How Does Property Location Influence Investment Risk and Return?

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Motivation

- Commercial properties in the largest and most concentrated urban locations tend to have the lowest cap rates
  - CBD office cap rates average 6.6% between 2001 and 2018 (RCA)
  - Suburban office cap rates average 7.6% over that period
- Cap rates are a function of expected rental growth rates and the discount rate
  - Cap rate = r – g
- Are NY cap rates low because expected rental growth rates are high or because discount rates are low?

Motivation (continued)

- We don't observe either expected growth rates or discount rates
- But arguably, both are affected by supply constraints
  - All else equal, supply constrained locations will experience greater appreciation because positive demand shocks are offset less by new supply
  - For the same reason, betas in constrained locations are higher
- This argument suggests that locations like NY should have higher rather than lower discount rates
  - Therefore, to justify the high cap rates in NY, expected rental growth rates should be relatively high
  - Or maybe, NY is overpriced
- We offer no insights about whether NY is overpriced, but we present evidence that more constrained locations have higher beta

Our Research Design

- Our proxy for supply constraints is the density of the location
- In denser locations, the supply of new space is less elastic; that is, property supply grows less in response to positive demand shocks
- Differential supply responses generate testable implications regarding NOI growth and systematic risk exposure and cap rates
- We combine data on REIT portfolio holdings with information on local employment density to examine the relationship between the density of property location, NOI growth rates, betas and cap rates

Summary of Results

- Can we have a slide that summarizes the results?
- Can we show the 2x2 table of betas and densities for high and low density locations?
- Can we show the same 2x2 table with cap rates instead of betas?
  - Use implied cap rates from REITs

	Multifamily		Office	
	Cap Rate	Beta	Cap Rate	Beta
Density	(1)	(2)	(3)	(4)
Low	7.7%	0.743	8.5%	0.832
High	7.3%	0.909	8.3%	0.955

Data

- Property holdings of listed U.S. REITs from S&P Global: 15,682 properties held by 30 multifamily REITs and 44 office REITs over 1994-2017
- *Density* for REIT *i* in week *t*, using zip code-level employment density from the U.S. Census Bureau's County Business Patterns Survey

$$Density_{i,t} = \sum_{l=1}^{L} \omega_{i,l,t} Density_{l,t}$$

- *Location Beta* for REIT *i* in week *t*, from estimated CBSA-level systematic risk

$$CBSA\ Return_{k,t} = \alpha + \beta Market\ Return_t + \epsilon_t$$

$$Location\ Beta_{i,t} = \sum_{k=1}^{K} \omega_{i,k,t} CBSA\ Systematic\ Risk_{k,t}$$

- REIT and market-level financial data from CRSP, Compustat, Ibbotson Associates, and S&P Global
- Construction starts (Dodge Data and Analytics); CRE stock (Costar)

Property Map | Descriptive Statistics | Density Distributions | Correlation Table

Density and Real Estate Supply

- We assume lower supply elasticity in locations with higher density
- Regress new construction in a CBSA-year on location density

$$\textit{New Construction}_{l,t} = \alpha + \beta_1 \textit{High Density}_{l,t-1} + \beta_2 \textit{Aggregate New Construction}_t + \beta_3 \textit{High Density}_{l,t-1} \times \textit{Aggregate New Construction}_t + \epsilon_{l,t}$$

	(1)	(2)	(3)	(4)
High Density	0.003**		0.003**	
	(0.001)		(0.001)	
Aggregate New Construction	0.723***	0.684***		
	(0.065)	(0.049)		
High Density × Aggregate New Construction	-0.135**	-0.093*	-0.135**	-0.085*
	(0.068)	(0.048)	(0.068)	(0.048)
Constant	-0.015***	-0.012***	0.000	0.001*
	(0.001)	(0.000)	(0.000)	(0.001)
Observations	7,875	7,875	7,875	7,875
R-squared	0.10	0.11	0.11	0.12

New real estate supply is less elastic in denser locations

➢ Given an increase in aggregate construction, locations with higher density experience a more sluggish response in new supply

Density and Real Estate Rents

- Differential supply responses in dense and less dense locations imply:
  1. Real estate rents in denser locations benefit more from positive demand shocks, but may not be hurt more during downturns
  2. This leads to higher NOI growth in denser locations on average
- Is NOI growth higher in denser locations on average?
- Is NOI growth in denser locations more sensitive to demand shocks?

$$NOI_{i,t} = \alpha + \beta_1 High\ Density_{i,t-1} + \beta_2 High\ Location\ Beta_{i,t-1} + \beta_3 Large\ Size_{i,t-1} + \beta_4 Total\ Portfolio\ Area_{i,t} + \gamma_t + \epsilon_{i,t}$$

$$NOI_{i,t} = \alpha + \beta_1 High\ Density_{i,t-1} + \beta_2 High\ Location\ Beta_{i,t-1} + \beta_3 Large\ Size_{i,t-1} + \beta_4 GDP\ Growth_{t-4} + \beta_5 High\ Density_{i,t-1} \times GDP\ Growth_{t-4} + \gamma_t + \epsilon_{i,t}$$

Density and Real Estate Rents

	Multifamily		Office	
	(1)	(2)	(3)	(4)
High Density	0.025**	-0.004	0.008	-0.011
	(0.011)	(0.005)	(0.007)	(0.007)
High Location Beta	0.017	0.000	0.004	0.001
	(0.013)	(0.005)	(0.007)	(0.006)
Large Size	-0.007	-0.008	0.001	-0.019***
	(0.011)	(0.006)	(0.007)	(0.007)
Total Portfolio Area	-0.008		-0.024***	
	(0.007)		(0.006)	
GDP Growth		-0.224		0.197
		(0.151)		(0.247)
High Density × GDP Growth		0.308**		0.413*
		(0.153)		(0.230)
Constant	0.004	0.003	0.061***	0.137***
	(0.027)	(0.010)	(0.014)	(0.039)
Observations	280	1,325	992	1,772
R-squared	0.09	0.13	0.04	0.12

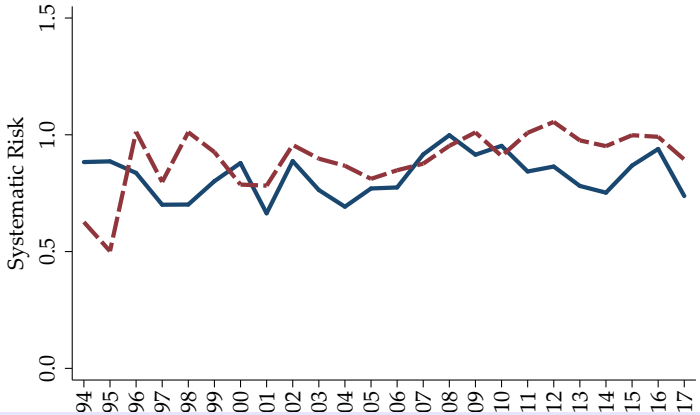
Lower supply elasticity in denser locations affects rental growth

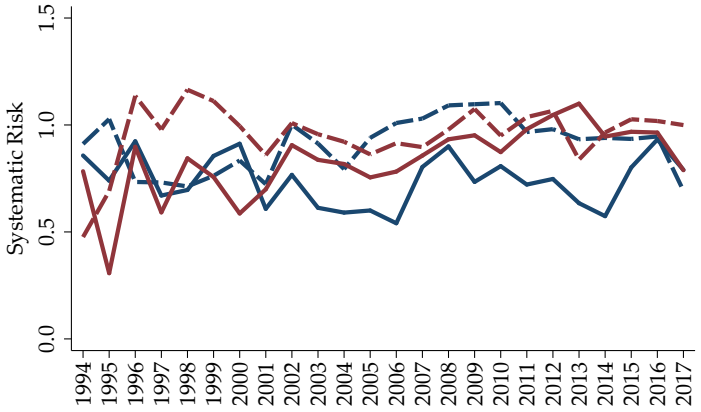
- Denser locations have higher rental growth on average (in multifamily)
- Also have greater sensitivity of rents to positive demand shocks

Density and Real Estate Risk and Return

Time-Series Patterns of Systematic Risk

- Greater demand sensitivity of rents in denser locations should mean higher systematic risk
- Regress weekly total excess returns of equally-weighted portfolios of REITs (by property type and density exposure) on excess benchmark returns, using rolling annual regressions, collect coefficients





NOI growth patterns in denser locations ➔ Higher systematic risk

- ➢ High-density office (multifamily) REITs have higher systematic risk than their low-density counterparts in 22 (20) out of 24 sample years

Density and Real Estate Risk and Return

Cross-Sectional Patterns of Systematic Risk

- Estimate REIT-level systematic risk exposures in the cross-section as a function of REIT-level Density

$$R_{i,t} = \alpha + \beta_1 \textit{High Density}_{i,t-1} + \beta_2 \textit{Market}_t + \beta_3 \textit{High Density}_{i,t-1} \times \textit{Market}_t + \gamma_t + \epsilon_{i,t}$$

	Multifamily (1)	Office (2)
High Density	0.000	0.000
	(0.000)	(0.000)
Benchmark Return	0.748***	0.884***
	(0.028)	(0.025)
High Density × Benchmark Return	0.225***	0.099***
	(0.034)	(0.031)
Constant	0.001	0.002*
	(0.001)	(0.001)
Observations	21,249	27,199
R-squared	0.399	0.407

High density REITs have higher systematic risk exposure

- Returns on portfolios of real estate assets located in high-density locations are more sensitive to variation in the returns on the market

Full Model | Credit Ratings

Density and Real Estate Cap Rates

- Higher average income growth in denser locations suggests lower cap rates — higher required returns (due to higher systematic risk exposure) suggest higher cap rates
- What is the relationship between location density and real estate cap rates?
  - If effect of higher income growth dominates, then cap rates of properties in denser locations are likely to be lower on average
  - If this is offset by the higher systematic risk and thus higher required rate of return in denser locations, then cap rates may be higher
- Regress quarterly REIT implied cap rates as a proxy for real estate cap rates on REIT density, location beta, and size

$$\textit{Implied Cap Rate}_{i,t} = \alpha + \beta_1 \textit{High Density}_{i,t-1} + \beta_2 \textit{High Location Beta}_{i,t-1} + \beta_3 \textit{Large Size}_{i,t-1} + \gamma_t + \epsilon_{i,t}$$

Density and Real Estate Cap Rates

	Multifamily		Office	
	(1)	(2)	(3)	(4)
High Density	-0.436***		-0.141	
	(0.110)		(0.141)	
High Location Beta	0.009		0.073	
	(0.080)		(0.128)	
Large Size	-0.735***		-0.907***	
	(0.110)		(0.144)	
Density		-0.022***		-0.006***
		(0.004)		(0.001)
Location Beta		-0.885**		-0.446
		(0.402)		(0.513)
Size		-0.229***		-0.339***
		(0.046)		(0.109)
Constant	8.850***	11.956***	8.934***	12.816***
	(0.155)	(0.666)	(0.946)	(1.745)
Observations	964	964	1,277	1,277
R-squared	0.78	0.80	0.43	0.50

High density (multifamily) REITs have lower implied cap rates

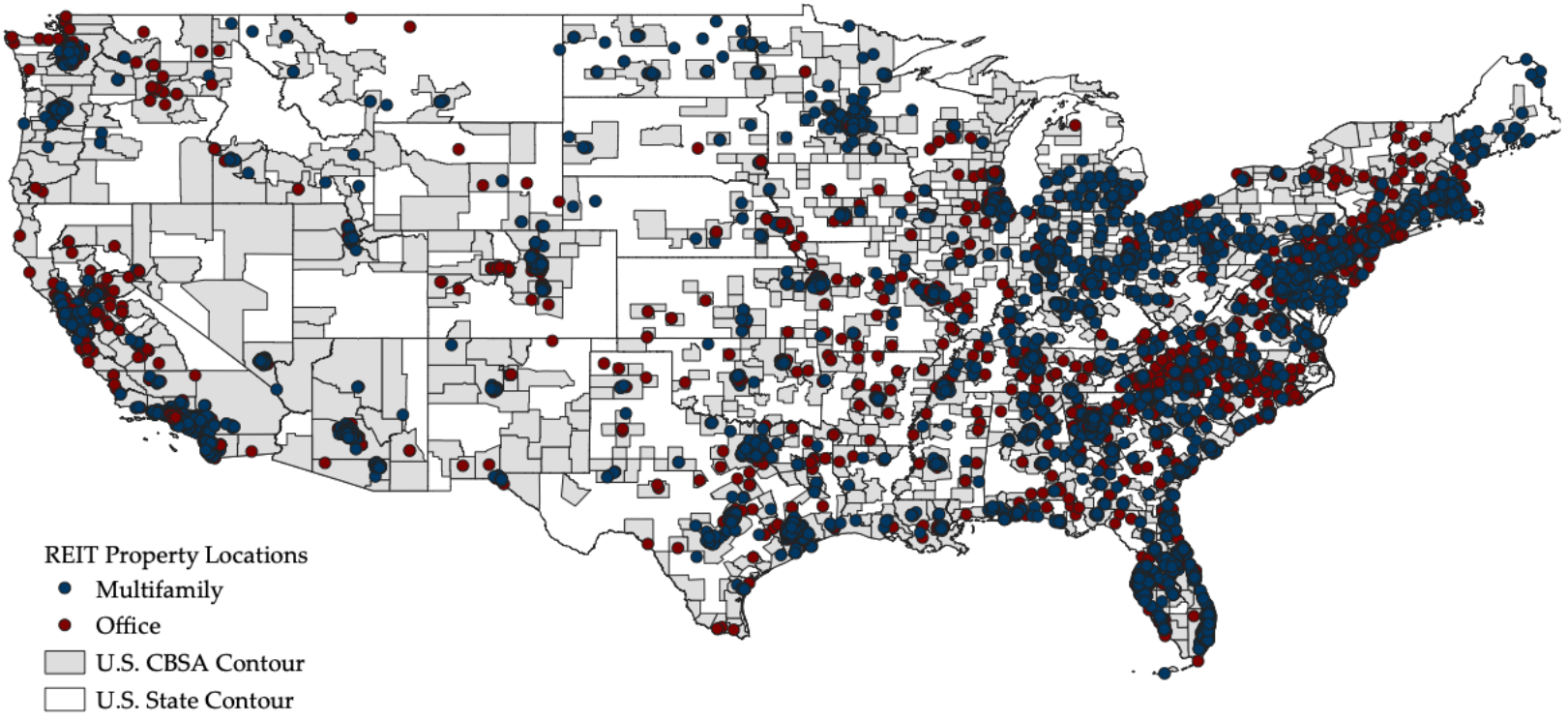
- Denser locations have tighter supply constraints ➔ higher RE NOI growth
- Those properties are more valuable and thus have lower cap rates

Concluding Remarks

- We characterize the relationship between location density and the patterns of risk and returns in commercial real estate investments
  - Density is a significant driver of real estate investment risk and return
  - Geographical characteristics play an important role in determining local rates of return in commercial real estate by modulating the sensitivity of local real estate investment performance to systematic demand shocks
- Practical implications
  - Results help us understand the link between the fundamental nature of the real estate held by REITs and the observed return patterns of REITs — and the extent to which investors appreciate these subtle locational differences
  - Learning more about the determinants of systematic risk can help REIT portfolio managers and direct real estate investors optimize their portfolios

Appendix

Real Estate Holdings of Sample REITs



Geographically dispersed, focused on growth markets

- Top 20 CBSAs contain 10,188 (65%) of all sample properties
- Those CBSAs are characterized by above-average employment growth

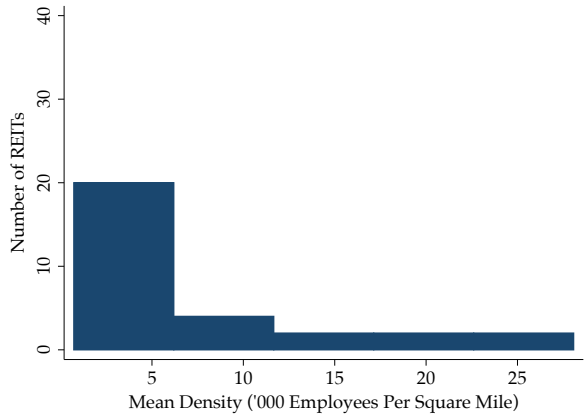
Back

Descriptive Statistics, REITs 1994–2017

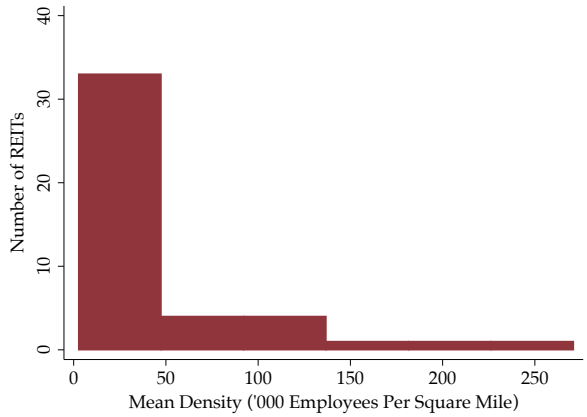
	N	Mean	SD	Median	Min	Max
Multifamily						
Density	21,279	7.8572	10.3513	3.8109	0.6931	65.5359
Location Beta	21,279	0.9446	0.1584	0.9776	0.4839	1.4227
Total Return	21,279	0.0027	0.0319	0.0021	-0.1027	0.1089
Size	21,279	2.5057	4.0428	0.8435	0.0111	19.9937
Investment-Grade Rating	21,279	0.4286	0.4949	0.0000	0.0000	1.0000
Short-Term Debt	16,708	0.0720	0.0858	0.0496	0.0000	0.8339
Implied Cap Rate	13,271	7.4418	1.5844	7.4368	4.5608	11.7213
Office						
Density	27,243	44.4262	65.6687	18.8915	0.6931	290.9172
Location Beta	27,243	0.9995	0.1438	0.9996	0.4839	1.4227
Total Return	27,243	0.0025	0.0348	0.0023	-0.1027	0.1089
Size	27,243	2.4154	3.5781	1.2938	0.0080	19.9937
Investment-Grade Rating	27,243	0.3459	0.4757	0.0000	0.0000	1.0000
Short-Term Debt	18,492	0.1086	0.1636	0.0458	0.0000	0.8339
Implied Cap Rate	17,148	8.4230	1.8748	8.3828	4.5608	12.6487
Market-Level Variables						
REIT Market Return	1,252	0.0020	0.0243	0.0030	-0.0768	0.0708
1-Month T-Bill Return	1,252	0.0005	0.0005	0.0004	0.0000	0.0013

Back

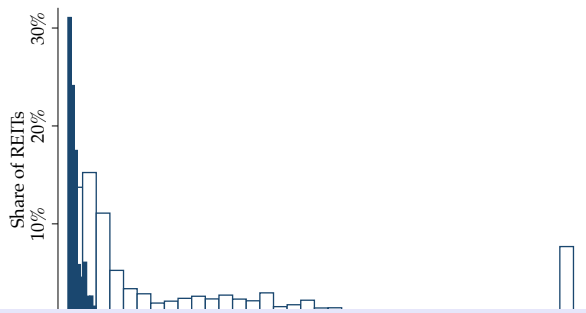
Density Distribution by Property Type & Size



(A) Multifamily REITs Mean Density



(B) Office REITs Mean Density



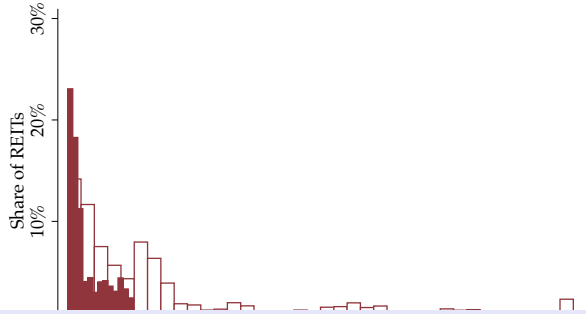


Figure shows distribution of *Density* by REIT category

- Average density exposure of office REITs exceeds that of multifamily REITs
- In contrast to large REITs, small REITs tend to focus on low-density locations

Back

Pairwise Correlation Coefficients

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Multifamily							
(1) Density	1.0000						
(2) Location Beta	0.1945	1.0000					
(3) Total Return	-0.0015	0.0067	1.0000				
(4) Size	0.5904	0.2385	0.0106	1.0000			
(5) Investment-Grade Rating	0.4830	0.2621	-0.0038	0.5290	1.0000		
(6) Short-Term Debt	0.0653	0.0911	-0.0012	0.0182	0.0169	1.0000	
(7) Implied Cap Rate	-0.3822	-0.3530	0.0205	-0.5714	-0.4064	-0.0659	1.0000
Office							
(1) Density	1.0000						
(2) Location Beta	-0.0276	1.0000					
(3) Total Return	-0.0025	0.0011	1.0000				
(4) Size	0.7559	0.0578	0.0106	1.0000			
(5) Investment-Grade Rating	0.3269	-0.0194	-0.0023	0.4909	1.0000		
(6) Short-Term Debt	-0.0417	0.2215	0.0072	-0.0886	-0.0847	1.0000	
(7) Implied Cap Rate	-0.3819	-0.1402	0.0273	-0.5049	0.0059	0.0932	1.0000

Back

Density and Systematic Risk (Full Model)

	Multifamily (1)	Office (2)
High Density	0.000	0.000
	(0.000)	(0.000)
Benchmark Return	0.593***	0.838***
	(0.034)	(0.034)
High Density × *Benchmark Return*	0.108***	0.040
	(0.033)	(0.033)
High Location Beta	0.001*	0.001***
	(0.000)	(0.000)
High Location Beta × *Benchmark Return*	0.142***	-0.006
	(0.029)	(0.029)
Investment-Grade Rating	0.000	0.000
	(0.000)	(0.000)
Investment-Grade Rating × *Benchmark Return*	0.211***	0.089***
	(0.041)	(0.034)
High Short-Term Debt	0.000	0.000
	(0.000)	(0.000)
High Short-Term Debt × *Benchmark Return*	0.036	-0.017
	(0.029)	(0.032)
Large Size	-0.001**	-0.001
	(0.000)	(0.000)
Large Size × *Benchmark Return*	0.044	0.146***
	(0.033)	(0.033)
Constant	0.001	0.000
	(0.001)	(0.001)
Observations	16,699	18,464
R-squared	0.440	0.429
Year-Fixed Effects	Yes	Yes
Standard Errors Clustered By	Firm-Year	Firm-Year

Statistical significance is indicated as follows:
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Back

Density and REIT Credit Ratings

- Test whether high-density REITs are more likely to have investment-grade credit ratings than their low-density counterparts

	Multifamily		Office	
	(1)	(2)	(3)	(4)
High Density	1.697**		1.457*	
	(0.431)		(0.287)	
High Location Beta	0.619**		1.240	
	(0.129)		(0.203)	
Large Size	17.817***		5.497***	
	(4.459)		(1.091)	
Density		1.072***		0.988***
		(0.024)		(0.002)
Location Beta		0.076***		0.068***
		(0.071)		(0.067)
Size		5.810***		8.788***
		(1.091)		(1.733)
Constant	0.156***	0.000***	0.159***	0.000***
	(0.032)	0.000	(0.030)	0.000
Observations	1,513	1,511	2,036	2,035
Pseudo R-squared	0.31	0.49	0.13	0.40
Year-Fixed Effects	No	No	No	No
Standard Errors Clustered By	Firm-Year	Firm-Year	Firm-Year	Firm-Year

Statistical significance is indicated as follows: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Back