# Homes Incorporated: Offshore Ownership of Real Estate in the U.K.*

Niels Johannesen (Oxford University and University of Copenhagen)
Jakob Miethe (LMU Munich)
Daniel Weishaar (LMU Munich)

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**Abstract**

This paper studies offshore ownership of residential real estate in the United Kingdom. Drawing on administrative land records, property transaction data, multiple offshore leaks and a global firm database, we present three main findings. First, ownership through offshore tax havens is economically significant with a market share of 1.5% overall and around 15% for top-end properties. Second, both tax and disclosure rules shape patterns of offshore ownership, suggesting that tax avoidance and secrecy are important motives for the beneficial owners. Third, the drop in offshore demand following the Brexit referendum caused prices and vacancy rates to fall, suggesting that offshore ownership has real effects in housing markets by inflating prices and lowering utilization of the housing stock. Our IV estimates imply that a change in offshore property demand equivalent to 1% of total property demand changes property prices by around 1.3%.

*Niels Johannesen is at the Oxford University Centre for Business Taxation, at Saïd Business School, and at the Center for Economic Behavior and Inequality at the University of Copenhagen (niels.johannesen@sbs.ox.uk.ac); Jakob Miethe is at the LMU Munich (jakob.miethe@econ.lmu.de); Daniel Weishaar is at the LMU Munich (daniel.weishaar@econ.lmu.de). We are grateful to Michael Devereux, Clemens Fuest, Jim Hines, Dominika Langenmayr, Andreas Peichl, Bruno Pellegrini, Kurt Schmidheiny, Juan Carlos Suárez Serrato, Gabriel Zucman, and to several seminar and conference audiences, especially at UC Berkeley, the OMG tax talks, NHH Bergen, University of Copenhagen, and LMU Munich for excellent comments and suggestions. We thank Martin Brieger and Paulina Dufter for valuable research assistance. All remaining errors are our own. Johannesen gratefully acknowledges financial support from the Danish National Research Foundation (grant DNRF134), from the European Commission through the EU Tax Observatory and from the United Nations University World Institute for Development Economics Research (UNUWIDER) through the project on illicit financial flows. Weishaar gratefully acknowledges financial support from the Joachim Herz Foundation and the Fritz Thyssen Foundation. Declarations of interest: none

# 1 Introduction

Anecdotal evidence suggests that top-end real estate in large cities like London, New York and Miami is increasingly held through opaque offshore structures. For instance, an investigative news story documents that around three quarters of the apartments in One Hyde Park, an exclusive residential development on one of London's most fashionable addresses, belong to corporations in offshore tax havens like the Cayman Islands, the British Virgin Islands and the Isle of Man with no trace of the beneficial owners in the land register (Shaxson, 2013).

Ownership of real estate through offshore shell corporations is a cause of concern for several reasons. First, it may play a role in money laundering and tax evasion. While governments have found new ways to pierce the offshore veil in the realm of financial investments (Alstadsæter et al., 2023; Boas et al., 2024; Johannesen et al., 2024), no such instrument exists for property investments. Second, it may facilitate avoidance of taxes triggered by property transactions such as capital gains taxes and stamp duties. These taxes are almost impossible to enforce when properties change hands through the sale of shares in offshore shell corporations with no change of ownership recorded in the land registry. Third, the broader effects on real estate prices and urban development may be socially undesirable. The construction of exclusive properties for foreign investors motivated by tax and secrecy may contribute to increasing real estate prices (Knoll et al., 2017), crowd out scarce housing for the middle-class, and create ghost neighborhoods with large contingents of absentee residents.

In this paper, we present descriptive and causal analyses of offshore ownership in the residential property market in the United Kingdom. In the first descriptive part, we document the scale of offshore ownership and analyze its geography and long-run trends. In the second part, on causes, we provide evidence on the role of tax and secrecy in shaping offshore ownership. In the third part, on consequences, we estimate the real effects of offshore ownership on property prices as well as vacancy rates.

Our analysis combines micro-data from multiple sources. First, the land register serves to delimit the set of properties with corporate owners. Second, a comprehensive database of transaction prices allows us to estimate the value of these properties and their share of the market. Combining these two sources is far from trivial as it requires unbundling transactions and land titles to the level of single properties using natural language processing techniques. Third, a global firm database serves us to unwind corporate ownership structures and identify UK properties that are controlled indirectly through offshore corporations. Fourth, a database with information from offshore data leaks (e.g. Panama Papers and Paradise Papers) allows us

to learn about the beneficial owners behind the offshore corporations controlling U.K. properties. Fifth, administrative data on vacant dwellings allows us to measure the utilization of the housing stock at the district level.

The descriptive analysis suggests that corporations in offshore tax havens (e.g. British Virgin Islands, Jersey, and Guernsey) own residential properties in the United Kingdom worth around £80 billion, four times more than the combined holdings of corporations in non-haven countries (e.g. United States, Japan and France). The importance of offshore ownership varies strongly across market segments: offshore corporations own around 1.5% of the overall residential market, but their market share is almost ten times larger in the most expensive market segments.[1] These relatively high levels of offshore property ownership reflect a steeply increasing long-run trend, in particular a spectacular offshore boom in the period 2005-2015. The beneficial owners of the properties are much more frequently in Africa, Asia, and the Middle East than in North America and Europe; and around 15% are round-tripping investors resident in the United Kingdom.[2]

To put these descriptive results in perspective, we compare them to offshore ownership in financial markets. The analysis suggests that offshore ownership is more pervasive in top-end residential property markets than in financial markets and the money is more likely to derive from beneficial owners in developing countries.

The next set of results concerns the causal determinants of offshore ownership, in particular the role of taxation and secrecy for the beneficial owners. We exploit two sources of policy variation for identification. First, a reform that tightened the capital gains taxation of foreign corporations with UK properties, but temporarily created a loophole for corporations registered in Luxembourg. Second, a government announcement mandating some but not all offshore tax havens associated with the United Kingdom to set up public corporate registers with information about beneficial ownership. Our results document that both events caused strong and immediate behavioral responses with offshore ownership migrating to jurisdictions with relatively low taxation and low transparency.

The third set of results concerns the real effects of offshore ownership in local property markets. Focusing on London where offshore ownership is particularly widespread, we use the surprising "leave" outcome of the referendum on European Union membership in 2016 as a natural experiment that triggered a sharp increase in property sales by offshore owners. In

[1]This finding resonates with the well-documented pattern that offshore financial assets are highly concentrated in the hands of the wealthiest (Alstadsæter et al., 2019; Guyton et al., 2021; Londoño-Vélez and Ávila-Mahecha, 2021; Londoño-Vélez and Tortarolo, 2022; Leenders et al., 2023; Johannesen et al., 2024).

[2]Existing studies have identified significant round-tripping in the context of financial investment (Hanlon et al., 2015; Damgaard et al., 2024).

a model that uses repeat sales for identification and allows price dynamics to vary flexibly across price segments, we show that local areas with a high ex ante share of offshore ownership experienced larger price decreases after the referendum. Consistent with a causal interpretation, local areas with different offshore ownership were on parallel price trends prior to the referendum and controls for potential confounders, such as the share of foreign residents and the share of total corporate ownership in the local area, have little impact on the estimates.

We develop an instrumental variable framework to estimate the sensitivity of property prices to offshore demand. The results suggest that a drop in property demand from offshore corporations equivalent to 1% of total demand reduces property prices by around 1.3%.[3] The large elasticity estimate suggests that property prices are highly sensitive to offshore demand. This may reflect that offshore property demand mostly constitutes new investment flows into the property market with a large potential for shifting prices.[4]

Finally, we study the effect of offshore ownership on the utilization of the housing stock. While the price effects of offshore ownership have mixed consequences for nationals – existing home owners win and potential buyers lose when offshore demand drives prices up – there is a clear efficiency case against unoccupied dwellings. The lack of property-level data on utilization makes identification challenging; however, our district-level analysis suggests that offshore ownership is associated with significantly higher vacancy rates. One set of estimates suggests that around 20% of dwellings owned by offshore corporations are unoccupied.

Our paper contributes to the broad descriptive literature on household wealth held through offshore tax havens (Zucman, 2013; Alstadsæter et al., 2019). While this literature focuses almost exclusively on financial assets, we add to the scant descriptive evidence on offshore ownership in property markets (e.g. Bomare, 2019; Bomare and Le Guern Herry, 2022).[5] Our main contribution to this literature is to develop and implement a metric that captures the importance of offshore property ownership in an intuitive way: the value of residential properties owned through offshore tax havens as a fraction of the total stock. We compare this metric across geographical areas and price segments and use it to track the boom in offshore ownership over several decades. We are not aware of existing papers that produce long time series of offshore

[3]Note that our elasticity estimate is not directly comparable to the existing much smaller estimates of the elasticity of property prices with respect to foreign demand (Gorback and Keys, 2020; Cvijanović and Spaenjers, 2021) as a 1% change in total demand is typically much larger than a 1% increase in foreign demand.

[4]A recent influential paper in asset pricing finds an elasticity of stock prices with respect to new investment flows into the stock market of around 5 (Gabaix and Koijen, 2021).

[5]A related literature studies foreign ownership of properties per se including direct ownership by individuals (e.g. Sá, 2016; Alstadsæter et al., 2022).

property ownership.[6]

We also contribute to a small literature studying the causal determinants of offshore property ownership. A handful of papers analyze how enhanced transparency of ownership in property and financial markets shape offshore investment in real estate (Collin et al., 2022; Bomare and Le Guern Herry, 2022; De Simone et al., 2020; Collin et al., 2025). Our finding that offshore ownership of properties shifts away from offshore tax havens that improve transparency toward those that do not is largely consistent with these studies and resonates with earlier evidence on shifting of financial assets across offshore tax havens in response to enforcement efforts (Johannesen and Zucman, 2014; Johannesen, 2014; Menkhoff and Miethe, 2019; Casi et al., 2020). Our finding that offshore ownership in property markets are highly responsive to tax incentives does not, to the best of our knowledge, have antecedents in the literature.

Finally, we contribute by showing that ownership through offshore tax havens has real consequences in housing markets. Our finding that the negative "Brexit" shock to offshore property demand caused property prices to fall relates to earlier work showing that positive shocks, such as political instability in foreign investor countries, drive prices up (Sá, 2016; Badarinza and Ramadorai, 2018; Gorback and Keys, 2020). Unlike previous work, we focus on ownership through offshore tax havens, rather than foreign ownership per se, and go beyond price effects by estimating the impact on the utilization of the housing stock.

The paper proceeds in the following way. Section 2 describes the data. Section 3 provides descriptive evidence on offshore ownership. Sections 4 and 5 report results on the causes and consequences of offshore ownership respectively. Section 6 concludes.

# 2 Data

This section describes the data sources we use in the paper and explains how we combine them to obtain a database of offshore ownership of real estate in England and Wales. In brief, we obtain comprehensive information about corporate acquisitions of property from the land register (section 2.1); add information about prices and transaction dates from an administrative database of real estate transactions in the residential market (section 2.2); and add information about holding companies and ultimate owners from a global firm database and from various offshore leaks (section 2.3). We provide an overview of the database (section 2.4) and report technical

[6]Our efforts to pierce the veil of offshore secrecy and assign real estate assets held through opaque ownership structures to their ultimate owners relates to similar efforts for corporate profits (Tørsløv et al., 2023); portfolio investment (Zucman, 2013; Coppola et al., 2021); bank deposits (Alstadsæter et al., 2018; Collin, 2021); and direct investment (Damgaard et al., 2024).

details about how the different data sources are combined in the Online Appendix B.

## 2.1 Corporate Ownership

Our main data source is two publicly available datasets from HM Land Registry with comprehensive administrative information about land and property in England and Wales held by legal entities. The Commercial and Corporate Ownership Data (CCOD) covers titles held by entities incorporated in the UK whereas the Overseas Company Ownership Data (OCOD) covers titles held by entities incorporated outside of the United Kingdom. Both datasets are organized as snapshots taken at regular intervals: The CCOD is available quarterly from March 2014 and monthly from December 2017 whereas OCOD is available quarterly from October 2015 and monthly from December 2017. Both datasets contain information about properties (e.g. address, tenure), about owners (e.g. company name, country of incorporation) and the date on which the proprietor was added to the land register.

We complement these relatively recent snapshots of the land register with information from two alternative sources that cover a longer time horizon. First, through a Freedom of Information (FOI) request, we have obtained data on all purchases of real estate in England and Wales by foreign corporations since 1990. Second, we use information from the current affairs magazine Private Eye (PE) that has collected property and ownership information about property titles in England and Wales acquired by foreign companies between 1999 and 2014. No similar data on purchases by domestic corporations is available.[7]

By harmonizing property addresses and company names across these four sources using natural language processing techniques, we are able to combine them to a single database of corporate acquisitions of property in England and Wales. For each acquisition, we record the property, the corporation and the month in which the corporation is added to the land register as the owner of the property. For domestic corporations, the only data source is CCOD, which means that our database includes all acquisitions after March 2014, but only acquisitions before March 2014 to the extent that the corporation remained the registered owner by that date. For foreign corporations, we rely on OCOD as well as FOI and PE, which means that our database includes all acquisitions since 1990.

[7]HM Land Registry confirmed this in a response to a second Freedom of Information request.

## 2.2 Transaction Prices and Dates

We combine the database of corporate acquisitions with the Price Paid Data (PPD) from the HM Land Registry, which covers all residential property transactions in the United Kingdom since January 1995.[8] This step is complicated by the fact that both land titles in CCOD/OCOD and transactions in PPD not rarely lump together multiple properties. We overcome this challenge by developing an algorithm that breaks down all three data sources to the level of single properties with unique addresses and merge them at this level (see Online Appendix B for details).

Combining ownership data with transaction data from PPD allows us to add important information for the subset of acquisitions that involves residential properties. First, we obtain the transaction prices. While the most recent transaction price is often available directly for the properties in the CCOD/OCOD snapshots, this is not the case for properties that were acquired by corporations and sold again prior to the first snapshots. For instance, if an offshore corporation acquires a property in July 2010 and sells it in May 2012, the property is not in the CCOD/OCOD snapshots; however, we can identify the acquisition in the FOI data and retrieve the transaction prices in the PPD data. Second, we obtain the transaction month. This does not generally coincide with the month in which the new owner is recorded in the land register because of administrative delays. For instance, if an offshore corporation acquires a property in July 2010, it is typically added to the land register in October or November the same year, but we can determine the actual transaction month in the PPD data. Third, we obtain the month in which corporate ownership ends. Again, this can often be inferred approximately from CCOD/OCOD, as the month when a corporate owner drops out of the land registry, but the PPD allows us to determine the timing more precisely, as the month in which a property previously acquired by a corporation is transacted, and - perhaps more importantly - we can also apply this approach to the period not covered by the CCOD/OCOD snapshots. For instance, if an offshore corporation acquires a property in July 2010 and sells it in May 2012, the property is not in the CCOD/OCOD snapshots. However, we observe that ownership is transferred to a foreign corporation in the FOI data and we observe that the property is sold to another owner in May 2012 in the PPD data. If a property appears in both datasets, we classify it as residential

[8]We note that the PPD may not perfectly delineate the stock of residential properties. For a small number of properties matching to a transaction in PPD, the address entry includes terms such as "Pub", "Agency", and "Store", suggesting that the property may be partly commercial or may have been used commercially in the past. Conversely, some properties not matching to a transaction in PPD have terms such as "House", "Mansion", and "Condominium" in the address entry suggesting residential use. This may simply be properties that have not been transacted on the market since the beginning of the PPD in 1995. Our best judgment is that the errors caused by such misclassifications are small. Comparing the value of the aggregate residential market based on our methodology to the official time series published by the Office for National Statistics substantiates this assertion.

and register all of its ownership changes.

## 2.3 Upstream Owners

We take two distinct approaches to tracing the owners behind the corporations recorded as proprietors of real estate in the land register. The first approach uses ORBIS, a proprietary dataset with accounting information and ownership links for a global sample of firms. For each of the domestic corporate owners identified in the CCOD dataset, we search for upstream ownership links in Orbis. This allows us to identify properties whose direct owner is a domestic corporation, which is in turn controlled by a holding company in a tax haven. Such structures allow the ultimate owners to benefit fully from the advantages offered by tax haven ownership in terms of secrecy and tax advantages while not exposing this directly in the land register.

The second approach uses leaked information from corporate service providers and corporate registers in offshore tax havens published by the International Consortium of Investigative Journalists (ICIJ). The leaks pierce the secrecy emblematic for tax havens by identifying the individuals who are the ultimate beneficial owners of the corporations in the leaked files. For each tax haven corporation in OCOD and for each upstream tax haven owner of non-haven corporations identified in ORBIS, we thus search for information about the ultimate beneficial owners in all of the five available leaks: Pandora Papers, Paradise Papers, Bahamas Leaks, Panama Papers and Offshore Leaks. This results in a sample of properties held through offshore corporations, for which we are able to determine the home country of the individuals who are the ultimate beneficial owners. To be clear, in most of the analysis, we are interested in offshore ownership per se and do not restrict the sample to properties, for which we can identify the ultimate beneficial owners.[9]

## 2.4 Data Overview

Table 1 provides an overview of the data sources and how we use them. As shown in Panel A, the various datasets deriving from the land register identify more than 4.2 million properties that are currently owned by corporations or have been owned by corporations at some point since 1990. While most of the corporate owners are registered in the United Kingdom, almost

[9]The Register of Overseas Entities seemingly offers an alternative route to establishing beneficial ownership. However, the coverage of the register is less than 30% (Advani et al., 2023), reflecting that compliance is effectively voluntary. We therefore prefer to rely on data leaks, which can reasonably be considered as random shocks and are therefore less likely to suffer from selection bias (Alstadsæter et al., 2019).

240,000 properties are owned by corporations registered elsewhere.[10] As shown in Panel B, around 390,000 properties are controlled directly or indirectly through offshore tax havens.[11] For around 220,000 of the 240,000 properties identified in OCOD/FOI, the foreign corporate owner is registered in an offshore tax haven. Additionally, for around 170,000 properties identified in CCOD, the domestic corporate owner is itself owned by a corporation in an offshore tax haven identified in ORBIS. As shown in Panel C, for around 16,000 properties owned through offshore tax havens, we are able to retrieve information about the beneficial owners by searching the ICIJ leaks. The Panama Papers contribute most of the links to beneficial owners, but the more recent Paradise Papers and Pandora Papers also make sizeable contributions.

Finally, in each stage, a significant share of the properties we identify are residential, which allows us to obtain transaction prices from the PPD data (Column 2). Specifically, we identify around 940,000 residential properties with corporate owners across the various datasets (Panel A). Around 100,000 residential properties are owned directly or indirectly through offshore tax havens (Panel B) and around 7,600 of them can be tied to beneficial owners (Panel C). Most of the analysis below requires price information and therefore uses only the sample of residential properties.

# 3 Descriptive Evidence

This section provides descriptive evidence on offshore ownership of residential properties in England and Wales. Our key metric is the *offshore market share*, which we define as the share of the property value owned directly or indirectly through corporations in offshore tax havens. Our starting point for estimating offshore market shares is the database created in the previous section.

Below, we present estimates of the offshore market share in the overall residential property market (section 3.1); break it down by jurisdictions (section 3.2); show how it varies cross-sectionally across price segments and local areas (section 3.3); and illustrate how it has evolved

[10]The subcategories in each panel do not sum to the total as the same property may appear in multiple datasets. For instance, if a property first has a domestic corporate owner and then a foreign corporate owner, it appears in both CCOD and OCOD.

[11]Our list of offshore tax havens combines the lists from Johannesen and Zucman (2014) and Gravelle (2015): Andorra, Anguilla, Antigua-Barbuda, Aruba, Austria, Bahamas, Bahrain, Barbados, Belgium, Belize, Bermuda, British Virgin Islands, Cayman Islands, Chile, Cook Islands, Costa Rica, Curacao, Cyprus, Dominica, Gibraltar, Grenada, Guernsey, Hong Kong, Ireland, Isle of Man, Jersey, Jordan, Lebanon, Liberia, Liechtenstein, Luxembourg, Macao, Malaysia, Maldives, Malta, Marshall Islands, Mauritius, Monaco, Montserrat, Nauru, Niue, Panama, Samoa, San Marino, Seychelles, Singapore, Sint Maarten, St. Kitts-Nevis, St. Lucia, St. Vincent-Grenadines, Switzerland, Tonga, Trinidad-Tobago, Turks-Caicos Islands, U.S. Virgin Islands, Uruguay, Vanuatu.

over time (section 3.4). Finally, we present evidence on the beneficial ownership of properties held through offshore corporations (section 3.5); and compare to patterns of beneficial ownership in financial markets (section 3.6).

## 3.1 Offshore Market Shares

To estimate offshore market shares in recent years where the land register snapshots are available, we face two empirical challenges. First, we need the values of all properties. As we only observe the market price of properties directly at the time they are transacted, we impute property values at all other times by applying changes in the district-level house price index to the most recent transaction prices. Second, we need to delimit the set of properties in the market of interest. While the land register snapshots only cover corporate-owned properties, the PPD covers all residential properties in England and Wales that have been transacted at least once since 1995. Hence, we can estimate the denominator of the offshore market share by summing imputed values over the set of properties in the market and the numerator by summing imputed values over the subset of these properties with offshore owners.

Table 2 shows the relevant magnitudes for the overall residential property market in England and Wales at the end of 2019. We estimate that the aggregate value of all properties in the market is around £5,000 billion.[12] The estimated value of the properties with offshore corporate owners is around £80 billion, with the bulk of the offshore ownership being direct and only a smaller fraction indirect through domestic corporations. These estimates imply a modest offshore market share in the overall residential market just above 1.5%.

By comparison, the aggregate value of residential properties with foreign non-haven corporate ownership is less than £20 billion. It follows that the foreign corporations owning properties in England and Wales are overwhelmingly registered in offshore jurisdictions. This striking pattern suggests that secrecy and tax evasion may be important motives for these investments, a hypothesis that we explore below. Finally, the value of the properties with domestic corporate ownership and no foreign corporations among the upstream owners is around £260 billion, around three times more than properties with foreign corporate owners. To be clear, the individuals who are the ultimate owners of these properties may be domestic as well as foreign, as we show below in the analysis of ultimate beneficial owners.

[12]Figure A1 in the Online Appendix shows that our estimates of the aggregate market value are consistent with national accounts, both in terms of levels and time series dynamics (left panel).

## 3.2 Geography of Foreign Corporate Ownership

Having shown above that the bulk of foreign corporate owners are registered in tax havens, we provide more detail by breaking down foreign corporate ownership by jurisdictions in Figure 1. The top owners are the British Virgin Islands and Jersey whose corporations jointly own residential property in England and Wales of around £40 billion. The vast majority of those properties are held directly (dark shading) whereas properties held indirectly through U.K. corporations contribute much less (light shading). The next jurisdictions are Luxembourg, Guernsey and the Isle of Man whose corporations together control properties worth around £20 billion. Hence, all jurisdictions in the top-5 are small tax havens with a legal infrastructure that makes them attractive places to establish shell corporations. Only six countries in the top-20 are not tax havens, e.g. United States, Japan and Germany.

## 3.3 Heterogeneity Across Price Segments and Local Areas

We explore the heterogeneity in the offshore market share across price segments and local areas. As shown in Figure 2, the offshore market share in the overall market of just above 1.5% conceals a strong positive price gradient. While less than 0.5% of the residential properties in low-price and mid-price segments have offshore owners, the share increases monotonically with the price level and exceeds 15% in the most expensive price segment with prices above £5 million. This pattern is consistent with anecdotal accounts that associate offshore ownership with the most exclusive residential properties.

As shown in Figure 3, offshore ownership is highly concentrated in urban centers such as London, Manchester and Leeds and in selected medium-sized cities such as Exeter, Nottingham and Durham while it is virtually non-existent in rural areas (Panel A). This is consistent with the price gradient in offshore ownership documented above, as most top-end residential properties are located in big cities. Moreover, there is considerable variation in the offshore market share across neighborhoods within the same urban centers. Specifically, offshore ownership in London is extremely high in areas such as Shoreditch, Finsbury Park and Hatton Garden with market shares exceeding 20% and much lower in suburban areas such as Bexley, Havering and Redbridge (Panel B).

## 3.4 Long-Run Dynamics

We produce a time series for the offshore market share of residential property that goes as far back in time as the data allows.[13] For recent years where the OCOD/CCOD snapshots are available, we can employ the methodology developed in section 3.1 for each time period separately. For earlier years, we face one additional challenge: In the FOI/PE data, we observe directly when foreign corporations buy properties and, combining with PPD data, we can also infer when they subsequently sell. Hence, we can track whether a property is owned by a foreign corporation at any date *after* the first time it is transacted within the period with data coverage, but not *before* the first transaction.[14] We address this challenge by assigning to each of these "first transactions" a probability that the seller was a foreign corporation based on what we learn from other transactions in the dataset. Specifically, the assigned probability is the share of foreign corporate sellers across all transactions in the same year, for which we know the seller because there is an earlier transaction in the dataset.[15] Figure A1 in the Online Appendix shows that this method delivers accurate imputations in the recent period where we can check them against the OCOD/CCOD dataset (right panel) whereas Figure A2 shows that the imputed values are relatively insensitive to the parametric choices.

As shown in Figure 4, the resulting time series reveals a striking pattern. Over the full period, the offshore market share has grown very significantly, from around 0.3% in the middle of the 1990s to the level of around 1.5% in 2019. There are notable differences across time periods: the pace of the increase was slow in the first decade (1995-2005), much faster in the second decade (2005-2015) and then again slow in the last part of the sample period (2015-2019).[16]

[13] We provide more details on the methodology in Online Appendix C.

[14] For example, if a property is transacted in June 1997 according to PPD, we can determine whether the buyer is a foreign corporation by checking if the transaction is included in the FOI/PE datasets. If the property is transacted again later on, say in May 2003, we can do the same. Hence, we can determine precisely when the property has a foreign corporate owner and when it does not at each point in time since 1997. However, if the transaction in 1997 is the first one within the period with data coverage, we cannot infer from the transaction data whether the seller in 1997 was a foreign corporation or not. Hence, in this case, we cannot make inference about ownership at points in time before 1997.

[15] Consider again the example where a property's first observed transaction is in 1997. What is the probability that the seller was a foreign corporation? We identify all the transactions in 1997, for which there exists an earlier transaction in the dataset and for which we therefore know whether the seller in 1997 was a foreign corporation or not. For this set of transactions, we compute the share with a foreign corporate seller and we assume this to be the probability of a foreign corporate seller in the case at hand.

[16] Figure A3 in the Online Appendix shows the evolution in the aggregate value of properties held through corporations in offshore tax havens and foreign non-havens, i.e. without scaling by the value of the total market.

## 3.5 Geography of Beneficial Ownership

Finally, we shine light on the individuals who own properties through offshore corporations by computing the distribution of beneficial ownership across countries for the set of properties that can be linked to their beneficial owners through the ICIJ leaks. As shown in Figure 5, the United Kingdom is by far the largest beneficial owner country with a market share above 15%.[17] Most of the properties that are truly foreign-owned have beneficial owners in the Middle East (e.g. United Arab Emirates and Saudi Arabia), Africa (e.g. South Africa and Nigeria) and Asia (e.g. China and Malaysia) and a relatively small fraction belongs to beneficial owners in Europe and North America. The two largest beneficial owners in Europe (i.e. Monaco and Switzerland), are both popular residence countries for global economic elites and their shares of beneficial ownership therefore do not necessarily reflect beneficial ownership by European nationals. It is interesting that Russia appears to account for a relatively small share of the beneficial ownership given the anecdotal evidence that Russian oligarchs are heavily invested in London properties (Guardian, 2022) and the massive focus on the seizure of such properties following the invasion of Ukraine.

It is important to emphasize that the results are based on a relatively small subsample. This implies that the ownership shares are estimates associated with uncertainty: individual countries may have a smaller or larger weight in the universe of beneficial owners than in the leaked subsample. The bootstrapped standard errors used to construct the confidence intervals in the figure quantify the sampling uncertainty under the assumption that beneficial owners from all countries have the same ex ante probability of being disclosed in a leak.[18]

## 3.6 Comparison with Financial Assets

It is illustrative to compare the patterns of offshore ownership in property markets that we have identified above to offshore ownership in financial markets, which has been the focus of a number of earlier studies. In the Online Appendix, we document how the share of deposits in U.K. banks owned through offshore tax havens has evolved over time (Figure A4) and illustrate how the beneficial ownership of financial assets in offshore tax havens may be distributed across countries

[17] This is consistent with other evidence on round-tripping investment in other economic domains (Hanlon et al., 2015; Damgaard et al., 2024).

[18] This follows the approach taken by Alstadsæter et al. (2019). In our setting, the risk of selection bias is smaller because we rely on data from five distinct data leaks and more than five distinct data sources, as some of the leaks include data from multiple sources.

(Figure A5).[19]

Three interesting insights emerge from the analysis. First, the tax haven boom in property markets occurred much later than in the financial market. While we established above that offshore ownership in property markets built up relatively recently (2005-2015 as shown in Figure 4), offshore ownership in deposit markets increased most rapidly in the decade before the financial crisis (1997-2008) and stayed roughly constant, if not falling slowly, in the remainder of the sample period (2008-2019). Second, offshore ownership is generally smaller than in the property market than in financial markets except at the top of the property price distribution. Specifically, the share of offshore ownership in the overall property market (around 1.5% as shown in Table 2) is significantly lower than in the deposit market (around 10%); but the opposite is true when considering only the most exclusive properties (around 15% as shown in Figure 2). Third, in property markets, the individuals behind the offshore ownership structures are to a much larger extent residents of developing countries than in financial markets. For instance, beneficial owners from Africa and Asia account for a large share of the properties held through offshore corporations (around 20% and each) whereas their share of financial assets in offshore banks is much smaller (only around 4% and 5% respectively).

# 4 Evidence on Causes

This section investigates the underlying motives for using offshore corporations as vehicles for owning real estate. The literature generally highlights two advantages associated with investment through tax havens, *lower taxation* and *secrecy*, and we provide evidence on each of these motives in turn. We first study the role of taxation by estimating the behavioral response to a reform that eliminated the favorable treatment of some but not all offshore structures in terms of capital gains taxation (section 4.1). We then study the role of secrecy by estimating the behavioral response to a reform intended to enhance transparency for some but not all offshore structures (section 4.2).

## 4.1 The Tax Motive

Generally, owning real estate through an offshore shell corporation can legally reduce the effective taxation in different ways. Most prominently, it may allow owners to avoid transaction taxes and

[19]The former analysis uses comprehensive data on U.K. banks from the BIS Locational Banking Statistics. The latter draws on leaked customer data from the HSBC Switzerland, a private bank in Switzerland managing around 2% of global offshore assets at the time of the leak (Alstadsæter et al., 2019). The leaked data was published by the ICIJ under the name *Swiss Leaks*.

capital gains taxes in the country where the property is located, as they can trade the shares in the offshore shell corporation rather than the property itself.

We consider a reform in the United Kingdom that targets this type of tax avoidance by extending the taxation of capital gains to "indirect disposals", i.e. the trading of shares in companies whose main assets are property in the United Kingdom. The reform was announced in November 2017 and took effect from April 2019. It allowed owners within the scope of the new rules to rebase property values so that only capital gains accruing after April 2019 would be subject to taxation.

While the reform aimed to remove one of the main advantages of holding real estate through offshore shell corporations, its effectiveness was limited by an existing double tax treaty with Luxembourg, which prevented the United Kingdom from taxing capital gains made on the disposal of shares in Luxembourg companies. The provision thus created a loophole by effectively exempting capital gains on U.K. properties, realized indirectly through the sales of Luxembourg holding companies, from taxation in the United Kingdom. The loophole was eventually eliminated with Luxembourg joining the OECD multilateral convention amending tax treaties to prevent base erosion and profit shifting and with the United Kingdom and Luxembourg signing a new treaty that explicitly covers the tax treatment of indirect disposals of properties.[20]

These events create useful variation in the tax incentive to hold property through offshore corporations. Before April 2019, offshore corporations in any tax haven would allow owners to avoid taxation of capital gains, but only corporations in Luxembourg could serve this purpose after April 2019. To the extent that tax avoidance is a motive for holding property through offshore corporations, we should therefore expect an increase in holdings through Luxembourg relative to holdings through other tax havens. Specifically, we should expect owners of property to switch to Luxembourg holding structures at some time between November 2017 and April 2019, since this would allow them to continue to avoid capital gains taxes after April 2019.[21]

To test these predictions, we use the database on corporate ownership constructed above to compare the evolution of property titles in England and Wales held by corporations in Luxembourg vs corporations in other tax havens. We make the scope of the analysis as broad as possible by including both residential and non-residential properties and estimate the following model:[22]

[20]We provide more details on the policy reform, the treaty amendment and their implications for taxation of capital gains in Online Appendix D.

[21]To the extent that owners anticipated that the Luxembourg loophole would eventually be closed, it may plausibly have muted the behavioral response.

[22]Our algorithm ensures that a property has only one owner at each point in time, which prevents that the

$$log(y_{it}) = \sum_{t \neq Oct.2017} \beta^t d_t \times d_i^{Lux} + \gamma_t + \alpha_i + \epsilon_{it} \quad (1)$$

where $y_{it}$ is the number of property titles held by corporations in country $i$ in month $t$, $d_i^{Lux}$ is a dummy indicating whether country $i$ is Luxembourg and $d_t$ captures monthly time dummies where the omitted category corresponds to one period before the announcement of the policy in November 2017. The equation includes country fixed effects, $\alpha_i$, that absorb all cross-sectional variation in holding patterns as well as time fixed effects, $\gamma_t$. The estimates of $\beta_t$ have the flavor of difference-in-differences estimates capturing the percentage change in the number of properties held through Luxembourg since the reference period over and above the percentage change in properties held in other tax havens.

Consistent with tax avoidance being an important motive for holding real estate through offshore corporations, the number of properties held by corporations in Luxembourg increased significantly, around 0.25 log-points, relative to corporations in other tax havens through 2018 and early 2019, as illustrated in Figure 6. Importantly, the parallel trends prior to the policy announcement in late 2017 strengthens the case for a causal interpretation of the divergence in early 2018.[23]

To get a sense of the aggregate importance of the behavioral response, we apply the estimated effect of around 0.25 log-points to the ex ante stock of UK properties owned through Luxembourg corporations of around £5.3 billion. This suggests that properties at an aggregate value of £1.2 billion was shifted to Luxembourg in response to the temporary tax loophole.

## 4.2 The Secrecy Motive

To investigate the importance of the secrecy motive, we consider a policy initiative targeting the secrecy provided by offshore corporations. In May 2018, the U.K. government announced that it would mandate the Overseas Territories - including well-known tax havens such as Bermuda, the Cayman Islands and the British Virgin Islands - to set up public corporate registers with information about beneficial ownership. Combined with the existing public land registers, the corporate registers would make it possible to trace the ultimate owners of real estate in England

same property is counted twice (see also Appendix B.4.)

[23]In the Online Appendix, we show that the increase in properties owned through Luxembourg corporations primarily reflects shifting of property titles from corporations in the United Kingdom and nearby tax havens like Jersey and Guernsey (see Figure A6). In robustness analysis, we also show that the results are robust to applying an inverse hyberbolic sine transformation to the outcome rather than the logarithmic transformation in the baseline (Panel A); to using no transformation at all (Panel B) and to measuring property investment in terms of property holdings (i.e. number of postal addresses) rather than property titles (Panel C) (see Figure A7)

and Wales through corporate structures in these jurisdictions and thus make such structures ineffective as vehicles of asset protection and tax evasion. Importantly, the mandate did not affect the Crown Dependencies - another group of well-known tax havens comprising Jersey, Guernsey and the Isle of Man - whose constitutional status is different and grants them a higher degree of autonomy. In June 2019, the Crown Dependencies announced that they had decided to set up corporate registers voluntarily.[24]

This policy process creates useful variation in the incentives to use corporations in otherwise similar tax havens to conceal the ultimate ownership of real estate. By May 2018, it appeared that the Overseas Territories would expose shareholders in a public register whereas no such decision was made by the Crown Dependencies before June 2019. To the extent that secrecy is a motive for holding properties through offshore corporations, we should therefore expect an increase in holdings of properties through the Crown Dependencies relative to holdings through Overseas Territories over this period.[25]

As the nature of the variation in secrecy provisions is similar to the variation in tax provisions studied above, we can use the same empirical approach to study its effect on behavior. In this case, however, it is natural to restrict the sample to the Crown Dependencies and the Overseas Territories so that identification comes from a comparison of tax havens with highly similar legal institutions affected differently by the mandate of the U.K. government. We estimate the following model:

$$log(y_{it}) = \sum_{t \neq Mar.2018} \beta^t d_t \times d_i^{OT} + \gamma_t + \alpha_i + \epsilon_{it}, \tag{2}$$

where the notation follows equation (1) except that $d_i^{OT}$ is a dummy indicating whether country $i$ is an Overseas Territory. As the government's decision to mandate the register was widely covered in the press already in April 2018, we choose March 2018 to be the omitted time period.

The estimates imply that the number of properties held by corporations in the Overseas Territories started decreasing relative to corporations in the Crown Dependencies shortly after the mandate to set up corporate registers in May 2018, as illustrated in Figure 7. Consistent with a causal effect of the mandate, the trends in the two outcomes were parallel in the pre-mandate period. Moreover, there are no clear signs of differential trends after the decision by the Crown Dependencies in June 2019 to set up similar corporate registers. The finding that ownership

[24]We provide more details on the policy process leading to the creation of corporate registers in the Overseas Territories and the Crown Dependencies in Online Appendix E.

[25]If there was some anticipation that Crown Dependencies would eventually agree to improve transparency for corporate ownership, it may plausibly have muted the behavioral response.

structures respond sharply to differential changes in transparency across highly similar tax havens suggests that secrecy is an important motive for holding real estate through offshore corporations for at least some investors.[26]

Again, we gauge the aggregate importance of the behavioral response by applying the estimated effect of around 0.06 log-points to the ex ante stock of UK properties owned through corporations in the Overseas Territories of around £22.4 billion. This suggests that properties at an aggregate value of £1.4 billion were shifted out of the Overseas Territories in response to the increase in transparency.

# 5 Evidence on Consequences

This section studies the real effects of offshore property ownership using the surprising outcome of the referendum on continued membership of the European Union in 2016 as a natural experiment. The referendum was followed by a surge in property sales by offshore owners, presumably due to uncertainty about the conditions under which foreign nationals could live, work and invest in the United Kingdom after Brexit. Our analysis exploits that similar local property markets were differentially exposed to this shock due to variation in ex ante offshore ownership. Intuitively, when offshore owners sell their properties in response to an adverse change in the economic environment, it amounts to a larger shock in local markets where offshore ownership is initially more prevalent. We first present reduced-form evidence of the real effects of offshore demand shocks by comparing price dynamics around the Brexit referendum across similar local property markets that differ with respect to ex ante offshore ownership (section 5.1). We then build a framework to retrieve a key structural parameter, i.e. the elasticity of property prices with respect to changes in offshore demand (section 5.2). Finally, we consider the effect of offshore ownership on vacancy rates (section 5.3).

## 5.1 Reduced-form evidence

### Empirical framework

We investigate whether the property price dynamics around the Brexit referendum are affected by ex ante offshore ownership. Indexing individual properties by $i$, 983 local property markets in London by $m$ and calendar years by $t$, we estimate the following transaction-level model for residential properties in London in the period 2011-2019:

[26] In the Online Appendix, we report additional results from a robustness analysis in Figure A8. The tests are analogous to the ones we conducted for the tax shock: We show that the results are robust to alternative transformations (Panels A & B) and units (Panel C).

$$log(p_{it}) = \mu_i + \sum_{t \neq 2015} \Gamma^t d_t \times \boldsymbol{x_i} + \sum_{t \neq 2015} \beta^t d_t \times z_m^{\text{Offshore}} + \varepsilon_{it} \quad (3)$$

where the dependent variable is the transaction price for property $i$ observed in year $t$; $\mu_i$ denotes property fixed effects; $d_t$ denotes year dummies (the omitted category is 2015); $z_m^{\text{Offshore}}$ denotes the ex ante share of the local property market owned by corporations in tax havens (measured end of 2015); and $\boldsymbol{x_i}$ denotes a vector of time-invariant controls at the property-level. In the baseline specification, $\boldsymbol{x_i}$ includes indicators for the percentiles of the ex ante national distribution of property prices (measured in 2015).[27] In robustness tests, we augment the model with additional controls.

The first and second terms of the model capture the underlying price dynamics within each of the 100 price categories. It is identified by comparing transaction prices for the same property in different years. The third term captures the key object of interest: the differential price dynamics in local property markets with more offshore ownership. It is identified by comparing within-property changes in transaction prices across properties that belong to the same narrow price segment but are located in local property markets within London with different ex ante shares of offshore ownership.

**Main Results**

Figure 8 illustrates the elements in the vector $\beta$. The post-2015 elements are all negative suggesting that prices decreased more following the Brexit referendum in local property markets with a higher ex ante share of offshore ownership. A causal interpretation of this result requires the identifying assumption that price trends in the post-2016 period would have been parallel across local property markets with different ex ante shares of offshore ownership absent the Brexit shock (within price segments). This assumption concerns a counterfactual and is not directly testable, but the parallel trends in the pre-2015 period makes it credible.

The estimated reduced-form effects are economically and statistically significant. The point estimate of around -1 in 2018 suggests that property prices dropped by around 1% over the period 2015-2018 for each additional 1 percentage point of ex ante local offshore ownership. This implies that prices were around 1.8% lower in 2018 in local areas at the 75th percentile of offshore ownership shares, around 4.4% lower at the 90th percentile, and around 8.2% lower at the 95th percentile.[28]

[27] Specifically, we consider each property's last transaction price prior to the Brexit referendum and determine the position of this price in the national distribution of transaction prices in the same quarter.

[28] Figure A9 in the Online Appendix illustrates the distribution of ex ante offshore ownership shares across

**Robustness**

Table 3 reports the results from additional robustness tests conducted in a compact framework where the vector $d_t$ is replaced with a simple post-2015 indicator. The estimated coefficient captures the differential price change between the pre-referendum period (2011-2015) and the post-referendum period (2016-2019) associated with an additional 1 percentage point of ex ante local offshore ownership.

First, we augment the estimating equation with additional area-level controls that absorb potential confounding factors. We add the ex ante share of the local property market with any corporate ownership (interacted with time dummies). As shown in Column (2), area-level corporate ownership is not generally associated with larger price decreases in the post-referendum period. By contrast, when controlling for overall corporate ownership, the effect of offshore corporate ownership is even stronger. We also add the ex ante share of foreigners in the local population (interacted with time dummies). As shown in Column (3), the results suggests that the presence of foreigners was associated with price decreases, for instance reflecting migration responses to Brexit; however, the estimated effect of offshore ownership barely changes. Finally, we control for the centrality of the local areas by adding 10 indicators capturing the Euclidean distance to London Tower. As shown in Column (4), the effect of offshore corporate ownership increases slightly relative to the baseline.

Next, we investigate whether the results are driven by offshore corporations with foreign beneficial owners, i.e. those directly affected by Brexit. For some of the offshore corporations in the sample, we observe the beneficial owners directly in the leaks (see section 2.3) and we rely on this information to impute beneficial ownership patterns for the remainder.[29] This allows us to re-estimate the baseline model while conditioning the effect of offshore ownership on foreign vs domestic beneficial ownership. As shown in Column (5), the estimates suggest that offshore ownership was associated with a differential price decrease after the Brexit referendum only when the beneficial owners were foreign.[30]

Finally, we examine the robustness to the treatment of outliers and serial correlation in the

the 939 local property markets in London with non-zero offshore ownership. In most of these areas, offshore ownership accounts for less than 2% of the local market, but in a handful of areas this metric exceeds 10%.

[29]Assuming random selection into the leaks within each offshore jurisdiction (Alstadsæter et al., 2019), we assign probabilities of foreign and domestic beneficial ownership to the corporations that are not in the leaks based on the ownership patterns observed in the leaks. For instance, observing that beneficial owners are foreign for 58.6% of the Jersey corporations and 94.1% of the corporations from the Seychelles in the leaks, the imputed probability of foreign beneficial ownership is 58.6% for Jersey corporations and 94.1% for Seychelles corporations not in the leaks.

[30]The reported standard errors should be interpreted with some caution, as they do not account for the fact that the two dependent variables are themselves estimates associated with uncertainty.

data. As shown in Columns (6)-(7), winsorizing at alternative levels makes the estimated effect of offshore ownership slightly more negative. As shown in Column (8), clustering standard errors more conservatively widens the standard errors, but the key estimate remains highly significant.

## 5.2 Retrieving the structural parameter

**Empirical framework**

Ultimately, we would like to retrieve a parameter that captures the effect of offshore ownership on property prices. This is not straightforward as offshore ownership is generally endogenous to concurrent price developments. We address this challenge by harnessing the exogenous variation in offshore ownership created by the Brexit referendum in an instrumental variable framework. Specifically, the exposure of local property markets to sales by offshore owners following the referendum was highly heterogenous and largely mechanical, reflecting the pre-determined share of offshore owners in the market just before the referendum.

It is useful to start from the following structural equation:

$$\frac{\Delta p_i}{p_i} = \alpha + \theta \frac{\Delta D_m^{\text{offshore}}}{D_m} + \varepsilon_{im} \tag{4}$$

which relates a percentage change in prices to a percentage change in property demand where the demand change comes from offshore corporations. Conceptually, we think of demand from offshore corporations as their property purchases net of their sales. We refer to the parameter $\theta$ as the elasticity of property prices with respect to offshore demand.

We propose to use the share of offshore ownership in the local property market before the Brexit referendum, $z_m^{\text{offshore}}$, as an instrument for the change in offshore demand after the referendum. Several conditions need to be satisfied for it to be valid. First, it must affect the change in offshore demand (relevance). Second, it must not correlate with other shocks to prices (random assignment). Third, it must not affect prices in other ways than through the change in offshore demand (exclusion restriction).

Intuitively, we expect the instrument to be relevant because a general surge in property sales by offshore owners, in this case triggered by the prospect of Brexit, mechanically increases sales more in local property markets where the offshore ownership share is initially high. Figure 9 illustrates this pattern in the data by plotting, for each quintile of the ex ante offshore ownership share, the change in sales by offshore owners. While sales by offshore owners increase after the referendum in all quintiles except the bottom one, the increase is much more pronounced in local property markets with a higher ex ante share of offshore ownership.

To strengthen the case for random assignment, we add a vector of property-level controls $\boldsymbol{x_i}$ to equation 4. The control vector includes 100 indicators for the ex ante price level (same as in equation 3). Thus, the assumption is that local property markets in London *within the same narrow price segment* were not exposed to other shocks varying systematically with the offshore ownership share around the Brexit referendum. The control vector also includes controls for the timing of the property transactions. By construction, all properties in the sample are transacted pre-referendum (2011-2015) and again post-referendum (2016-2019). We include indicators for all combinations of transaction years, e.g. 2013-2018, 2014-2016, 2015-2018 and so on.

It is useful to note that the IV system is closely related to eq. 3 except that it is formulated in differences rather than in levels. Specifically, eq. 3 is essentially the reduced form of the IV system, relating the instrument (ex ante offshore ownership) directly to the outcome (prices). While the reduced form only requires random assignment (conditional on controls), the IV system comes with an additional assumption namely the exclusion restriction.

**Results**

Table 4 reports the estimates for the full IV system. As shown in Column (1), the reduced-form estimate is -0.728, which is very close to the baseline reported in Table 3 as expected. It implies that property prices dropped by around 0.7%, pre-referendum to post-referendum, for each additional 1 percentage point of local offshore ownership. The small discrepancy relative to the baseline reflects that we now estimate a cross-sectional model in differences rather than a multi-year panel model in levels.

As shown in Column (2), the first stage has the expected negative sign and is highly statistically significant (F-stat: 37.36). The point estimate implies that offshore corporations' property demand (i.e. their purchases net of their sales) dropped by 0.54% of total demand in the market (i.e. the ex ante value of property purchases) for each additional 1 percentage point of local offshore ownership.

The second stage delivers the structural parameter of interest: the elasticity of property prices with respect to offshore demand. As shown in Column (3), the point estimate is around 1.3, suggesting that a drop in property demand from offshore corporations equivalent to 1% of total demand reduces prices by around 1.3%. It is reasonably robust to alternative specifications: it hovers between 1 and 1.6 when we include additional area controls and winsorize more aggressively (Columns 4-7).

The sizable elasticity estimate suggests that property prices are highly sensitive to offshore demand, which largely constitutes new flows into the property market by foreign investors. This

contrasts with domestic demand where property buyers are often also property sellers, which dampens the effect on prices. Viewed in this light, the large elasticity estimate resonates with recent research showing that new flows into the stock market have large effects on stock prices (Gabaix and Koijen, 2021).

## 5.3 Vacancies

Finally, we investigate whether offshore ownership is associated with real effects in the form of vacancies. From the perspective of urban development, the emergence of ghost properties owned by absentee residents is a salient risk associated with foreign property investments motivated by tax and secrecy rather than by residence.

Our analysis uses administrative data on vacancies available at the level of local authority districts.[31] The data originates from the collection of council taxes on properties levied to fund local services. Councils require information about vacancies because the tax treatment varies with the vacancy status. Vacant dwellings usually benefit from a tax discount, but if a dwelling has been empty for more than two years, a tax penalty may apply.[32]

Our main specification mirrors the reduced-form framework we used to study price effects, except that vacancy information is at the area-level rather than the property-level:

$$\mathrm{V}_{at} = \mu_a + \sum_t \Gamma^t d_t \times \boldsymbol{x_a} + \beta Post_t \times z_a^{\text{Offshore}} + \varepsilon_{at}$$

where $\mathrm{V}_{at}$ is the vacancy rate in local authority district $a$ in year $t$, $z_a^{\text{Offshore}}$ denotes the ex ante share of the property market in district $a$ owned by corporations in tax havens and $Post_t$ is an indicator for years after 2015. The specification allows for different underlying trends in vacancy rates across price segments. In particular $x_a$ includes 10 indicators of the ex ante district-level price level, each of which is interacted with time dummies.[33] We estimate the model with annual data for 33 local authority districts in London.

Table 5 displays the results from the main specification in Panel A. The estimates suggest that the vacancy rate decreased by 0.11 percentage points after the Brexit referendum for each additional 1 percentage point of ex ante local offshore ownership (Column 1). The estimate compares to a baseline average vacancy rate of 1.7%. The estimate is reasonably robust to

[31] In particular, we relate the number of vacant dwellings by local authority district (Table 615) to the total dwelling stock (Table 125) from the UK government statistics to estimate the vacancy rate for each district.

[32] For details, see information on the tax treatment of empty properties provided by the UK government.

[33] We calculate the mean transaction price for each local authority district in England and Wales over the period 2011-2015, compute the deciles of the distribution of mean transaction prices, assign the districts in our sample to 10 income groups defined by the deciles and construct indicators for each of the groups.

adding controls for the foreign population share (Column 2) and the overall share of corporate ownership (Column 3) and indicators for the distance to London Tower (Column 4). In all these specifications, the estimates are between 0.1 and 0.2. The reduced-form estimates are consistent with the notion that the property sales by offshore owners induced by the Brexit referendum lowered the prevalence of vacant dwellings in London.

To gauge the share of dwellings with offshore owners that are vacant, we use an alternative specification that exploits the time variation in the offshore ownership share:

$$\mathrm{V}_{at} = \alpha_a + \mu_t + \omega \mathrm{Offshore}_{at} + \varepsilon_{at}$$

$\mathrm{Offshore}_{at}$ is the share of the property market in district $a$ owned by corporations in tax havens in year $t$. The specification includes fixed effects for local districts ($\alpha_a$) and years ($\mu_t$). The coefficient of interest, $\omega$, is identified by comparing the change in vacancy rates across districts with different changes in the offshore ownership share. Because both the dependent variable and the main explanatory are expressed in shares of the market, we can approximately interpret $\beta$ as the fraction of properties that become vacant when acquired by offshore owners.[34]

Table 5 displays the results from this specification in Panel B. The baseline estimate suggests that increasing the offshore ownership share by 1 percentage point is associated with an increase in the vacancy rate by just above 0.2 percentage points (Column 1). It is reasonably robust to controls for the foreign population share, overall corporate ownership, and the distance to London Tower (Columns 2-4). Taken at face value, the estimate suggests that one out of five properties owned through offshore corporations is vacant.

# 6 Conclusion

The role of offshore corporations in the U.K. residential property market has increased dramatically over the two most recent decades. It currently exceeds 1.5% in the overall residential market and reaches 15% for the most expensive properties.

Our analysis suggests that taxation and secrecy are important motives for funnelling property investments through offshore tax havens. Changes in tax rules and disclosure requirements induce sharp changes in offshore ownership structures. Seemingly, offshore ownership can serve to avoid taxes on capital gains and to conceal the identity of the ultimate owners.

[34]The interpretation is only approximate as $\mathrm{Vacancy}_{at}$ refers to the vacant share of housing units whereas $\mathrm{Offshore}_{at}$ refers to the offshore-owned share of housing values. Identification could be much improved with vacancy information at the property-level.

Our analysis also shows that the rise of offshore ownership has significant impacts on real outcomes in property markets. The Brexit referendum triggered a sharp increase in property sales by offshore owners accompanied by differential decreases in prices and vacancy rates in areas with higher ex ante offshore ownership rates. Offshore ownership appears to drive prices up and leads to more empty dwellings.

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**Table 1** – Data Sources and Aggregates

| | (1) All properties | (2) Residential properties |
|---|---|---|
| **Panel A: Corporate owners** | **4,224,072** | **941,577** |
| - Direct owner is domestic corporation (CCOD) | 4,059,065 | 885,209 |
| - Direct owner is foreign corporation (OCOD + FOI) | 239,049 | 79,117 |
| **Panel B: Offshore corporate owners** | **389,155** | **98,076** |
| - Direct owner is corporation in tax haven (OCOD + FOI) | 221,224 | 75,013 |
| - Indirect owner is corporation in tax haven (ORBIS) | 167,931 | 23,063 |
| **Panel C: Beneficial owner observed in leaks** | **16,639** | **7,635** |
| - Pandora Papers | 1,729 | 728 |
| - Paradise Papers | 3,753 | 1,945 |
| - Panama Papers | 8,439 | 3,623 |
| - Offshore Leaks | 1,035 | 568 |
| - Bahamas Leaks | 2,647 | 1,204 |

*Notes*: This table shows the number of unique post-able addresses across all available years after the data preparation described in the main text. If a property appears in multiple datasets (for example because it changed hands from a domestic to a foreign corporate owner), it is counted for both datasets meaning the components do not necessarily add to the aggregates in bold font. While Column 1 includes all properties, Column 2 includes properties that are residential as they match with the price data (PPD). Panel A shows the number of addresses we identify in the corporate ownership data. Panel B shows the number of properties for which we observe an offshore corporate owner as the immediate investor (OCOD + FOI) and as indirect investors (ORBIS). Panel C shows the number of properties for which we can identify a natural person as the beneficial owner based on a match with the ICIJ data leaks.

**Table 2** – Aggregate Ownership Statistics (Dec. 2019)

| | |
|---|---|
| **(A) All residential properties in England and Wales (£ bn.)** | **4,920.60** |
| **(B) Owned directly or indirectly by offshore corporations (£ bn.)** | **79.28** |
| - of which: offshore corporation is immediate owner | 68.92 |
| - of which: offshore corporation is ultimate holding company | 10.37 |
| *Offshore market share (= B/A)* | *1.61%* |
| **(C) Owned directly or indirectly by other foreign corporation (£ bn.)** | **18.19** |
| - of which: foreign corporation is immediate owner | 4.56 |
| - of which: foreign corporation is ultimate holding company | 13.63 |
| *Other foreign corporate market share (= C/A)* | *0.37%* |
| **(D) Owned exclusively by domestic corporations (£ bn.)** | **264.43** |
| *Domestic corporate market share (= D/A)* | *5.37%* |

*Notes*: This table shows estimates of the aggregate value of residential properties in England and Wales by ownership structure as of December 2019. The total residential real estate stock value (A) includes properties owned by corporations in offshore tax havens (B), other foreign corporations (C), and domestic corporations (D). Foreign-owned properties are further differentiated by direct foreign ownership, observed in the land register, and indirect foreignownership identified via ORBIS. For details on the ownership assignment and the estimation of market shares, see Appendix B and Appendix C.

**Table 3** – Offshore Ownership and Property Prices, Robustness

| | (1) **Baseline** | (2) | (3) **Additional Area Controls** | (4) | (5) **Beneficial Ownership** | (6) **Alternative Winsorization** | (7) | (8) **Alternative Clustering** |
|---|---|---|---|---|---|---|---|---|
| Post x Offshore | -0.701*** | -1.06*** | -0.659*** | -0.856*** | | -0.820*** | -1.09*** | -0.701*** |
| | (0.069) | (0.087) | (0.070) | (0.070) | | (0.068) | (0.078) | (0.153) |
| Post x Corporate | | 0.237*** | | | | | | |
| | | (0.034) | | | | | | |
| Post x Foreign Population | | | -0.043*** | | | | | |
| | | | (0.011) | | | | | |
| P.x O., Exp. For. | | | | | -1.24*** | | | |
| | | | | | (0.130) | | | |
| P.x O., Exp. Dom. | | | | | 0.014 | | | |
| | | | | | (0.100) | | | |
| | 143,308 | 143,308 | 143,308 | 143,308 | 143,308 | 143,308 | 143,308 | 143,308 |
| Property FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 100 price bins × year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| 10 distance bins × year FE | | | | Yes | | | | |
| Clustering | Property | Property | Property | Property | Property | Property | Property | 983 areas |
| Winsorization | | | | | | 2x2% | 2x5% | |
| Observations | 143,308 | 143,308 | 143,308 | 143,308 | 143,308 | 143,308 | 143,308 | 143,308 |
| Adjusted $R^2$ | 0.94977 | 0.94982 | 0.94978 | 0.95011 | 0.94982 | 0.94978 | 0.94979 | 0.94977 |

*Notes*: This table shows difference-in-differences estimates for our reduced-form price analysis. The sample is identical to the event study presented in Figure 8, i.e. we focus on property sales between 2011 and 2019 and limit the sample to properties sold both before and after the Brexit referendum. Post indicates that the year is 2016 or later. Column 1 shows the results from the baseline model. Column 2 adds a control for the total corporate market share (domestic and foreign corporations). Column 3 adds a control for the foreign population share (defined at the district level). Column 4 adds 10 Euclidean distance bands from the Tower of London constructed at the output area level and interacted with year fixed effects as controls. Column 5 conditions the effect of offshore ownership on the expected residence of the beneficial owners (Foreign vs British). Columns 6-7 show results with alternative winsorization (0.5% and 2% level). Column 8 shifts the clustering from the property level to the local property market level (983 local areas). Signif. Codes: ***: 0.01, **: 0.05, *: 0.1

**Table 4** – Offshore Ownership and Property Prices, Structural Parameter

| | (1) **Reduced Form** | (2) **First Stage** | (3) **Second Stage** | (4) | (5) **Additional Area Controls** | (6) | (7) **Alternative Winsorization** |
|---|---|---|---|---|---|---|---|
| *Variables* | | | | | | | |
| Offshore Market | -0.728*** | -0.540*** | | | | | |
| | (0.167) | (0.088) | | | | | |
| Demand Shock | | | 1.35*** | 0.989*** | 1.27*** | 1.61*** | 1.39*** |
| | | | (0.317) | (0.187) | (0.319) | (0.325) | (0.301) |
| Clustering | local area | local area | local area | local area | local area | local area | local area |
| Winsorization | | | | | | | 2x5% |
| Observations | 62,638 | 62,638 | 62,638 | 62,638 | 62,638 | 62,638 | 62,638 |
| 100 price bins x pre-post | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Corporate x pre-post | | | | Yes | | | |
| Foreign Population x pre-post | | | | | Yes | | |
| 10 distance bands x pre-post | | | | | | Yes | |
| Adjusted $R^2$ | 0.2623 | 0.1570 | 0.2312 | 0.2469 | 0.2468 | 0.2223 | 0.2293 |
| Kleibergen-Paap F-Statistic | | 37.36 | | | | | |

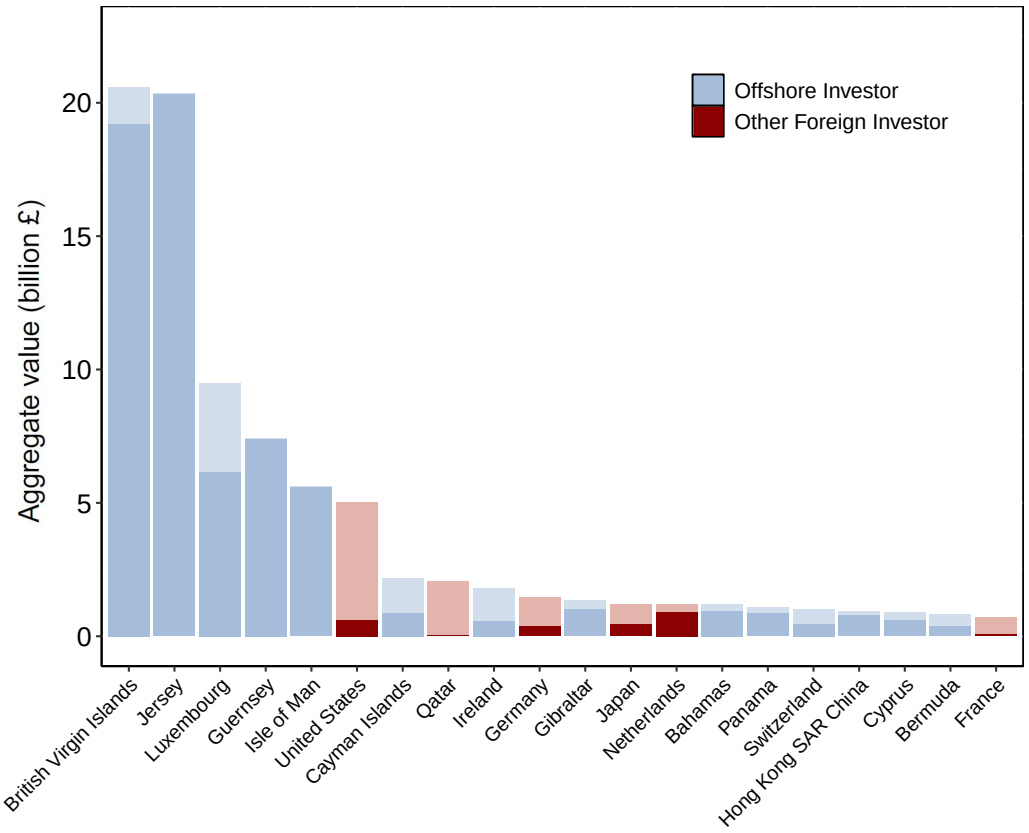
*Notes*: This table reports the estimation results for our IV system. The dependent variable in the reduced form and the second stage is the property-level change in transaction prices (in logs) between the most recent transaction before the Brexit referendum and the first transaction after. The exogenous instrument is the share of local property market $m$ owned by offshore corporations end of 2015. The endogenous variable is the change in average offshore demand in market $m$ between 2011-2015 and 2016-2019 as a share of total demand in market $m$ 2011-2015 where offshore demand is the value of property purchases net of property sales by offshore corporations and total demand is the value of all property transactions. The vector of control variables in all three regressions includes 100 indicators for the ex ante price level (computed as in the main regression) and 20 indicators for the timing of the property transactions, e.g. 2013-2018, 2014-2016 and 2015-2018. Columns 4–6 control for total corporate investment (column 4), the foreign population share (column 5), and the distance from the London Tower (column 6), all interacted with pre-post dummies. Column 7 winsorizes the offshore market share using 5 percent on both sides. Signif. Codes: ***: 0.01, **: 0.05, *: 0.1

**Table 5** – Offshore Ownership and Vacancies

| | (1) **Baseline** | (2) **Foreign Pop.** | (3) **All Corp.** | (4) **Dist. Band** |
|---|---|---|---|---|
| **Panel A: Brexit Identification** | | | | |
| Post × Offshore | -0.11*** | -0.11*** | -0.20 | -0.10** |
| | (0.027) | (0.030) | (0.128) | (0.042) |
| District FE | Yes | Yes | Yes | Yes |
| 10 price bins × year FE | Yes | Yes | Yes | Yes |
| Post × Foreign Pop. | | Yes | | |
| Post × All Corp. | | | Yes | |
| 4 distance bins × year FE | | | | Yes |
| Observations | 297 | 297 | 297 | 297 |
| Adjusted $R^2$ | 0.6157 | 0.6150 | 0.6177 | 0.6569 |
| **Panel B: Variation over Time** | | | | |
| Offshore | 0.20*** | 0.21*** | 0.29** | 0.17** |
| | (0.071) | (0.068) | (0.106) | (0.070) |
| District FE | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| Foreign Pop. | | Yes | | |
| All Corp. | | | Yes | |
| 4 distance bins x year FE | | | | Yes |
| Observations | 297 | 297 | 297 | 297 |
| Adjusted $R^2$ | 0.5725 | 0.5754 | 0.5751 | 0.6254 |

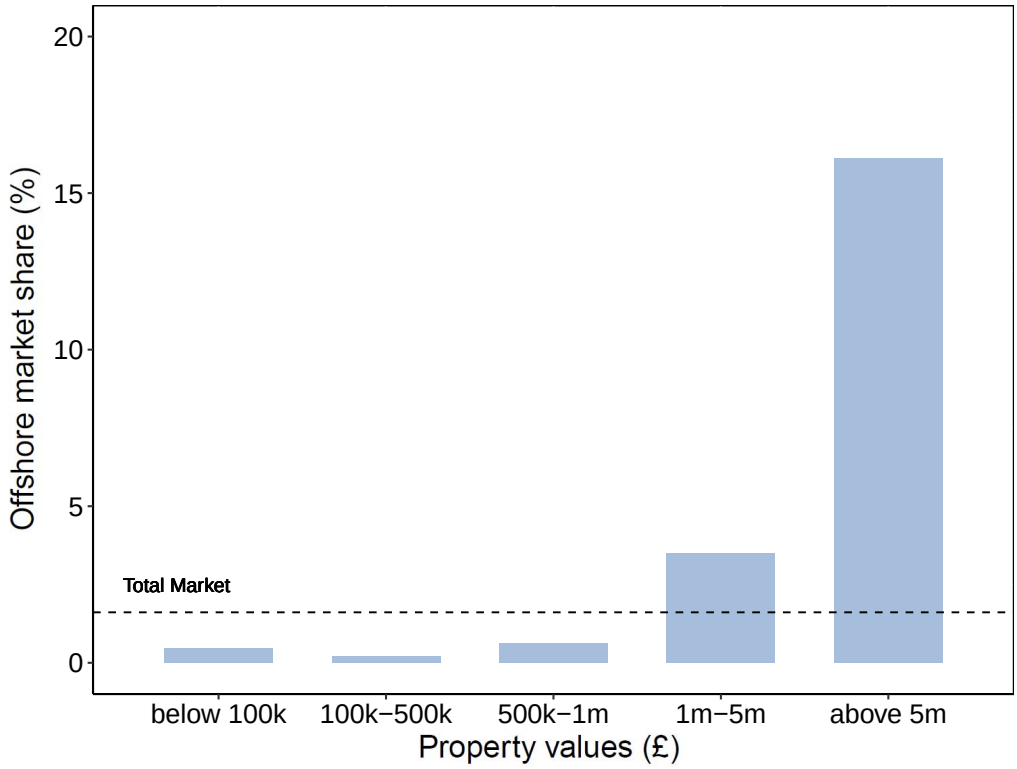
*Notes*: This table shows the regression results for the analysis of vacancy rates. Across all specifications, we use annual observations for the period 2011-2019 for each of the 33 districts in London. The dependent variable is the vacancy rate, i.e. the share of dwellings in the district that are vacant. *Post* indicates that the year is 2016 or later, $z^{\text{Offshore}}$ is the share of the local property market owned by offshore corporations in 2015 and Offshore is the share of the local property market owned by offshore corporations in the current year. Panel A shows results from a specification that mirrors the price analysis and exploits the Brexit referendum as a shock that changes the ownership structure of properties in London. The coefficient on $Post \times z^{\text{Offshore}}$ indicates the differential change in the vacancy rate associated with a one percentage point higher ex ante offshore market share. Panel B shows results from a specification that exploits longitudinal variation in offshore ownership. The coefficient of interest on *Offshore* indicates how the vacancy rate changes when the offshore market share increases by one percentage point. Column (1) displays the baseline results. Column (2) adds controls for the foreign population. Column (3) adds controls for total corporate ownership, and Column (4) adds controls for distance bands from the London Tower. Distance bands are constructed as quartiles from the district-specific average distance from the London Tower. The unweighted average vacancy rate across all London districts in 2015 was around 1.7%. Signif. Codes: ***: 0.01, **: 0.05, *: 0.1

**Figure 1** – Aggregate property investments by foreign corporations




*Notes*: The figure shows the aggregate value of residential property in England and Wales owned by corporations in each of the top-20 foreign jurisdictions in December 2019. It distinguishes offshore tax havens (blue bars) and other foreign countries (red bars) and includes direct ownership (dark color) as well as indirect ownership (light color). For details on the ownership assignment and the estimation of stock volumes, see Appendix B and Appendix C.

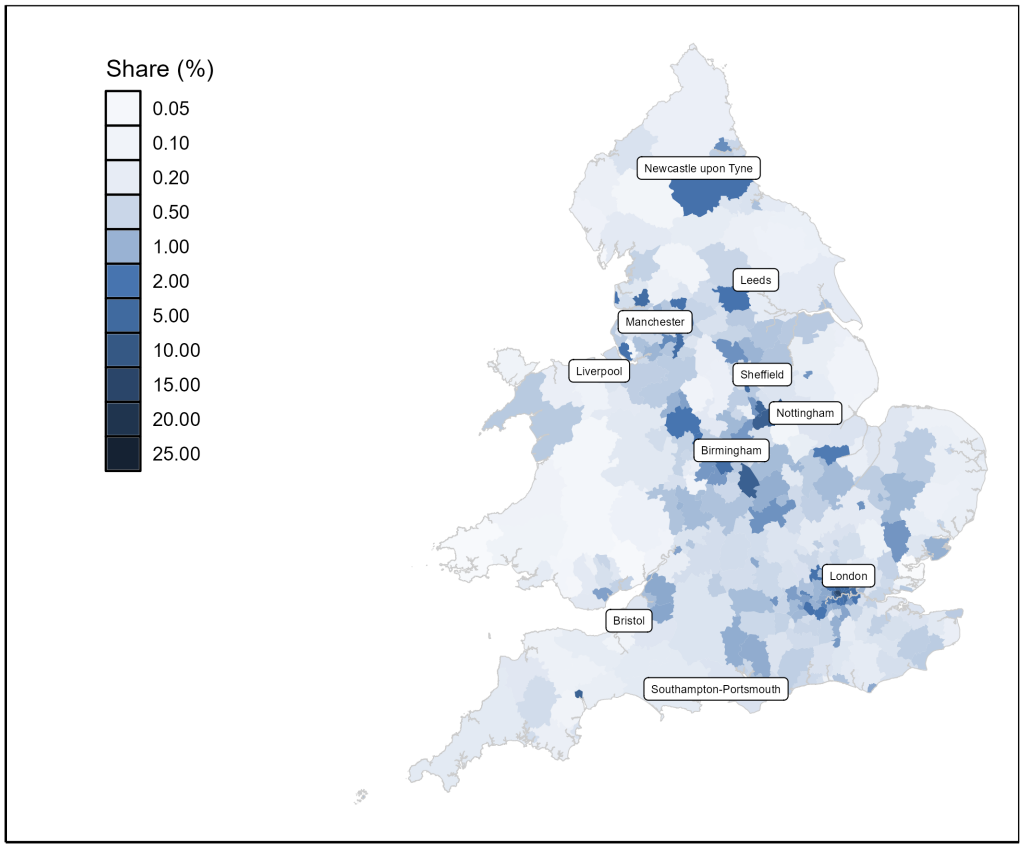
**Figure 2** – Offshore Market Share by Price Segment



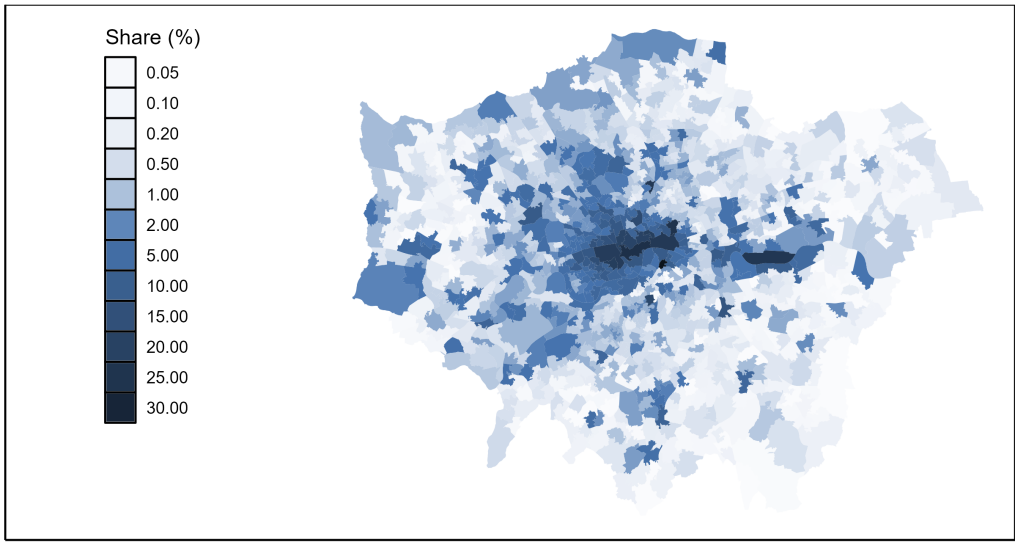

*Notes:* The figure shows the share of aggregate residential property value in England and Wales owned by corporations in offshore tax havens, in the total market (dashed line) and in different price segments (blue bars, £) in December 2019. Offshore ownership includes direct as well as indirect ownership. For details on the ownership assignment and the estimation of market shares, see Appendix B and Appendix C.

**Figure 3** – Geography of Offshore Market Shares

**(a)** England and Wales

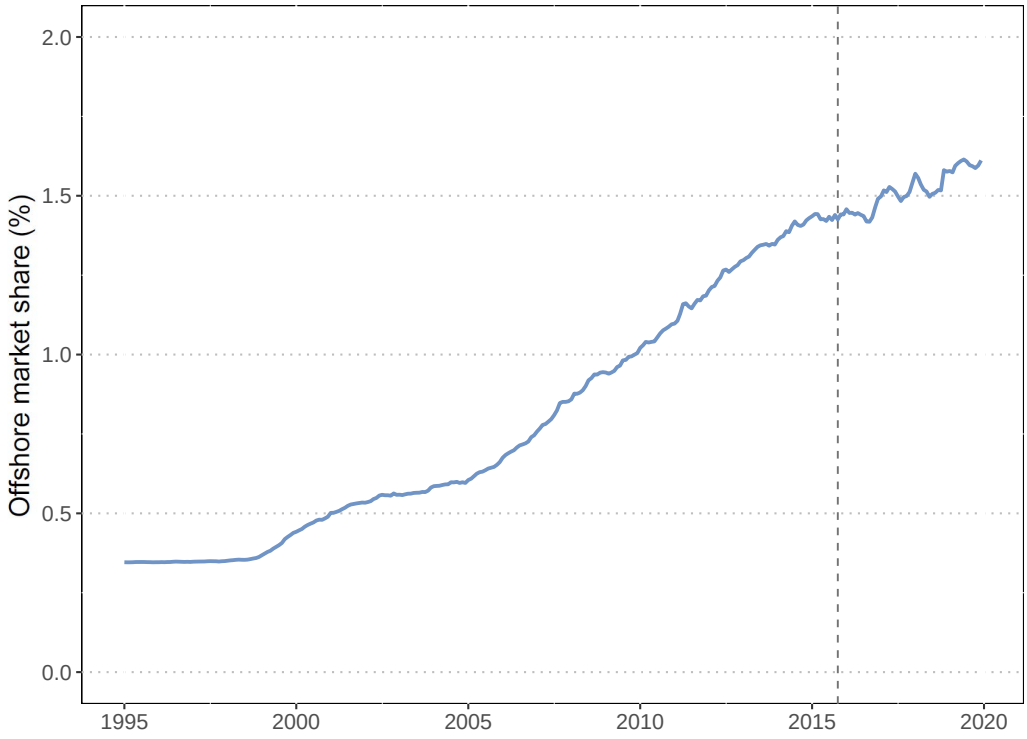



**(b)** London



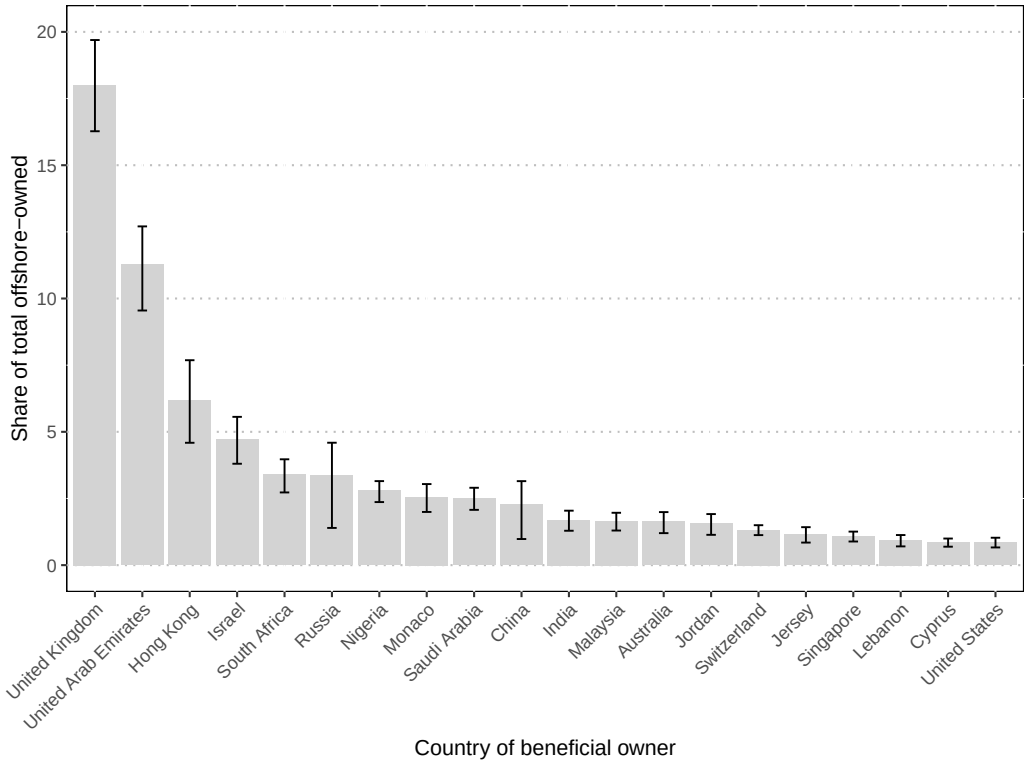

*Notes:* The figure shows the share of aggregate residential property value owned by corporations in offshore tax havens varies across local areas in December 2019. Offshore ownership includes both direct and indirect ownership. Figure 3a displays market shares across districts in England and Wales while Figure 3b displays market shares across local areas in London. For illustration, the upper panel includes labels with major cities. For details on the ownership assignment and the estimation of market shares, see Appendix B and Appendix C.

**Figure 4** – Offshore Market Share over Time



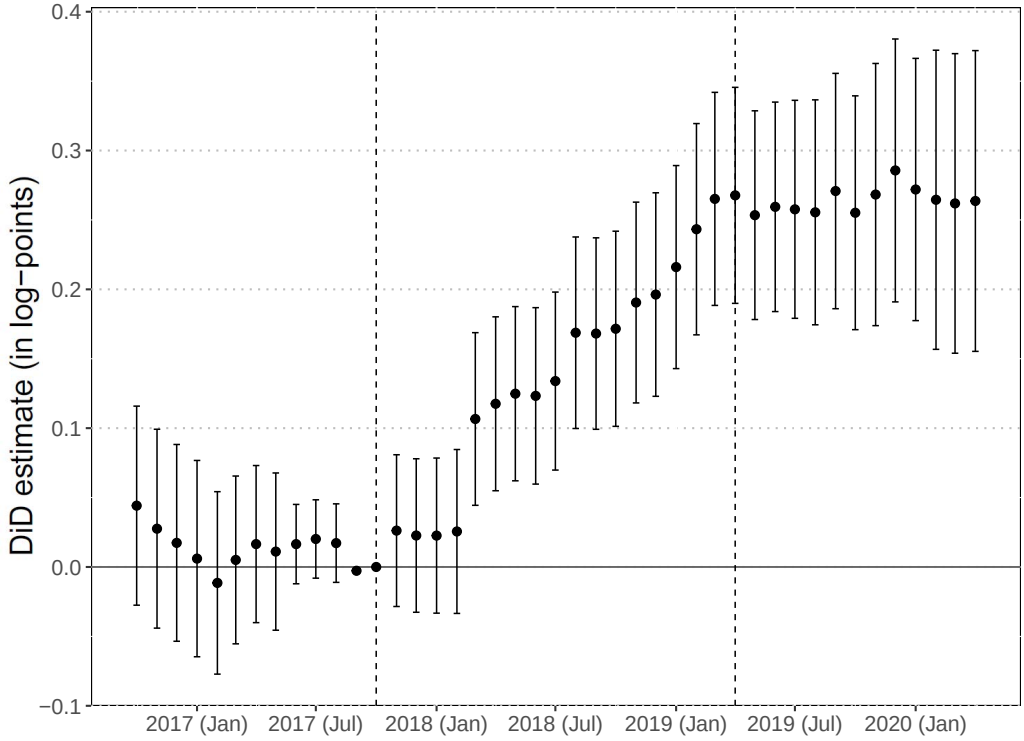

*Notes*: The figure shows the estimated share of the aggregate residential property value in England and Wales that is owned by corporations in offshore tax havens in each month between January 1995 and December 2019. Offshore ownership includes direct and indirect ownership links. The dashed line indicates the start of the real-time snapshots for direct ownership of offshore companies (OCOD). For details on the ownership assignment and the estimation of market shares, see Appendix B and Appendix C.

**Figure 5** – Beneficial Ownership by Home Country



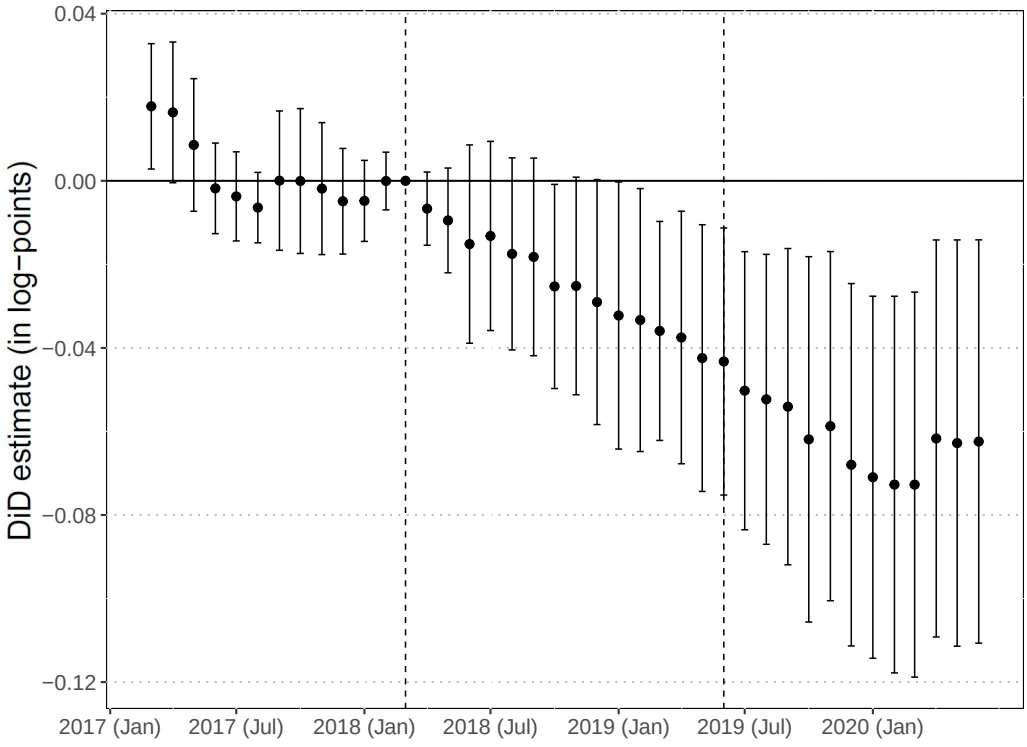

*Notes*: The figure shows the distribution of residential property in England and Wales by the country of the ultimate beneficial owners, in the sample of properties owned by corporations in offshore tax havens, for which we identify the ultimate beneficial owners in the offshore leaks (gray bars). It also illustrates the statistical uncertainty under the assumption of random selection into the leaks by plotting the interquartile range of bootstrapped shares (black vertical lines).

**Figure 6** – The Tax Motive



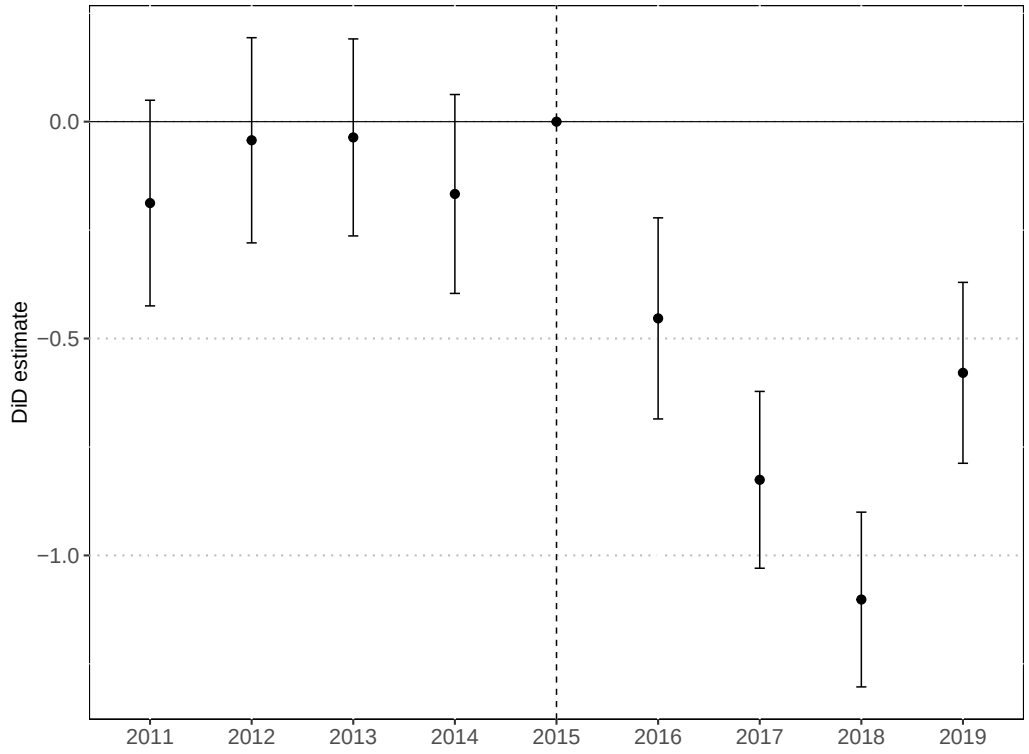

*Notes*: The figure plots the estimated coefficients from the baseline analysis of the tax motive (black dots). The estimates show the evolution of property holdings by companies in Luxembourg relative to companies in other tax havens. The omitted time category is October 2017, the month before the extension of the capital gains tax coverage was announced (first dashed line). The second dashed line refers to the implementation of the capital gains tax extension. The confidence bands are at the 95%-level and based on heteroskedasticity and autocorrelation robust standard errors (black vertical lines). For details on the capital gains tax extension, see Appendix D.

**Figure 7** – The Secrecy Motive



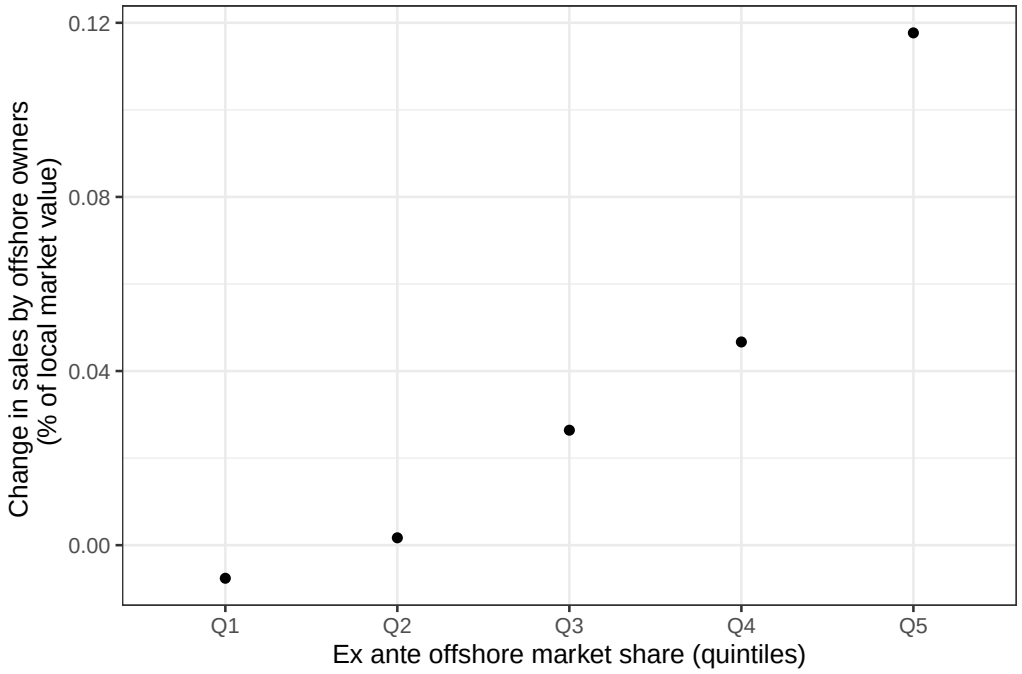

*Notes:* The figure plots the coefficients from the baseline analysis of the secrecy motive (black dots). The estimates show the evolution of property holdings by companies in the Overseas Territories relative to companies in the Crown Dependencies. The omitted time category is March 2018, two months before the Sanctions and Anti-Money Laundering Act (SAMLA) amendment passed parliament (first dashed line). The second dashed line refers to the announcement of Crown Dependencies to voluntarily establish public ownership registries. The confidence bands are at the 95%-level and based on heteroskedasticity and autocorrelation robust standard errors (black vertical lines). For details on the Sanctions & Anti-Money Laundering Act (SAMLA) amendment behind this policy change, see Appendix E.

**Figure 8** – Offshore Ownership and Property Prices around Brexit




*Notes*: The figure plots the coefficients from the baseline analysis of offshore ownership and property prices around the Brexit referendum (black dots). The coefficients show the estimated change in property prices relative to 2015 for each additional percentage point of offshore ownership in the local property market in 2015. The local property markets correspond to the 983 middle output areas of London. The regression is at the property-level and the sample is limited to properties in London transacted both before and after Brexit. The baseline regression includes property fixed effects, so that the underlying price dynamics is identified from repeat sales, and 100 indicators for the ex ante price level interacted with calendar time, so that the effect of offshore ownership is identified from comparisons of within-property price changes across similarly-priced properties located in property markets with different shares of offshore ownership. The confidence bands are at the 95%-level and based on robust standard errors clustered at the property level (black vertical lines).

**Figure 9** – Offshore Capital Flight After the Brexit Referendum




*Notes*: The figure illustrates how the exposure of local property markets to sales by offshore owners after the Brexit referendum correlates with the ex ante offshore market share. For each local property market, we compute the change in the average annual property sales by offshore corporations to other investors from before the referendum (2011-2015) to after the referendum (2016-2019), with sales scaled by the aggregate value of the local property market. The figure plots the average of this metric by quintile of the ex ante offshore market share.

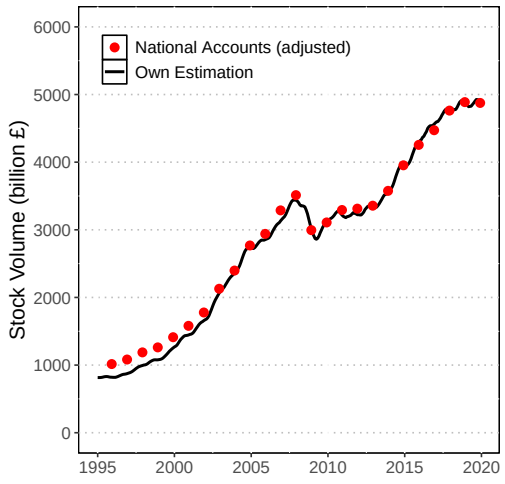
# Online Appendix

"Homes Incorporated: Offshore Ownership of Real Estate in the U.K. "

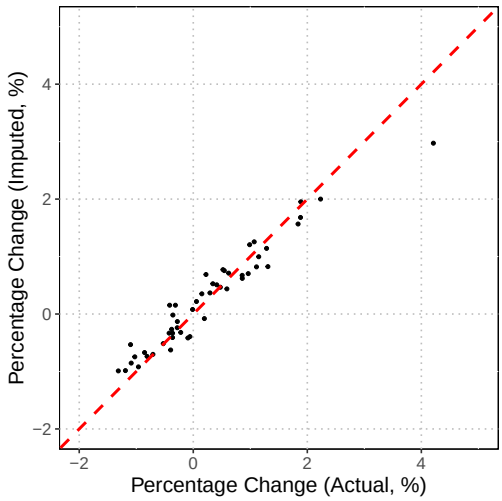
# A Additional Results

**Figure A1** – Validating Long-run Time Series

**(a)** Residential Market Volume

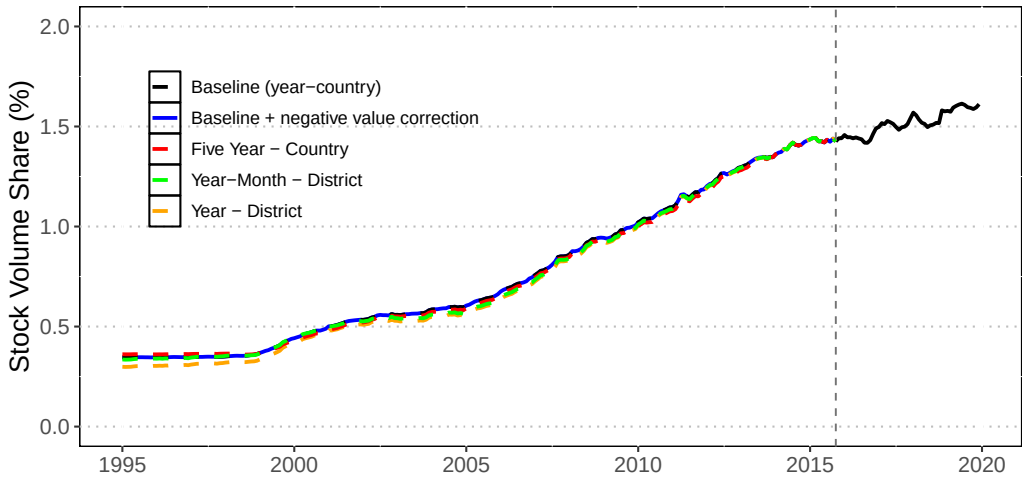



**(b)** Offshore Market Share Growth




*Notes:* The figure shows the results from two exercises that aim to validate our strategy for estimating long-run time series of real estate values. Figure A1a compares the total value of residential real estate in England and Wales according to our estimation (black line) with adjusted values from the National Accounts (red points). Figure A1b compares imputed (y-axis) and actual (x-axis) month-to-month growth rates of the offshore market share for the time between October 2015 and December 2019 when reliable snapshot data is available. For details on the estimation of market shares and the validation exercises, see Appendix C.

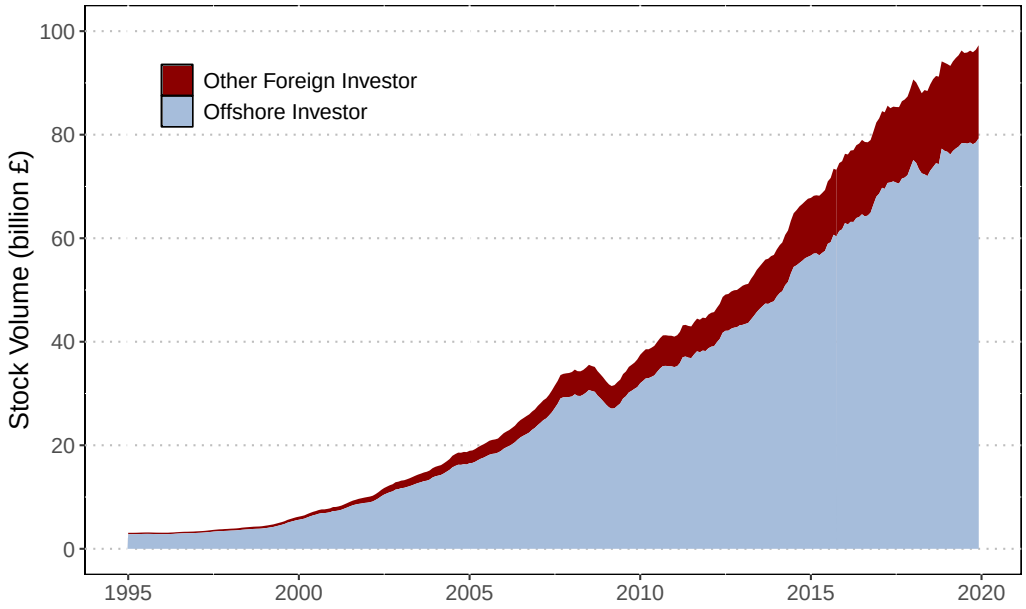
**Figure A2** – Robustness of Imputation Approach



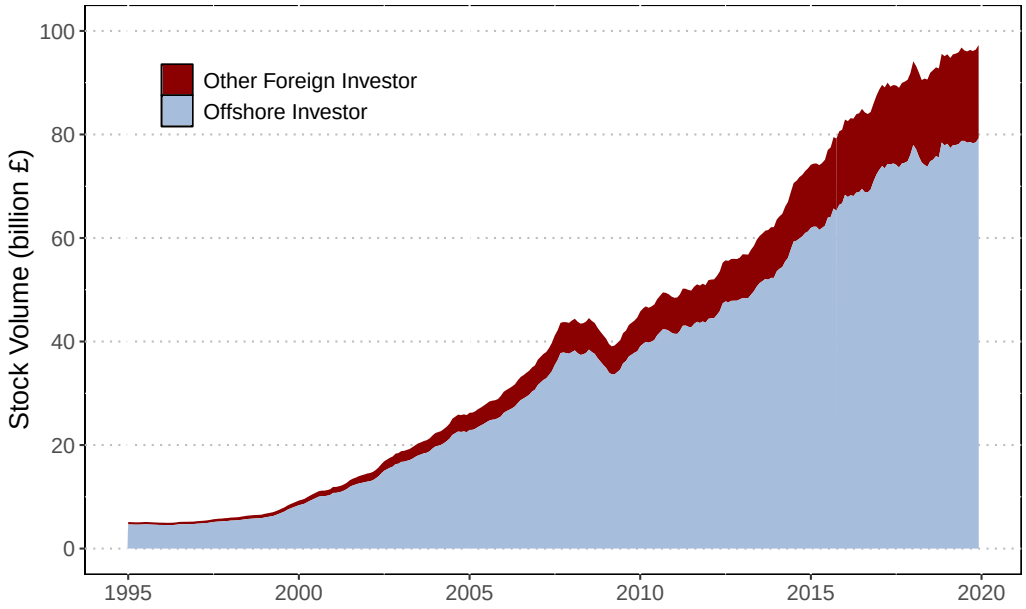

*Notes:* The figure illustrates the robustness of the estimated long-run dynamics in the offshore market share (Figure 4) to alternative choices in the imputation procedure. In the baseline, transition probabilities are calculated at the year-country level and negative values at the district level are preserved (black line). Alternative approaches set negative values to zero at each imputation stage (blue line) or calculate transition probabilities at the five-year-country level (red line), month-district level (green line) and year-district level (orange line). For details on the estimation of market shares and the validation exercises, see Appendix C.

**Figure A3** – Foreign Corporate Ownership of Residential Real Estate

**(a)** Current Prices




**(b)** Real Prices

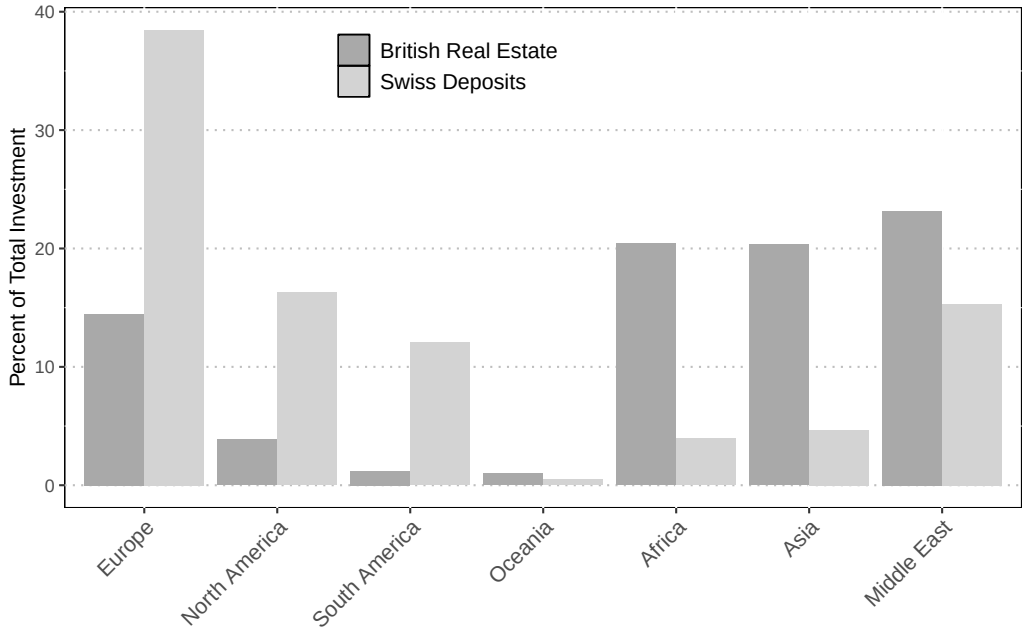



*Notes:* The figure shows the estimated aggregate value of residential real estate in England and Wales held by corporations in offshore tax havens (blue) and other foreign corporations (red). The estimates include direct as well as indirect ownership. The top panel shows values in current prices while the bottom panel shows values in 2019-prices (deflated with CPI). For details on the ownership assignment and the estimation of market shares, see Appendix B and Appendix C.

**Figure A4** – Tax Haven Share, Real Estate vs. Bank Deposits

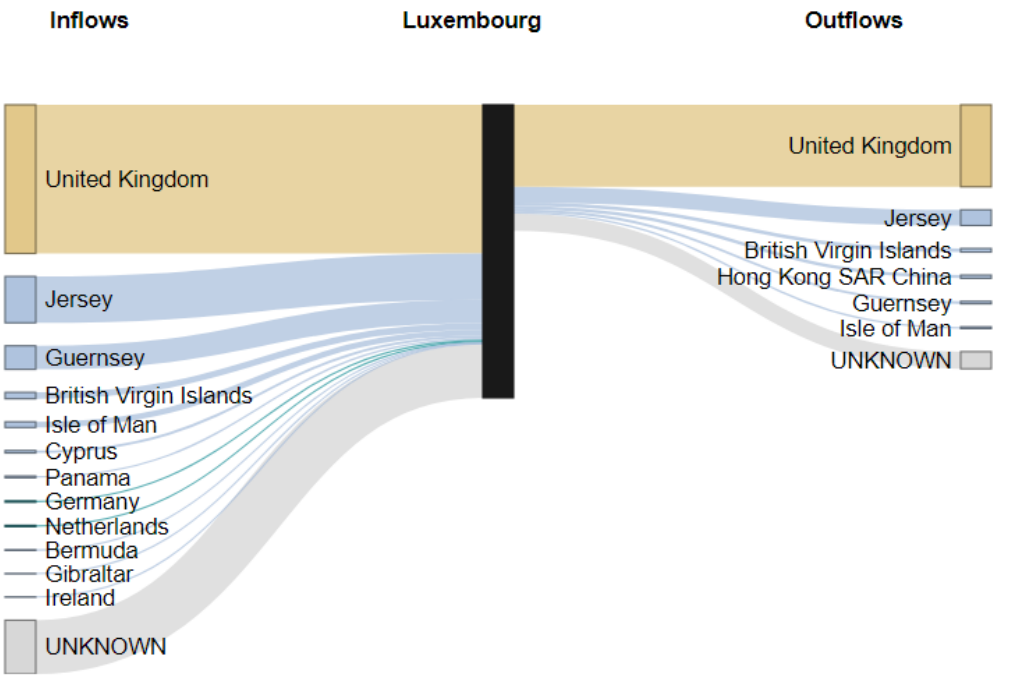

*Notes:* The figure compares the share of aggregate residential real estate value in England and Wales owned by offshore tax havens (solid line, left horizontal axis) to the share of deposits in British banks owned by offshore tax havens (dashed line, right horizontal axis). The tax haven share of deposits is computed based on the Locational Banking Statistics of the Bank for International Settlements.

**Figure A5** – Beneficial Ownership, Real Estate vs. Banking




*Notes:* The figure compares the distribution of beneficial ownership across geographical regions for residential real estate in England and Wales (dark gray bars) and for financial assets managed in Switzerland (light gray bars). The beneficial ownership of financial assets is based on the leaked customer records from HSBC Switzerland published by the International Consortium of Investigative Journalists as the *Swiss Leaks*. Both metrics exclude ultimate owners from the United Kingdom.

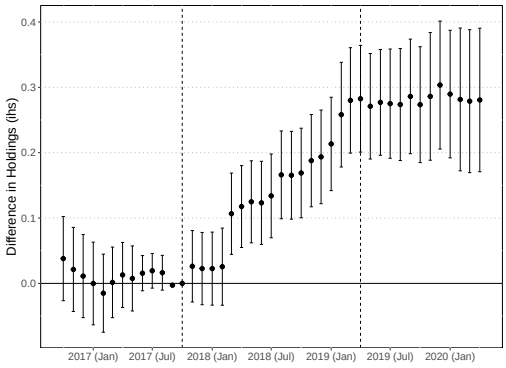
**Figure A6** – Tax Motive, Flows



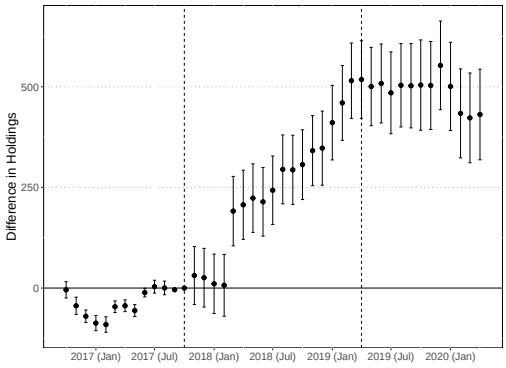

*Notes:* The figure visualizes the flows of property holdings to (from) companies incorporated in Luxembourg between October 2017 and April 2019. Country assignments in flows to (from) Luxembourg are based on the owner that precedes (succeeds) the Luxembourg corporation within at most a time window of 6 months. If no direct predecessor (successor) is visible in the data, we assign this predecessor to the "Unknown" category that consists of private owners, deconstructed properties and newly built properties.

**Figure A7** – The Tax Motive, Robustness

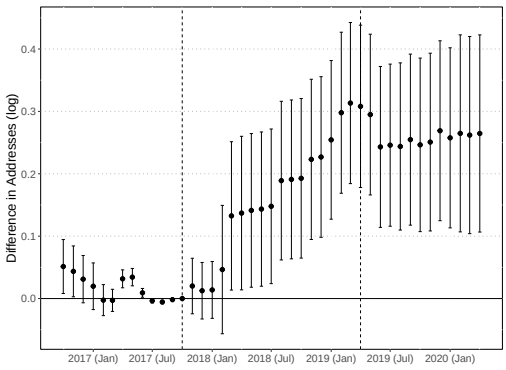
**(a)** Inverse Hyperbolic Sine




**(b)** Absolute Number



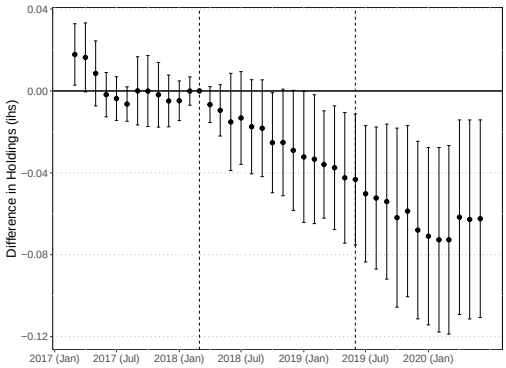

**(c)** Property Addresses



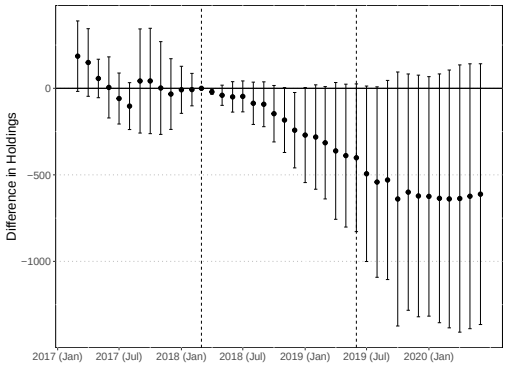

*Notes:* The figure shows robustness tests of the baseline result on the tax motive. The robustness tests use alternatives to the logarithmic transformation of the outcome variable: the inverse hyberbolic sine (Panel A) and the absolute number without any transformation (Panel B). They also use an alternative unit of observation: the number of property addresses (Panel C).

**Figure A8** – The Secrecy Motive, Robustness

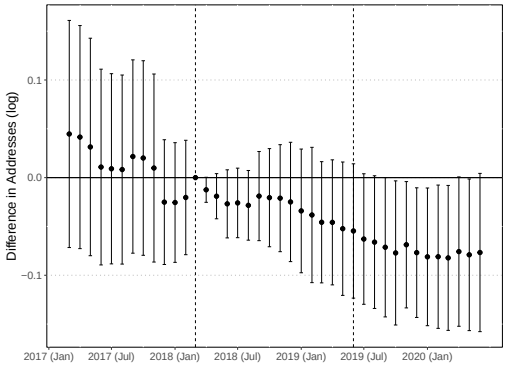
**(a)** Inverse Hyperbolic Sine




**(b)** Absolute Number

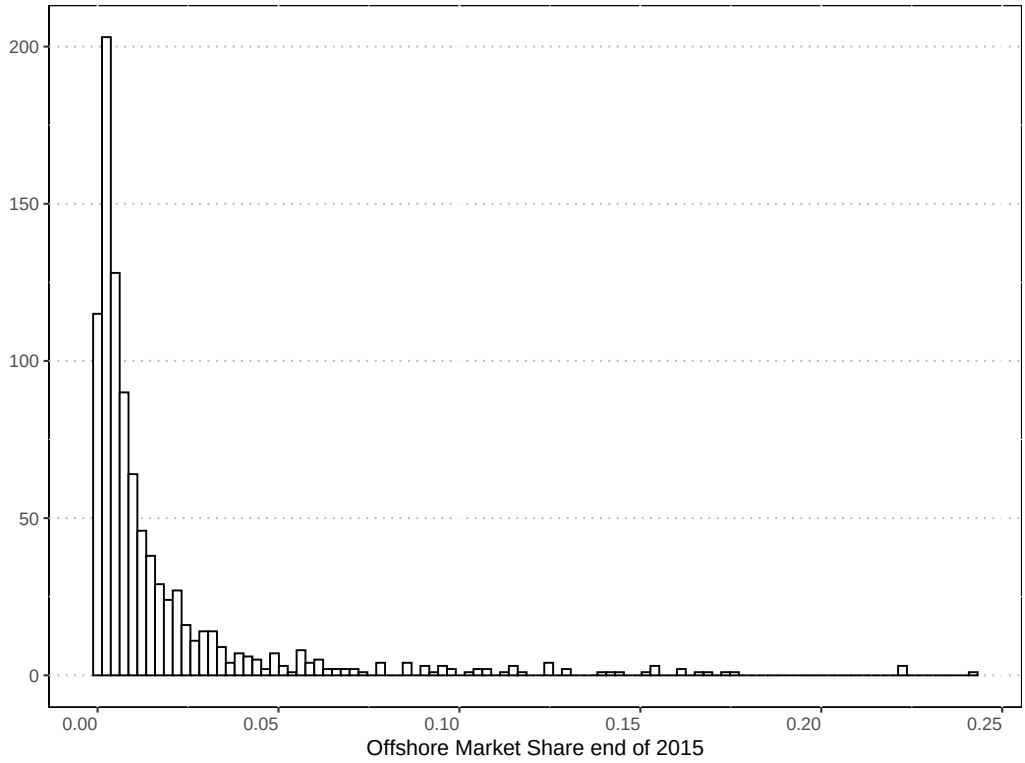



**(c)** Property Addresses




*Notes:* The figure shows robustness tests of the baseline result on the secrecy motive. The robustness tests use alternatives to the logarithmic transformation of the outcome variable: the inverse hyberbolic sine (Panel A) and the absolute number without any transformation (Panel B). They also use an alternative unit of observation: the number of property addresses (Panel C).

**Figure A9** – Distribution of Offshore Ownership Shares in London




*Notes:* The figure shows the distribution of the share of residential real estate owned by corporations in offshore tax havens across 983 local areas in London (omitting the 44 areas with no offshore ownership).

# B Combining Data Sources

This part of the appendix provides details on the combination of price, purchase date, and ownership information to create a comprehensive dataset of British real estate transactions. In Section B.1, we describe in detail, how address string information from various sources is harmonized. Section B.2 discusses, how ownership information from the land register is combined with information about ownership chains from ORBIS and ultimate ownership details from the ICIJ leak data. Finally, we provide insights on the conditions that are utilized to match price and ownership information (Section B.3).

## B.1 Preparing British Addresses

Understanding the relative importance of foreign held residential real estate requires information that is not readily available from British sources. The Price Paid data records sales price information for the entire residential market, the different ownership datasets contain the immediate ownership information for the entire corporate market. Our goal is to match these sources to obtain combined price-ownership information for the residential market that is owned by corporate investors. Unfortunately, the UK registers do not publish identifiers linking the Price Paid data and the ownership data. Even if these were published, they would most likely link the data specific identifiers which are of limited use. The main identifier in the Price Paid data is a "transaction id" that can include many properties sold in one transaction. The main identifier in the ownership data is the "land title registration number" that can include dozens of addresses that have the same owner and are registered as one land title. To be able to combine the data, we move all datasets to the level of a postal address. An example for a simple data entry is:

*"FLAT 5, 213 SUSSEX GARDENS, LONDON (W2 2RJ)"*

This entry can easily be moved to the postal address level:

| **Postcode** | **Street** | **House No.** | **Unit** | **Unit No.** | **Locality** | **Locality No.** |
|---|---|---|---|---|---|---|
| W2 2RJ | SUSSEX GARDENS | 213 | FLAT | 5 | | |

An example for a complicated data entry is:

*"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)"*

This entry is separated by our code into multiple postal addresses:

| **Postcode** | **Street** | **House No.** | **Unit** | **Unit No.** | **Locality** | **Locality No.** |
|---|---|---|---|---|---|---|
| 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 |
| ... | ... | ... | ... | ... | ... | ... |

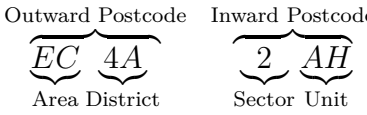
This process is carried out for the following datasets:

- the Price Paid database that collects all residential transactions
- the CCOD database that contains all domestic corporate investment
- the historical CCOD database
- the OCOD database that contains all foreign corporate investment
- the historical OCOD database
- the freedom of information request data containing foreign transactions since 1990
- the Private Eye data containing a 2014 snapshot of foreign ownership

### Detecting Postcodes

Our code starts with basic string cleaning exercises such as: Moving everything to uppercase letters, adjusting typos such as "Esat" instead of "East", eliminating apostrophes, aligning cardinal points ("Northerly = North", or "North-West = North West"), aligning punctuation, removing trailing or leading whitespaces as well as unnecessary punctuation.

We then start the address preparation by separating data entries along the information on postcodes. We exploit the fact that postcode assignment in the UK follows regularized patterns and contains different layers which are shown in the following exemplary postcode:



Given that the different layers allow for a limited number of patterns, we can use regular expressions to identify the postcode. Since postcodes usually appear at the end of an address entry, any auxiliary information that appears after the postcode is dropped.[35] In very rare cases, there is only one postcode for a land title that includes several streets and it is only specified for the first street. If we find any additional street information after a postcode, we assign the same postcode.[36]

**Detecting Streets**

Having separated addresses by postcodes, we next turn to street names. Since a data entry can contain multiple streets under the same postcode, we first use regular expressions to identify how many different streets are included in the entry of the land registry.[37]

Depending on the number of matches, we then repeatedly extract streets from the data entry following a two step procedure. The first step makes use of the list of street names provided by the national mapping agency of the UK.[38] In particular, we extract streets in the data entry by looking through all street names associated with the respective outward postcode. The identification of street names via location-specific lists has the advantage that it reduces false positives associated with terms that can be a street name in one place, but are a locality or property name in others. In a second step, if we have not identified a street using the lists above, we extract remaining street names based on street regular expressions using general terms commonly associated with streets.

For each extracted address, we also obtain a leading string that contains house numbers, unit information (e.g. "FLAT 10", "APARTMENT 5"), locational information (e.g. "LAND AT", "BUILDINGS LYING TO THE SOUTH OF"), and locality information (e.g. "WALLACE COURT"). In the next sections, we discuss how we separate these elements.

**Separating House Numbers, Units, and Localities**

In the data, house number information is placed directly in front of the street while unit and locality information is located in front of the house number (e.g. "FLAT 7, DORCHESTER

[35]For instance, this auxiliary information includes strings like "and adjacent parking lot" that are not relevant for the preparation of the address.

[36]In particular, we look for the appearance of any of the following street regular expressions: STREET, ROAD, ARCADE, VALE, LANE, AVENUE, CLOSE, WHARF, ACRE, MEWS, WALLS, CHASE, SQUARE, CRESCENT, PLACE, ROW, TERRACE, WAY, QUAY, BOULEVARD, GATE, DRIVE, GROVE, GARDENS, GARDEN, CIRCUS, WALK, EMBANKMENT, HEIGHTS, GARTH, PARKWAY, COURT, YARD, VIEW, HILL, PARADE, APPROACH, RISE, PATH, GLADE, and TERRACE.

[37]We use the same list of street pointers used in the postcode preparation above.

[38]These data are available from the Ordnance Survey.

COURT, 77-81 SLOANE STREET, LONDON (SW1X 9SE)"). This order allows us to identify the house number as a regular expression that directly precedes the street name and contains only non-alphabetical strings.[39]

Once the house number is extracted, we detect units and their corresponding number(s) by searching the remaining entry for elements of an extensive list of unit types.[40] The non-alphabetical regular expressions following the extracted unit types are recorded as the respective unit number(s). Again, unit numbers are allowed to follow the same patterns as house numbers.

The land registers are full of special property names such as "Wallace Court" or "Grayston House". We opt for treating these localities differently from the units described above, though they often fulfill the same role in identifying addresses. The most important difference is that unlike flats or apartments, these localities often appear without a number associated with them. We detect localities using regular expressions, which is simpler than detecting units after the latter have been taken out of the running string.

**Treating House, Unit and Locality Numbers**

Having identified the strings that include information about the house, unit, and locality numbers, we transform them into a harmonized numeric appearance. For instance, we create integer sequences of simple numeric sequences ("1-3" becomes "1,2,3"). Thereby, we pay special attention to ranges of numbers that also include letters (e.g. "3A-4C") and make sure that all combinations (e.g. "3A, 3B, 3C, 4A, 4B, 4C") are created for the final data.

Whenever one of the above steps leads to more than one postcode, street, house number, unit number, or locality number, we reshape the dataset into long format. This process results in a dataset of postal addresses that are uniquely identified. Whenever data quality concerns prohibit precise recognition, the entire land register entry is dropped from the dataset.

The classification of address information is a challenge that is also discussed in the field of computer science. Bourne et al. (2018) show how a general model of natural language processing (spaCy) has to be trained on the OCOD data to structure the address string snippets from the UK land register. The goal of their analysis is to provide a good aggregate classification of market shares, where we are interested in offshore investment specifically and at the property level. We therefore do not infer prices based on area-level aggregates.

[39]We allow for one-digit alphabetical strings attached to numbers and for particular alphabetical strings such as "ODD" or "EVEN". Thereby, our code is also able to identify more complicated house number combinations like "1-11 (ODDS)", "16-20 (EVEN)", or "14, 17A-18C".

[40]Among others, unit types include "APARTMENT","FLAT","UNIT", "BUILDINGS", "BUNGALOWS", "SUITE", "ROOM", "FLOOR".

By manually inspecting the different data sources (FOI, PPD, OCOD, CCOD), our approach allows a characterization that is tailored to capture the heterogeneity in the address recordings in our various data sources. In addition, we aim to provide a transparent classification, while machine learning algorithms are often a black box.

## B.2 Preparing Ownership Information

HM Land Registry differentiates its registers for commercial real estate between real estate titles held by domestic companies (CCOD) and titles held by foreign companies (OCOD).[41]

The Commercial and Corporate Ownership Data (CCOD) contains all freehold and leasehold registered titles to land or property in England and Wales that are held by non-private entities incorporated in the UK. Examples of non-private entities include public limited companies, unlimited companies and limited liability partnerships.[42] While land registration in the UK exists for more than 150 years, it fis only publicly available and updated on a monthly basis from November 2017 onward. In addition, using the legal procedure of a Freedom of Information (FOI) request, we obtained quarterly data for the time period between March 2014 and September 2017. The latest version of the data contains more than three million property titles including both property-related information (e.g. geographical information, tenure) and owner-related information (e.g. name, company registration number, proprietor type).[43]

The Overseas Company Ownership Data (OCOD) is the corresponding administrative register for property titles registered to companies outside of the UK. OCOD was made publicly available in 2017 as part of the government's strategy to enhance the understanding of the UK housing.[44] Apart from information recorded in the CCOD, the OCOD contains the country of incorporation of the proprietor(s). Although the country of incorporation has been routinely recorded in the register since 1999, OCOD is also only available from November 2017. In the process of our FOI request, we could extend the coverage obtaining quarterly OCOD data, which dates back to October 2015. As of June 2020, OCOD counts around 100,000 property titles which we separate into the addresses described above and in the main text.

[41] Detailed information on CCOD and OCOD is provided by HM Land Registry.

[42] The data does exclude Charitable Incorporated Organizations. Land register data for private individuals is also maintained by HM Land Registry, but not available for the public.

[43] For some properties, the land register also contains information about the price paid. However, since the recordings of the prices is incomplete, we ignore the price information from the land register, since we have comprehensive price information in the transaction data (Price Paid data).

[44] This process had been pushed by a data publication of the current affairs magazine *Private Eye* in 2014. It contains property and ownership information of around 100,000 property titles in England and Wales acquired by foreign companies between 1999 and 2014. For details on the data and related news coverage, see information by the Private Eye Magazine.

### Preparing Companies in the British Registers

In order to link ownership information across different data sources, we also harmonize the details about the corporate owners in three steps. First, we align the string entries by treating leading and trailing white spaces, caps, or special characters. Second, we extract company types from the strings based on an extensive list of incorporation types and separate them from the information about the company name.[45] Finally, we harmonize company types and reclassify them in a unified way given that a limited liability company for instance could be recorded as "Limited", "Ltd.", or "Limited Liability Company". For companies incorporated abroad, we use a fourth step to extract and harmonize information about the country of incorporation. This harmonization is not only necessary due to frequent misspellings of country names, but also because the records sometimes present regional or local information instead of the country information (e.g. "Tortola" instead of "British Virgin Islands", or "Abu Dhabi" instead of "United Arab Emirates").

### Adding Orbis Ownership Information

While the British land register data separates between real estate held by foreign and domestic companies, a domestic company can directly be owned from abroad. This would disguise foreign ownership as domestic ownership. In order to address this issue, we employ corporate ownership information from the Orbis dataset by Bureau van Dijk (BvD). This proprietary dataset includes data on 400 million companies and their ownership structure. Starting from the British company, we first harmonize company incorporation types to create a 1:1 match with the Orbis dataset and assign a BvD ID to the British companies that appear in the British registers. In the simplest cases, Orbis already has information on the global ultimate owner of a company, defined as holding more than 50% of the voting shares (GUO 50 in Orbis) of a company. In that case, we can simply re-assign the country of origin from "United Kingdom" to that owner for the company in question. If this is not the case, we exploit information on shareholders. If a company in Britain for example has one shareholder in France who is not the ultimate owner, we move to that shareholder and check if it has an ultimate owner. The country that has the majority ultimate owner share is then designated as the country of origin of an investment. Whenever we cannot identify global ultimate owners, we refrain from reclassifying the country of origin. This is a conservative approach once the shareholder structure has moved offshore but avoids assigning the shareholder country when no global ultimate owner is identified. Therefore, in our dataset, this data effort re-codes the country of origin from "United Kingdom" to the respective

[45] Examples of company types include "LTD", "SARL", and "PLC".

country of the GUO 50 we find in Orbis.

### Matching ICIJ Ownership Information

Shell companies in tax havens are routinely used to hide ownership. A regular stream of large data leaks has been collected into a consistent database by the International Consortium of Investigative Journalists (ICIJ). The last installment of this dataset was published in May 2022, adding further data from the *Pandora Papers* leak. The dataset used here includes all available information from the *Offshore Leaks* (2013), the *Panama Papers* (2016), the *Bahamas Leaks* (2016), the *Paradise Papers* (2017), and the *Pandora Papers* (2021). Together with the files on Mossack Fonseca in the Paradise Papers, parts of the corporate registers of six well known offshore jurisdictions were leaked with much less media attention but more data.[46] In total, the data contains information on more than 810,000 offshore entities and the respective managerial structures. Most importantly, the data identifies the persons connected to an offshore identity ('officers') and reveals their respective role in the company (e.g. beneficial owner, nominee director, nominee shareholder). After several updates over the last years, this database is now available online as a network database.

**Preparing Offshore Entities** In order to match the information in the leaked databases to the British land registers, we first prepare the company name and company type information using the approach described above for British companies. The list of company types, including misspelled versions, is longer here (298 company types, only including those that exist in the offshore leaks database) because the data spans multiple corporate registers. For example, limited liability companies could be a Malaysian SDN BLD, a Luxembourgian SARL, or a British LTD. Having aligned company names, we match both data sources using name, type, and country of incorporation. This conservative approach can lead to false positive matches only if two firms with the identical name and the same incorporation type exist in the corporate register of one country. This is legally prohibited in the corporate register of the UK and we have not found such a duplicate in the tax havens for which we have data.

Since the country information is therefore important for the match with the leak data and the registers, we go through the country information in the offshore leaks database in detail. In some cases, the description of the jurisdiction is sub-national. We update the sub-national jurisdictions (such as Delaware, Texas, Ras Al Khaimah, or Dubai) to the country level (USA and

[46]These six jurisdictions are: Aruba, the Cook Islands, the Bahamas, Barbados, Malta, Nevis [part of St. Kitts and Nevis], and Samoa.

United Arab Emirates for these cases). Instead of creating a synthetic Netherlands Antilles, we assign historical Netherlands Antilles cases to Curacao. Other updates concern spelling mistakes usually due to the mistreatment of special characters at some point of the data construction which we re-assign using regular expressions.

**Preparing Offshore Officers** Officers are the shareholders, directors, and beneficial owners that the offshore leak database identifies. These officer nodes can be linked to entity nodes with undirected edges supplied in the offshore leaks database. This is a many to many match as one officer can be connected to more than one entity and one entity can have more than one officer.

We add one important step to this link: The 'officer' assignment in the offshore leak database includes legal entities if they are entered as shareholders, beneficial owners, or directors. In order to distinguish those from legal entities, we employ our company type recognition code and classify any officer name in which we find a company type (such as "Ltd.") as a legal entity. Whenever we do not, we classify it as a natural person. We confirm the quality of this approach with manual inspection.

**Matching Linked Entity-Officer Data with British Register Data** The resulting combination of offshore shell companies with their beneficiaries can then be matched to our previously prepared address data. In order to do so, we rely on three prepared pieces of information: The name of a company, its incorporation type, and the country of incorporation. Our matching first uses the original capitalized names and types and the country of incorporation (28% of all matches). For the not yet matched data, we then proceed to match using the prepared company types and the country of incorporation (44% of all matches). Finally, we discard the company type and only match using the name stump and the country of incorporation (28% of all matches). We use all these uncertainty levels in the results of the paper, and we have not detected non-randomness of the resulting country distributions across these three uncertainty levels.

Note that we do not use the ICIJ leak data to update our main dataset. A property will still be counted as offshore held for our main statistics even if we could identify the beneficial owner in the ICIJ leak. We analyze the ICIJ match in the respective section in detail.

## B.3 Matching Price and Ownership Data

Having access to prepared postal address information for the transaction price dataset (Prices Paid data), as well as prepared addresses and company information for the corporate ownership

datasets (CCOD, historical CCOD, OCOD, historical OCOD, our freedom of information request, and the Private Eye data) we then proceed to match the two. The central outcome of our address preparation is a unique property identifier. With this identifier, combining ownership and price data is straightforward.

**Timing of Transactions and Owner Registrations** Beyond address information, the second ingredient of our match is information on the timing of real estate transactions. The price paid data registers the time that the transaction was recorded, while the "date proprietor added" in the ownership data registers the date of entry of the new owner in the land register. Usually, an ownership change is recorded with a lag of 3-4 months in the land register in our data. Correspondence with the British land register confirmed this expected time lag. We double the tolerance and match transactions and ownership changes in a window of -1:8 months. When we observe an ownership change that is not matched to a transaction but we do observe the address in the price paid data at another time, we update ownership at the ownership change. This essentially introduces an assumption that a property that is residential at some point in time can always be treated as part of the residential market. This ensures that we do not miss ownership changes that were not due to a sale.

If a property was sold to a foreign company in 2010 and not sold since then, this sale will show up in the freedom of information data as a transaction. It will also show up in the historical OCOD stock data since the first entry still captures the current owner. It will also show up a few months later in the OCOD dataset. We introduce a data hierarchy going from the last available dataset to the first (OCOD $\rightarrow$ OCOD hist $\rightarrow$ FOI $\rightarrow$ Private Eye; CCOD $\rightarrow$ CCOD hist) and take all other auxiliary information from the data source of the highest point in the hierarchy where the match appears. Here, the Private Eye data is dominated by OCOD and its historical version (and is not registered separately in table 1). This is expected and a useful sanity check as the Private Eye data was originally based on a freedom of information request on foreign property purchases: The same data that was used to construct OCOD in the first place. Our own FOI request does provide purchases of foreign companies that took place before the current owner at the start of the real time database was entered into the register, however. Whatever did not change owner between the start of real time OCOD data and the Private Eye data is registered in the first iteration of OCOD. Whatever did change ownership is registered in the data we obtained through the FOI request on ownership changes since 1990.

Any deviation in address data quality will prohibit a match. False positives are therefore

very unlikely and our match should be interpreted as a lower bound estimate.

## B.4 Corporate Ownership Data including Non-Residential Properties

In the analysis of causes of offshore ownership in section 4, we make the analysis as broad as possible by focusing on the stock of both non-residential and residential property holdings. Since we are interested in the monthly stock of property titles held by companies registered in different jurisdictions, we use all ownership data after October 2015 for which we have regular snapshot information available. Since the frequency of the snapshots varies over time, we update the stock data using the date proprietor added information if the date proprietor added information is less than four months (six months) away from the snapshot date for snapshots after December 2017 (before December 2017). For instance, a property title held that appears in the snapshot of November 2017, but has a date proprietor added of October 2017 is also assigned to the stock of October 2017 (for which a regular snapshot is not available). The main specification focuses on property titles. As discussed above, since a property title can include multiple unique addresses, we also provide results for unique addresses.

# C Long-run Dynamics of the Offshore Market Share

To estimate the stock volume of foreign held residential real estate, we combine transaction information on all *residential* real estate from the Price Paid Data (PPD) with ownership information on *all corporate held* real estate from the land register (LR) and ORBIS. The confidence of this stock volume estimation varies over time. While after October 2015, regular snapshots of the land register are available, we only have limited information on purchases by foreign companies between 1995 and October 2015. We thus discuss the estimation strategy for these two periods, i.e. 1995 to October 2015, and after October 2015 separately.

## Estimation after October 2015

Given that snapshots of the land register are available after October 2015 on a regular basis, we can estimate the foreign held stock volume based on the information in each respective snapshot. For this purpose, we first merge the land register snapshot to PPD and supplement it with ownership information from ORBIS.[47]

For the estimation of the aggregate offshore market share at different points in time, we improve upon this data combination by making two adjustments. First, we also include transactions from the land register data that do not appear in the PPD, but whose transacted properties appeared at any point in the PPD. We thereby assume that a property is always either residential or non-residential but does not switch between these categories. Second, we impute the real estate stock value between the land register snapshots by using the transaction dates instead of the dates of the land register snapshot. Purchase prices are adjusted using district level house price indices (HPI). By using the transaction date information separately from the actual snapshot time, we correct for lagged appearances of properties in the land register.[48]

## Estimation before October 2015

Before October 2015, we no longer have regular LR snapshots at our disposal. We therefore use all available purchase information before October 2015 to estimate the stock volume and shares of foreign held residential real estate between January 1995 and October 2015.[49]

[47] For details on the combination of land register data, Price Paid Data, and ORBIS, see Appendix B.

[48] For example, a property might be registered in LR with a date proprietor added (DPA) of August 2018, but only appears in the snapshot of December 2018. Disentangling snapshot time from transaction time might thus increase the accuracy of our stock volume measure.

[49] As above, PPD information is supplemented with land register information on properties that appear at any time in PPD and are thus considered residential.

**Stocks** For every year-month $t$, we are interested in the stock value of real estate that is held by private owners ($S_t^P$), domestic corporate owners ($S_t^D$), foreign tax haven corporate owners ($S_t^{TH}$), foreign non haven corporate owners ($S_t^{NH}$), and foreign corporate owners without country information ($S_t^F$). Stock estimates at time $t$ refer to the end-of-month stock.

**Flows** While we do not observe stocks directly, we observe at every year-month $t$ the flow value $F_t^{o-d}$ from origin $o$ to the destination $d$. Consistent with the stock owner types, origin and destination can be $P, D, TH, NH, F$. In addition, the origin of a flow can also be $New$. Flows from $New$ to one of the other owner type segments are identified from PPD information on whether a property is newly built or an established residential building.

**Linking Stocks and Flows** The following equation shows exemplary for the stock of real estate held by tax havens, how stocks and flows can be linked. Note that we link stocks and flows separately for every district $i$.

$$\begin{aligned} S_{t,i}^{TH} = \quad & \underbrace{(1+g_{t-1,i})}_{\text{HPI growth adjustment}} \quad \underbrace{S_{t-1,i}^{TH}}_{\text{Stock end of previous period}} \\ & \underbrace{-F_{t,i}^{TH-P} - F_{t,i}^{TH-D} - F_{t,i}^{TH-NH} - F_{t,i}^{TH-F}}_{\text{Flows out of tax havens into other owner type segments}} \\ & \underbrace{+F_{t,i}^{P-TH} + F_{t,i}^{D-TH} + F_{t,i}^{NH-TH} + F_{t,i}^{F-TH}}_{\text{Flows into tax havens from other owner type segments}} \\ & \underbrace{+F_{t,i}^{New-TH}}_{\text{New Properties}} \end{aligned} \tag{5}$$

Importantly, we observe foreign ownership of purchases only since 1995. As a consequence, we do not observe all flows with their origin $o$. Flows $F$ thus consist of an observed and an unobserved component denoted by $\hat{F}$ and $\tilde{F}$ respectively. For instance, the flow from tax haven to private reads

$$F_{t,i}^{TH-P} = \underbrace{\hat{F}_{t,i}^{TH-P}}_{\text{observed}} + \underbrace{\tilde{F}_{t,i}^{TH-P}}_{\text{unobserved}} . \tag{6}$$

The unobserved part of the flow can be estimated, since we know if a property has existed already before the purchase. For instance, denote $F_{t,i}^{?-P}$ the inflow of property value into the private sector that has no previous owner and does not consist of newly built properties.

In order to assign the origin of these flows into destination $d$, we assume that the origins are proportional to the origins of flows into destination $d$ for which we know the owner. For the example above, it follows that

$$\begin{aligned}\tilde{F}_{t,i}^{TH-P} &= \underbrace{\hat{F}_{t,i}^{?-P}}_{\text{flows to P, unobserved origin}} \times \; r_{y(t)}^{TH-P} \\ &= F_{t,i}^{?-P} \times \frac{\hat{F}_{y(t)}^{TH-P}}{\hat{F}_{y(t)}^{TH-P} + \hat{F}_{y(t)}^{NH-P} + \hat{F}_{y(t)}^{F-P} + \hat{F}_{y(t)}^{P-P}}\end{aligned} \tag{7}$$

Note that the ratio $r_{y(t)}^{TH-P}$ is calculated at the country level and at the year level y(t) to have a reasonably large sample size for the estimation of the shares.[50] Importantly, for the years after our first snapshot (2014, Private Eye data), any purchase of an already existing property without owner prior owner information must have had a private owner before this purchase. If the previous owner would have been corporate, we would have observed it in the stock data.

**Combination and Inversion** We estimate the stocks at every point in time by inverting equation (5) and solving for the stocks going backward in time. This is possible because we have a correct estimate of the stock of real estate with corresponding owner types in October 2015.[51] Combining the inverted equation (5) with equations (6) and (7), we obtain

$$\begin{aligned}S_{t-1,i}^{TH} = \frac{1}{(1+g_{t-1,i})}\Bigg[ & S_{t,i}^{TH} \\ & + \hat{F}_{t,i}^{TH-P} + \hat{F}_{t,i}^{TH-D} + \hat{F}_{t,i}^{TH-NH} + \hat{F}_{t,i}^{TH-F} \\ & + \tilde{F}_{t,i}^{TH-P} + \tilde{F}_{t,i}^{TH-D} + \tilde{F}_{t,i}^{TH-NH} + \tilde{F}_{t,i}^{TH-F} \\ & - \hat{F}_{t,i}^{P-TH} - \hat{F}_{t,i}^{D-TH} - \hat{F}_{t,i}^{NH-TH} - \hat{F}_{t,i}^{F-TH} \\ & - \tilde{F}_{t,i}^{P-TH} - \tilde{F}_{t,i}^{D-TH} - \tilde{F}_{t,i}^{NH-TH} - \tilde{F}_{t,i}^{F-TH} \\ & - F_{t,i}^{New-TH}\Bigg].\end{aligned} \tag{8}$$

[50] For the evolution of the aggregate market share, these choices do not change the results substantially as shown by Figure A2 in which variations to the geographic level and period of transition probabilities are shown. Also note that we refrain from conditioning the transition probabilities on property characteristics, since our data is relatively scarce in this dimension.

[51] It is possible that the imputation yields negative stock values at the district level if we overestimate the inflows of properties based on the transition probabilities at a given point in time. However, as shown in Figure A2, putting a zero lower bound threshold to the stock value at the district level in each backward imputation step does not influence the aggregate evolution of the market share.

**Aggregation** In a final step, we aggregate the district level stock estimates and calculate the stock shares by ownership with respect to the total residential market denoted by $s$. For instance, the aggregate offshore tax haven share is calculated as

$$s_t^{TH} = \frac{\sum_i S_{t,i}^{TH}}{\sum_i S_{t,i}^{TH} + \sum_i S_{t,i}^{NH} + \sum_i S_{t,i}^{F} + \sum_i S_{t,i}^{D} + \sum_i S_{t,i}^{P}}. \tag{9}$$

## Validation

To validate our results, we employ two validation exercises. First, we benchmark our estimate of the total volume of residential real estate against information from the national accounts. Second, we validate our imputation strategy by applying it to the period after October 2015 for which reliable estimates of the offshore market share growth rates exist.

**Residential Market Volume** The UK national accounts[52] provide a yearly estimate of the capital stock value for dwellings (residential properties), other buildings and structures, and land since 1995 at the national level. We make two assumptions to make the time series of the national accounts comparable to our estimate. First, we allocate all land and land improvements to the residential market, but exclude other buildings and structures. Second, since the national accounts capture the entire UK, we scale the time series by the land share of England and Wales. Figure A1a compares the values from the adjusted national accounts with our own estimation at the monthly level.

**Offshore Market Share Growth** To validate our imputation strategy, we focus on the two most recent years in our data (October 2015 to December 2019). In this time period, we have credible longitudinal information on the offshore market share growth rates to which we can compare results from our imputation. We take the December 2019 value of real estate as given. We then deliberately ignore information about previous owners at the property level. Instead, we follow the imputation strategy above by classifying previous owners based on the year-specific transition probabilities calculated at the aggregate level. Figure A1b compares the resulting month-to-month growth rates for the tax haven share in residential real estate to its actual values.

[52] https://www.ons.gov.uk/economy/nationalaccounts/uksectoraccounts/datasets/thenationalbalancesheetestimates

# D Taxation of Capital Gains

Capital gains tax (CGT) in the UK was introduced in 1965 and applies to profits resulting from selling, swapping or transferring an asset which increased in value. With respect to real estate holdings, the capital gains tax applies to all real estate property that is (i) not the primary residence of the taxpayer, or (ii) the primary residence of the taxpayer, but is let, used for business, or is larger than 5,000 square meters. While capital gains valuations are usually based the difference between the purchase and sales price, market valuations can be applied if assets are transferred at prices below their market value. Capital gains tax applies to net gains across all taxable assets, i.e. losses from one asset can be deducted from the gains of another asset. Both the tax rates and the tax-free allowances for the capital gains tax vary with the type of investor and the income level of the taxpayer.[53]

Historically, foreign investors—both individuals and corporate—were mostly exempt from capital gains tax.[54] In April 2015, CGT rules were extended to foreign individuals, close companies (companies controlled by five individuals or fewer), trusts and personal representatives disposing UK residential property. However, both the disposal of UK residential property by diversely held foreign companies and the disposal of non-residential property remained exempt.

**The 2017 Policy Change** In November 2017, the government announced to remove these remaining advantages for non-resident investors:

> *To align the UK with other countries and remove an advantage which non-residents have over UK residents, all gains on non-resident disposals of UK property will be brought within the scope of UK tax. This will apply to gains accrued on or after April 2019.*
>
> Autumn Budget 2017, p. 35

The details of this policy change were further specified during a consultation process between November 2017 and July 2018. The final draft legislation included provisions to extend CGT coverage to both direct disposals of non-residential properties and indirect disposals of residential property through "property-rich" corporations. In particular, indirect disposals through shares became subject to CGT if the company derives at least 75 percent of its gross asset value from UK real estate and if the person making the disposal held at any time at least a 25 percent

[53] For detailed information on the capital gains tax, see https://www.gov.uk/browse/tax/capital-gains.

[54] From 2013 to 2015, CGT did apply to foreigners subject to the Annual Tax on Enveloped Dwellings (ATED).

**Table 6** – Capital Gains Tax Rates for Foreigners, April 2019

| Investor Type | Non-Residential Property | Residential Property |
|---|---|---|
| Individuals | 10% / 20% | 18% / 28% |
| Companies | 19% | 19% |
| Trustees | 20% | 28% |

*Notes:* The table displays capital gains tax rates applicable to non-resident individuals, companies, and trustees applicable to capital gains as of April 2019. Non-residential properties include commercial property, for example shops or offices, agricultural land, forests, and any other land or property which is not used as a residence. Residential properties include buildings used or suitable for use as a dwelling as well as the underlying garden or grounds associated with such buildings. Marginal tax rates for individuals differ, since individuals pay lower rates within the basic income tax band and a higher rate on any amount above the basic income band.
*Source:* HM Revenue & Customs.

investment in the company during the last two years.[55] Table 6 summarizes the tax rates applicable to foreigners on gains accrued after April 2019.

**The Luxembourg Exemption** At the time of announcement, the new regulation interacted with existing double tax treaties, most notably with the double tax treaty between the UK and Luxembourg. While taxing rights regarding the direct disposal of property are usually not affected by double tax treaties, the UK was restricted in taxing the gains made by foreign investors via shares in UK property rich entities. Although the UK government was aware of this loophole and enacted general anti-forestalling rules, it was and is still unclear, how the exact coverage and the enforcement of these rules will look like.[56].

As an additional measure against "treaty shopping", the UK implemented the OECD multilateral convention to implement tax treaty related measures to prevent base erosion and profit shifting in October 2018. This multilateral amendment included a particular clause on indirect disposals of "property-rich" entities:

> *For purposes of a Covered Tax Agreement, gains derived by a resident of a Contracting Jurisdiction from the alienation of shares (...) may be taxed in the other Contracting Jurisdiction if (...) these shares or comparable interests derived more than 50 per cent of their value directly or indirectly from immovable property.*
>
> OECD Multilateral Amendment, Article 9, Paragraph 4

This multilateral amendment allowed the UK to regain the rights to capital gains through

[55]While the UK government explained that both the asset value test and the ownership test aggregate disposals of multiple entities and ownership shares held by certain persons through a series of entities, it is unclear how this provision is implemented, if beneficial owners are concealed through offshore structures. Additional exemptions to this rule include UK property used by the UK branch or agency of a foreign company, property held by overseas pension schemes, sovereign wealth funds and charities. For details, see information on the consultation process and the regulatory framework on the capital gains tax for non-residents.

[56]See for instance a comment by the law firm Goodwin Procter, but also a more recent assessment by the law firm DLA Piper stating that "UK anti-forestalling rule (...), depending on the facts, could be circumvented."

the indirect disposal of immovable property. However, Luxembourg ratified the amendment only in April 2019 and the corresponding changes on capital gains tax formally apply only to capital gains after April 2020.[57] In mid 2022, the UK and Luxembourg signed a new double taxation treaty that directly integrates this treatment of the indirect disposals of "property-rich" entities:

> *Gains derived by a resident of a Contracting State from the alienation of shares or comparable interests, such as interests in a partnership or trust, deriving more than 50 per cent of their value directly or indirectly from immovable property (...) situated in the other Contracting State may be taxed in that other State.*
>
> 2022 UK-Luxembourg Double Taxation Convention, Article 13, Paragraph 2

This tax treaty came into force at the end of 2023.

[57] See information by HM Revenue & Customs on Tax Treaties between the UK and Luxembourg.

# E Public Ownership Registers

At least since 2016, the installation of ownership registers and the exchange of the corresponding beneficial ownership information has become a core priority of governments around the world to combat illicit financial flows including terrorist financing, money laundering and tax evasion.[58]

While ownership registers have been in place in some of the Overseas Territories (OT) and the Crown Dependencies (CD) for a long time, the access to these registers (if available) was historically very restricted. Even the UK government could not access the recorded information until a series of bilateral agreements was negotiated between the UK government and the OT and CD authorities in 2016.[59] These agreements were supposed to give law enforcement authorities fast and secure access to beneficial ownership information on companies incorporated in OT and CD countries. Importantly, however, OT and CD did not plan to make the ownership information *publicly* available at that time.

**The 2018 Policy Announcement** The announcement of public corporate registers has its roots in an amendment to the *Sanctions and Anti-Money Laundering Act* (SAMLA) that entered the parliamentary process already at the beginning of 2018.[60] While the government first opposed the amendment, it became apparent in April 2018 that it had enough supporters to defeat the government.[61] The amendment was approved in the House of Commons on May 1st 2018.[62]

According to the amendment, the UK Secretary of State shall provide assistance to the Overseas Territories in setting up a publicly accessible register of the beneficial ownership of companies registered in each government's jurisdiction. In the case that OT governments fail to install public registers until the end of 2020, the UK government is required by law to formally mandate such a public register:

> *The Secretary of State must, no later than 31 December 2020, prepare a draft Order in Council requiring the government of any British Overseas Territory that has not introduced a publicly accessible register of the beneficial ownership of companies within its jurisdiction to do so.*
>
> Sanctions and Anti-Money Laundering Act 2018, Section 51, Subsection 4

[58] See for instance the joint statement by multiple countries on the systematic sharing of beneficial ownership information and the implementation Financial Action Task Force standards.
[59] See the collection on the bilateral agreements between the UK and different OT and CD jurisdictions.
[60] See the proposal of Amendment 73 to SAMLA at the report stage of the bill.
[61] See for instance a Guardian newspaper article on the SAMLA amendment.
[62] See details on the legislative implementation procedure of SAMLA.

While the law itself does not specify a particular date at which the registers are expected to be accessible, a Joint Ministerial Council explained in December 2018 that the mandate would request the registers to be operational at the end of 2023.

**The Exclusion of Crown Dependencies** While OT were supposed to be directly mandated to set up public beneficial ownership registers in the future, CD were excluded from SAMLA, because their constitutional status implies a higher degree of autonomy. In particular, Guernsey, Jersey and the Isle of Man elect their own legislatures and run their own domestic legislation. Although a formal mandate is not possible, CD have announced in June 2019 to set up public registers voluntarily:

> *Within 12 months of [the publication of the Implementation Review of the 5th AMLD in January 2022], we will each bring forward to our own parliament legislative proposals to establish public access to beneficial ownership data of companies held on a central register.*
>
> Joint commitment by Guernsey, Jersey and the Isle of Man

At the end of 2020, when the OT mandate was supposed to be issued, the government published the draft Order in Council.[63]. It is noteworthy, however, that the UK government did not see the need to officially bring this mandate into force given the "firm commitments from all of the inhabited Overseas Territories to adopt publicly accessible registers".[64]

[63]See draft Order in Council.

[64]See Ministerial Statement on publicly accessible registers in the UK Overseas Territories.