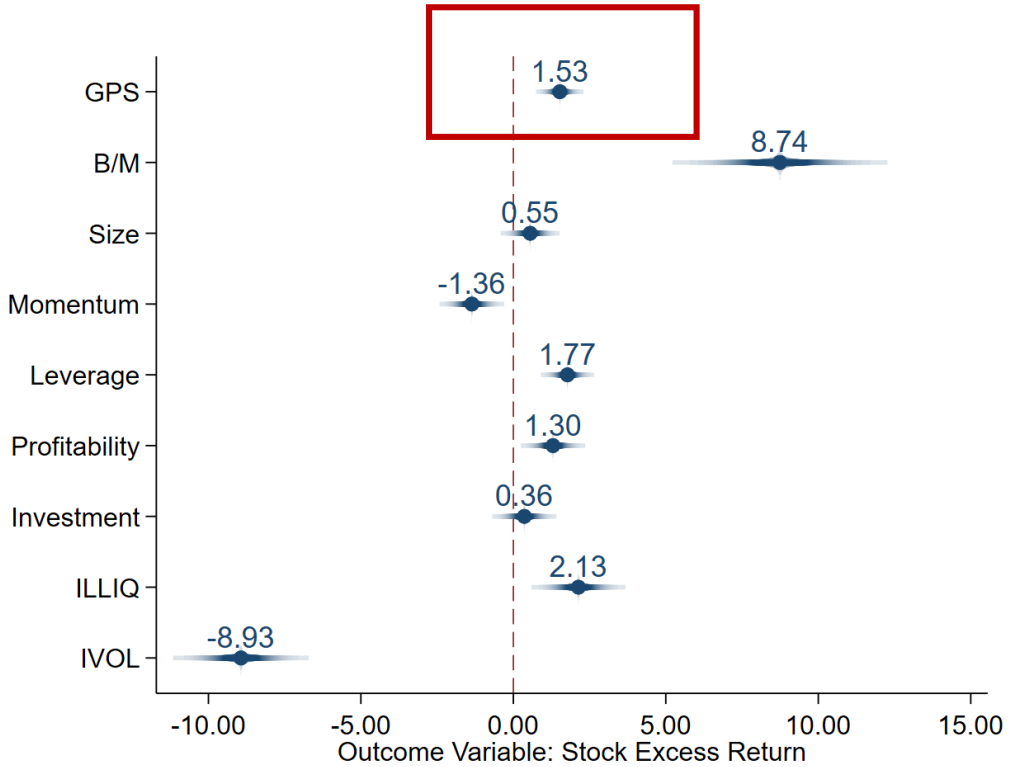
Naïve GPS, cont.

Firm-level regressions

All variables have 0 mean and 1 sd (same below)

1 sd shock ↓

→ Stock excess return **1.53%↓**



Endogeneity

MSA-level shocks ($\boldsymbol{e_{izt}}$) encompass…

- A component that *commoves* with the idiosyncratic firm shock ($\boldsymbol{v_{it}}$)
  - **Corr(*Naïve GPS*, v_{it})** = Corr($\Sigma_z s_{izt} e_{izt}$, v_{it}) **≠ 0!**
- A component that ONLY contains shocks to property markets ($\boldsymbol{u_{izt}}$)

Endogeneity, cont.

MSA-level shocks ($\mathbf{e_{izt}}$) equals…

$$e_{izt} = \boldsymbol{\delta_i v_{it}} + u_{izt}$$

- *Objective*: Purge out $\boldsymbol{v_{it}}$
- How? Estimate $\boldsymbol{u_{izt}}$

Granular Instrumental Variable (GIV)

With u_{izt}, we construct a valid instrument for GPS (Naïve)

- Scenario 1: No granularity, all MSAs have a similar effect on firm returns
  - A REIT will adopt **1/N** diversification (**portfolio risk = σ/sqrt(N)**)

GIV, cont.

With u_{izt}, we construct a valid instrument for GPS (Naïve)

- Scenario 1: No granularity, all MSAs have a similar effect on firm returns
  - A REIT will adopt 1/N diversification (portfolio risk = σ/sqrt(N))

- Scenario 2: Granularity, Rank-Size
  - Possibly **1/Log(N)** diversification (**portfolio risk = σ/sqrt(Log(N))**)

GIV, cont.

Based on those two scenarios, we have

$$\text{Granular instrument } (\boldsymbol{GIV}) = \boldsymbol{\Sigma_z (s_{izt}) u_{izt} - \Sigma_z (1/N_z) u_{izt}}$$

- *Naïve GPS* $= \Sigma_z \boldsymbol{s_{izt}} e_{izt}$ Corr(*GIV*, *Naïve GPS*) **≠ 0** **First stage** ✓
- $e_{izt} = \delta_i v_{it} + u_{izt}$ Corr(*GIV*, v_{it}) **= 0** **Exogeneity** ✓

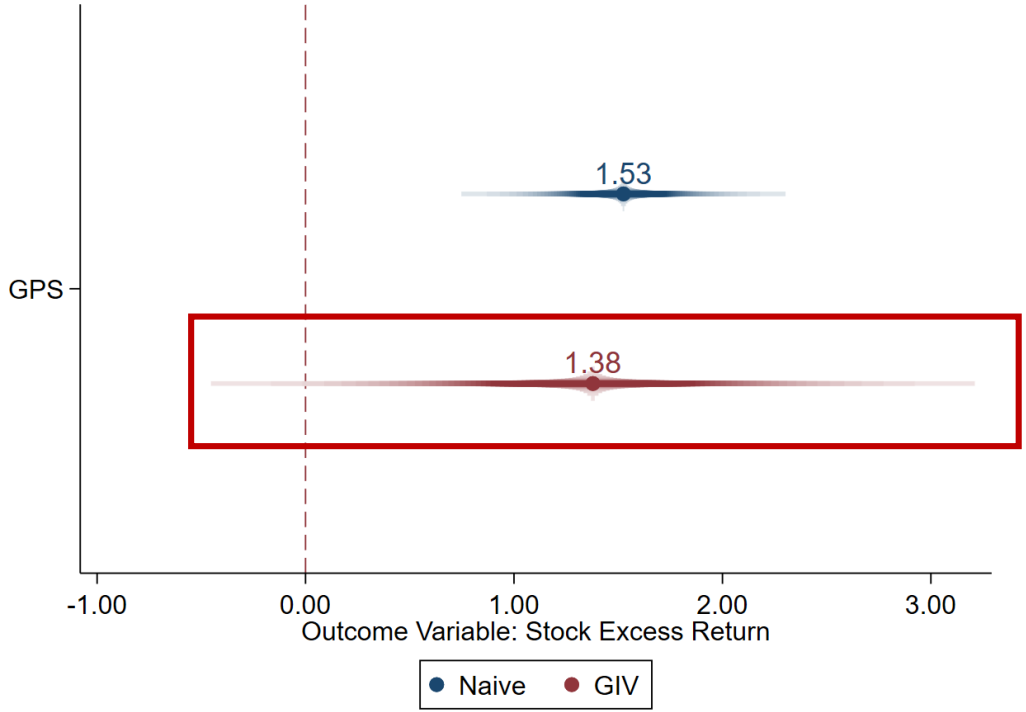
GIV, cont.

2SLS: Second-Stage results

Main takeaway?

a 1-std-dev shock to *GPS (IV)* affects REIT returns by 1.38%, about

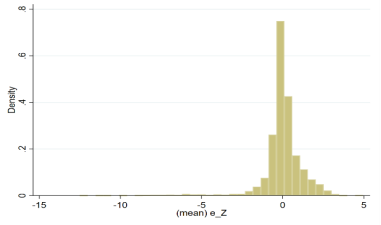
40% of its mean value



Channels

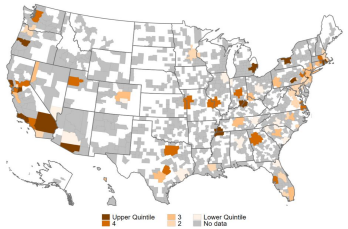
Negative shocks

- Asymmetric effects of GPS
- MSA-level shocks are **highly Skewed**
  - Large mass in the left tail



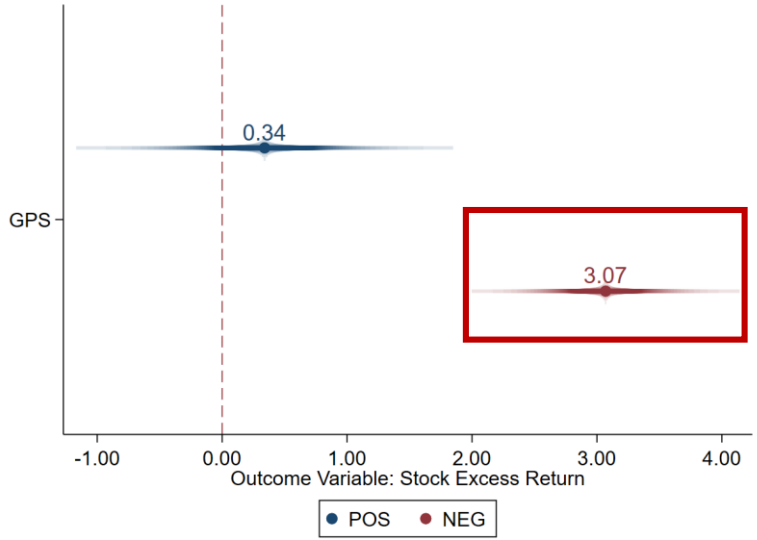
Shocks to Gateway Markets

- Shocks to large MSAs are not easily diversifiable.
- They also enjoy greater transparency and market depth.

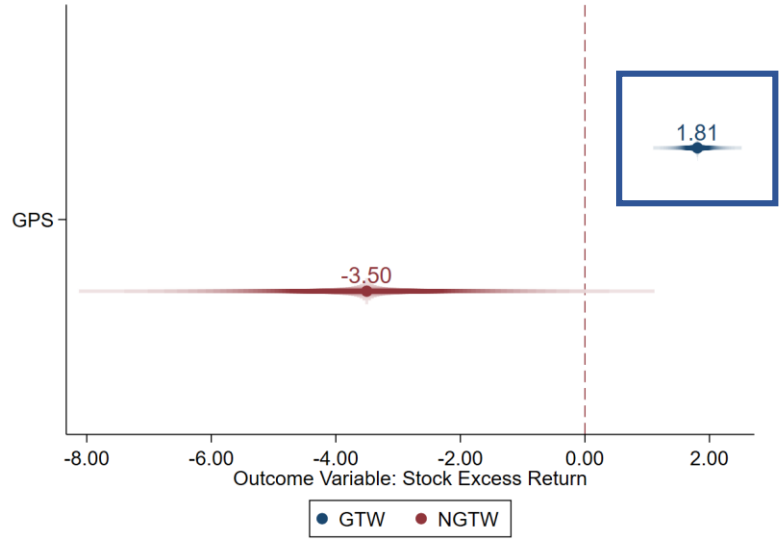


Channels, cont.

Negative shocks



Shocks to Gateway Markets



Channels, cont.

Price appreciation

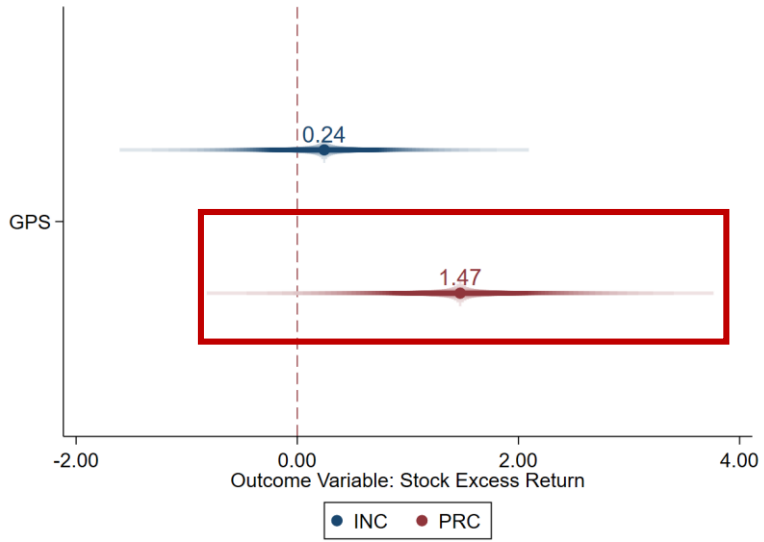
- CRE returns
- = Inc return + **Prc appreciation**
- Prc appreciation is highly sensitive to unexpected shocks to rents
  - The SD of Prc appreciation is about **5 times** its mean!

Liquidity

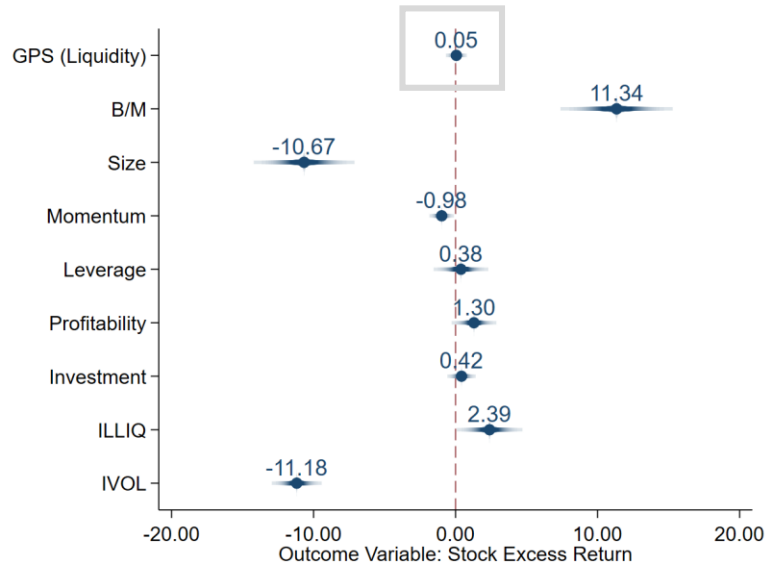
- Property and stock market liquidity are correlated.
- Construct GPS and GIV using NCREIF **property turnovers**.

Channels, cont.

Price appreciation



Liquidity? No…



Summary

- A typical U.S. equity REIT invests **53%** of its assets in its top-three MSAs
- A 1-std-dev change in instrumented GPS increase REIT returns by 1.38%, **40%** of its mean value
- Our results are driven by…
  - **Negative** shocks to MSAs
  - Shocks to large ("**gateway**") markets, and
  - Shocks to **price appreciation**

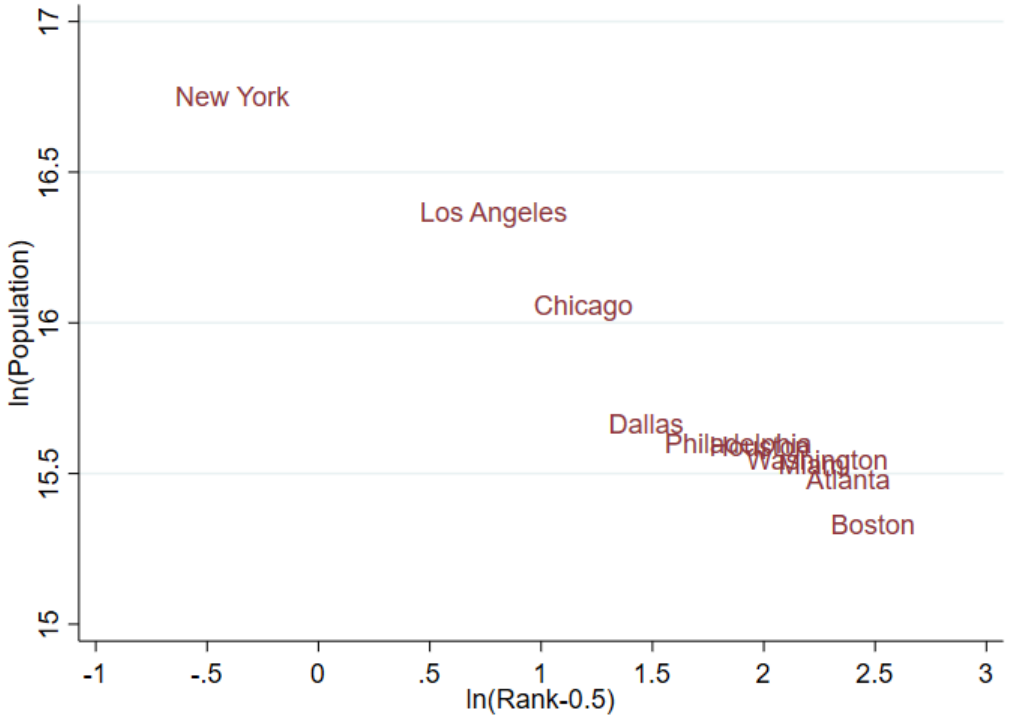
THANK YOU

Q&A

Appendices

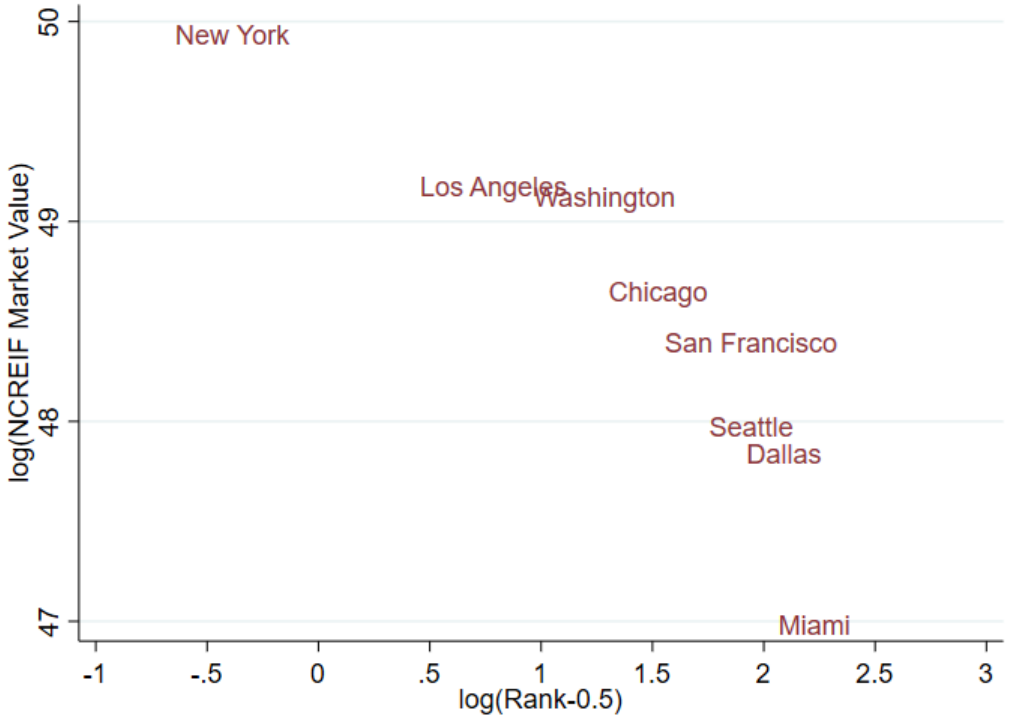
Appendix 1: Granularity in CRE Markets

- Concentration of population & diversification benefits
  - Gabaix (1999)



Appendix 2: Granularity in CRE Markets

- Concentration of CRE projects & diversification
  - Dombrowski et al. (2020)



Appendix 3: MSA-level shocks, cont.

- ***i*: Firm** 
- *Z*: MSA 
- *t*: Time 

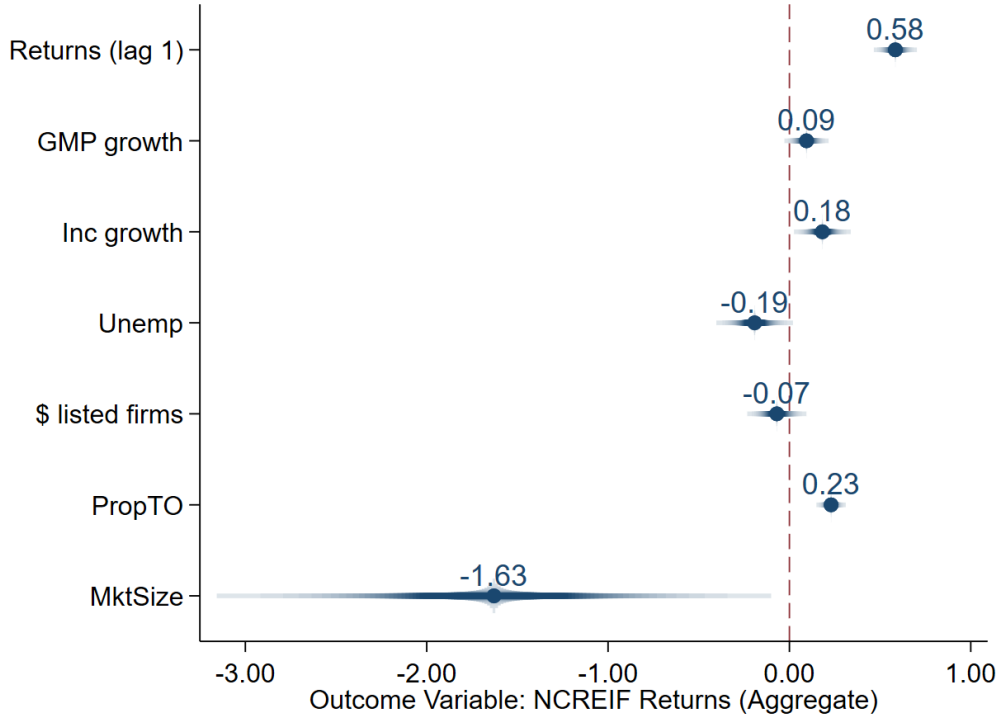
Appendix 4: MSA-level Shocks, cont.

Estimate MSA-level shocks

MSA (*z*) FEs & Year-Qtr FEs (*t*) are included

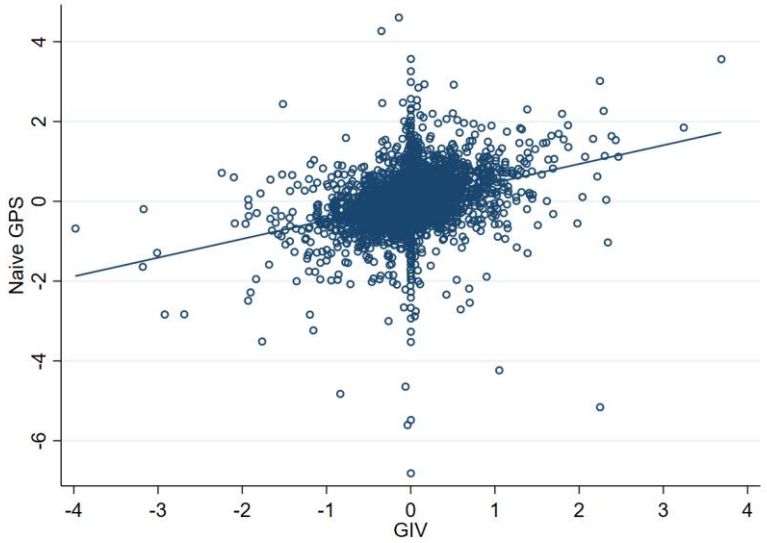
Robustness:

- By property type
- Include lagged *NCREIF*

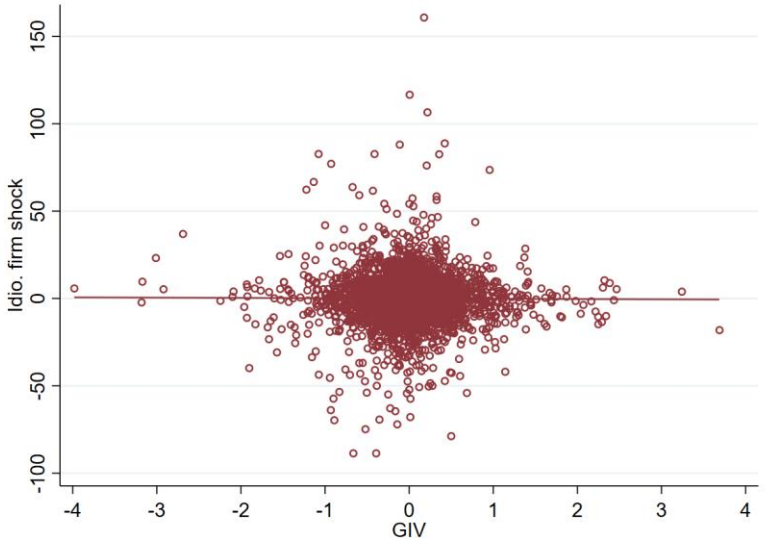


Appendix 5: GIV Assumptions

First stage



Exogeneity



Appendix 6: GIV, cont.

Based on those two scenarios, we have

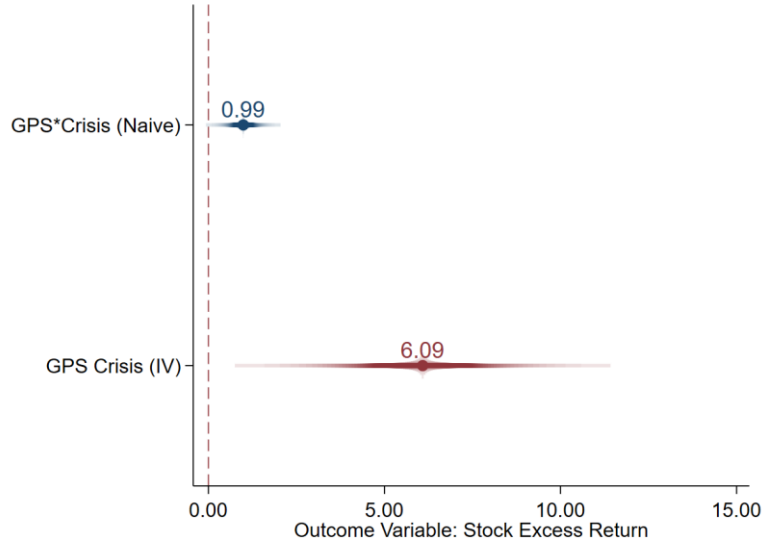
Granular instrument (***GIV***) = $\boldsymbol{\Sigma_z (s_{izt}) u_{izt} - \Sigma_z (1/N_z) u_{izt}}$

- *Naïve GPS* = $\Sigma_z s_{izt} e_{izt}$ — Corr(*GIV*, *Naïve GPS*) ≠ 0 — **First stage**
- $e_{izt} = \delta_i v_{it} + u_{izt}$ — Corr(*GIV*, v_{it}) = 0 — **Exogeneity**

- No CRE granularity: $\boldsymbol{s_{izt} = 1/N_z}$ → $\boldsymbol{GIV = 0}$

Appendix 7: Robustness Checks

The Great Recession



Property Market Commonalities