Leverage and Fire Sale Externalities in the Thai Housing Market: Evidence from the Covid-19 Shock

(preliminary: please do not cite)

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Fire Sale

Fire sales everywhere

Fire sales occur when you must meet liabilities by selling assets at "dislocated" prices. Shleifer and Vishny (1992), Kiyotaki and Moore (1997)

- Firm distress: Acharya et al. (2007), Benmelech and Bergman (2011)
- Mutual funds: Coval and Stafford (2007), Hau and Lai (2017), Schmidt, Timmermann, and Wermers (2016)
- Stocks: Bian et al. (2018)
- Bonds: Ellul, Jotikastira and Lundblad (2011)
- Real estate: Campbell, Giglo and Pathak (2011), Mian, Sufi and Trebbi (2015), Gupta (2019)

Problems with fire sales: runs and negative spirals → spillovers.

Durable goods and substitutability between primary and secondary markets → spillovers.

Example: Noparumpa and Saengchote (2017), first car tax rebate in Thailand in 2011.

Research question: does leverage-induced fire sale in the primary condominium market affect secondary market?

Empirical strategy
- Covid-19 exposure and demand shock (proxy: density), pre-post
- Leveraged [financially constrained] developers are more likely to offer discount
- Condominium only

Finding:
- No evidence that variations in Covid-19 exposure differentially affect condo prices.
- Condos whose developers are more leveraged experience greater price decline.

Why Condominium?

Bonds issued by sector
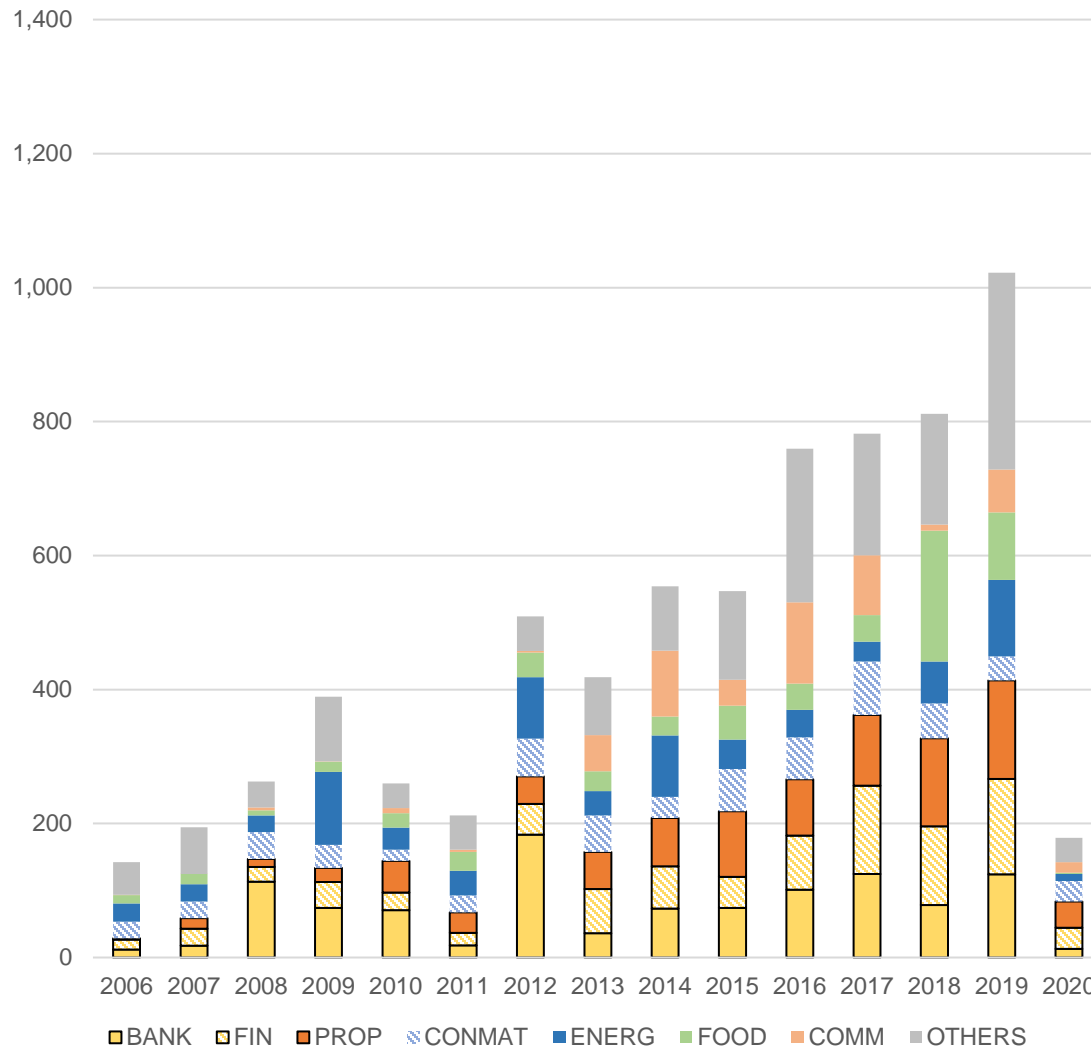
Commercial papers issued by sector

Legend: BANK · FIN · PROP · CONMAT · ENERG · FOOD · COMM · OTHERS
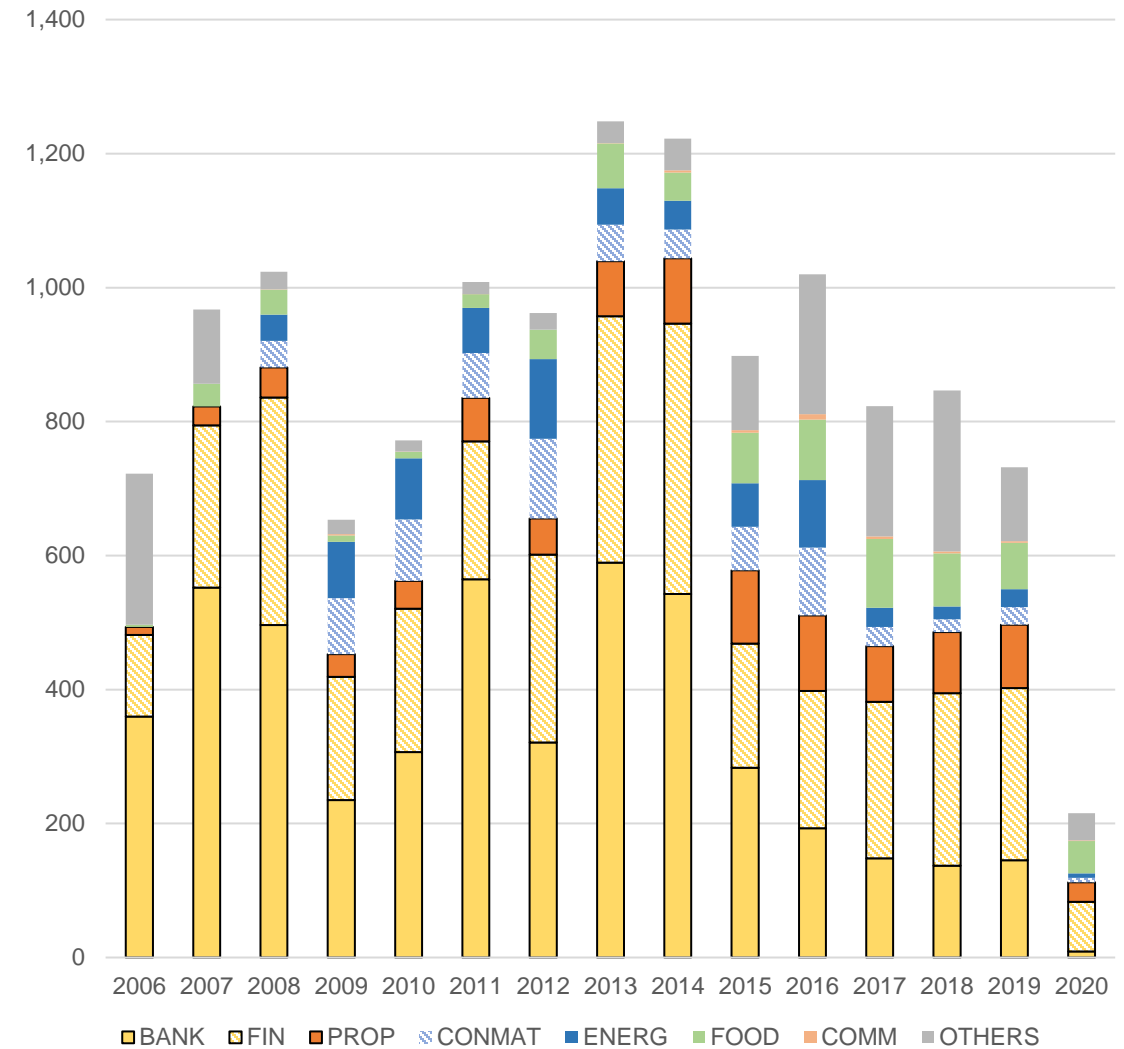
Data & Methodology

- Condominium listings (not transaction) data from Baania.com
  - 383,604 listings from 1,245 developments between January 2019 to June 2021.
  - 3 periods: 2019Q1 – 2020Q1 | 2020Q2 – 2020Q3 | 2020Q4 – 2021Q2
  - Missing development attributes are obtained manually to best extent possible.

- Financial statement data of developers
  - Annual reports for listed developers (54)
  - DBD filings for unlisted developers (253)
  - Data as of December 2019 only.

- Capital market financing data from ThaiBMA

Side note: Data challenge in Thai context
1) only listing data is available, not transaction data.
2) attribute data is self-reported and therefore inconsistent and sparse.

Panel A: listing data

		Price / unit	Price / sq.m.	Unit size (sq.m.)	% Two bedrooms
Pre-closure	Mean	6,545,768	135,662	44.44	24.7%
Num observations	Std Dev	6,026,363	68,263	21.08	
143,939	Median	4,800,000	121,875	35.71	
Closure - Q3	Mean	4,839,952	109,400	40.20	19.1%
Num observations	Std Dev	5,356,540	62,193	17.88	
20,486	Median	3,270,000	91,429	34.00	
Post Q3	Mean	6,786,261	134,702	46.13	28.0%
Num observations	Std Dev	6,447,364	72,082	22.37	
219,179	Median	4,900,000	119,643	38.00	
All periods	Mean	6,592,080	133,711	45.18	26.3%
Num observations	Std Dev	6,252,720	70,408	21.72	
383,604	Median	4,780,000	118,750	36.28	

Panel B: development data

	Mean	Std Dev	Median	Count
Year finished	2013.9	4.84	2015	1,131
Missing year finished	9.2%			1,245
Num units	525	573	364	1,245
Num floors	20	13.4	15	1,245
Developer listed in SET	58.8%			1,245
Population density (Facebook)	26.64	8.74	25.56	1,245

Panel C: developer data

	Mean	Std Dev	Median	Count
Total sales (THB million)	2,138.7	6,163.2	79.3	305
Total assets (THB million)	7,697.7	20,162.7	437.8	307
Total liabilities (THB million)	4,607.6	12,577.0	206.3	307
Leverage ratio (TL/TA)	53.2%	32.7%	58.0%	307
Developer listed in SET	17.6%			307
CP due in 6 months / total liabilities	7.1%	8.8%	2.9%	54
CP due in 12 months / total liabilities	13.1%	15.0%	8.4%	54

Leveraged Fire Sales - Assoc. Prof. Kanis Saengchote, Ph.D. ©
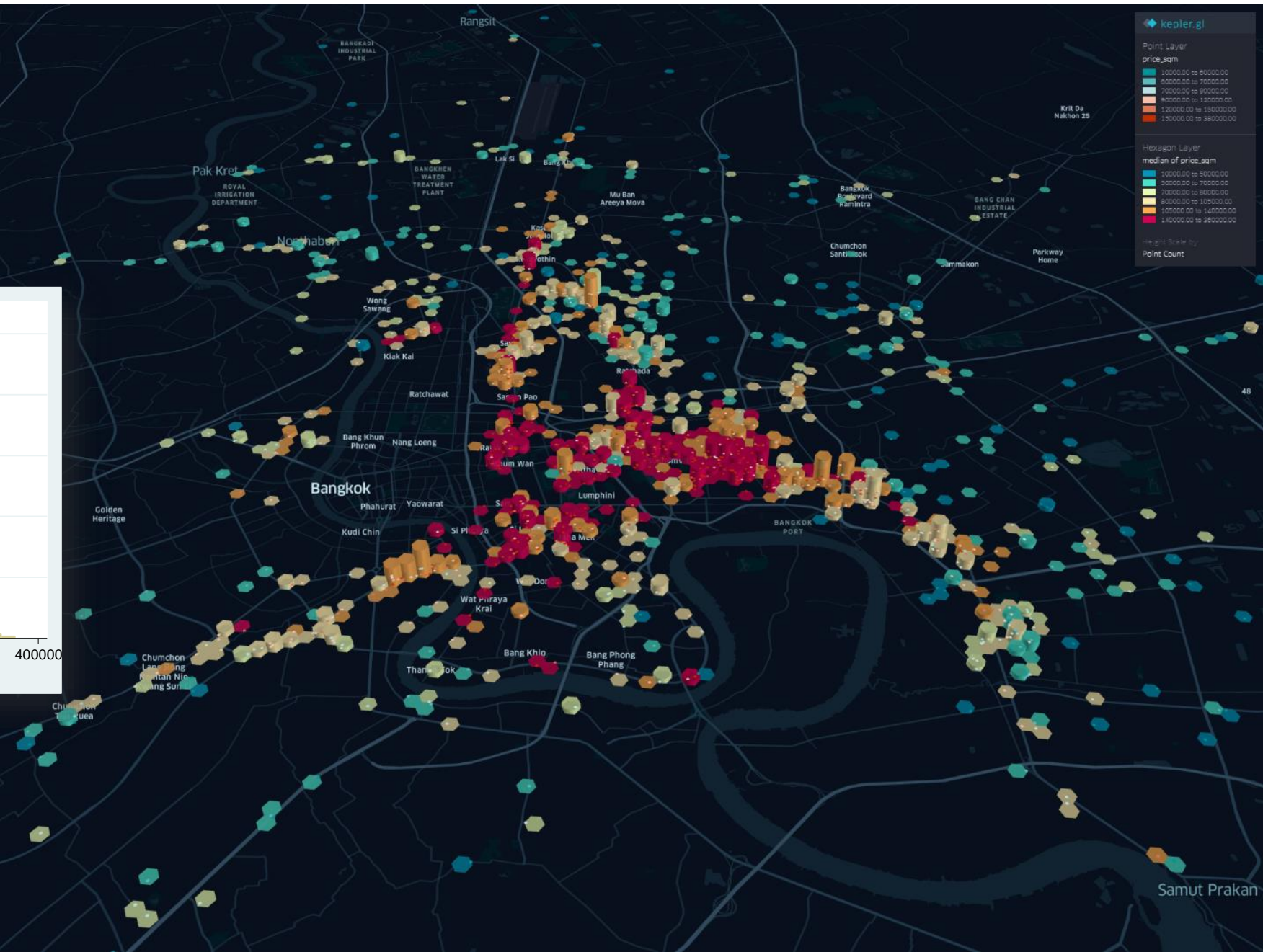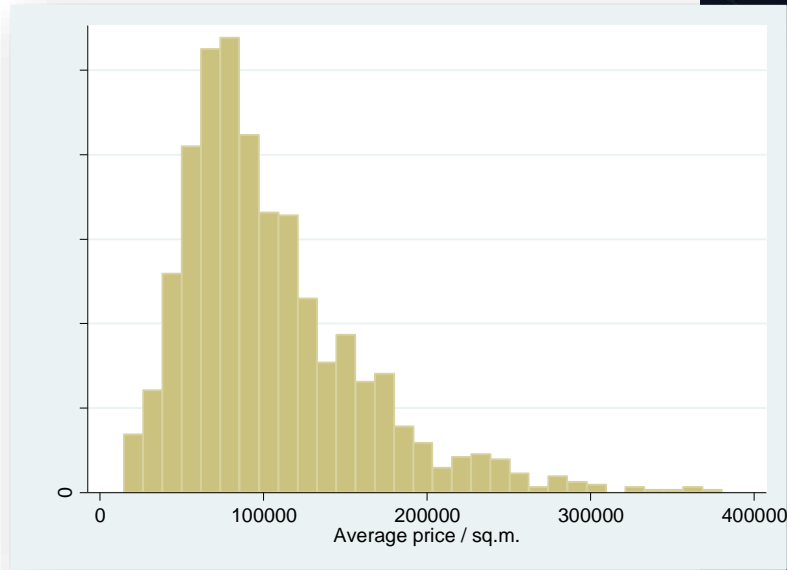
Side note: Data challenge in Thai context
Fixed effects can address a lot of unobserved variations in condominiums.
Not great for hedonic pricing model; okay for uncovering trends.

Unit size (sq.m.)		0.0249***	0.0174***	0.0170***	0.0138***
		(0.001)	(0.001)	(0.001)	(0.000)
2 bedrooms		-0.0156	0.0955***	0.0972***	0.1622***
		(0.028)	(0.026)	(0.017)	(0.008)
High rise (> 8 floors)		0.3629***	0.1880***	0.1715***	
		(0.035)	(0.035)	(0.028)	
Within 1 year		0.0715*	0.0375	0.0327	0.0308***
		(0.041)	(0.027)	(0.021)	(0.007)
Less than 2 years		-0.0165	0.0124	0.0083	0.0543***
		(0.042)	(0.023)	(0.020)	(0.008)
Less than 3 years		-0.0276	0.0064	0.0263	0.0660***
		(0.047)	(0.029)	(0.023)	(0.010)
Less than 5 years		-0.2260***	-0.1161***	-0.0727***	0.0699***
		(0.051)	(0.032)	(0.027)	(0.010)
Less than 10 years		-0.3580***	-0.2653***	-0.1924***	0.0675***
		(0.051)	(0.035)	(0.031)	(0.012)
Older than 10 years		-0.5094***	-0.4447***	-0.3011***	0.0625***
		(0.054)	(0.039)	(0.034)	(0.014)
Listed developer		0.0941***	0.0894***		
		(0.031)	(0.023)		
Sub-district FE	No	No	Yes	Yes	Yes
Developer FE	No	No	No	Yes	Yes
Property FE	No	No	No	No	Yes
Observations	441,299	441,299	441,262	441,262	441,299
Adj R-squared	0.0324	0.658	0.846	0.898	0.956

$$p_{ijt} = \delta_t + \alpha_j + X_i\beta + \varepsilon_{it}$$

The coefficients on the time fixed effects can uncover [unexplained/residual] averages → trends.

Note that $p_{it} - \alpha_j - X_i\beta = \delta_t + \varepsilon_{it}$.
This how the hedonic price index works.

- Averages only: 3.24%
- + unit / property attributes: 65.8%
- + sub-district fixed effects: 84.6%
- + developer fixed effects: 89.8%
- **+ development fixed effects: 95.6%**

On average, Bangkok condominiums have lost value over time.
→ appropriate index construction methodology depends on question of interest.

Figure A2: Quality-adjusted (hedonic) condominium price index

This figure plots the time fixed effects from Model 5 of Table A1. The fixed effects can be viewed as quality-adjusted average price change compared to the baseline date (here, 2017Q4). Listing prices in secondary market dropped in 2020Q2 when closure order was issued and have since stabilized.

LTV ratio macroprudential policy (not a surprise)

Covid-19 (a surprise)
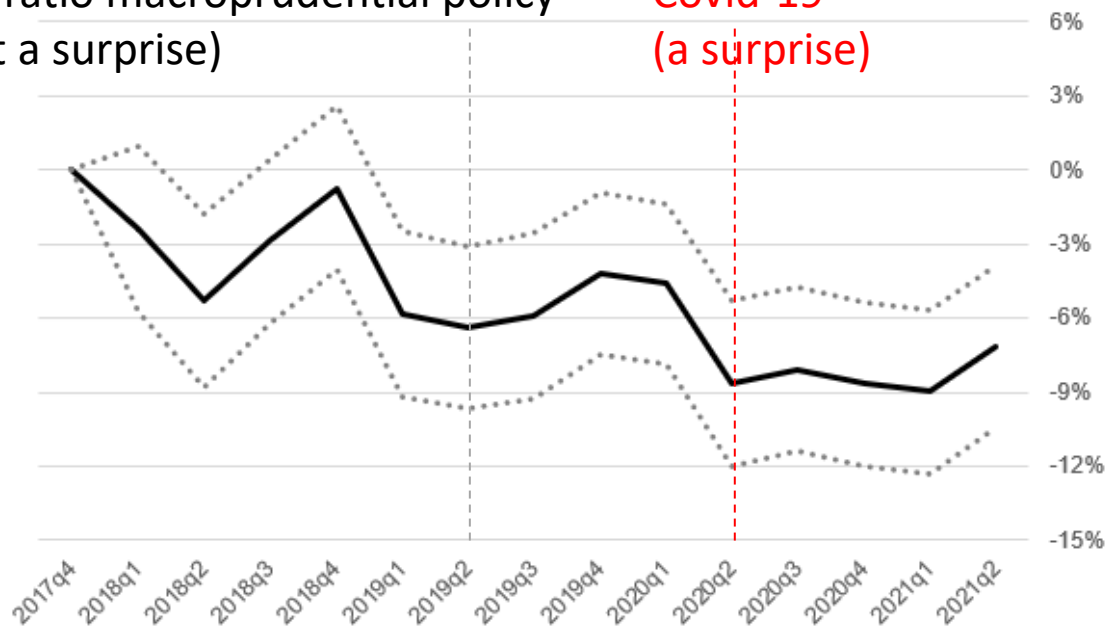
EC_EI_008_S2 : House Price Index
(Commercial Bank Mortgage Loan)
Condominium
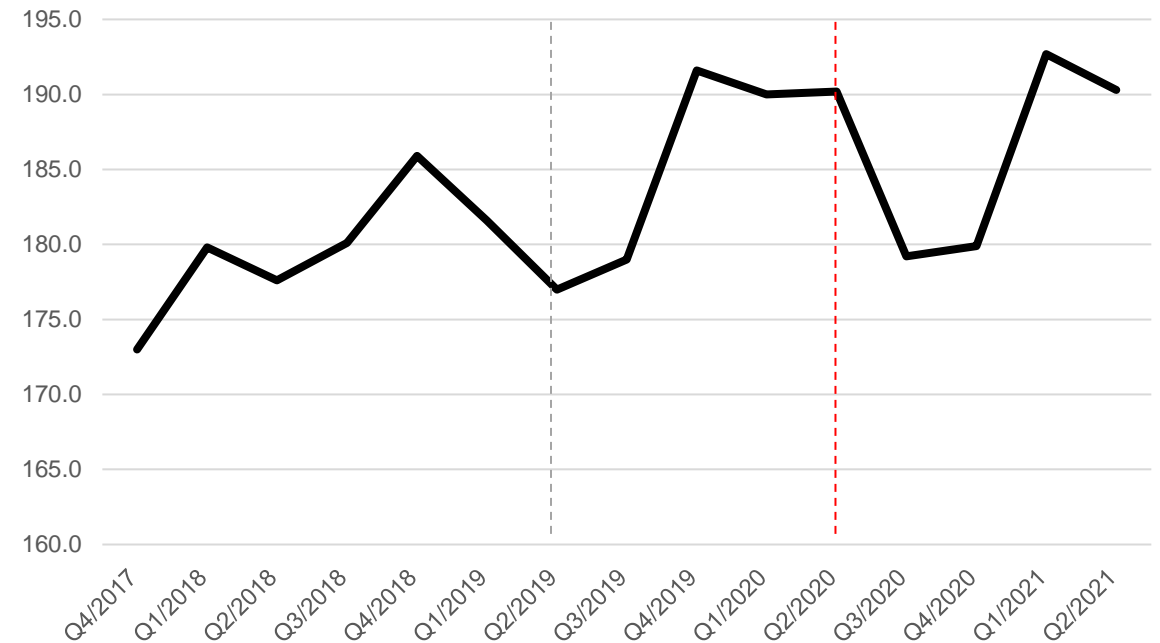
Prediction 1: condos with high Covid-19 exposure suffer more.
Prediction 2: …and developer has more leverage suffer more.

$$y_{idt} = \alpha_d + \delta_t + \beta_1 Post_t \cdot Density_i + \beta_2 Post_t \cdot Density_i \cdot L_i + \gamma' X_i + \varepsilon_{idt}$$

- $Post_t = 1$ for 2020Q2 – 2020Q3
- $Density_i$: Facebook population density, number of units in development
- $Leverage_i$: total liabilities / total assets → interaction
- $Due6/Due12$: total CP due in 6m or 12m / total liabilities → interaction
- $CP_i = 1$ developer issues commercial paper (37 of 54 listed developers)
- Controls || standard errors clustered at development level
  - Usable area: sq m
  - Bedroom category: 1 or 2 (3 or more excluded from sample)
  - Age category: within 1 year, 1, 2, 3, 4-5, 6-10, >10 (7 categories)
  - Development fixed effects α_d
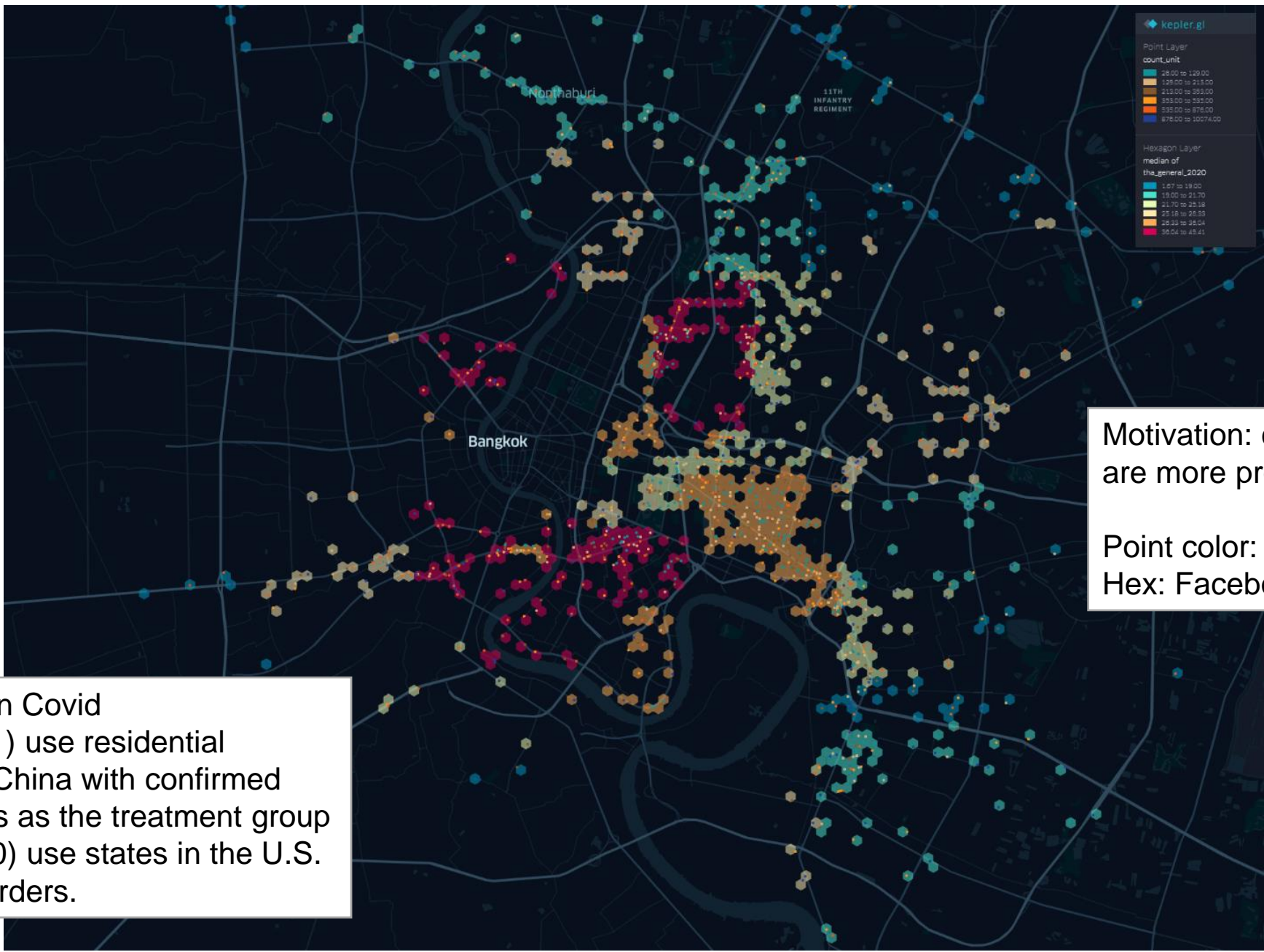
Motivation: condominiums are more prone to infection risk

Point color: high density dev
Hex: Facebook pop den

Existing research on Covid
- Qian et al. (2021) use residential communities in China with confirmed COVID-19 cases as the treatment group
- Lima et al. (2020) use states in the U.S. with shutdown orders.

Covid-19 conjectures are not supported by data. Unit density may act as proxy for something else.
Leverage channel, however, is related to price.

Table 2: January 2019 – September 2020

This table reports the result from the difference-in-differences and interaction regressions of log listing prices between January 2019 to September 2020. In model 1 to 4, the proxy for density is population density obtained from Facebook Data for Good Polulation Density Map. In model 5 to 8, the proxy for density is number of units in each development, measures in increments of 100. Because of limited data availability, control variables only include unit size (measured in square meters), an indicator variable for listings with 2 bedrooms (only 1- and 2-bedroom units are included) and indicator variables for development age but are omitted for brevity. Post is an indicator variable for listings from April 2020 to September 2020. For interaction term, leverage is defined as total leverage divided total assets. CP due is calculated as face value of commercial papers and bonds due with March 2020 as the baseline date. All regressions include development and month fixed effects. Standard errors are clustered at development level. Stars correspond to statistical significance level, with *, ** and *** representing 10%, 5% and 1% respectively.

VARIABLES	(1) Pop Density	(2) Pop Density	(3) Pop Density	(4) Pop Density	(5) Unit Density	(6) Unit Density	(7) Unit Density	(8) Unit Density
Post * Density	-0.0005	0.0003	-0.0010**	-0.0009**	0.0013***	0.0035***	-0.0004	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Post * Density * Leverage ratio		-0.0014***				-0.0042***		
		(0.000)				(0.001)		
Post * Density * CP due in 6 months / TL			0.0043***				0.0095**	
			(0.002)				(0.005)	
Post * Density * CP due in 12 months / TL				0.0020**				0.0046*
				(0.001)				(0.003)
Observations	164,425	164,425	122,557	122,557	164,425	164,425	122,557	122,557
Adj R-squared	0.957	0.957	0.957	0.957	0.957	0.957	0.957	0.957

Covid-19 exposure seems to play little role → focus on leverage.
Leverage affects prices of condos by listed developers more.
Average leverage ratio of unlisted / listed are similar (statistically insig.)

Possibilities: Unlisted developers are more patient? Listed developers are more sensitive performance?
For listed developers, CP issuers have access to capital market?
If so, rollover risk fear may have been alleviated by coordinated action (BSF).

	(1) All	(2) Unlisted	(3) Listed	(4) Listed	(5) All	(6) Unlisted	(7) Listed	(8) Listed
Developers listed or unlisted?								
VARIABLES	Pop Density	Pop Density	Pop Density	Pop Density	Unit Density	Unit Density	Unit Density	Unit Density
Post * Density	-0.0005	-0.0005	-0.0005	-0.0005	0.0012***	0.0017**	0.0008*	0.0008*
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Post * Leverage ratio	-0.0436***	-0.0174	-0.0947***	-0.1282***	-0.0388***	-0.0201	-0.0830***	-0.1119***
	(0.014)	(0.016)	(0.026)	(0.030)	(0.013)	(0.016)	(0.027)	(0.032)
Post * Has CP * Leverage ratio				0.0444*				0.0410*
				(0.023)				(0.022)
Unit size (sq.m.)	0.0152***	0.0138***	0.0158***	0.0159***	0.0152***	0.0138***	0.0158***	0.0159***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
2 bedrooms	0.1288***	0.1277***	0.1245***	0.1216***	0.1288***	0.1275***	0.1245***	0.1216***
	(0.009)	(0.015)	(0.011)	(0.011)	(0.009)	(0.015)	(0.011)	(0.011)
Observations	164,425	41,868	122,557	116,798	164,425	41,868	122,557	116,798
Adj R-squared	0.957	0.955	0.957	0.957	0.957	0.955	0.957	0.957

What might the Covid-19 exposure proxies be capturing?

Table 3: Two-way tabulation

This table reports the two-way tabulation of developer leverage and measures of density. Developments are independently classified by each dimension into quintiles. Changes in average price per square meters before (January 2019 to March 2020) and after (April 2020 to September 2020) closure for each development are computed, and the median of the price changes in each 5 x 5 cell of the matrix is reported.
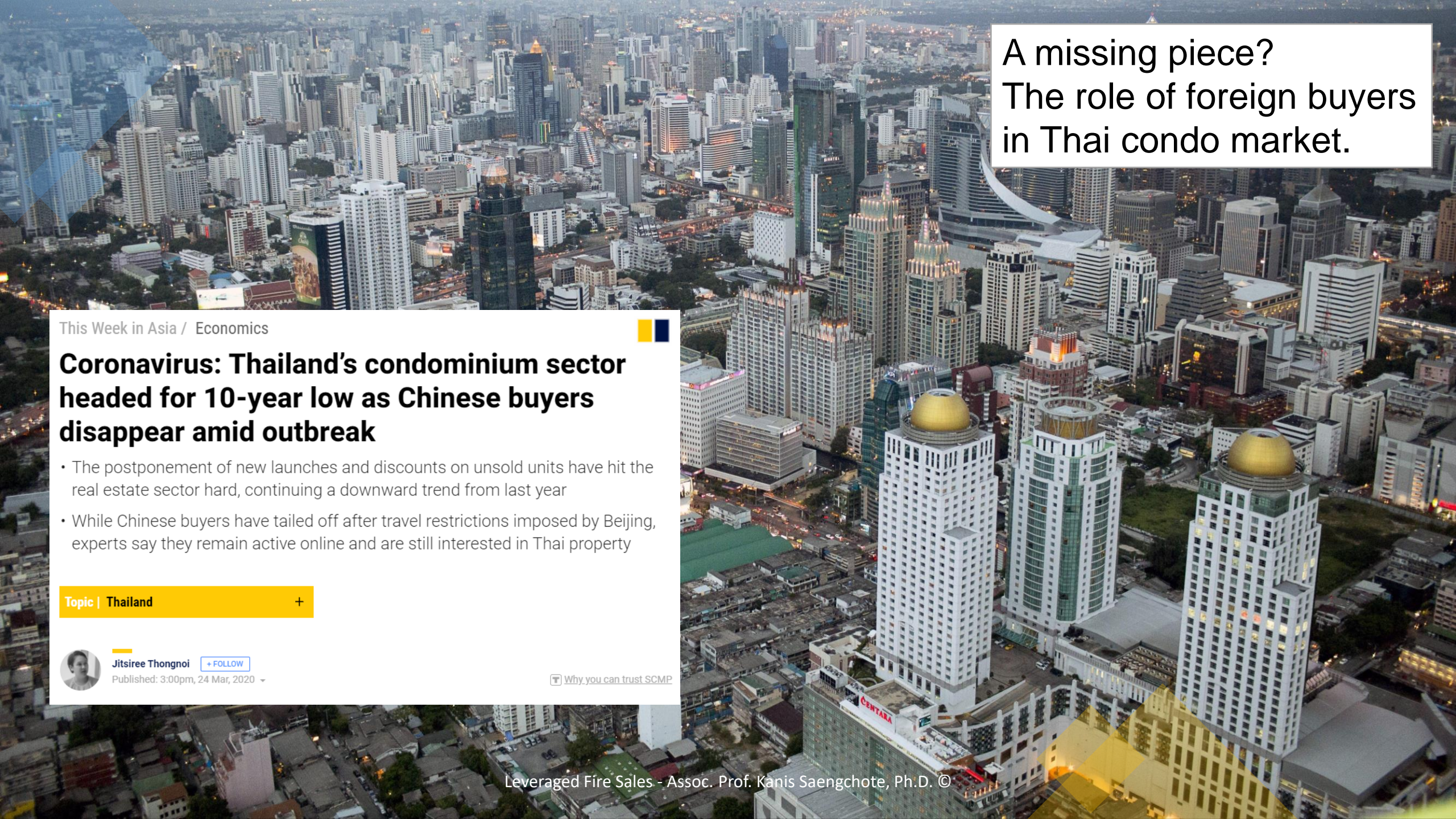
Panel A: Population density

		Leverage					
		1	2	3	4	5	All
Pop density	1	-1.6%	-3.5%	-1.5%	-1.6%	-1.8%	-1.7%
	2	-1.4%	-4.4%	-3.3%	-4.0%	-4.0%	-3.2%
	3	-1.8%	-4.7%	-1.7%	-3.1%	-3.9%	-3.0%
	4	-1.7%	-10.3%	-6.2%	-1.4%	-2.1%	-2.9%
	5	-1.9%	-4.8%	-4.6%	-4.8%	-3.4%	-3.3%
	All	-1.6%	-4.4%	-3.0%	-2.9%	-3.2%	-2.7%

Non-monotonic relationship between pop density and change in listing price.

Panel B: Unit density

		Leverage					
		1	2	3	4	5	All
Num units	1	-3.6%	-6.3%	-4.9%	-4.5%	-4.4%	-4.6%
	2	-1.5%	-3.9%	-4.6%	-3.3%	-2.9%	-3.2%
	3	-3.2%	-3.7%	-3.8%	-2.0%	-4.1%	-3.3%
	4	-1.6%	-4.3%	-2.3%	-1.4%	-1.6%	-1.8%
	5	-1.1%	-4.0%	-2.5%	-4.7%	-3.3%	-2.0%
	All	-1.6%	-4.4%	-3.0%	-2.9%	-3.2%	-2.7%

For unit density, developments with fewer units suffered greater price decline.

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A missing piece?
The role of foreign buyers in Thai condo market.

This Week in Asia / Economics

Coronavirus: Thailand's condominium sector headed for 10-year low as Chinese buyers disappear amid outbreak

- The postponement of new launches and discounts on unsold units have hit the real estate sector hard, continuing a downward trend from last year
- While Chinese buyers have tailed off after travel restrictions imposed by Beijing, experts say they remain active online and are still interested in Thai property

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Conclusion: developers' leverage matters.

- No evidence to conclude that Covid-19 exposure affects condominium prices differentially in Bangkok.

- Leverage-induced fire sale externalities relevant only for listed property developers, but listed developers with capital market access are less prone despite initial fear of rollover risk.

- Implication: potential spillover from primary to secondary market is one more reason why developers' leverage should be monitored in conjunction with household leverage.

- Caveat: indirect evidence
  - Listing price, not transaction price. Behavioral bias against listing at a loss?
  - No direct evidence of deep discount of primary market inventory by developers