Work From Home and the Office Real Estate Apocalypse

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July 7, 2022
No Consensus on the Future of the Office

Big NYC office tenants quietly shrink square footage in ‘major reset’

By Steve Cuozzo

May 8, 2022 | 7:36pm | Updated

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
Remote Work is Shock to CRE Office Value

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.
Remote Work is Shock to CRE Office Value

- **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
Remote Work is Shock to CRE Office Value

- **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
Remote Work is Shock to CRE Office Value

▶ **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:**
Remote Work is Shock to CRE Office Value

- **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](http://www.wfhresearch.com))
- 82% of employees (WFH $\geq$ 1 day/week) comply with employer WFH policy

*Pre-COVID estimate taken from the 2017-2018 American Time Use Survey

*The break in the series in November 2020 reflects a change in the survey question.
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 development)
- Growth 2019-21 in rural job postings > urban postings, reversing pre-19 trend

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

- 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+)

![Graph of Total Annualized Leasing Revenue](image1.png)

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<td>85</td>
<td>90</td>
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<td>100</td>
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![Graph of Total Annualized Leasing Revenue Index](image2.png)
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 ⇒ addtl. lease expiration in 23-25

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

- 2020: 20.0%
- 2021: 17.5%
- 2022: 15.0%
- 2023: 12.5%
- 2024: 10.0%
- 2025: 7.5%
- 2026 or later: 5.0%
New Office Leases Signed - National

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

![Graph showing total square footage of leases signed annually (6M MA, in Millions) from 2015 to 2022.](image)
New Office Leases Signed - NYC

Drop from 40 mi sf to 20 mi sf per year in NYC
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)
**Net Effective Rent on New Leases - NYC**

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

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**Annualized Net Effective Rents (6M MA)**

- **No FE ($ in Dec 2021)**
- **All FE ($ in Dec 2021)**

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**Execution Month**

- Jan 2018
- Jul 2018
- Jan 2019
- Jul 2019
- Jan 2020
- Jul 2020
- Jan 2021
- Jul 2021
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

<table>
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<td>-0.392**</td>
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<td>Remote Listings (12 months)</td>
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<td>Remote Listings (24 months)</td>
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<td>(-0.61)</td>
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<tr>
<td>R²</td>
<td>0.042</td>
<td>0.044</td>
<td>0.030</td>
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</table>

** Indicates significance at the 0.01 level.
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 ($V_t$) is expected present discounted ($M_{t,t+j}$) value of rent revenues ($Rev_t$) minus costs ($Cost_t$):

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

- 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

- 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 \( 4 \times 4 \) state transition decomposed as:

\[
\pi(z' | z) = \pi_{BC}(z' | z) \otimes \pi_{WFH}(z' | z)
\]

\[
\pi_{BC} = \begin{bmatrix}
E & R \\
0.877 & 0.123 \\
R & 0.581 & 0.419
\end{bmatrix}
\]

\[
\pi_{WFH} = \begin{bmatrix}
\text{No WFH} & \text{WFH} \\
1 - q & q \\
1 - p & p
\end{bmatrix}
\]

\[
\pi_{WFH} = \begin{bmatrix}
\text{No WFH} & \text{WFH} \\
0.95 & 0.05 \\
0.13 & 0.87
\end{bmatrix}
\]
Determining Persistence of Remote Work State $p$

- 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
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)
Match lease duration of 7 years

Market NER growth $\epsilon$ 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

<table>
<thead>
<tr>
<th>Variable</th>
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<tbody>
<tr>
<td>Market NER growth</td>
<td>$\epsilon$</td>
<td>0.026</td>
<td>-0.044</td>
<td>0.000</td>
<td>-0.050</td>
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<tr>
<td>Supply growth</td>
<td>$\eta$</td>
<td>-0.008</td>
<td>-0.005</td>
<td>-0.018</td>
<td>-0.015</td>
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<tr>
<td>Lease renewal share</td>
<td>$s^O$</td>
<td>0.757</td>
<td>0.702</td>
<td>0.584</td>
<td>0.541</td>
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<tr>
<td>New leasing share</td>
<td>$s^V$</td>
<td>0.186</td>
<td>0.095</td>
<td>0.146</td>
<td>0.073</td>
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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

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

Net Effective Rent

Total Annualized NER (6M MA)

Annualized Rent Index (in 2021 Dec $)

Net Effective Rent

Total Annualized Rent Index (6M MA)

Annualized Rent Index (100 in 2020 Jan), Class A+

Annualized Rent Index (100 in 2020 Jan), others
Active leasing revenue declines similarly to office (Jan 20 = 100)
Large decline in new leasing volume (but sparse data coverage)
Flight to Quality: NYC Office Occupancy Rate

Occupancy rate for A+/other in NYC

Occupancy Rate Index for A+ VS Others in New York
## Calibrating Model

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<td>0.095</td>
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<td>0.073</td>
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<tr>
<td>Fixed cost/rent ratio</td>
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<td>Leasing commission renewals</td>
<td>$LC^R$</td>
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<td>0.150</td>
<td>0.120</td>
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Similar procedure for A+ (top 10% of most expensive signed leases)
- Slightly longer lease duration (7.82 years, $\chi=0.13$)
- Reflects “flight to quality”: better demand in WFH state

### Table: Calibration for NYC A+

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<td>Supply growth</td>
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<td>Lease renewal share</td>
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### Model Solution for NYC All Calibration

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<td>0.077</td>
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<td>Equity RP = $\mathbb{E}[\text{Ret}] - 1 - R_f$</td>
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<td>$\hat{\text{Rev}}$</td>
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<td>0.800</td>
<td>0.823</td>
<td>0.778</td>
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<td>$\hat{\text{Cost}}$</td>
<td>0.412</td>
<td>0.418</td>
<td>0.409</td>
<td>0.400</td>
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<tr>
<td>NOI = $\hat{\text{Rev}} - \hat{\text{Cost}}$</td>
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<td>0.382</td>
<td>0.413</td>
<td>0.378</td>
<td>0.395</td>
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<td>$\hat{V}^R$</td>
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<td>$\hat{V}^C$</td>
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<tr>
<td>$\hat{V} = \hat{V}^R - \hat{V}^C$</td>
<td>6.743</td>
<td>6.994</td>
<td>6.411</td>
<td>6.391</td>
<td>5.838</td>
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</table>
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?

![Average Days per Week Working From Home](chart)

**Average Days per Week Working From Home After the Pandemic Ends: Employer Plans**

Sample: Workers able to work from home
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](chart)

Sample: Respondents who are able to WFH
WFH Experience Perceived Positively by Employees

- Desire to work remotely fueled by positive experience with it

Relative to expectations, how has WFH turned out?

- Hugely better, 20%+: 26.6%
- Substantially better - 10 to 20%: 21.9%
- Better -- up to 10%: 17.0%
- About the same: 26.7%
- Worse - up to 10%: 6.8%
- Substantially worse - 10 to 20%: 3.4%
- Hugely worse, 20%+: 3.7%
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 ↑, output ↓, productivity ↓ 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.

Note: Data includes requests for change of address within New York City
Source: United States Postal Service
Sluggish Transit Recovery

Weekly turnstile entries

Daily turnstile entries

Data via MTA
toddeschneider.com
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

Source: Moodys