Homes Incorporated

Offshore Ownership of Real Estate in the U.K.

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UNU WIDER – Revving up revenue for development

Motivation

Anecdotal evidence about foreign investors in the real estate market in large cities like London and New York (e.g. Vanity Fair, 2013; Financial Times, 2020).

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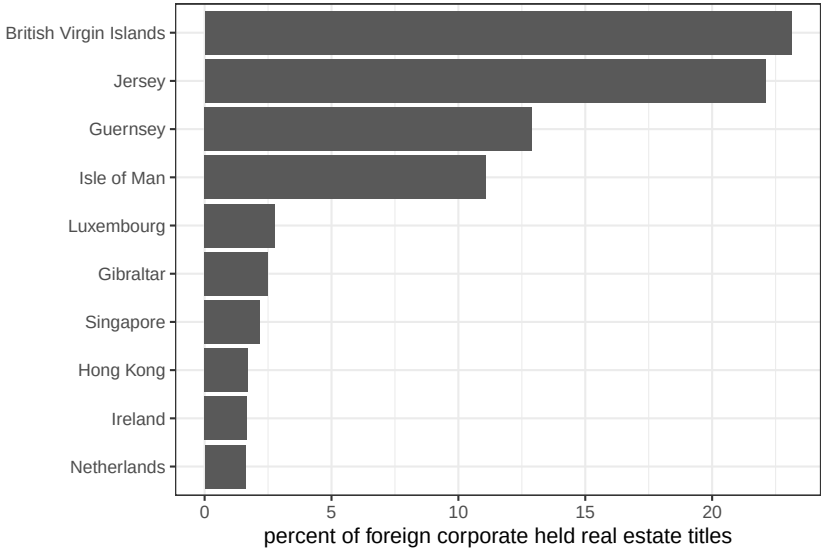
- Broader effects on real estate markets.
- Store of value motives conflict with housing objectives.

$\Rightarrow$ Despite substantial attention, *quantitative* evidence on the (i) the importance of offshore real estate investment, (ii) its causes, and (iii) its consequences is scarce.

Top 10 investing countries in British real estate



In a Nutshell

Main Research Questions

- What is the role of offshore investors in U.K. real estate? Who are these investors?
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- Explore policy variations to estimate causes and consequences.

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Main Results

1. Offshore ownership is important in high price segments.
2. A substantial share of offshore investment has U.K. beneficial owners.
3. Offshore owners have tax motives and secrecy motives.
4. Offshore investment affects real estate prices significantly.

Contributions

1. **Real Estate:** Mishkin (2011), Knoll et al. (2017); Martínez-Toledano (2019)
   ⇒ Add foreign ownership to the picture.
2. **Tax Haven Capital Flows:** Johannesen and Zucman (2014), Suárez Serrato (2018), Menkhoff and Miethe (2019), Casi et al. (2020), Langenmayr and Zyska (2021)
   ⇒ Can follow single assets over time.
3. **Ultimate Ownership of Tax Haven Assets:** Zucman (2013), Alstadsæter et al. (2019), Londoño-Vélez and Tortarolo (2022), Brounstein (2022), Damgaard et al. (2019), Coppola et al. (2021), Tørsløv et al. (2022)
   ⇒ Extend analysis to real estate assets.
4. **Foreign Real Estate:** Sá (2016), Badarinza and Ramadorai (2018), Agarwal et al. (2020), Cvijanović and Spaenjers (2021), Collin et al. (2022), Bomare and Le Guern Herry (2022), Alstadsæter et al. (2022), Alstadsæter and Økland (2022), Bourne et al. (2022)
   ⇒ Comprehensive picture looking through four questions including price effects.

Data

Data — Transaction Data

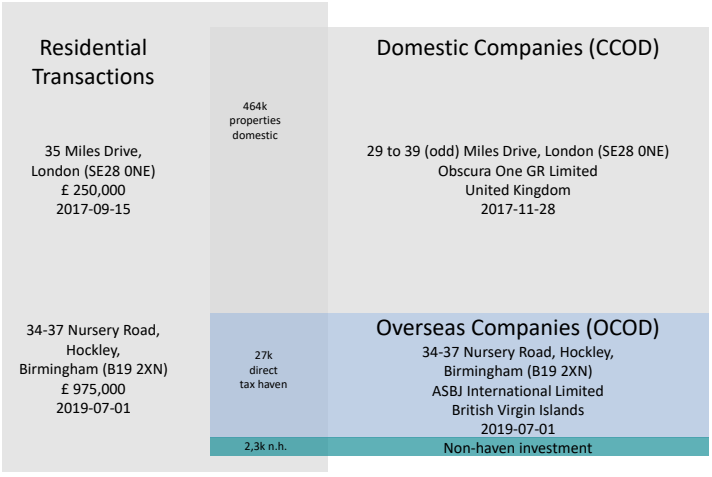
Residential Transactions

35 Miles Drive,
London (SE28 0NE)
£ 250,000
2017-09-15

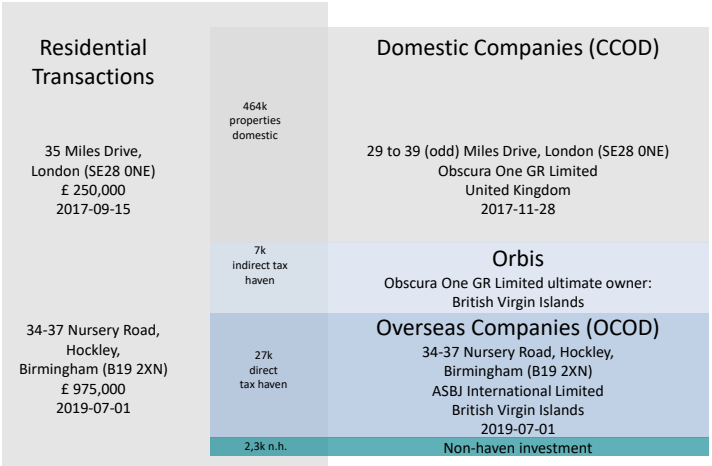
34-37 Nursery Road,
Hockley,
Birmingham (B19 2XN)
£ 975,000
2019-07-01

Data — Domestic Ownership Data

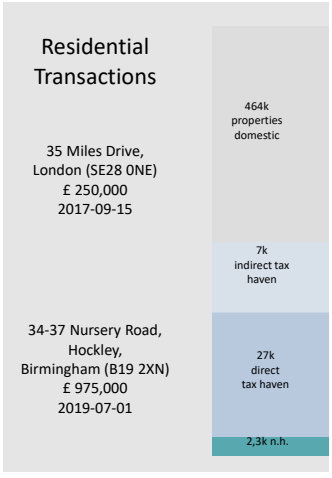
Data — Foreign Ownership Data



Data — Updating ‘Domestic‘ Data



Data — Overview



Data Availability

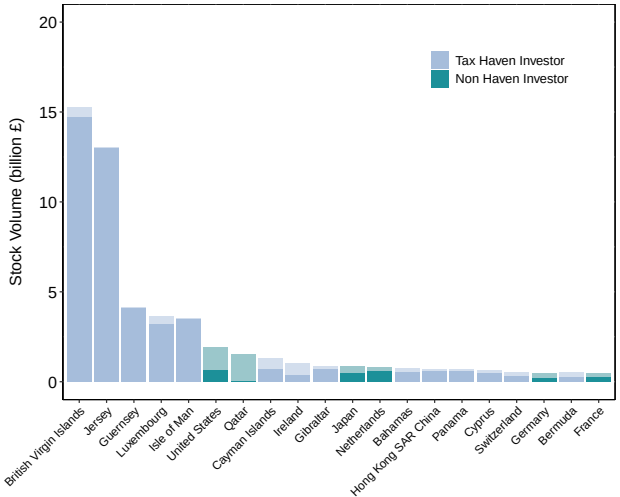
- Residential transactions: 1995-2019.
- Corporate ownership: 2015-2019 real time, some going back to 1890.
- FOI: Foreign corporate purchases since 1990.

Matching Challenges | Matching Statistics | Details Land Register | Details Ownership | Details ICIJ Leak Data | Matching Table

Descriptive Evidence

Stylized Facts — Stock Value by Country

Offshore Market by Investing Country (Dec. 2019)

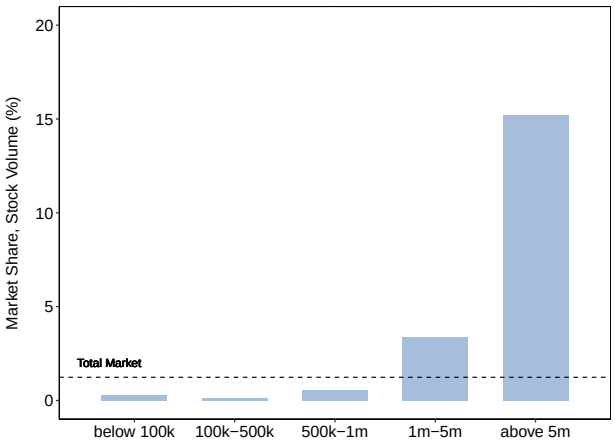


Take-Aways:

- Tax havens dominate foreign real estate investment.
- 8 out of the top 10 investing countries are tax havens.
- 93 percent of foreign investment comes from tax havens.

Stylized Facts — Concentration by Market Segments

Offshore Market Share by Price Segment (Dec. 2019)



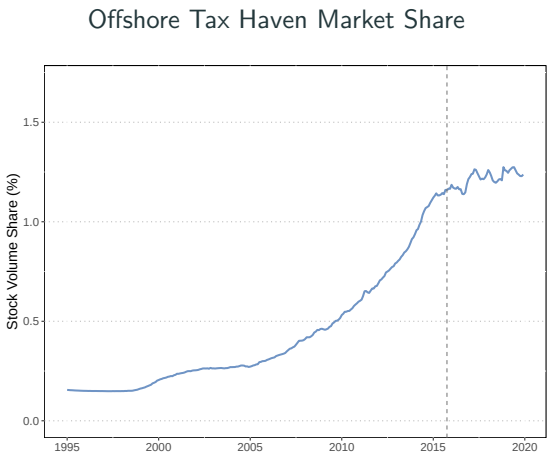
Take-Aways:

- Offshore real estate investment concentrated at the top price segments (more than 15 percent of stock volume).
- Total market share all England and Wales: 1.25%.

Transaction count

Stock value | Stock count

Stylized Facts — Evolution Over Time



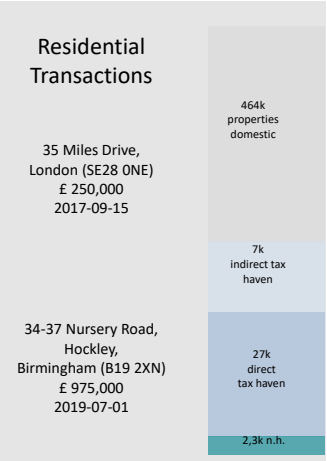
Take-Aways:

- Tax haven market share increased substantially from 0.15 percent in 1995 to 1.25 percent in 2019.

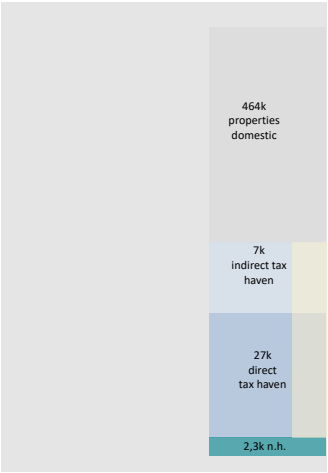
Details Construction | Absolute Value | Validation | Geographic Concentration | BIS comparison

Beneficial Ownership

Beneficial Ownership — Data



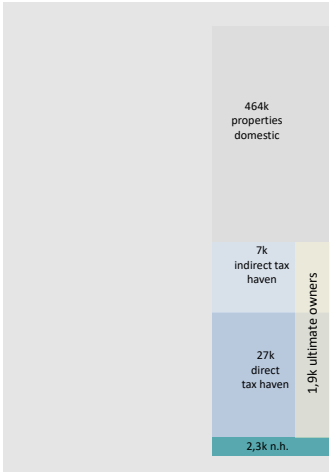
Beneficial Ownership — Data



ICIJ leaks

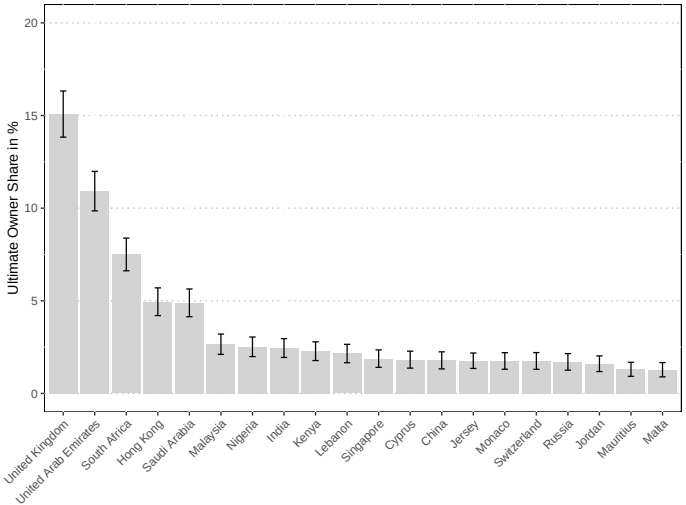
- 810k shell companies
- Offshore Leaks, Bahamas Leaks, Panama Papers, Paradise Papers, Pandora Papers
- Company name, country
  + beneficial ownership

Beneficial Ownership — Randomization



- Match 9,035 individuals to 12,835 properties
- Assumption: Sample of matched properties is randomly drawn from all properties owned by foreign companies.
- Randomization tools: Bootstrap sample (1000 iterations).
- Over all iterations, calculate bottom quartile, mean, and top quartile.

Beneficial Ownership — Country Shares

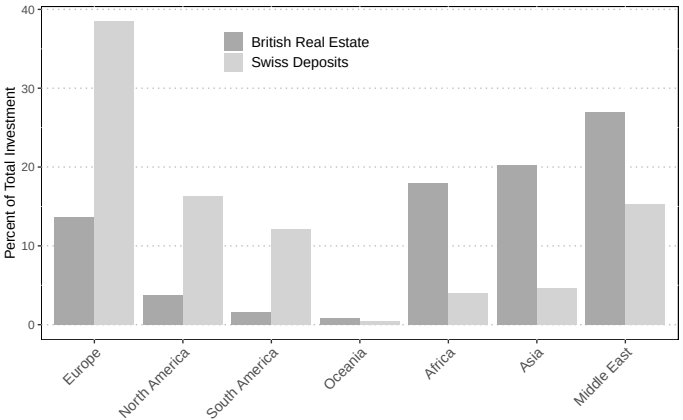


Take-Aways:

- Around 15 percent of *nominal* offshore investment is *ultimately* coming from home.
- Tax haven secrecy can be pierced for part of the sample.

3 uniques | Number of officers | numbers leaks | 10 countries | 50 countries

Beneficial Ownership by Region - British Real Estate vs. Swiss Private Banking



Take-Aways:

- Regional distribution of real estate investment quite different from financial assets.
- Role of Asia, Africa, and Middle East much higher for tax haven real estate investment.

Evidence on Causes

Tax and Secrecy Motives

1. We find reactions to a capital gains tax exemption for investments from Luxembourg, evidence of a tax planning motive.
2. We find reactions to a transparency announcement for investments from the Crown Dependencies, evidence of a secrecy motive.
3. Reactions are sizable and take place without much delay.

Details Capital Gains Tax ES Capital Gains Tax

Details Secrecy ES Secrecy

Evidence on Consequences

Identification

⇒ **Does offshore ownership affect market outcomes, i.e. prices?**

- Challenge: Endogeneous selection into particular market segments.

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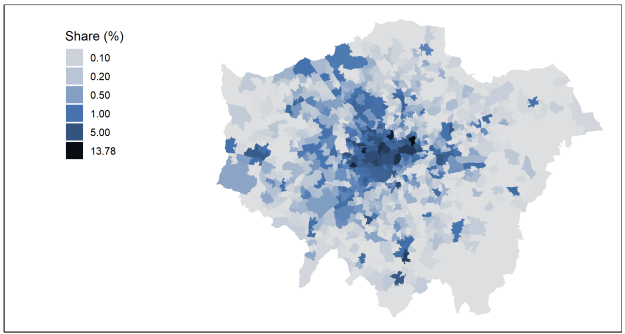
⇒ We compare the within property price evolution between areas in London that are differentially affected. fpi inflow | foreign sales probability | foreign stock value | foreign share

Geographic concentration — London

Offshore Market Shares in London, Jan. 2016



Take-Aways:

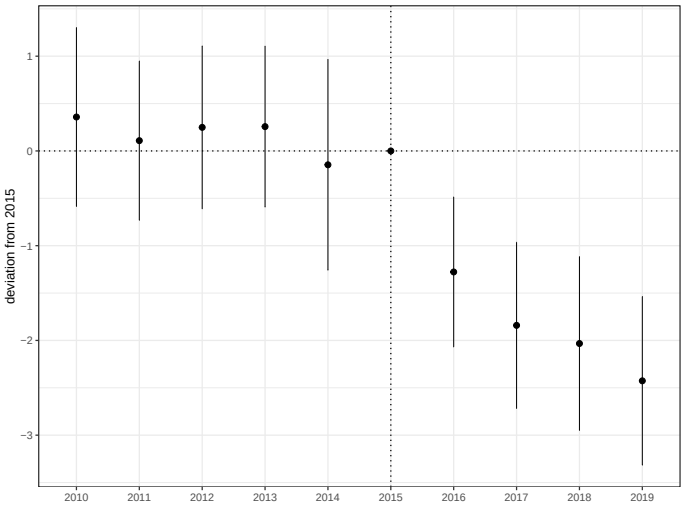
- Offshore Penetration (OP) varies at 983 output areas middle.
- 79,029 unique addresses available for within price change analysis.

Estimation

$$log(price_{it}) = \mu_i + \sum_t \Gamma^t d_t \times \boldsymbol{x_i} + \sum_t \beta^t d_t \times \text{Offshore}_a + \varepsilon_{it}$$

- price_{it}: Price paid for of property i in year t
- μ_i: property fixed effects
- d_t: time dummies, omitted category 2015
- x_i a vector of time-invariant controls, baseline: 100 pre-Brexit price bins
- Offshore_a is the share of the residential real estate market

Results — Price effects of offshore real estate

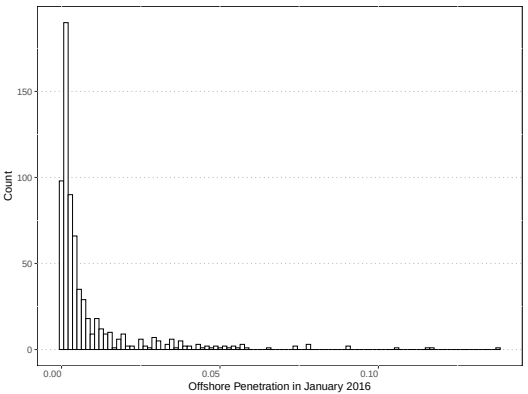


Take-Away:

- Prices in areas with high offshore penetration show comparatively lower prices after Brexit.
- Effect is immediate and persistent.

quarterly specification | monthly specification

Results — Economic size of the effect



- An output area with a one standard deviation higher OP experiences a 2% stronger relative price decline of within property prices after Brexit.
- Examples under linearity & sticky supply assumptions:
  - Westminster without offshore capital: at least 16% lower prices.
  - Liverpool with Westminsters' offshore market share: at least 13% higher prices.

Results — Robustness

	(1) **Baseline**	(2) **Additional area controls**	(3)	(4) **Alternative winsorization**	(5)	(6) **Alternative clustering**	(7) **Alternative property controls**	(8)
Post × Offshore	-1.91***	-1.91***	-1.85***	-2.34***	-2.94***	-1.91***	-1.16***	-1.26***
	(0.216)	(0.221)	(0.216)	(0.266)	(0.376)	(0.376)	(0.162)	(0.221)
Post × Corporate		-0.013						
		(0.109)						
Post × Foreign Population			-0.039**					
			(0.019)					
Property FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
100 price bins × year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Property type × year FE							Yes	
Tenure type × year FE								Yes
Clustering	Property	Property	Property	Property	Property	983 areas	Property	Property
Winsorization				2×0.5%	2×2%			
Observations	99,565	99,565	99,565	99,197	97,395	99,565	97,692	99,565
Adjusted R^2	0.9356	0.9356	0.9356	0.9353	0.9355	0.9356	0.9788	0.9366

Details domestic corporate | ES domestic corporate | Details migration | ES migration

Results — Mechanism and Spill-overs

	(1) Baseline	(2) Mechanism	(3) Spill-overs
Post x Offshore	-1.91***		
	(0.216)		
Post x Offshore, Expected British		-1.01	
		(2.01)	
Post x Offshore, Expected Foreign		-2.10***	
		(0.545)	
Post x Offshore, Low Price			-2.23***
			(0.610)
Post x Offshore, High Price			-1.98***
			(0.257)
	99,565	99,565	68,868
Property FE	Yes	Yes	Yes
100 price bins x year FW	Yes	Yes	Yes
observations	99,565	99,565	68,868
Adjusted R^2	0.9356	0.9356	0.9421

Ultimate Ownership Details

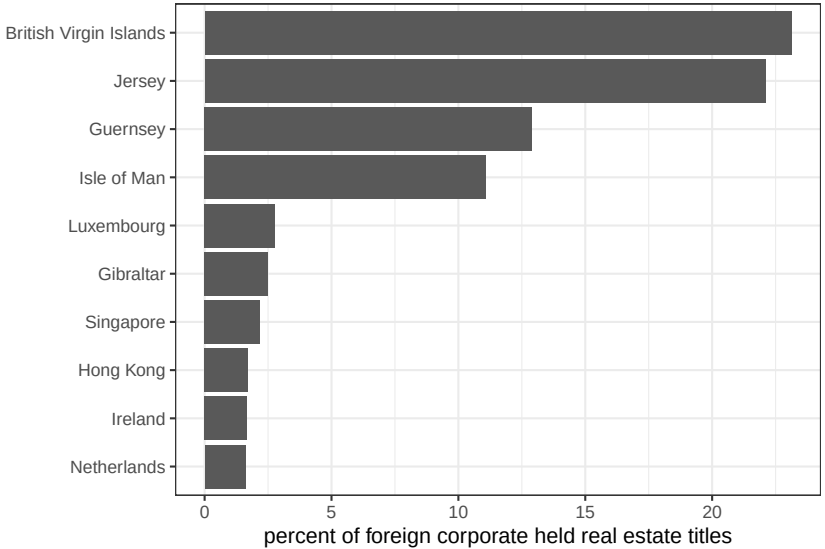
$\Rightarrow$ Price reactions driven by ultimately foreign investors.

Spill-overs Details

$\Rightarrow$ Evidence for spillovers across market segments.

Conclusion

Top 10 investing countries in British real estate



Conclusion

Combine administrative and commercial data with information on ownership chains and leak data on beneficial ownership and show descriptively:

- Predominance of tax havens among foreign held real estate.
- Importance in high price segments and increasing importance over time.
- UK citizens relevant beneficial owners.

Exploit unique (policy) experiments and show:

- Secrecy as well as tax motives present, reactions timely.
- Price effects of offshore real estate investments.
- Some evidence for spillovers across price segments.

Questions and comments highly welcome!

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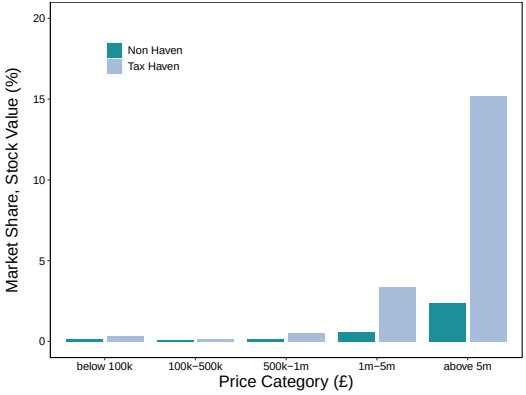
Appendix: Concentration by market segments

Market Shares, Stock 2019



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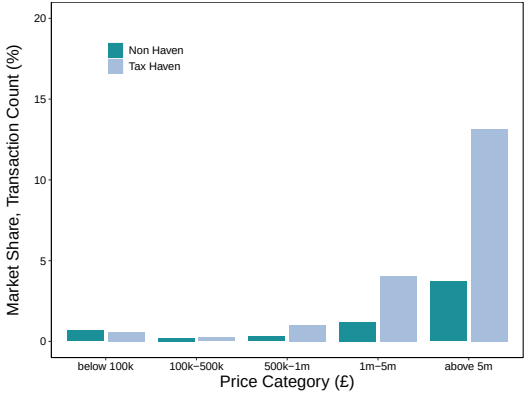
Market Shares, Transaction Number



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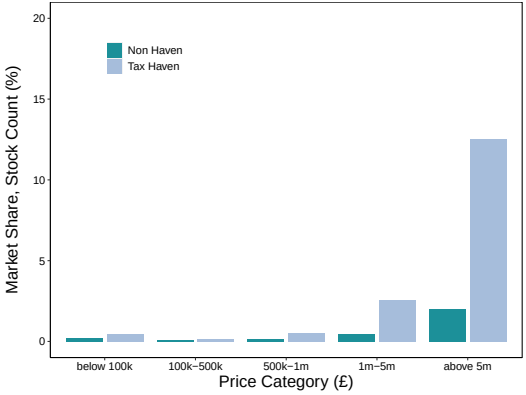

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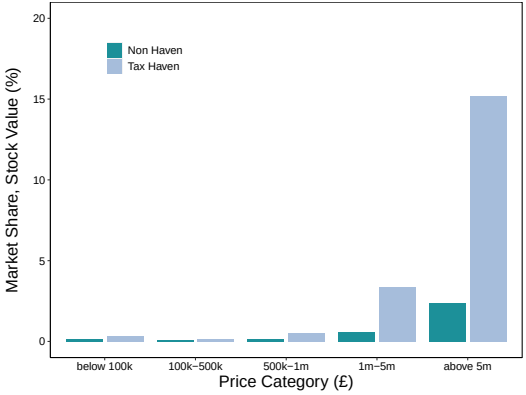

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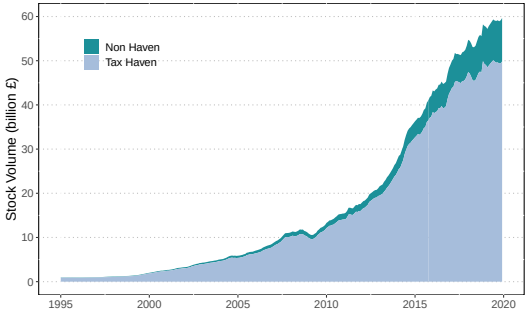
Appendix: Evolution over time — Absolute Values

Foreign market value in residential market



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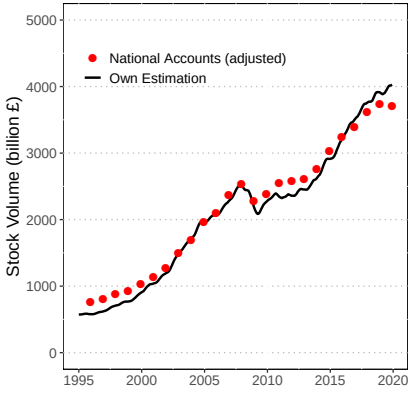
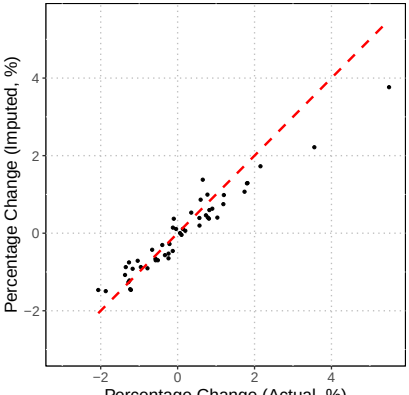
Appendix: Evolution over time — Validation





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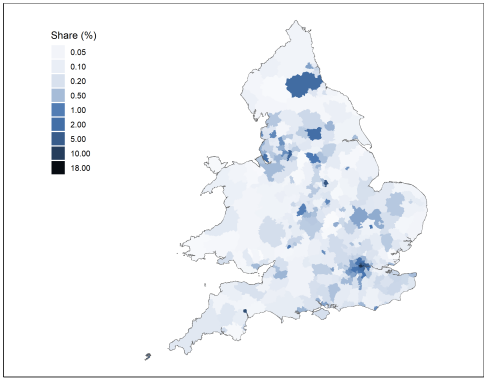
Stylized Facts — Geographic Concentration

Geography of Offshore Market (Dec. 2019)



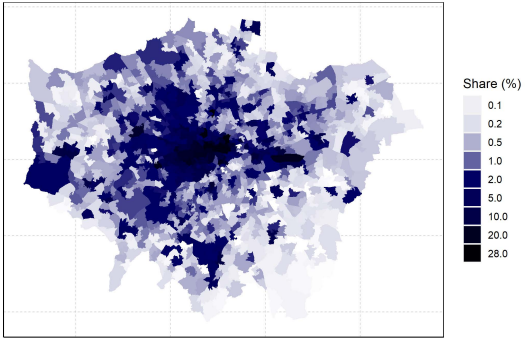
Take-Aways:

- Offshore real estate investment concentrated in urban areas, but not exclusively.
- Large variation within urban areas.

London back

Appendix: Geographic concentration

London Stock Volume Shares, Dec. 2019



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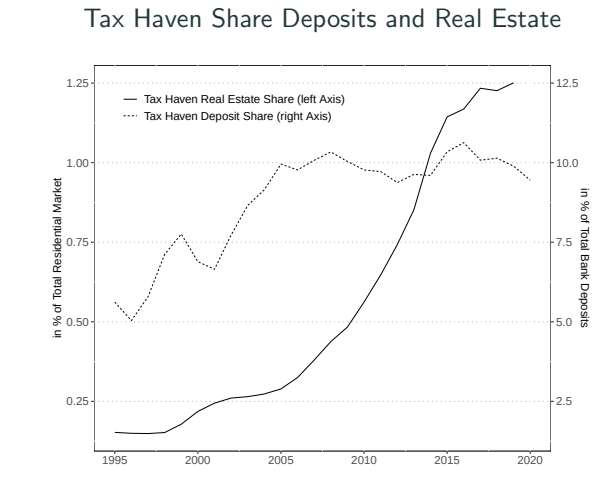
Tax Haven Share - British Real Estate vs. British Bank Deposits



back

Take-Aways:

- Offshore real estate more recent phenomenon compared to bank deposits.
- Substantial growth since 2008.
- Total share of real estate market around a 10th of all bank deposits.

Capital gains tax (CGT) — Institutional framework

CGT particularities for foreign investors

- UK took steps to abolish CGT exemption for foreigners
- November 2017: government announced an extension of CGT to non-residents
- implemented in April 2019

$\rightarrow$ We exploit a temporary loophole for investments from Luxembourg to which the CGT extension did not apply until April 2019.

Capital gains tax (CGT) - Empirical specification

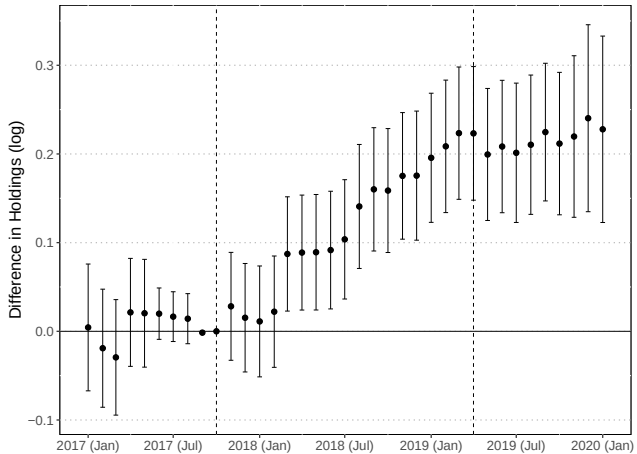
$$\log(y_{i,t}) = \sum_{t \neq \text{Oct 2017}} d_t \times d_{LUX} + \gamma_t + \alpha_i + \epsilon_{i,t}$$

- $y_{i,t}$: number of properties held from jurisdiction i at time t
- $d_t \times d_{LUX}$: treatment indicator
- γ_t: time fixed effect
- α_i: country fixed effect
- $\epsilon_{i,t}$: error term

$\rightarrow$ Sample: all tax haven countries

Capital gains tax (CGT) - Results

Reactions to CGT Policy - Luxembourg vs. Other Tax Havens



▸ Unit of Analysis ▸ Outcome Variable Transformation ▸ Flows ▸ back

Transparency shock - Institutional framework

- Beyond tax advantages, offshore jurisdictions provide secrecy
- April 2018: Parliamentary initiative to mandate the *Overseas Territories* (OTs) to set up public registers of beneficial ownership
- UK parliament acted under advice that cannot directly mandate the *Crown Dependencies* (CDs) to do so
- CDs voluntarily announced the adoption of the policy in June 2019

$\rightarrow$ hypothesis: OTs became less attractive compared to other tax havens and the CDs if secrecy motive is present.

Transparency shock - Empirical specification

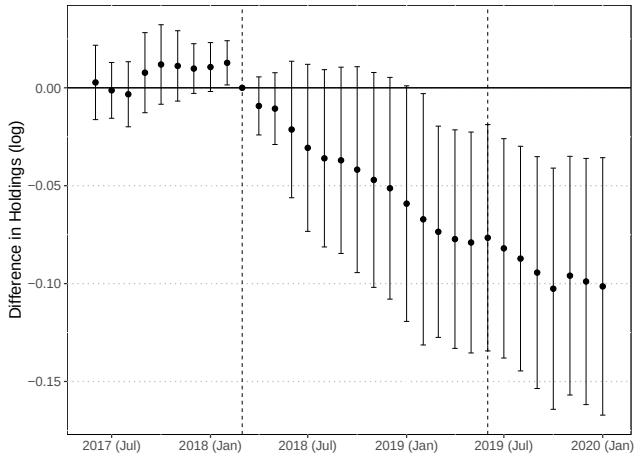
$$\log(y_{i,t}) = \sum_{t \neq \text{Mar 2018}} d_t \times d_{OT} + \gamma_t + \alpha_i + \epsilon_{i,t}$$

- $y_{ij,t}$: number of properties held from jurisdiction i at time t
- $d_t \times d_{OT}$: treatment indicator (changed in robust tests)
- γ_t: time fixed effect
- α_{ij}: country-district fixed effect
- $\epsilon_{i,t}$: error term

$\rightarrow$ Sample: CD & OT tax haven countries

Transparency shock - Results

Transparency Shock - OTs vs. CDs.



▸ Unit of Analysis ▸ Outcome Variable Transformation ▸ back

Data — Overview U.K. Land Register

1. **Administrative Price Paid Transaction Data:**
   - Universe of transactions in the *residential* real estate market 22 million transactions, 13 million properties.
   - Time Coverage: 1995 - 2019.
   - Main Variables: address of property, price paid, date of purchase.
2. **Administrative Ownership Data:**
   - All corporate held real estate.
   - Real time data 2015 - 2019, some ownership information going back until 1890.
   - FOI request: foreign purchases since 1990.
   - Main Variables: address of property, company name, country of incorporation.

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Data — Firm data and leak data

3. Leak Data from ICIJ:

- Ultimate ownership information for 810,000 shell companies.
- Main Variables: company name, country of incorporation, beneficial ownership.

4. ORBIS Company Data:

- Global ownership structure of companies (around 400 million).
- Time Coverage: varying quality since 1990s.
- Main Variables: company name, country of incorporation, shareholder chains, global ultimate owner.

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Details: UK Land Register Data

Information on corporate owner(s): up to 4 corporate proprietors including addresses & countries

Country information for each, we categorize non-havens and tax havens (high secrecy, low tax rates, based on union of Johannesen and Zucman (2014) and Gravelle (2015)), among which:

1. Crown Dependencies (3): Guernsey, Jersey, Isle of Man
2. Overseas Territories (14): **Anguilla**, **Bermuda**, British Antarctic Territory, British Indian Ocean Territory, **British Virgin Islands**, **Cayman Islands**, Falkland Islands, **Gibraltar**, **Montserrat**, Pitcairn Islands, Saint Helena Ascension and Tristan de Cunha, South Georgia and the South Sandwich Islands, Sovereign Base of Akrotiri and Dhekelia, **Turks and Caicos Islands**
3. 'other' tax havens (46): includes Bahamas, Maldives, Cook Islands, Cyprus,...

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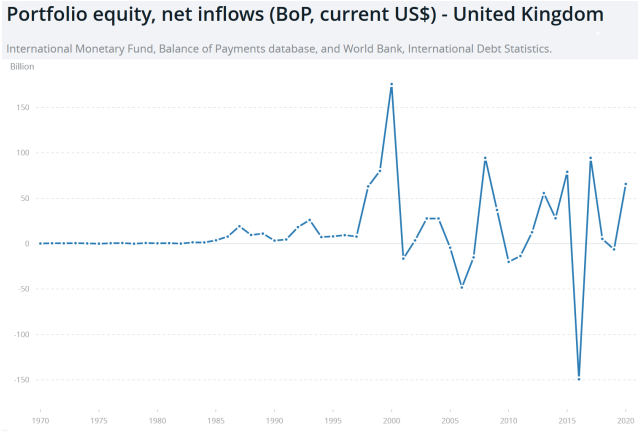
	All properties	Residential properties
Panel A: Corporate ownership		
Commercial and Corporate Ownership Data (CCOD)	2,283,212	471,522
Overseas Company Ownership Data (OCOD)	95,847	21,503
Freedom of Information (FOI)	90,224	8,261
Total with corporate ownership	**2,469,283**	**501,286**
Panel B: Offshore corporate ownership		
Direct owner is corporation in tax haven (OCOD + FOI)	181,463	27,375
Indirect owner is corporation in tax haven (Orbis)	121,069	7,238
Total involving offshore corporate owners	**302,532**	**34,613**
Panel C: Ultimate owners (natural persons)		
- Pandora Papers	1,086	283
- Paradise Papers	1,211	348
- Panama Papers	3,817	968
- Offshore Leaks	306	77
Total with identified ultimate owners	**7,310**	**1,918**

FPI inflows into the UK



source: International Monetary Fund, Balance of Payments database, and World Bank, International Debt Statistics.

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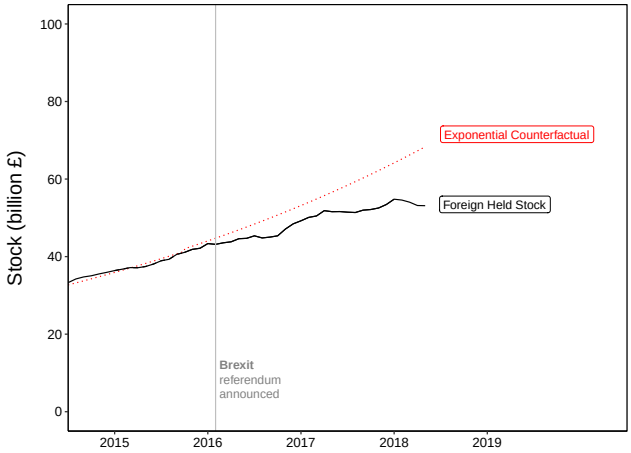
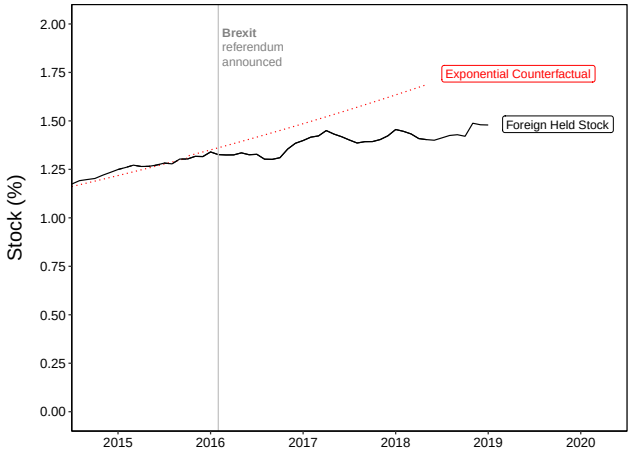
Counterfactuals for real estate share over time



Back

Counterfactuals for real estate share over time



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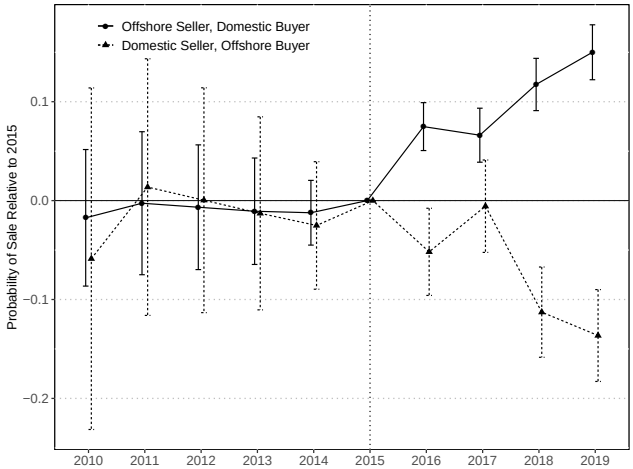
Probability of Selling / Buying



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Estimation of Stock Volume (1)

1. **After Oct. 2015:** extract stock volume from monthly snapshots.
2. **Before Oct. 2015:** use flow data to carry stocks backward from first snapshot.

Example, Stock of Real Estate held by Foreign Owners in District i

$$S^F_{t,i} = \underbrace{(1 + g_{t-1,i})}_{\text{HPI adjustment}} \underbrace{S^F_{t-1,i}}_{\text{Previous Stock}} - \underbrace{F^{F-NF}_{t-1,i}}_{\text{Flows from foreign to non-foreign}} + \underbrace{F^{NF-F}_{t-1,i}}_{\text{Flows from non-foreign to foreign}} + \underbrace{F^{New-F}_{t-1,i}}_{\text{New properties}}$$

back

Estimation of Stock Volume (2)

Challenge: for some flows, we only observe the destination, but not the origin of the flow (flow data only starts in 1995). *Example, Flow from Foreign Owners to Non-Foreign Owners in District i*

$$F^{F-NF}_{t-1,i} = \underbrace{\hat{F}^{F-NF}_{t-1,i}}_{\text{observed}} + \underbrace{\tilde{F}^{F-NF}_{t-1,i}}_{\text{unobserved}}$$

$\rightarrow$ Estimation of unknown flow origins based on the origins of observed flows.

$$\tilde{F}^{F-NF}_{t-1,i} = \underbrace{\hat{F}^{U-NF}_{t-1,i}}_{\text{flows to non-foreign, unobserved origin}} \times \underbrace{\frac{\hat{F}^{F-NF}_{t-1}}{\hat{F}^{F-NF}_{t-1} + \hat{F}^{NF-NF}_{t-1}}}_{\text{share of flows to non-foreign that come from foreign}}$$

back

Details: Leaked data from the ICIJ

Leaks (International Consortium of Investigative Journalists):

- Offshore Leaks: 105,114 companies, current through 2010
- Panama Papers: 206,526 companies, current through 2015
- Bahamas Leaks: 175,514 companies, current through 2016
- Paradise Papers: 286,094 companies, through 2014/2016
- Pandora Papers: 27,501 companies, through 2020

Information:

- entity name, intermediary, 'officers': incl. address & country
- we distinguish 'officers'
- we use entity names, extensively treat company types (so far $>$ 30 different types of LLC's), and country information
- we link company name + type + country with Land Registry

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Matching Statistics

OCOD

- 20423 (8.7%) prepared addresses, max is 18.3% in 2018
- 15236 (14,9%) unique original titles, max is 24.92% in 2018

CCOD

- 415079 (5.3%) prepared addresses, max is 18.4% in 2019
- 366149 (15.3%) unique original titles, max is 24.8% in 2019

ratio

- raw data CCOD = 33.5 * OCOD; match: CCOD = 20.3 * OCOD
- But: unique original property titles: factor 23.4 raw, 24 match

PP

- 1.76% of transactions, max is 8.3% in 2019 back

Data — Matching Challenges

- No unique identifier that links transaction data and ownership data
- Inconsistent recording of addresses
- Transactions / Ownership entries can contain multiple postal addresses

Example Record:

"FLATS 1-27 WALLACE COURT, 54 TIZZARD GROVE, LONDON (SE3 9EE), FLATS 103-128 WALLACE COURT, 44 TIZZARD GROVE, LONDON (SE3 9EQ)AND FLATS 129-157 WALLACE COURT,52 TIZZARD GROVE, LONDON (SE3 9FE),1-48 GRAYSTON HOUSE, 21 ASTELL ROAD LONDON (SE3 9FN), 49-110 GRAYSTON HOUSE, 1 OTTLEY DRIVE, LONDON (SE3 9FP), 1-62 MALTBY HOUSE, 2 OTTLEY DRIVE, LONDON (SE3 9FJ), 63-105 MALTBY HOUSE, 18 TUDWAY ROAD, LONDON (SE3 9FL), 5-12 OTTLEY DRIVE, LONDON (SE3 9FT), 2-16 (EVEN) TUDWAY ROAD, LONDON (SE3 9FR)"

Data — Matching Challenges

This entry is made up op 313 unique addresses:

postcode	street	...number	unit	...number	locality	...number
SE3 9EE	TIZZARD GROVE	54	FLAT	1	WALLACE COURT	
SE3 9EE	TIZZARD GROVE	54	FLAT	2	WALLACE COURT	
...	...	...	...	...	...	...
SE3 9EE	TIZZARD GROVE	54	FLAT	27	WALLACE COURT	
SE3 9EQ	TIZZARD GROVE	44	FLAT	103	WALLACE COURT	
...	...	...	...	...	...	...
SE3 9FP	OTTLEY DRIVE	1			GRAYSTON HOUSE	94
...	...	...	...	...	...	...

of which for example 94 GRAYSTON HOUSE, 1 OTTLEY DRIVE, SE3 9FP shows up in the transaction price paid data and is matched within our 4 months matching tolerance.

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Stylized facts — Ultimate ownership

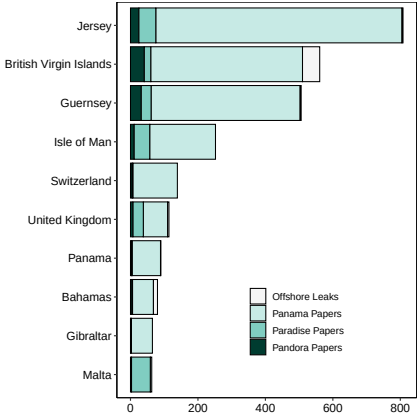
Objective: find ultimate owners of British real estate

- Match is based on name, incorporation type, and incorporation country
- Match 9,035 "officers" to 12,835 properties of which 7,310 pass quality checks
- Different officer types:
  - 3,629 legal entities — corporate structures connected to the investing firm
  - 5,406 natural persons — 1,250 beneficiaries and 3,186 shareholders.

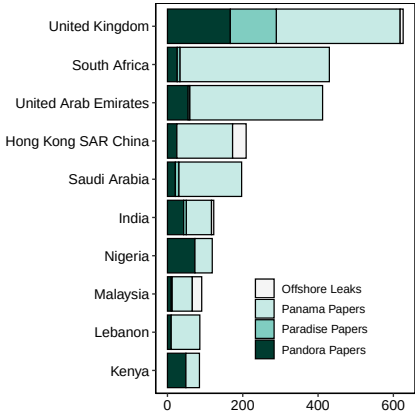
back

Stylized facts — Ultimate ownership by natural persons

Legal entities

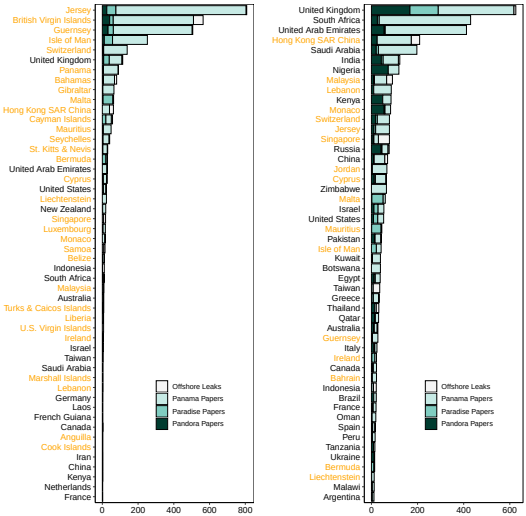


Natural persons



back

Stylized facts — Ultimate ownership: 50 countries



- looking through leaks updates ownership substantially
- top 3 countries move from being tax havens to non-havens
- Crown Dependencies and British Virgin Islands much further down the list

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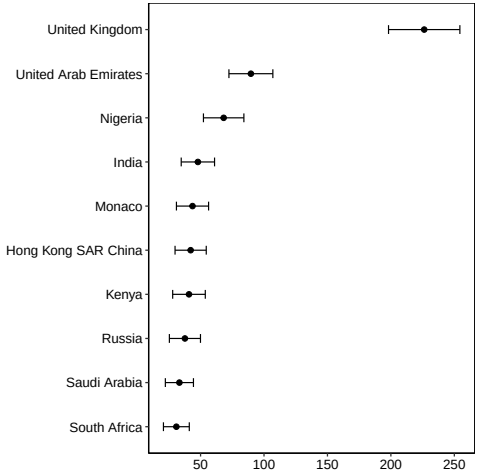
Market Shares: Numbers



- version: matched ownership with price paid data
- market: corporate held residential real estate market
- plotting total unique natural persons (beneficiaries and shareholders)

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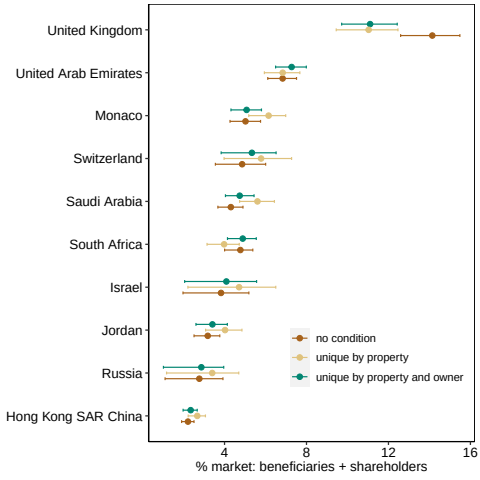
Market Shares: Different Uniques



- three versions of unique owners: no change, each property only once, each owner-property pair only once
- this changes importance of properties held by more than one company and companies connected to more than one individual

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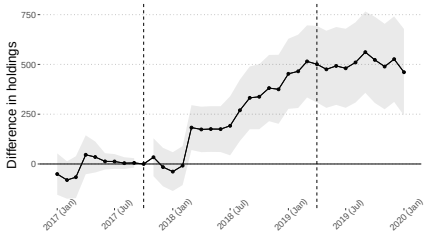
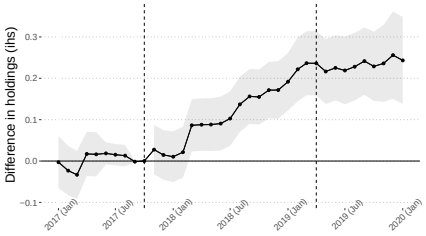
Appendix: Capital Gains Tax, Transformation of Outcome Variable

Reactions to CGT, Transformation of Outcome Variable



(a) Absolute Number



(b) Inverse Hyperbolic Sine

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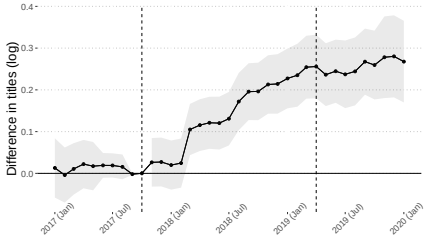
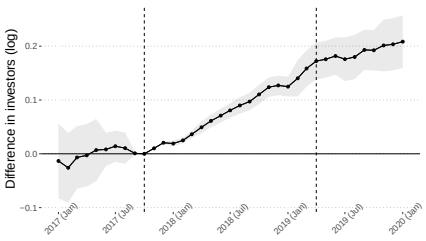
Appendix: Capital Gains Tax, Unit of Analysis



(a) Property Titles



(b) Unique Investors

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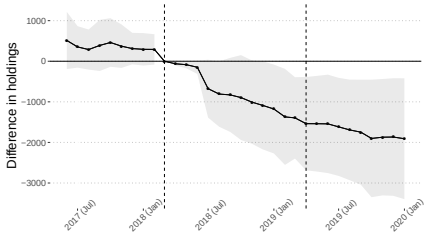
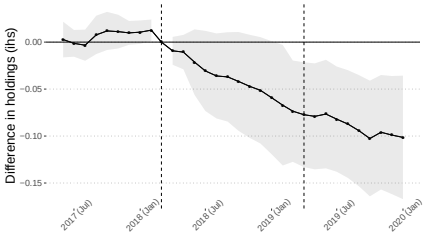
Appendix: Reactions to Transparency, Transformation of Outcome Variable



(a) Absolute Number



(b) Inverse Hyperbolic Sine

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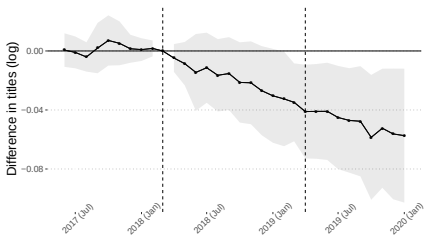
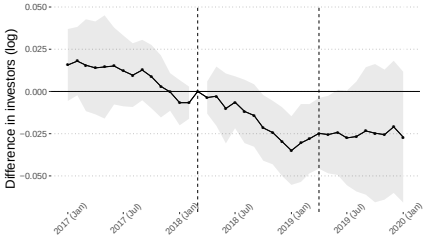
Appendix: Reactions to Transparency, Unit of Analysis



(a) Property Titles



(b) Unique Investors

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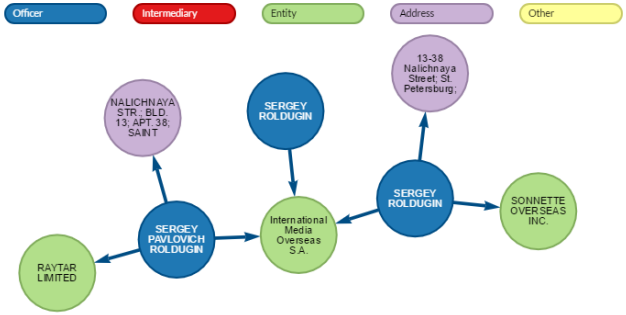
Appendix: ICIJ data example

Find "Roldugin" anywhere it appears.



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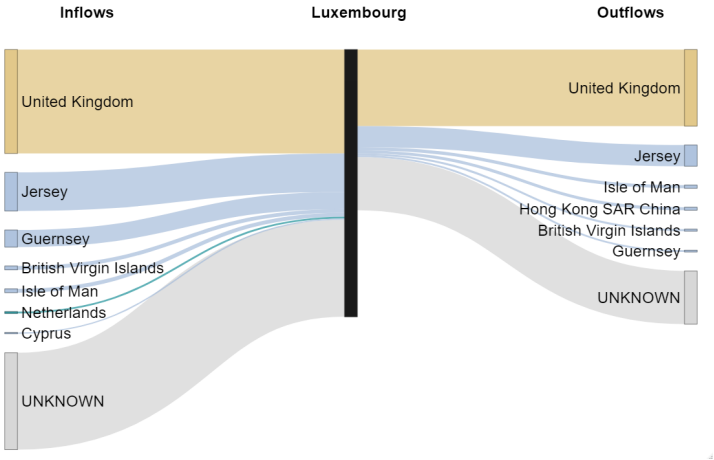
Tax Shock - Flows (Oct. 2017 - Apr. 2019)



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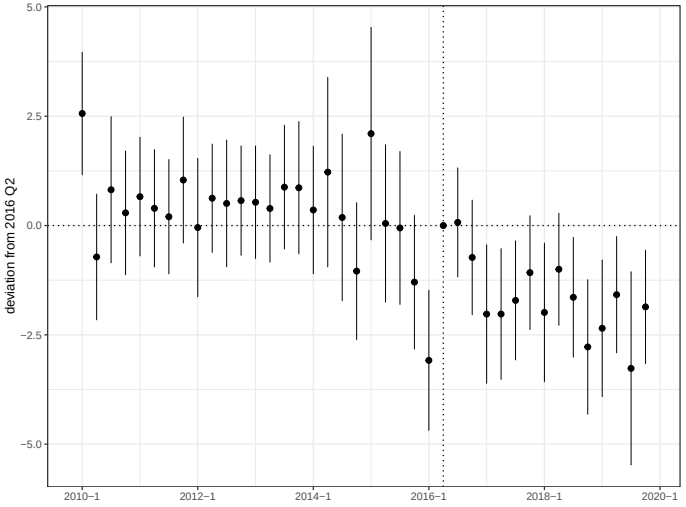
Results — Baseline quarterly



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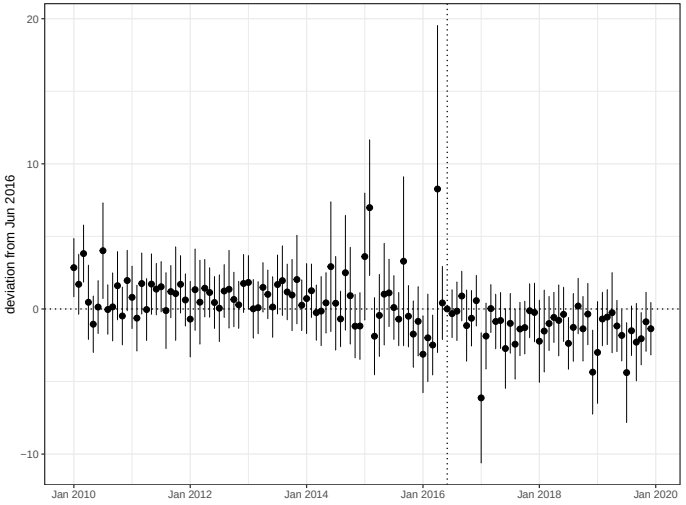
- time period: year-quarter
- baseline quarter: 2016 q2

Results — Baseline monthly



- time period: year-month
- baseline month: Jun 2016

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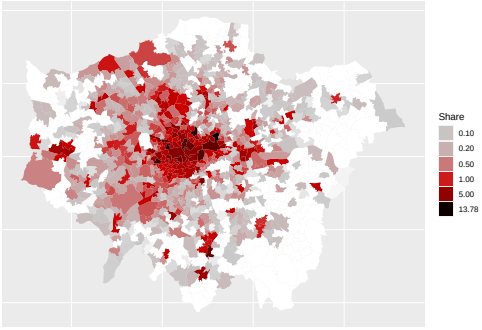
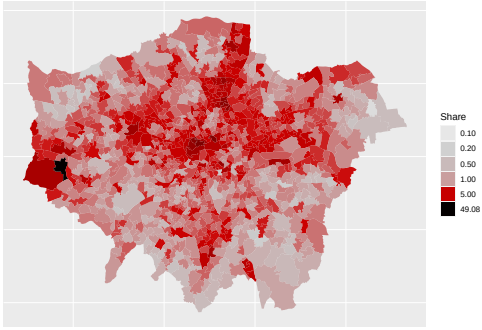
Other Channels — Domestic Corporate Market Share

Baseline OP



Domestic Corporate Market Share



Other Channels — Domestic Corporate Market Share

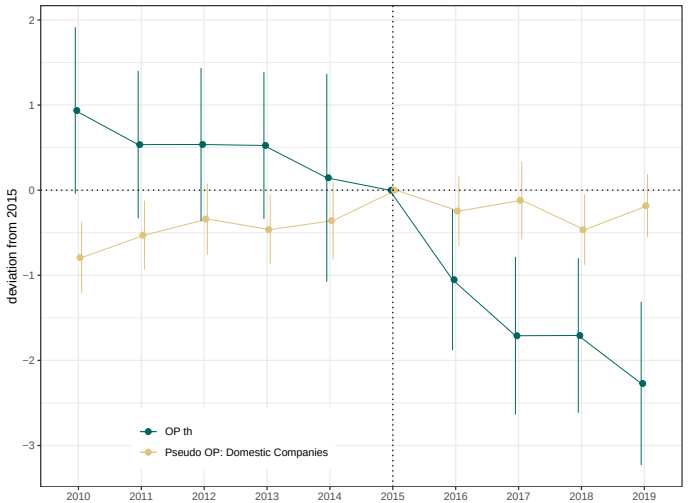
Intuition: If we have identified a causal effect of foreign investment, the same approach should show a 0 effect in an identical setup using domestic corporate real estate.

- We construct a second measure of market penetration: corporate "domestic penetration" (DP)
- This is introduced alongside OP such that:

$$\log(\text{price}_{it}) = \sum_{\substack{\underline{t}=2010 \\ t \neq 2015}}^{\bar{t}=2019} \beta^t \theta_t * OP_a + \sum_{\substack{\underline{t}=2010 \\ t \neq 2015}}^{\bar{t}=2019} \beta^t \theta_t * DP_a + \sum_{\underline{b}=2}^{\bar{b}=100} \gamma^b \, \text{bin}_i \times \theta_t + \mu_i + \varepsilon_{it}$$

back

Other Channels — Domestic Corporate Market Share



- Potentially a slight break in trend for domestic corporate price effects
- However: main results are not driven by the spatial distribution of corporate investment

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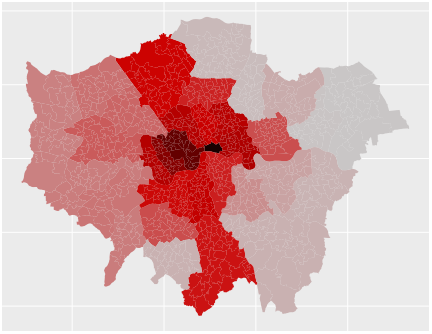
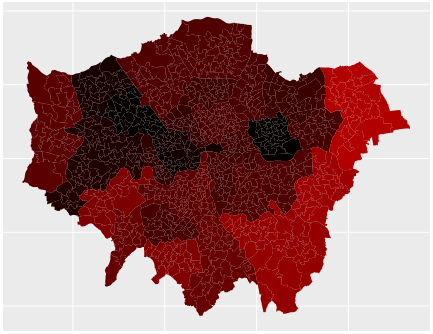
Other Channels — Outward Migration

OP at 33 LAAs



Foreign Population Ratio



Other Channels — Outward Migration

Intuition: If we have causally identified are foreign capital effect, it should not be driven by migratory responses.

- We use the ratio of foreign population (by country of birth) from the British 'Annual Population Survey' per local authority area (LAA)
- This is introduced alongside OP such that:

$$\log(\text{price}_{it}) = \sum_{\substack{\bar{t}=2019 \\ \underline{t}=2010 \\ t\neq 2015}} \beta^t \theta_t * OP_{laa} + \sum_{\substack{\bar{t}=2019 \\ \underline{t}=2010 \\ t\neq 2015}} \beta^t \theta_t * ForPop_{laa} + \sum_{\underline{b}=2}^{\bar{b}=100} \gamma^b \, \text{bin}_i \times \theta_t + \mu_i + \varepsilon_{it}$$

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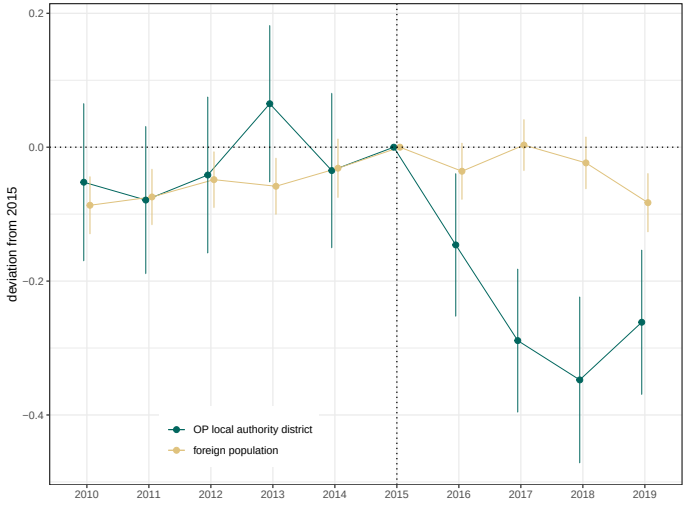
Other Channels — Outward Migration



- OP defined at 33 local authority districts
- both re-scaled to be between 0 and 1

using baseline OP

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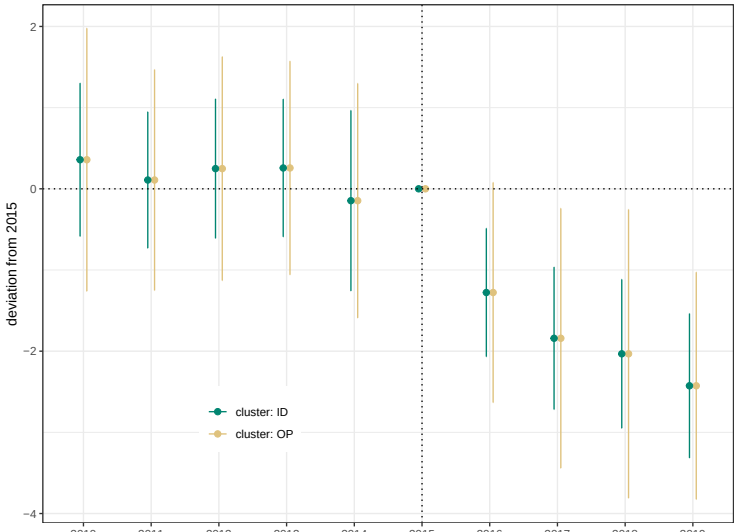
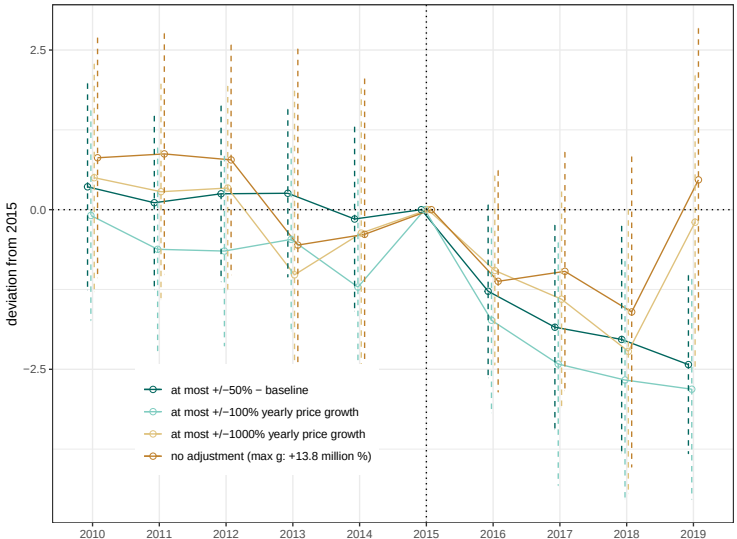
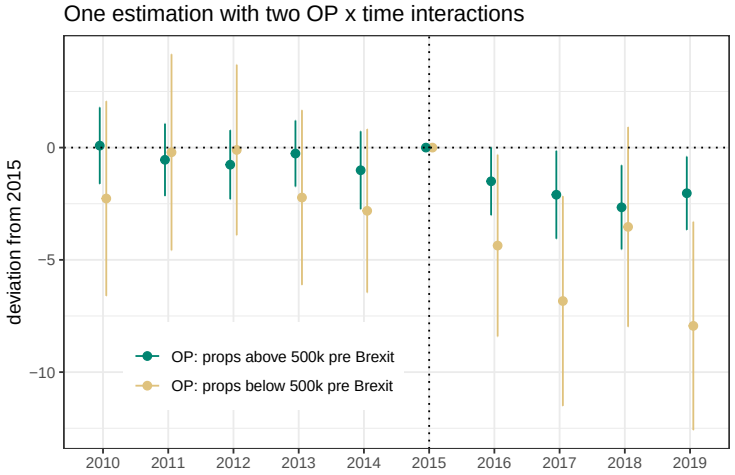
Results — Clustering



Results — Outliers



Results — Below/Above price 500.000



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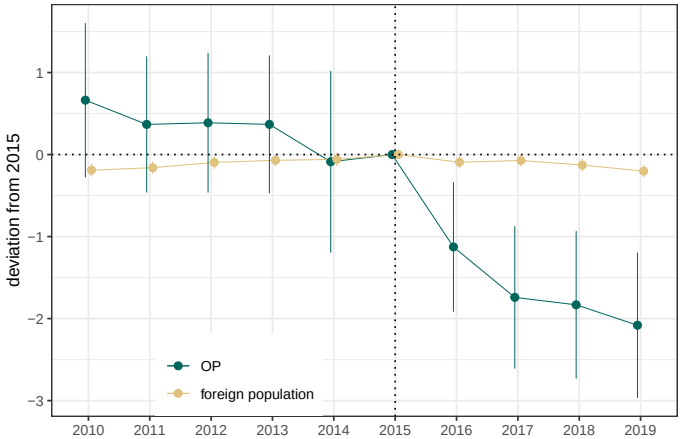
Results — Migration



- tests if our results are driven by outward migration
- uses share of foreign population in 33 local authority districts as alternative treatment

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Estimation — True foreigners vs. round-tripping

Our ultimate owner match shows that not all "foreign" investment is foreign. Does the effect of round-trip investment and true foreign investment differ?

- we assign "true British" probabilities
- property from, Jersey, enters with its price * TrueBrit into true British OP, with 1-TrueBrit into true Foreign OP
- if not possible, third category: OP "uncertain"
- all three offshore penetration measures are then used in one regression to compare effects.

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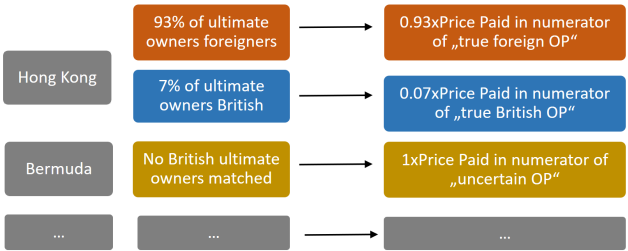
Variaion — 3 OP measures



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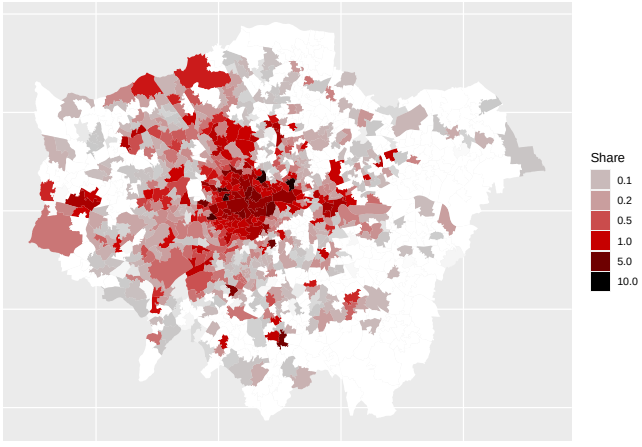
Variation — True Foreign



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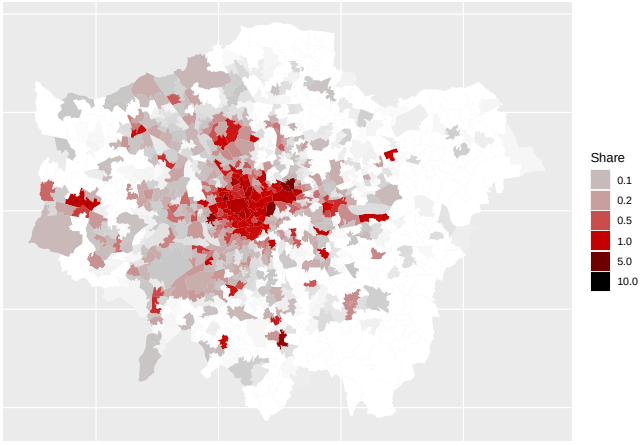
Variation — True British



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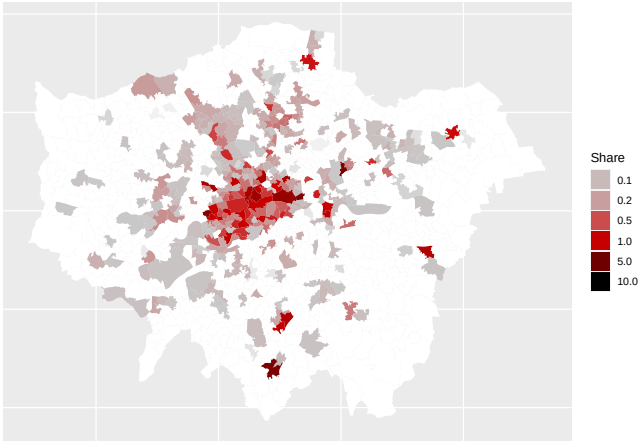
Variation — Unassigned



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Estimation — Spillovers across price segments

Intuition: Do these results only matter for high end real estate?

- we construct a measure of offshore penetration exclusively built using properties with a pre-Brexit price of more than 500,000 pounds $OP_a^{>500}$
- the denominator is still the entire residential real estate market
- sample is reduced to properties worth less then 500,000 pounds

$$\log(\text{price}_{it}) = \sum_{\substack{\underline{t}=2010 \\ t \neq 2015}}^{\bar{t}=2019} \beta^t \times OP_a^{>500} + \theta^t \times OP_a^{<500} + \gamma^b \,\text{bin}_i + \mu_i + \varepsilon_{it}$$

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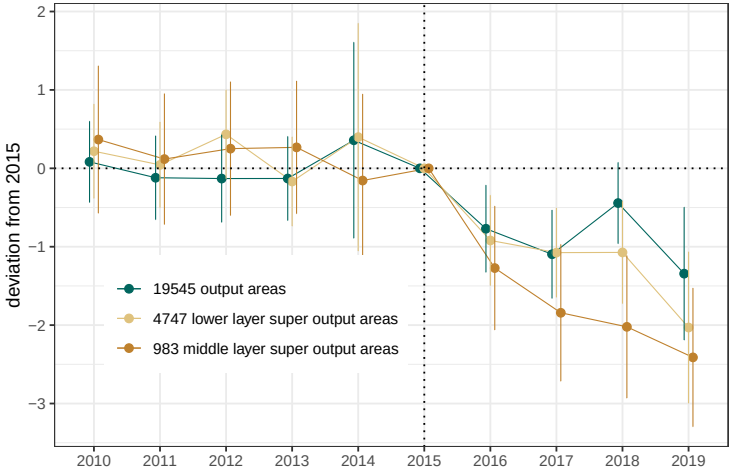
Robustness — OP level



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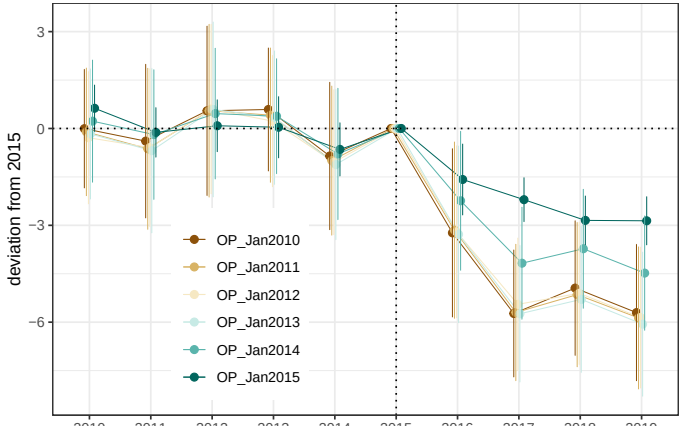
Robustness — OP timing



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Coefficient Stability of Diff-in-Diff Brexit result

Dependent Variable:	log(transaction price)		
	(1)	(2)	(3)
treatment variation:	983 soa middle	4747 soa low	19545 oa
$1^{t>=2016}$ * OP calculated at 983 middle output areas	-1.88***		
	(0.227)		
$1^{t>=2016}$ * OP calculated at 4747 lower output areas		-0.950***	
		(0.202)	
$1^{t>=2016}$ * OP calculated at 19545 output areas			-0.481***
			(0.151)
observations	71,195	36,094	13,681
effect of one s.d. increase in %	-2.99	-3.34	-3.23
effect from 25th to 75th OP percentile in %	-1.28	-1.21	-1.37
property f.e.	Yes	Yes	Yes
100 bins by year f.e.	Yes	Yes	Yes
Adjusted R^2	0.9368	0.9385	0.9164

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