Work From Home and the Office Real Estate Apocalypse

Arpit Gupta (NYU Stern), Vrinda Mittal (Columbia GSB), Stijn Van Nieuwerburgh (Columbia GSB)

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No Consensus on the Future of the Office

REAL ESTATE REALTY CHECK

Big NYC office tenants quietly shrink square footage in 'major reset'

By Steve Cuozzo

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Opinion US small business If everyone's working from home, why is commercial office space booming? *Gene Marks*

Not everyone is going to be working from home in the months to come. They're coming back to the office

Sun 8 May 2022 05.00 EDT

- Research Question: How to value commercial office buildings given technological disruptions from remote work?
 - Total commercial real estate value: \$4.7 trillion in 2019, office is a large component. NYC: city assessment of \$172 billion in commercial office.
 - Using market prices capitalized into some listed assets allows us to learn about the persistence of remote work
 - Extrapolating to larger universe of unlisted CRE assets informs understanding about possibly large impact on urban life and municipal finances

- Research Question: How to value commercial office buildings given technological disruptions from remote work?
- 1. Document Shifts in CRE Office Demand
 - Large declines in rent revenue in 2019–2021
 - Flight to quality: younger, more expensive buildings have seen smaller decline
 - Older, lower quality buildings more likely to be "stranded assets"
 - Remote work policies appear to drive these trends

- Research Question: How to value commercial office buildings given technological disruptions from remote work?
- 1. Document Shifts in CRE Office Demand
- 2. Assess Impact of Remote Work on Value of Office Shock
 - Develop novel asset pricing model to value buildings
 - Use leasing and REIT data to discipline calibration
 - Incorporate both cash flow shocks and WFH risk

- Research Question: How to value commercial office buildings given technological disruptions from remote work?
- 1. Document Shifts in CRE Office Demand
- 2. Assess Impact of Remote Work on Value of Office Shock

Main Result:



- Research Question: How to value commercial office buildings given technological disruptions from remote work?
- 1. Document Shifts in CRE Office Demand:
- 2. Assess Impact of Remote Work on Value of Office Shock

WFH appears to be a persistent trend and important for Commercial Office Valuation—33% decline in office values immediately and 28% in the long run, but with substantial uncertainty around point estimate.

1. Trends in Remote Work and Office Demand

Document Remote Work Shifts Office Use

Largest Increase in Remote Work Since WW-II

- Six-fold increase in paid days worked from home from 5% to 30%
- Now stabilizing (Survey of Working Arrangements and Attitudes, Barrero, Bloom, and Davis, www.wfhresearch.com)
- ▶ 82% of employees (WFH \ge 1 day/week) comply with employer WFH policy



Job Postings for Remote Work Rising

- Rise in job postings for full or partial remote work, stabilizing
- Highest for sectors that had higher 2019 share of remote postings (software dvlpmt)
- ▶ Growth 2019-21 in rural job postings > urban postings, reversing pre-19 trend



Remote job postings remain elevated

Source: Indeed

Actual Office Use: Turnstile Data Stabilizing

- Kastle turnstile data on physical office stabilizing
- At 44% of pre-covid levels on June 13, 2022



Actual Office Use: Turnstile Data NYC

Kastle turnstile data in NYC: 41% on 06/13



Leasing Revenues on Active Leases Rent Quantity

- Compstak data, comprehensive coverage after 2015
- Lease revenues decline 8.1% from Dec 19-Dec 21
- Less so for buildings in the top-10% rent tier (A+)



Staggered Lease Expiration

- Staggered lease expiration: only some tenants have had to make active space choice so far
- More short-term leases signed in 2020-21 \Rightarrow addtl. lease expiration in 23-25



% of Leases Active as of Dec'19 by Scheduled Expiration Years

New Office Leases Signed - National

Drop from 300 mi sf to 100 mi sf per year, nationally



New Office Leases Signed - NYC

Drop from 40 mi sf to 20 mi sf per year in NYC



Total Sq Footage of Leases Signed annually (6M MA, in Millions)

Net Effective Rent on New Leases - National

- About 15% decline in 2020, nationally, followed rebound in 2021 on low, selected volume (blue line)
- Some of the decline and all of the rebound is a composition effect (orange)



Annualized Net Effective Rents (6M MA)

Net Effective Rent on New Leases - NYC

About 24% decline in 2020 in NYC, then stay flat



Flight to Quality in Rents – NYC 🚥

- Left: A+ (top-10% of newly signed rents) smaller drop
- Right: Recently constructed buildings see strong NER increase on new leases



Remote Work Associated with Lower Firm Space Demand

- Remote listings (Job Platform: Ladders) predicts lower tenant space demand
- Based on 135 of the largest tenants in our data set

	Δ Space	Δ Space	Δ Space
Remote Listings (3 months)	-0.392** (-2.41)		
Remote Listings (12 months)		-0.492**	
		(-2.46)	
Remote Listings (24 months)			-0.468**
			(-2.01)
Constant	-0.0123	-0.0106	-0.0156
	(-0.61)	(-0.52)	(-0.77)
Observations	135	135	135
R ²	0.042	0.044	0.030

2. Office Valuation Model

Estimation of Remote Work Shifts on Office Valuation

Office Value is Function of Cash Flows and Discount Rates

Value of a building (V) is expected present discounted $(M_{t,t+j})$ value of rent revenues (Rev_t) minus costs $(Cost_t)$:

$$V_t = E_t \sum_{j=1}^{\infty} M_{t,t+j} \left(Rev_{t+j} - Cost_{t+j} \right) = E_t \sum_{j=1}^{\infty} M_{t,t+j} Rev_{t+j} - E_t \sum_{j=1}^{\infty} M_{t,t+j} Cost_{t+j}$$

- Revenues: rents on a portfolio of leases, of which fraction come due each period
 - Fraction $s^{O}(z)$ of expiring leases are renewed at the market rent (NER)
 - Fraction $s^{V}(z)$ of vacant space newly leased at the market rent (NER)
- Costs are divided into: variable, fixed, and broker commissions
- Revenues and Costs depend on aggregate state variable z

Modeling Economic States

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- Need to model evolution of future state of economy z, uncertain
 - Business Cycle: Expansion (E) or Recession (R), calibrated to observed frequency and length of NBER recessions 1926–2019
 - WFH state with mass adoption of remote work
 - **q** = 5%, probability of entering WFH from no-WFH state
 - **p** probability of persisting in WFH, calibrated from REIT data

Annual 4 × 4 state transition decomposed as:

$$\pi(z'|z) = \pi^{BC}(z'|z) \otimes \pi^{WFH}(z'|z)$$

$$E R$$

$$\pi_{BC} = \frac{E}{R} \begin{bmatrix} 0.877 & 0.123 \\ 0.581 & 0.419 \end{bmatrix}$$
No WFH WFH
No WFH WFH
No WFH
$$\begin{bmatrix} 1-q & q \\ 1-p & p \end{bmatrix} = \frac{No WFH}{WFH} \begin{bmatrix} 0.95 & 0.05 \\ 0.13 & 0.87 \end{bmatrix}$$

Determining Persistence of Remote Work State p Robustness

- Matching realized return on NYC-centric REIT portfolio (Vornado, SLG, Empire State Trust) between Dec 2019-Dec 2020
- De-lever stock return to obtain asset return decline of 22.75%
- Recognize that this is the A+ market, not the overall NYC office market
- ▶ \Rightarrow implies p = 0.87
- WFH state is persistent; 25% chance that we are still in it in 2029



Modeling Discount Rates WFH Factor

One-period discount rate decomposed into pre-WFH SDF and WFH shifter:

$$M(z'|z) = M^{BC}(z'|z) \otimes M^{WFH}(z'|z)$$

• $M^{BC}(z'|z)$ chosen to match risk-free and equity risk premium in each state z = E, R

 M^{WFH}(z'|z) chosen to match cross-sectional exposure of office REIT returns to WFH equity factor (intuition: long Zoom, short Carnival)

Office Cash Flows for All NYC 💷 🗛

- Match lease duration of 7 years
- Market NER growth e based on Compastak data Jan 2000–Feb 2020. In remote state, require:
 - $\epsilon(E) > \epsilon(WFH E) > \epsilon(R) > \epsilon(WFH R)$
 - Consistent with stable long-run NOI growth
- Supply is slightly counter-cyclical due to construction lags, based on observed construction year adjusted for depreciation (100 bp lower in WFH states)
- Renewal rates pro-cyclical, chosen to match realistic vacancy rates
 - 13.1% in E, 16.1% in R, 18.7% in WFH-E, and 21.5% in WFH-R

Variable	Symbol	Е	R	WFHE	WFHR
Market NER growth	ϵ	0.026	-0.044	0.000	-0.050
Supply growth	η	-0.008	-0.005	-0.018	-0.015
Lease renewal share	s	0.757	0.702	0.584	0.541
New leasing share	s^V	0.186	0.095	0.146	0.073

Main Results: Office Occupancy Rate

- Simulate model from 2019 (E) to 2020 (WFH-R) to 2021 (WHF-E) and stochastic evolution in 2022-29
- Since future is uncertain, simulate many sample paths (fan charts)
- Black line: average path, Red line: still in WFH state in 2029



Main Results: Rent Revenues

- Revenues normalized to 100 in 2019
- Slow lease expiration: revenues only slowly reflect decline in underlying market rent



Main Results: NOI

- NOI normalized to 100 in 2019
- Revenue decline partially offset by cost decline (lower occupancy)



Main Results: Cap Rates

- Model matches average NYC office cap rates
- Cap rates widen modestly along average path (100 bps)



Office Values

- Asset prices are forward looking
- Initial decline in 2020: 33% (A-/B/C initial decline: 44%)
- Long-run decline (by 2029): 28%; WFH until at least 2029: 38%
- Substantial range of estimates: WFH risk



Office Values A+ Segment

- Initial decline in 2020: 25%
- Long-run decline (by 2029): 1.5%; WFH until at least 2029: 8.5%
- Much stronger performance due to stronger rent growth in WFH state



Discussion

- Dollar Impact
 - Compstak data set has \$20 bi in annual lease revenue for NYC office
 - Model implies value/lease revenue of 8.76
 - Implies \$175 bi in value (close to NYS estimate of \$172 bi)
 - 28% long-term loss amounts to \$49 bi
 - Scaling up nationally in Compstak data set: \$177 bi
 - Scaling up for incomplete Compstak coverage (esp. outside NY): \$500 bi
- Explore sensitivity to parameters: persistence of remote work, rent growth in WFH state
- Calibration to other cities: NYC/SF vs. Miami/Austin
- Conversion debate
 - From A-/B/C to A+ office
 - To alternative use (e.g., multifamily) easier for older office product
 - Challenges: zoning, physical feasibility, cost
- Valuations lower if 2022-23 turns out to be a recession (WFH-R)

Broader Ramifications: For Lenders

- If correct, a 30% value correction would impair some loans
- Any evidence for this in debt markets?
- CMBX BBB- tranche prices: series 10-13 have 31% office concentration vs. 7 (18%)



Broader Ramifications: For Cities

- The urban CBD (office and nearby retail) has historically sustained urban public finances through property tax and tenant rent tax revenue
- Reduction in tax revenue would require either spending cuts to local public amenities (transportation, education, police, etc.) or increases in taxes
- Federal aid during pandemic years plugged the hole, but Federal largesse unlikely to continue
- The local fiscal dynamics may propagate net out-migration

Appendix

Backup material

Pandemic Decline in Leasing Revenues Rent Quantity

CompStack total revenues decline, more so for buildings not in the top tier



Flight to Quality in Office Rents (NYC) TX BY AGE

Newly constructed buildings see increase in rents, compared to older buildings



Change in Valuation with Different **p** for NYC All



Pandemic Decline in Quantity of In-force Contracts



Pandemic Decline in Leasing Rents (Back)



Pandemic Decline in NYC Retail Leasing

- Active leasing revenue declines similarly to office (Jan 20 = 100)
- Large decline in new leasing volume (but sparse data coverage)



Flight to Quality in Office Rents (TX) (Back



Flight to Quality: NYC Office Occupancy Rate (Back)



Calibrating Model

Variable	Symbol	Е	R	WFHE	WFHR
Market NER growth	ϵ	0.026	-0.044	0.000	-0.050
Supply growth	η	-0.008	-0.005	-0.018	-0.015
Lease renewal share	s	0.757	0.702	0.584	0.541
New leasing share	s^V	0.186	0.095	0.146	0.073
Fixed cost/rent ratio	c ^{fix}	0.200	0.200	0.200	0.200
Variable cost/rent ratio	c ^{var}	0.230	0.230	0.230	0.230
Leasing commission new	LCN	0.300	0.300	0.240	0.240
Leasing commission renewals	LC ^R	0.150	0.150	0.120	0.120

Cash Flows for NYC A+ Buildings (back)

- Similar procedure for A+ (top 10% of most expensive signed leases)
- Slightly longer lease duration (7.82 years, χ =0.13)
- Reflects "flight to quality": better demand in WFH state

Table: Calibration for NYC A+

Variable	Symbol	Е	R	WFHE	WFHR
Market NER growth	ϵ	0.032	-0.042	0.025	-0.033
Supply growth	η	0.004	0.010	-0.006	0.000
Lease renewal share	s	0.919	0.769	0.760	0.636
New leasing share	s^V	0.168	0.177	0.139	0.147

Model Solution for NYC All Calibration

Statistic	Uncond	E	R	WFHE	WFHR
R _f	0.015	0.008	0.047	0.008	0.047
Equity $\mathbb{E}[Ret] - 1$	0.095	0.077	0.185	0.075	0.182
Equity RP = $\mathbb{E}[Ret] - 1 - R_f$	0.080	0.069	0.138	0.066	0.135
Cap rate	0.057	0.055	0.064	0.059	0.068
Office $\mathbb{E}[Ret] - 1$	0.057	0.043	0.123	0.045	0.120
Office RP = $\mathbb{E}[Ret] - 1 - R_f$	0.043	0.035	0.076	0.036	0.074
$\mathbb{E}\left[g_{t} ight]$	-0.002	-0.005	0.036	-0.019	0.008
Vacancy rate $= 1 - \widehat{Q}^{O}$	0.165	0.146	0.178	0.200	0.229
Rev	0.798	0.800	0.823	0.778	0.787
Cost	0.412	0.418	0.409	0.400	0.392
$\widehat{NOI} = \widehat{Rev} - \widehat{Cost}$	0.386	0.382	0.413	0.378	0.395
\widehat{V}^R	13.043	13.615	12.140	12.324	11.042
<i>V^C</i>	6.300	6.621	5.729	5.933	5.204
$\widehat{V} = \widehat{V}^R - \widehat{V}^C$	6.743	6.994	6.411	6.391	5.838

Construct WFH Factor Back

 Rebalanced monthly index which goes long (Pfizer, Zoom, Peloton) and short (United, Carnival, Marriott)



Employer Views on Remote Work Shifting

- Employers now expect 2.3 days of remote work "after pandemic is over"
- Revised beliefs about productivity of WFH or tight labor market?



Employees Like Working From Home

- More than half of employees wants to WFH 3 or more days per week
- Desires are stronger among higher-income/skilled employees



Workers' desired amount of post-COVID WFH days

WFH Experience Perceived Positively by Employees

Desire to work remotely fueled by positive experience with it



Relative to expectations, how has WFH turned out?

Impact of Remote Work on Productivity?

- Positive productivity effects from WFH:
 - Call centers: Bloom et al. (2015, 2022), Harrington and Emanuel (2021)—positive productivity effects, but historically negative selection
 - Choudhury et al. (2020): 4.4% increase in patent examiners productivity after remote option
 - Chen, Frey, Presidente (2022): Effect of remote collaboration on breakthrough discovery becomes positive in 2010s
- Negative consequences of remote work:
 - Atkin, Chen, Popov (2022): face-to-face interactions result in more patent citations
 - Catalini (2018): Labs more likely to collaborate after random shock results in colocation, but disruption does not decrease collaboration
 - Proximity particularly important for starting collaboration
 - Lin, Frey, Wu (2022), Yang et al. (Microsoft, 2022): short-run increase in productivity, but long-term teams more "siloed" and less synchronous communication
 - ► Gibbs et al. (2021): hours worked \uparrow , output \downarrow , productivity \downarrow 8-19%
 - Roche, Oettl, Catalini (2022): Startups more likely to adopt technology used by randomly allocated proximate peers

Population Changes

NYC population losses have shrunk but not reversed (USPS)

Net loss of movers has slowed down

Chart shows the net number of permanent address change requests received by the U.S. Postal Service: Adding the number of people moving into NYC addresses and subtracting the number of people moving away from NYC addresses.



Sluggish Transit Recovery



Manhattan Office Workers in Office

- Survey evidence by Partnership for NYC in April 2022
- Only about 20% of workers are in office 4 or 5 days/week



Cities with More Remote Work Saw Larger Increase in Office Vacancy

