Automatic Exchange of Information and Real Estate Investment *

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Abstract

Building on rich administrative data on real estate purchases made by foreign companies in England and Wales, we identify one important channel through which tax evaders escape automatic exchange of information treaties: real estate investments, which are excluded from the scope of these agreements. First, using several tax-related data leaks, we identify the country of residence of more than 2,500 company owners who appear in our database. We show that the residents from countries committing to the CRS in May 2014 reacted strongly to this event by investing in real estate in England and Wales. Second, we extend this finding to all foreign companies in our database and estimate that almost £65 billion have been invested in real estate in England and Wales between 2014 and 2016 because of the threat Automatic Exchange of Information constitutes for tax evaders. This represents more than 6% of all real estate investment on the territory during this period.

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1 Introduction

How well are we able to track offshore wealth and identify its owners? Around $8.3 trillion were held in tax havens in 2016 (Zucman, 2017). This represents 10% of world GDP, a percentage that is stable since at least 2001. The combination of globalization of financial flows and innovations in the finance industry, and the growth of the wealth management and tax evasion profession since the 1980s (Harrington, 2016), accompanied the development of tax havens. Secrecy is the main feature allowing tax havens to provide tax evasion services. Individuals around the world can hide their wealth in havens because of the guarantee that these jurisdictions will not share information about their offshore account with their country of origin's tax administration. Thus, tax havens have strong incentives to protect their secrecy environment. As a result, international efforts to curb tax evasion have focused on breaking through the secrecy veil of havens. Several policies attempting to recover information about tax evaders have been enacted since 2000: the European Savings Directive (2005), treaties of Information upon Request in the OECD (2009), FATCA in the US (2010).

This paper studies one of the latest of these attempts to fight tax evasion, the implementation of the Common Reporting Standard (CRS). The CRS is a standard of automatic exchange of information treaty enacted by the OECD in 2014 and put in place in most countries in 2017 and 2018. Participating countries have to automatically exchange financial information about account holders. That is, if a French taxpayer opens an account in e.g. Germany, the German fiscal administration will automatically report to the French fiscal administration the information linked to this account. The CRS has been shown to be effective at reducing cross-border bank deposits held in tax havens (Menkhoff and Miethe, 2019; Casi et al., 2020).

The aim of our paper is to evaluate the efficiency of the CRS, taking into account that tax evaders might find new ways to escape automatic exchange of information about their offshore accounts. In particular, we identify an important loophole in the coverage of the CRS: real estate assets are not required to be reported under its rules. Shifting from financial to real estate investments could therefore be a strategy to continue to avoid reporting even after the implementation of this new standard. The question of whether a part of the financial assets found to have been reduced thanks to the CRS have been invested in offshore real estate is key in providing a global evaluation of this policy. If we find a non zero elasticity of asset shifting from financial to real estate assets, this indicates that incorporating all assets classes in AEOI agreements is necessary to recover tax liabilities illegally withheld by tax havens.

To investigate this potential loophole, we study how real estate investments in England and Wales reacted to the enactment of the CRS in foreign countries. We use publicly available data on all real estate purchases made by foreign companies: the Overseas Companies Ownership dataset (OCOD), kept by the Land Registry. The registry provides data on the time and location of the purchase, the price paid (when available)

and on the company buying (country of incorporation, address). About 90% of all the purchases in our sample are made by companies incorporated in tax havens. To recover the nationality of the people buying UK real estate through these shell companies, we match our OCOD sample to three 'leaked' datasets, the Offshore Leaks (2013), the Panama Papers (2016), and the Paradise Papers (2017), and to the recently unveiled OpenLux data. This matching process allows us to recover the country of residence of roughly 2,500 individuals buying real estate in England and Wales. Using a difference-in-differences design, we show that there is a surge in real estate investments coming from early adopters of the CRS at the time of its implementation, compared non-CRS adopters.

To quantify the size of this response, we exploit the totality of the OCOD sample. To identify the effect of the adoption of the CRS of a country i on real estate investments from nationals of this country i, we need to make hypotheses on the country of origin of the ultimate owners of shell companies buying in the UK. We use the leaks and OpenLux data to construct estimates of the use of each tax haven by non-haven countries. From these, we build a measure of real estate investment coming from CRS-adopters countries. Using a difference-in-differences design around the implementation of the CRS by a wave of early adopters, we estimate that about £65 billion have been invested in real estate in England and Wales between 2014 and 2016 because of the threat Automatic Exchange of Information constitutes for tax evaders. This represents more than 6% of all real estate investment on the territory during this period.

This article first contributes to the literature on offshore wealth and its distribution. Several papers have estimated the amounts held offshore using systematic anomalies in countries' portfolio investment positions. Zucman (2017) combines this method with data from the Swiss National Bank and find that about $8.3 trillion or 8% of global household financial wealth is held in tax havens in 2016. Subsequent academic studies find consistent results (Pellegrini et al., 2016; Vellutini et al., 2019). The Boston Consulting Group also provides offshore wealth estimates, adopting a different method. Based on interviews conducted with wealth managers, they estimate that about 14% of the world's GDP is held in tax havens in 2016. The Tax Justice Network finds that offshore wealth amounts to more than the fourth of the world's GDP (Henry, 2012). Alstadsæter et al. (2018) provide a more granular estimation, calculating a country-by-country decomposition of the wealth held in tax havens.

Our paper complements these estimates by focusing on a type of offshore wealth that has not been studied before: real estate assets. Academic estimates based on exploiting anomalies in international investment statistics only capture offshore financial wealth. They exclude real estate and other real assets held in tax havens. Our paper sheds light on the importance of real estate as an offshore asset. To our knowledge, this is the first paper studying offshore real estate.

We also contribute to the literature evaluating policies fighting tax evasion. A strand of this literature

studies the reaction of potential tax evaders to transparency measures, and the strategies they adopt to keep on under-reporting their assets. Johannesen and Zucman (2014) show that the exchange of information upon request in OECD countries has not led to a repatriation of funds, but rather to a flight of funds from cooperative tax havens to uncooperative ones. Johannesen (2014) finds similar results studying the EU's Tax and Savings Directive of 2005. Even though the directive reduced EU-owned bank deposits in Switzerland by 29%, he finds evidence that the deposits were relocated to non-cooperative haven jurisdictions. Closer to our paper, another strand of the literature studies the effects of the recently implemented automatic exchange of information (AEOI) agreements. Casi et al. (2020) show that the implementation of the CRS led to a reduction of 11.5% of cross-border deposits held in tax havens. However, they find evidence that the CRS may have led to a relocation of part of these deposits to the United States, which is not participating in the agreements. O' Reilly et al. (2019) obtain similar results. They show that following the announcement of their participation in AEOI in 2014, deposits in the first cooperating tax havens decreased of about 11%.Menkhoff and Miethe (2019), using a longer sample period, point to an even larger reduction. They show that deposits held in tax havens decrease of about 38% following the activation of an AEOI relationship. In the United States context, Johannesen et al. (2020) study the efficiency of the U.S. agreement of AEOI, FATCA. They find that FATCA led to the disclosure of about $100 billion in offshore accounts. De Simone et al. (2020) investigate the effects of FATCA on different types of assets. They find that the law significantly reduced equity investment into the U.S. from tax havens, suggestive of round-tripping. They also find that residential real estate could be an alternative asset allowing to keep under-reporting wealth under the new FATCA regulations. They take increases in real estate prices as a signal that investors shift assets from financial accounts into the real estate market. Hanlon et al. (2015) show that FATCA also had a significant impact on foreign portfolio investments going into the U.S. While most of these papers find that exchange of information had a significant effect on bank deposits in tax havens, they also identify new channels allowing to keep on under-reporting assets. Relocating funds to uncooperative tax havens Johannesen and Zucman (2014); Johannesen (2014), to non-participating jurisdictions like the U.S. Casi et al. (2020), or switching the class of assets held offshore De Simone et al. (2020) are strategies adopted in responses to the new policies fighting tax evasion in the OECD.

Our paper follows De Simone et al. (2020) in identifying switching from financial to real assets as an efficient strategy to avoid income reporting. But importantly, we base our estimates on administrative data on real estate purchases and not on real estate prices. We also provide new evidence on the extent to which real estate is used as an alternative channel of evasion, by quantifying the effect of AEOI on real estate investments.

The rest of the paper is organized as follows. Section 2 presents the details of the OECD's automatic

exchange of information standard, the CRS. Section 3 presents our data. In Section 4, we provide evidence that CRS led to an increase of real estate investments from countries that adopted it, using our sample of identified companies' owners. Section 5 generalizes this analysis to the full sample, and quantifies the effect CRS had on real estate investments. Section 6 concludes.

2 The Automatic Exchange of Information

In a 2009 report announcing new measures to increase international tax transparency, G20 countries declared "the end of the era of bank secrecy". This report followed a series of measures directed against tax havens, initiated by the United States with sanctions taken against two Swiss banks accused of concealing accounts of American taxpayers from the Internal Revenue Service (IRS), the United States tax administration (United States Senate, 2008, 2014). In the report, the OECD decided to take action against tax havens which would not comply with its information exchange standard. It threatened havens which would not sign at least 12 treaties of information exchange with economic sanctions. The OECD list of non-compliant countries was empty in just a few days.

However, the OECD model of information exchange treaty was based on exchange of information upon request (EOIR). This means that to require information from a partner administration, a government must have a prior suspicion of tax evasion. It limits the efficiency of such agreements, as it obliges fiscal agencies to gather overhand evidence of non compliance, which is essentially achievable only through prior exchange of information. EOIR treaties have been shown not to have led to a repatriation of non-reported funds (Johannesen and Zucman, 2014).

Automatic exchange of information (AEOI) agreements address this issue. AEOI was first put in place by the United States with the Foreign Account Tax Compliance Act (FATCA) agreement. The FATCA was passed into law in March 2010. It establishes a new framework of information exchange for foreign financial institutions (FFIs) with U.S. clients. It requires all FFIs to automatically report information about their U.S. account holders, or to be subject to a withholding tax of 30% on all their US-source income. FATCA has been effective at curbing the use of offshore accounts by U.S. taxpayers (Johannesen et al., 2020).

Other OECD members started to follow the U.S. example a few years later. The United Kingdom introduced a similar model of AEOI with its crown dependencies and overseas territories[1] in June 2013. The UK-FATCA or UK-Cdot provides for automatic exchange of information about UK residents with accounts in the Crown Dependencies and Overseas Territories[2].

[1]UK crown dependencies include Jersey, Guernsey and the Isle of Man. UK Overseas Territories consist of fourteen territories: Akrotiri and Dhekelia, Anguilla, Bermuda, British Antarctic Territory, British Indian Ocean Territory, British Virgin Islands, Cayman Islands, Falkland Islands, Gibraltar, Montserrat, Pitcairn Islands, Sandwich Islands, Saint Helena, Turks and Caicos Islands.

[2]It is a reciprocal agreement: it also provides for AEOI regarding residents of the CDOT with accounts in the UK.

In September 2013, the G20 leaders endorsed the AEOI standard and made a formal request to the OECD to design a model of AEOI. A few months later, in May 2014, fourty-four jurisdictions announced their commitment to the designed model of AEOI: the Common Reporting Standard (CRS). Countries participating to the CRS have to automatically exchange financial information about account holders. The first exchanges of information took place in September 2017. Another group of countries started the exchange in September 2018. Figure 1 shows a simplified timeline of the introduction of AEOI in the OECD. A more detailed timeline of the introduction of the CRS is available in Box 4 of O' Reilly et al. (2019).

The CRS has been shown to reduce the amounts held in tax havens by non-haven countries (Menkhoff and Miethe, 2019; Casi et al., 2020; O' Reilly et al., 2019). However, the model suffers from numerous loopholes. Noked (2018) points at alternative tax evasion channels available to evaders even after the implementation of AEOI. In particular, evaders could still under-report wealth by investing in cryptocurrencies or by relocating their wealth towards non-participating jurisdictions like the United States. We list more loopholes allowing tax evaders to continue under-reporting their assets after the implementation of AEOI in Appendix table 13. In this paper, we focus on another channel of evasion subsisting after the implementation of the CRS: holding non-financial offshore wealth. In particular, we study amounts held in offshore real estate around the OECD commitment to the CRS. Real estate held directly (Noked, 2018) or indirectly Knobel and Meinzer (2014) is not subject to reporting under CRS provisions.

In our article, we focus on the endorsement of OECD countries of the AEOI. We follow O' Reilly et al. (2019) and study two events: the September 2013 G20 adoption of the AEOI principle, and the May 2014 Joint Announcement of forty four countries that they are going to enter the CRS. These events are likely to trigger an important response from tax evaders as they signal the future entry into AEOI of numerous countries. Tax evaders would react before the first exchanges of information to escape reporting of their offshore assets. As we focus on the OECD model of AEOI, we use the terms "AEOI" and "CRS" interchangeably throughout the article.

3 Data

3.1 Overseas Companies Ownership Dataset

The British Land Registry records all real estate purchases made in England and Wales by foreign companies in the Overseas Companies Ownership Dataset (OCOD)[3]. The registry provides data on the time and location of the purchase, the price paid (when available), the tenure (Freehold or Leasehold[4] and on the

[3]The OCOD does not include transactions made by companies incorporated in the UK or by private individuals, whether British or foreign.

[4]Freehold properties are held for an infinite duration, whole leasehold estates have a fixed or maximum lease duration.

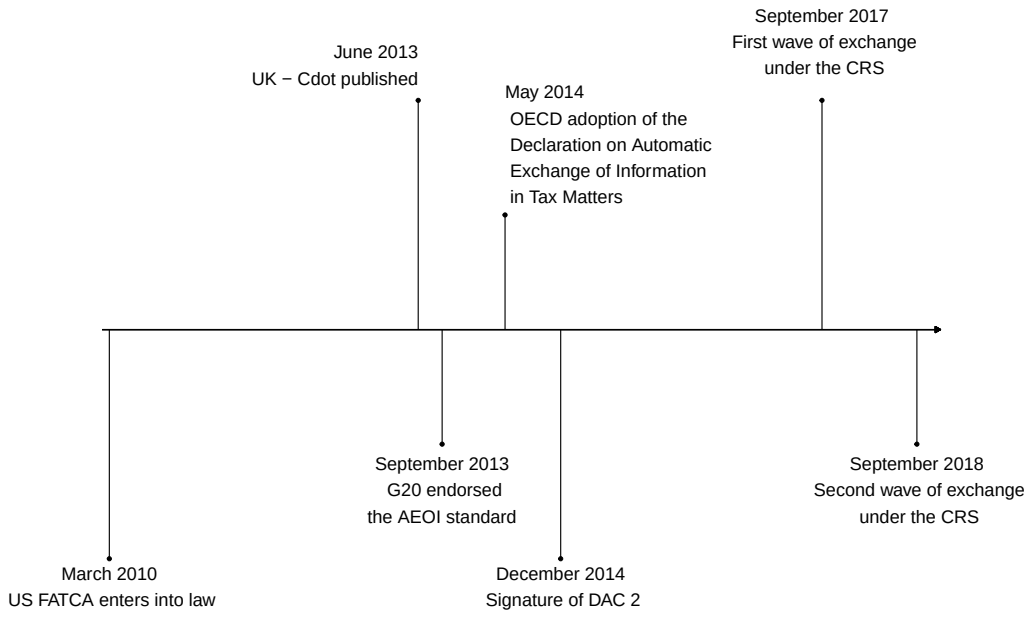


Figure 1: Timeline of Automatic Exchange of Information Agreements

Notes: This figure shows the main steps towards the global expansion of automatic exchange of information. We study the implementation of the OECD standard of AEOI, the Common Reporting Standard (CRS).

company buying (country of incorporation, address). It is exhaustive, as companies are required to report their purchases.

The transactions registered in the OCOD can refer to very different types of properties. For example, the purchase of an entire building can either be recorded as a single transaction, or as one transaction per flat in the building. The same can happen for parking spaces, plots of land etc. To avoid our results to be systematically affected when one buyer is registered to purchase a high number of transactions on the same day (when buying a building, e.g.), we restrict our sample to a maximum of five transactions per company and per quarter. We keep the five most expensive transactions.

Our final OCOD sample records more than 115,000 transactions. The first purchase was registered in 1959, but most of the transactions take place from 1999. Figure 2 shows the evolution of the number of transactions on the dataset and their total value from 2000 to 2019. Number of purchases increases steadily from 2000 to 2007, with a peak of more than 6,000 transactions in 2007. The number of purchases rapidly declines in 2008, most likely as a result of the financial crisis. Transactions recover quickly and steeply increase until 2015. Looking at the value of these transactions draws a different pictures. The value of purchases made in the UK by foreign companies increases almost continuously, from about £2 billion in 2000 to £10 billion in 2013. It jumped to £28 billion in 2014 before reaching a high in 2015, with more than £33 billion in purchases that year. The value of transactions decreases in all the ensuing years. In total, the OCOD lists transactions for a value of more than £209 billion.

Almost 50% of the transactions take place in London. Figure 3 shows the location of the transactions across London boroughs. They are concentrated in the Center and in the West of the City, particularly in the central boroughs.

More than 90% of the purchases in the registry are made by companies incorporated in tax havens[5]. Table 1 shows the top-five countries in terms of number of purchases and value of these purchases in the OCOD, separately for havens and non-havens. Companies incorporated in havens realize a considerably larger number of purchases, for a total value that is an order of magnitude higher. Havens with the strongest links to the UK are the main buyers: the Channel Islands (Jersey and Guernsey), the British Virgin Islands (BVI) and the Isle of Man. Companies incorporated in Jersey are the top-buyers in our sample, having purchased the equivalent of almost £55 billion in real estate in England and Wales. The main country in terms of number of purchases is the BVI, with almost 30,000 transactions. Purchases from non havens are mainly coming from the United States and European countries.

The prices specified in the Land Registry OCOD suffer from a number of quality issues. First, when

[5]There is no consensus on which countries should be considered as tax havens. We use the same list of tax havens as Menkhoff and Miethe (2019), which is obtained by combining the lists of Gravelle (2015) and Johannesen and Zucman (2014). The lists contains 58 countries listed in Appendix (Table 9)

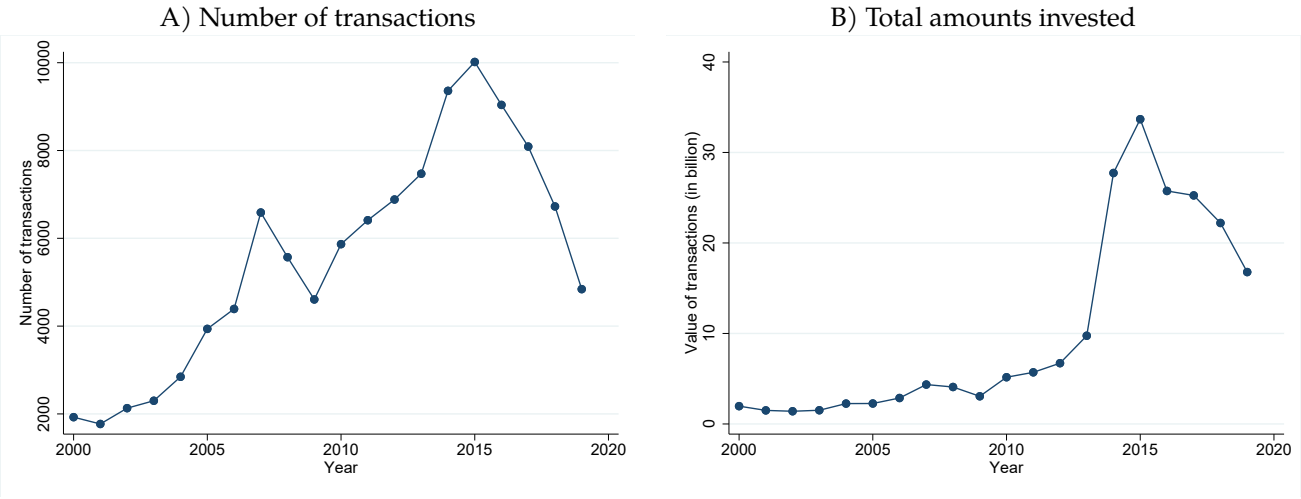


Figure 2: Real estate investment from foreign firms in England and Wales, full OCOD sample

Notes: This figure shows the yearly count of purchases made by foreign firms in England and Wales (Panel A) and their total value (Panel B). It is based on the Overseas Companies Ownership Dataset. The calculations are made after we cleaned the data according to the process detailed in section 3.1.

one company buys several properties on the same day, sometimes the price registered for each transaction is the same. As this price is generally inconsistently high for one property, we make the hypothesis that it corresponds to the price of the bundle of transactions bought rather than of each single one. Therefore, we divide the price of purchases made by the same owner(s) on the same day by the number of purchases, if the price specified in the OCOD is identical. A second issue with OCOD prices is that they are only available for about 31% of the transactions. To obtain estimates of the amounts invested in the British real estate market, we need to make hypotheses on the distribution of the missing prices. One solution would be to infer prices using moments of the distribution of real estate prices in the UK. The Land Registry provides granular information allowing to identify mean and median real estate prices per district and per quarter. This strategy was used in a Global Witness analysis to estimate how much money was hidden in London real estate market by companies incorporated in tax havens [6]. The main problem of this method is that purchases made by foreign companies could present a distribution significantly different from the other transactions made in the UK. In particular, transactions made by companies incorporated in tax havens are likely to be on average more expensive than the rest of real estate sales in the UK (De Simone, 2015; Force, 2007; Unger et al., 2011).

To account for this, we build our estimates on the empirical distribution of prices in the OCOD data. More precisely, we infer missing prices using the mean price per district, date and category of property bought, as

[6] "£100bn of property in England and Wales is secretly owned, estimates show", Global Witness, Press release March 2019. https://www.globalwitness.org/en/press-releases/100bn-of-property-in-england-and-wales-is-secretly-owned-estimates-show/ accessed on 08/08/2021.

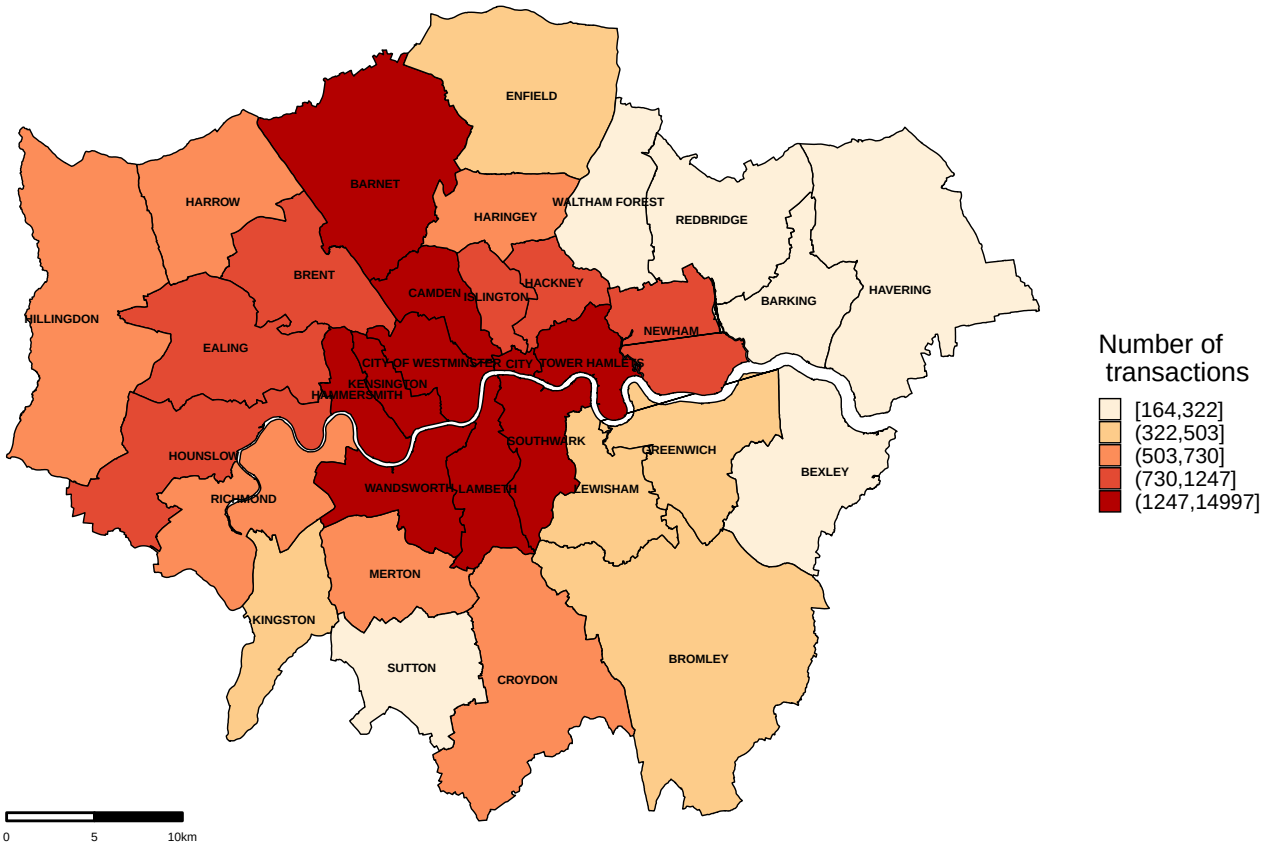


Figure 3: Number of foreign purchases in London in the full OCOD sample, ranked by quintile

Notes: This figure shows the detailed location of the purchases made by foreign firms in London, as recorded by the OCOD. The map represents the region of Greater London, which is composed of 32 boroughs and the City of London local government. The boroughs are ranked in five quintiles according to the total number of purchases made by foreign firms during the entire period covered by the OCOD (1959-2020).

Havens				Non-havens			
Country	Value of purchases (in billion £)	Country	Number of purchases	Country	Value of purchases (in billion £)	Country	Number of purchases
Jersey	54.6	BVI	28,193	Netherlands	3.94	United States	1,839
BVI	45.1	Jersey	23,231	United States	3.73	Germany	1,667
Guernsey	24.1	Guernsey	13,662	Germany	3.26	Netherlands	1,287
Isle of Man	17.8	Isle of Man	13,267	UAE	0.792	Australia	602
Luxembourg	15.7	Luxembourg	3,388	France	0.789	UAE	564

Table 1: Top five of companies buying in England and Wales, incorporated in haven and non-haven countries

Notes: This table shows the five more frequent countries where companies buying English and Welsh real estate are incorporated. Columns 1-4 show the ranking for companies incorporated in tax havens, in terms of value of purchases and number of purchases. Columns 5-8 show the same but for companies incorporated in non-haven countries. The table is based on data from the Land Registry OCOD.

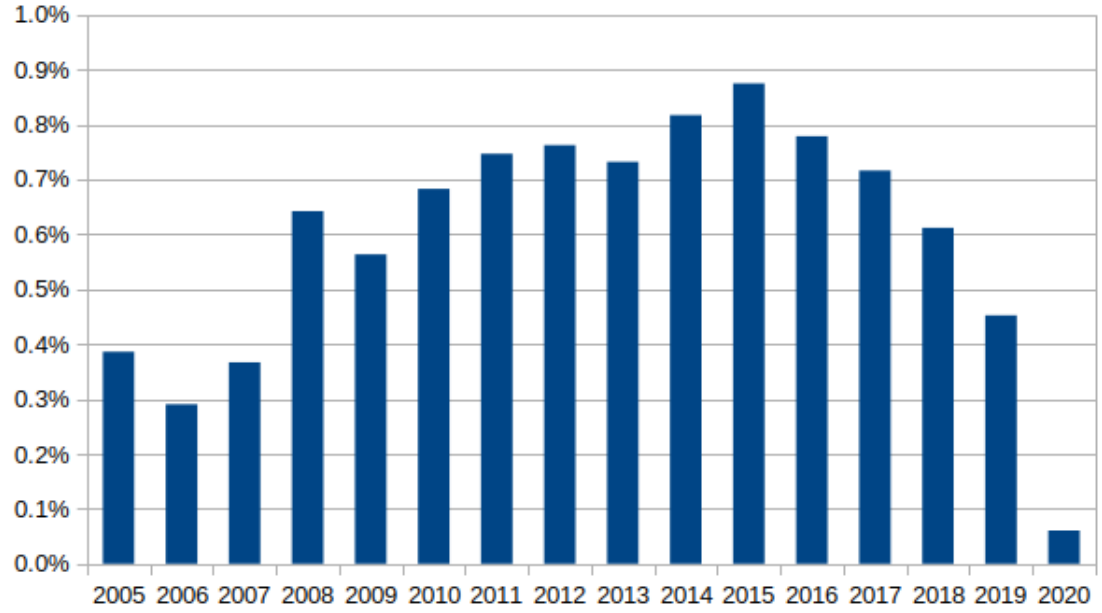
available in the OCOD, winsorized at the 99.5% level in order to reduce the influence of outliers. There is no information on the type of property bought in the OCOD. We create categories of real estate using textual analysis of the titles: we create several categories (Flat, Land, Parking, ...) based on the property's address. This method is a simplified version of the strategy Sá (2016) uses to classify the OCOD dataset in residential and commercial real estate. All prices are adjusted using the Land Registry House Price Index to take into account real estate inflation.

To give a sense of the importance of non-UK companies in the British and Welsh property market, Figure 4 gives the evolution of the percentage of total number of transactions (panel A) and of the fraction of total investment (panel B) coming from foreign companies. We see that purchases made by foreign firms represent between 0.3% and 0.9% of the total number of real estate transactions over the 2005-2019 period. The amount involved in transactions made by foreign firms lie between 0.8% and more than 10% over the same period, with a sharp jump in 2014, as the properties bought are more expensive than the average.

3.2 Beneficial ownership data

The OCOD only provides information on the country of incorporation of the purchasing company. For companies incorporated in tax havens, it is likely that the beneficial owners are from a different country. To be able to recover the nationality of the beneficial owners of companies buying in the UK, we exploit several files that have been leaked to the public since 2013. The Offshore Leaks, the Bahamas Leaks, the Paradise Papers and the Panama Papers are documents from law firms and corporate service providers giving information on the beneficial owners of thousands of shell companies they created or managed for their clients. Taken together, they provide an insight into the structure of more than 785,000 entities. They give information on

A) Number of transactions



B) Amount invested

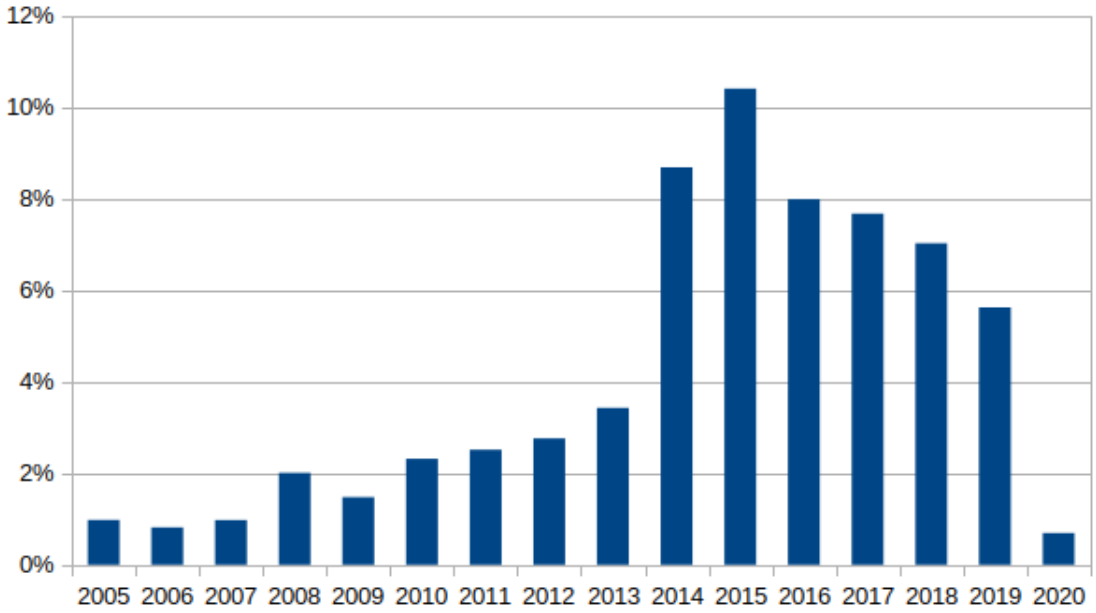


Figure 4: Importance of real estate investment coming from offshore companies, comapred to all real estate purchases made in England and Wales

Notes: This graph is constructed using two datasets maintained by the Land Registry, data on property transactions completed in the UK and the Price Paid Data. The Land Registry produces summary statistics on property transactions completed in the UK with value of £40,000 or above. More precisely, the dataset provides monthly estimates of the number of residential and non-residential property transactions in the UK. The Price Paid Data provides information on all residential property sales in England and Wales (date of the transactions, address of the property bought, price paid). Panel A presents the ratio of OCOD transactions over all UK transactions as reported in the UK Property Statistics, by year. Because the UK Property Statistics doesn't provide information on property prices, we have to use Price Paid Data to construct Panel B. As Price Paid Data only covers residential transactions, we start by calculating how many transactions are missed in this dataset, by comparing yearly number of sales with figures from the UK Property Statistics. We correct yearly amounts invested in the UK as registered in the Price Paid Data with this factor. Panel B presents the ratio of the value of OCOD transactions over this total, by year.

the country and date of incorporation of a company, its intermediaries, and the name and country of its beneficial owners. The files have been gathered by the International Consortium of Investigative Journalists[7] and have resulted in the publication of many large-scale analyses in national newspapers. However, they have not been used extensively in the academic world.

We also exploit the recently unveiled OpenLux data. OpenLux is not a leaked dataset. It is the result of the work of several newspapers around the world, who scrapped the "Registre de commerce et des sociétés", the companies registry of Luxembourg. They matched it with the "Registre des Bénéficiaires Effectifs", the beneficial ownership registry, to obtain information on all beneficial owners of companies incorporated in Luxembourg.

To identify the nationality of the beneficial owners of companies buying in the UK, we match the leaks data and the OpenLux data to our Land Registry dataset. We proceed in several steps. First, we match the standardized names[8] of the companies listed in the beneficial ownership data and in the OCOD. Then, we check the country of incorporation is the same for companies with identical names. A third check we run is to make sure that the company matched was active at the time of the purchase, as we have access to the company's status over the years. At this stage, we obtain a list of matched companies with their ultimate beneficial owners (UBO). In some cases, the identified UBO is a company and not a real person. To identify the actual UBOs of these companies, we run the list we obtain through the same matching process one more time. We repeat the operation 4 times.

A fraction of the final list of the UBOs we obtain is linked to a tax haven. We make the hypothesis that in these cases, the UBO is likely to correspond to an intermediary or to a second shell company and not to an individual[9]. We also discard the portion of UBOs that are still companies. The final step we take is to allocate the shares of the companies identified. If a matched company is owned by n identified owners, we allocate $\frac{1}{n}$ shares to each UBO.

To avoid our results to be significantly influenced by the way the OCOD is constructed, we apply the same restrictions than for the full sample. We limit the number of transactions per identified UBO and per quarter to five, keeping the five most expensive purchases.

The matching process allows us to identify a total of 2,536 ultimate beneficial owners of 1,434 offshore companies involved in 3,012 real estate transactions in England and Wales. As shown in Table 3, the most important data source for our identified sample is the Panama Papers. Table 2 shows the fraction of trans-

[7] All of the files have been made public and free to access on https://offshoreleaks.icij.org/
An online database has also been created, which allows users to search directly for a name or a country.

[8] For example, we replace all the occurrences of "Ltd" by "Limited", "Corp" by "Corporation"...

[9] Since our main tax haven list includes countries such as Austria, Ireland or Lebanon, which are likely to be the true residence country of company owners, we only discard UBOs linked to tax havens that have less than 2 millions inhabitants, except Hong Kong, Panama, Singapore and Switzerland, which are unquestionably tax havens. Thus, we keep UBOs linked to Austria, Bahrain, Belgium, Chile, Costa Rica, Ireland, Jordan, Liberia, Malaysia, Lebanon and Uruguay.

Source	Number of transactions	Amount invested in £ billion	Fraction of total transactions in OCOD	Fraction of total amount invested in OCOD
OCOD full	115,384	202.9	100.0%	100.0%
OCOD matched	3,012	3.7	2.6%	1.8%
OCOD London	53,197	133.0	46.1%	65.5%
OCOD matched London	1,978	2.8	1.7%	1.4%

Table 2: Percentage of companies identified in the full OCOD sample and in the London sample

Notes: This table shows the number of OCOD's transactions we manage to link with their ultimate beneficial owners' using the Bahamas Leaks, the Offshore Leaks, the Paradise Papers, the Panama Papers and OpenLux data. Columns 2 and 3 show the raw number of transactions and their amounts in the full and matched samples, while columns 4 and 5 show the corresponding percentages the matched transactions represent. We show these figures for all transactions in England and Wales, and for purchases in London only.

actions identified, in value and in volume, in our full sample and when considering only London. Figure 5 shows where the real estate buyers come from. As mentioned above, we take into account the fact that the ownership of some companies is split into several owners (often with the same familly name). When this is the case, we divide the value of the property bought by the number of individuals owning the company making the purchase. For example, if *Dupont Real Estate Limited* buys a property in London for a value of £1 million and if this company is owned by one French and one Canadian residents, we will attribute $\frac{1}{2}$ transaction for France and $\frac{1}{2}$ for Canada and the amount invested from both countries will be recorded as £500,000.

Interestingly, in our identified sample, the group of buyers is from the United Kingdom. They are followed by Middle East countries and the United States. Between 1986 (the first transaction year for which we are able to identify the beneficial owner) and 2020, United Kingdom residents from our sample of identified beneficial owners bought 800 properties in England and Wales amounting to a total of £934 million, for an average price per property of more than one million Pounds.

Data source	Number of companies	Number of transactions	Number of UBO
OpenLux	190	432	224
Offshore leaks	35	65	53
Panama papers	1,073	2,044	2,020
Paradise papers	136	471	239
Total	1,434	3,012	2,536

Table 3: Number of companies, transactions and ultimate beneficial owners matched to leaks and OpenLux data

Notes: This table shows the number of companies, of transactions and of ultimate beneficial owners we identify in the OCOD, by data source. Note that we do not identify any beneficial owners using the Bahamas Leaks, hence we do not show it in the data sources.

What is also interesting to look at is the heterogeneity in the use of tax havens by beneficial owner's

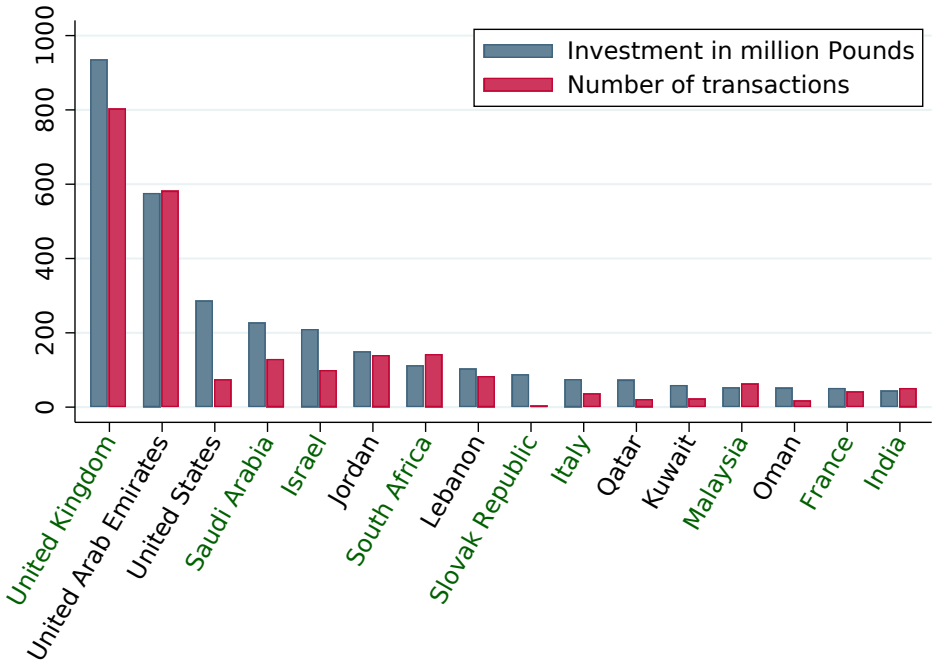


Figure 5: Importance of real estate investment in England and Wales through an offshore company.

Notes: This figure shows the importance of real estate flows in England and Wales through an offshore company, by country of residence of the ultimate beneficial owner. The data comes from the OCOD sample matched with the Offshore Leaks, the Bajamas Leaks, the Paradise Papers, the Panama Papers and the OpenLux data. Countries written in green take part to the May 2014 Joint Announcement while countries written in black do not.

world region. In Figure 6, we group the countries of our identified owners by world region. We start with the groups of Badarinza and Ramadorai (2018), and create finer sub-groups in order to reflect the importance of some countries in our sample. We therefore create 11 groups, constituted by the Arabian Peninsula, the United Kingdom alone, North America and English speaking world (including South Africa), Africa (excluding South Africa), Asia-Pacific, Western Europe, South Asia, Southern Europe, Rest of Middle-East, Eastern Europe and South & Central America. As we can see, the British Virgin Islands is the most frequent tax haven used by investors willing to buy a property in England or Wales through an offshore company. Though this is true in the whole sample and for most world region, we notice that Luxembourg comes first for Western and Southern Europe in our sample, where Malta is also commonly used, highlighting the geographical component of tax havens use.

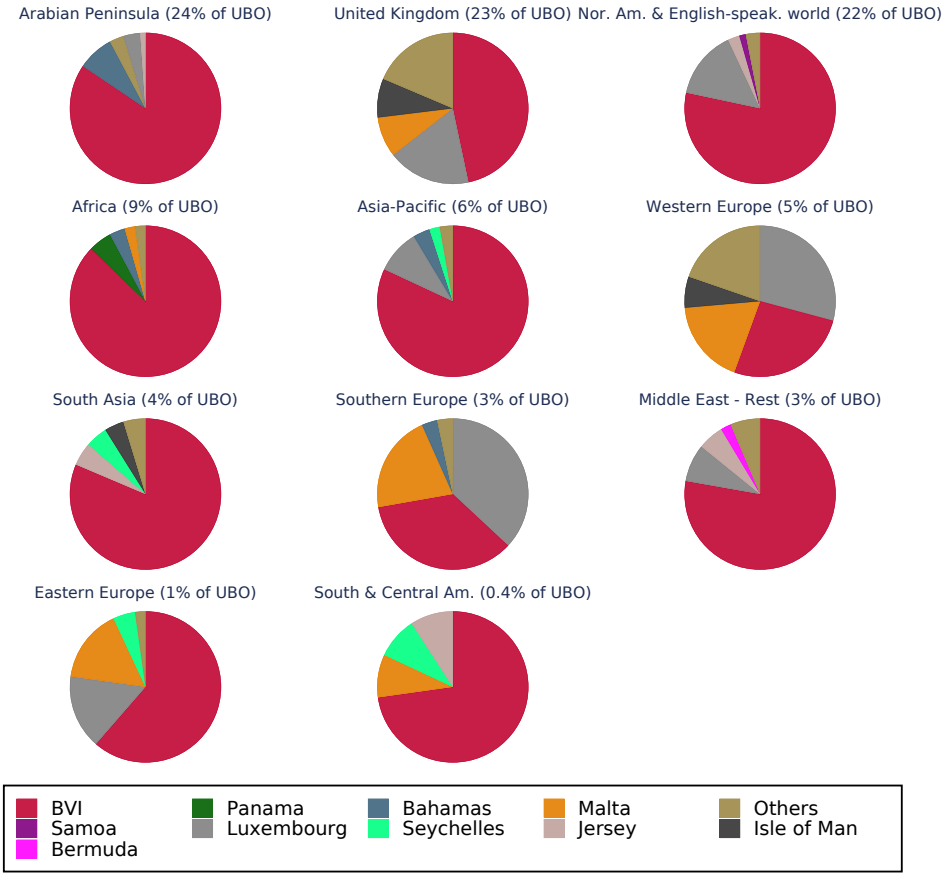


Figure 6: Most frequent tax havens hosting companies investing in real estate in England and Wales.

Notes: This figure shows the four most frequent tax havens hosting companies investing in real estate in England and Wales, in terms of number of ultimate beneficial owners (UBO) identified with the leaks data and the OpenLux data. The UBO are organized in 11 groups according to their world region. The share of UBO identified in our data is shown for each group.

3.3 Tax advantages of using an offshore company to buy real estate in the UK

Four main taxes apply for the owners of UK properties. Stamp Duty and Land Tax (SDLT) when buying the property, Capital Gains Tax when selling it, Income Tax if the property generates rental income and Inheritance tax in case of death of the owner. Until recent years, UK residents, non-UK residents and UK-residents non-domiciled[10] (non-dom) have been able to decrease or even completely avoid these taxes by "enveloping" UK properties with an offshore company (i.e. owning the property through a company instead of directly), the scale of the tax "savings" depending on each specific fiscal status. From 2012 onwards, the UK government has progressively introduced a series of tax changes that have greatly reduced the tax advantages previously enjoyed by the owners of enveloped UK properties. For each of the four taxes mentioned above, we mention the advantages indirect ownership provide and how they evolved since 2012.

Stamp Duty and Land Tax. If an individual buys a residential property in the UK, Stamp Duty and Land Tax (SDLT) is charged on the whole amount of the purchase. The rate is progressive and the top rate was set to 4% up to 2012. From 2012, the top rate reaches 15% for properties with a value of more than £2 million bought by corporate entities (the maximum rate for properties bought directly by individuals is set to 7%). A way to avoid the SDLT is to buy the property through a corporate structure and to sell the shares of the company instead of the property itself. In order to counterbalance this tax privilege, the Annual Tax on Enveloped Dwellings (ATED) is introduced in the Finance Act of 2013. It is an annual tax payable by companies owning UK residential property valued at more than £2M in 2013 (the threshold is now set at £500,000) and occupied rather than let out to an unconnected person[11]. The amount charged is progressive, lying from £3,700 (property value below £1M) to £237,400 (values above £20M) in 2021-2022.

Inheritance Tax. For non-UK residents and non-dom individuals, a common way to avoid inheritance tax on a UK property is to hold it through an offshore company. Indeed, while the personal representatives or the beneficiaries of a non-dom individual owning UK property *directly* are liable to the inheritance tax in case of death (40% on the value of the property), no inheritance tax is applied to the shares of a foreign company - even though its sole asset is a UK property - and the inheritance tax can therefore be avoided[12]. This tax privilege was however drastically reduced in 2017, when companies which value are wholly attributable to a UK residential property interest (UK RPI) started to fall within the scope of Inheritance Tax[13]

[10] In the UK, a "non-domiciled" status can be given to foreign individuals living (i.e. resident for tax purposes) in the UK but domiciled (i.e. with their permanent home) in another country. This can lead to significant tax advantages for wealthy people, whose foreign income is taxed only if repatriated to the UK, under the principle of "remittance basis".

[11] Properties let to unconnected parties qualify for relief and are therefore exempt from the ATED charge.

[12] This scheme does not work for UK residents.

[13] If the company has other assets (e.g. located in France), Inheritance tax will only apply on the fraction of assets subject to the English Inheritance tax. Moreover, if the deceased person's stake in the company is too small (that is, less than 5% when combined with the stakes of persons connected to her) then the new rule doesn't apply.

Capital Gains Tax. As for Inheritance tax (before 2017), until 2019, no Capital Gains Tax (CGT) is applied for non-residents selling shares of a company. Thus, owning a UK property through an offshore company allows its non-resident owner to avoid the CGT (28% in the case of properties subject to ATED) by selling the shares of the company instead of the property itself.

Income Tax. Regardless of who owns the property, any rental income will remain taxable in the UK. If the property is owned by an offshore company only the basic rate of UK income tax (20%) will apply regardless of the level of income[14]. This can result in substantial savings when compared with personal ownership under which the banded UK income tax rates (up to 50%) apply.

In brief, the tax advantages of owning UK property through an offshore entity were sizeable until 2012. They remain important for non-residents and non-dom individuals at least until 2017, date of the Inheritance Tax reform, but are less relevant for UK residents. However, even though corporate ownership of UK property is profitable for tax reasons for the most important part of our sample period, there is also another reason individuals may resort to this scheme: opacity. Shell companies allow anonymity when investing in real estate assets, and using them is not always linked to tax advantages (De Simone, 2015; Force, 2007; Unger et al., 2011).

4 Identifying the beneficial owners of the companies

4.1 The effect of AEOI

Observing the country of residence of roughly 2,500 individuals buying real estate in England and Wales through an offshore company, we can test whether the adoption of Automatic Exchange of Information by some countries led to more investment in real estate from these countries' residents. We consider two events related to Automatic Exchange of Information which are likely to have constituted a credible threat to tax evaders from several countries at the same time. The first one is when the G20 Leaders committed to Automatic Exchange of Information as the new global standard on 6 September 2013. This event, together with the Announcement of US-Swiss Bank Program (August 29, 2013) is shown to be concomitant to a sudden decrease in foreign-owned deposits in Switzerland (O' Reilly et al., 2019). The second event we consider is the OECD Declaration on Automatic Exchange of Information in Tax Matters on the 6^{th} of May 2014, where 44 jurisdictions (including all G20 countries except Russia, South Korea and the United States) committed to implement a single global standard on Automatic Exchange of Information. We will hereinafter refer to this

[14]While this is true for the period we consider in the paper, it no longer holds from 2020

declaration as the Joint Announcement. This event described by the OECD as a "major step towards ensuring that tax cheats have nowhere left to hide" is found to have reduced offshore deposits owned by residents of the committing countries by 11% (O' Reilly et al., 2019).

Figure 7 plots the total amount invested in real estate from 2005 to 2016 for residents from countries committing to the CRS in May 2014 - whom we call the early adopters - and for residents from non-committing countries. The most important buyers of each group appear in Figure 5, where early adopters appear in green and the others in black. We use a 3 quarters-moving average in order to address several issues in our sample. First, as we identify a limited number of companies in the OCOD, there is a high volatility in the time-series of real estate investment in the UK in our matched dataset. Second, the timing of real estate transactions is relatively long compared to financial assets, which are more liquid. Third, real estate purchases present a strong seasonality; there are way more sales in summer than in winter. Taking moving averages instead of raw levels allows us to take these specific timing and volatility into account.

As the graph clearly shows, real estate purchases from early adopters country ("Commitment to CRS") and from countries not participating to the Joint Announcement ("No committment to CRS") are very similar - both in trend and level - prior to our first AEOI event (september 2013) and start diverging immediately after, with a sharp peak starting right after the Joint Announcement. Indeed, while total investment by quarter for both groups remains below £20 million during almost the whole period, it reaches close to £50 million for the early adopters immediately after September 2013 and then exceeds £110 million after the date of the Joint Announcement, while the increase is much more modest for the group of countries not committing to adopt the CRS at that date.

In order to further investigate the effect of the two AEOI events, we split our sample of early adopters into one sample of G20 countries (excluding the United States which followed a distinct path with FATCA) and a second sample made by the other early adopters that don't belong to the G20. We then estimate the effect of both AEOI events with both samples in a simple difference-in-differences setting, keeping countries not participating to the Joint Announcement as control group. Our identification hypothesis is that both groups' investment trends would have evolved in the same way without the implementation of the CRS. Using the control group of countries not participating to the Joint Announcement allows us to take into account the evolution of the conditions of the UK real estate market throughout our sample period. Our observation unit is at the quarter-country level, and our panel is balanced. We estimate the following equation:

$$Y_{iq} = \sum_{j \neq 2013q1} \beta_q \cdot Quarter_{j=q} \cdot Treat_i^g + \gamma_i + \eta_q + v_{iq} \tag{1}$$

where Y_{iq} denotes the amount in million Pounds (taking a 3 quarters-moving average) invested in real estate

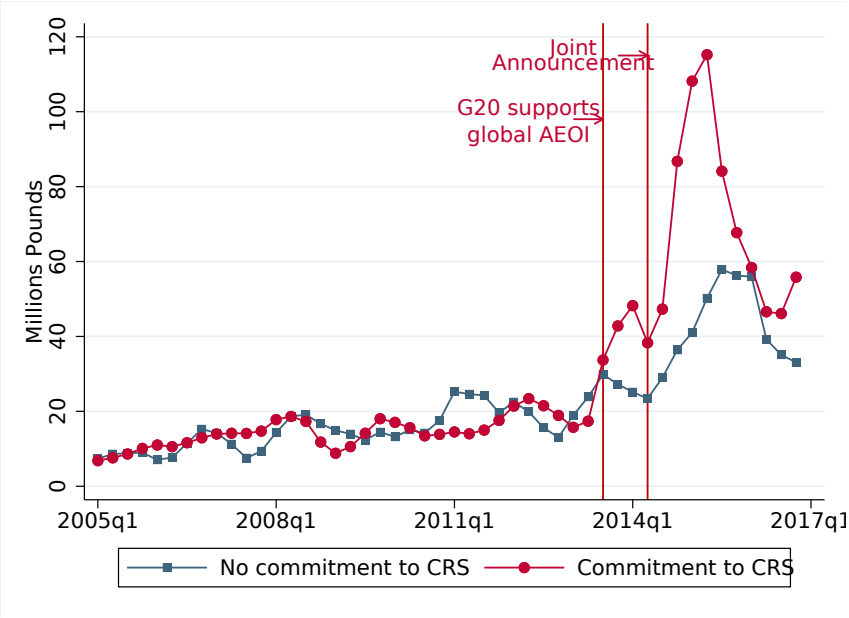


FIGURE 7: INVESTMENT IN REAL ESTATE FROM RESIDENTS OF COUNTRIES PARTICIPATING TO THE JOINT ANNOUNCEMENT AND FROM RESIDENTS OF COUNTRIES NOT PARTICIPATING

Notes: This figure shows the quarterly flows of investment from residents of countries participating in the May 2014 Joint Announcement and from residents of countries not participating to the Announcement. The graph is based on our identified data sample.

by country i at quarter q, $Treat_i^g$ is a dummy equal to 1 when country i is in the treatment group g ($g \in \{g20, nog20\}$), γ_i is a country fixed effect, η_q a quarter fixed effect and v_{iq} an error term. The difference-in-differences coefficient β_q captures the effect of the AEOI event in quarter q relative to the pre-reform quarter, 2013q1. We take the first quarter of 2013 as reference rather than the second quarter because in June 2013, the United Kingdom publishes a draft model agreement for automatic information exchange with the Crown Dependencies and Overseas Territories (UK-Cdot) that is likely to have affected UK residents' purchasing decisions [15]. When estimating the equation on the sample of G20 countries, we expect both AEOI events to have a significant effect on real estate purchases, while when we consider the sample of early adopters that don't belong to the G20, we expect that only the joint Announcement - and not the G20 support for AEOI - will have an effect on property purchases. For the latter group, the event of September 2013 can thus be considered as a placebo event.

Focusing first on the G20 countries as treatment group, we see in Figure 8 that until 2013, the treatment and control groups follow a very similar trend, supporting our identification hypothesis that both groups' investment trends would have followed the same path without the introduction of the CRS. Real estate investment starts to diverge immediately after the first AEOI event (G20 support for global AEOI) and the gap

[15] Two elements are worth highlighting concerning the UK CDOT. First, when we restrict the analysis to the UK, we see indeed that the increase in real estate purchases starts in the second quarter of 2013, so one quarter *before* the G20 support for AEOI from September 2013. Second, when estimating the effect of automatic information exchange on property purchases by UK residents, we cannot disentangle the effect of the UK CDOT from the general impact of the CRS.

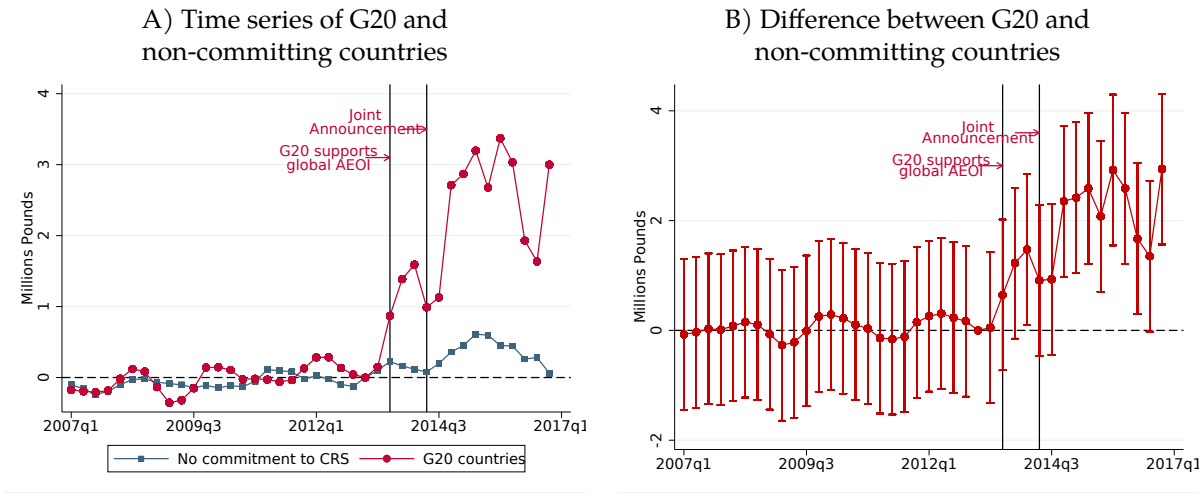


Figure 8: Difference-in-differences comparing real estate investment of G20 countries to countries not committing to the CRS in May 2014

Notes: This figure shows the quarterly flows of real estate investment from G20 countries committing early to AEOI and from residents of countries not committing to the CRS (Panel A) and the difference-in-differences coefficients of the gap between the two series (Panel B). The graph is based on our identified data sample.

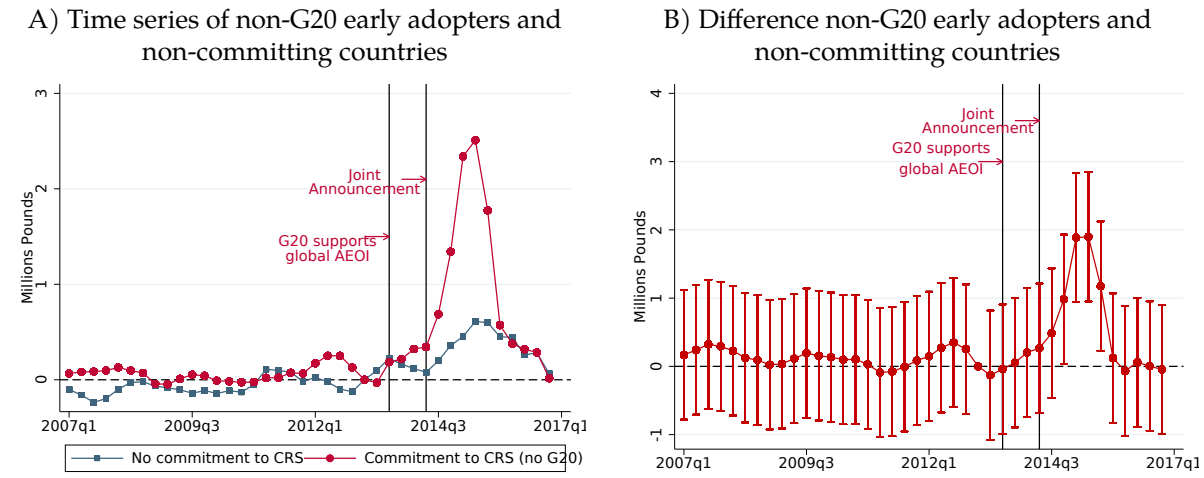


Figure 9: Difference-in-differences comparing real estate investment of early adopters not in the G20 group to countries not committing to the CRS in May 2014

Notes: This figure shows the quarterly flows of real estate investment from non-G20 countries participating to the Joint Announcement and from residents of countries not committing to the CRS (Panel A) and the difference-in-differences coefficients of the gap between the two series (Panel B). The graph is based on our identified data sample.

increases significantly after the Joint Announcement. During the second quarter after the Joint Announcement, each G20 country invested on average 3 million Pounds more than in 2013q1, which is 2 million more than the control group. The effect is statistically significant and persistent until the end of 2016. Then, looking at Figure 9, which takes the non-G20 early adopters countries as the treatment group, it is interesting to note that the divergence between the treatment and control groups only starts after May 2014, meaning that they did not respond to the G20 support for a global AEOI model. Here, the effect on property purchases is somehow more modest and less persistent, while still significant for almost one year after the Joint Announcement.

This analysis, focusing on a sample of companies for which the owners' country of residence is observable, shows that investment in real estate in England and Wales reacted to the strengthening of tax transparency by the investor's country of residence. More specifically, we reveal that the owners of offshore companies coming from AEOI early adopter countries responded to the Joint Announcement of May 2014 by buying significantly more real estate than the owners coming from the other countries. Interestingly, the G20 support for a global model of AEOI of September 2013 induced a response from investors coming from G20 countries while it had no effect on the other early adopters. This result, together with the estimated decrease in offshore bank deposits following the same AEOI events (O' Reilly et al., 2019) point at substitution responses of taxpayers from reportable (bank deposits) assets to non-reportable assets (real estate) following the implementation of the automatic information exchange.

5 Estimating an effect of AEOI on total real estate investment

After having shown that commitment to AEOI by one country induced its resident to buy more real estate, we propose in this section to extend the analysis to the full OCOD sample in order to estimate how much money went to the English and Welsh real estate market due to the increase in tax transparency through the CRS. In this sample, we only observe the country of *incorporation* of the companies buying properties, but no longer the country of *residence* of their owners. First, comparing property purchases from companies incorporated in tax havens vs. companies incorporated in non-havens countries, we find a diverging pattern starting around September 2013, i.e. when the G20 expresses its support for a global model of AEOI. Then, we exploits the leaks and OpenLux data and the heterogeneity in the use of tax havens by investors' country of residence in order to show that the diverging pattern that we see between havens and non-havens comes from haven jurisdictions that are particularly used by the countries taking part to the May 2014 Joint Announcement.

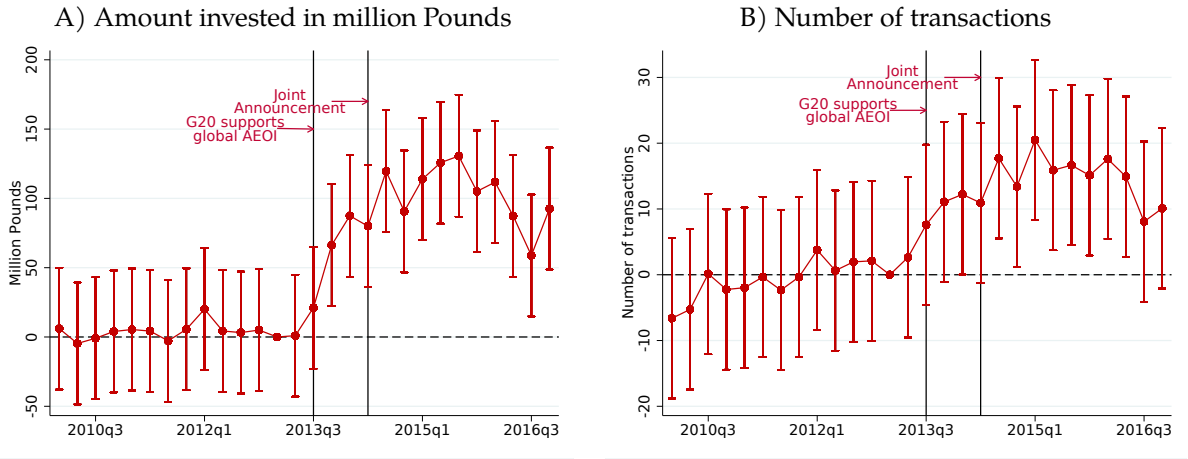


FIGURE 10: DIFFERENCE-IN-DIFFERENCES COMPARING REAL ESTATE INVESTMENT FROM COMPANIES INCORPORATED IN TAX HAVENS TO COMPANIES INCORPORATED IN NON-HAVEN COUNTRIES

Notes: This figure shows the difference-in-differences coefficients comparing quarterly real estate investments from companies incorporated in tax havens to investments from companies incorporated in non-havens, for total amount invested (Panel A) and number of transactions (Panel B). The flows are normalized at their value of 2013q1. The estimation is based on the full data provided in the Land Registry OCOD.

5.1 Diverging patterns of real estate investment between tax havens and non-haven countries around first AEOI events

To investigate the effect of AEOI on suspicious real estate investments, we compare purchases made by firms incorporated in tax havens (treated group) to investments from firms incorporated in non-havens (control group). Indeed, while offshore companies are likely to capture investments made by non-compliant taxpayers, companies incorporated in non tax-havens are presumably legitimate businesses whose real estate purchases should not react to changes in international transparency regulations. Then, we make the hypothesis that without the introduction of the CRS, the trends in real estate purchases of havens and non-havens would have been the same.

We estimate the same model as in (1). We run it on the whole OCOD sample, where the treated group is tax havens and the control is non-haven countries. We take both real estate investment in million Pounds and in number of transactions as outcome variables. We take again 2013q1 as reference quarter. A coefficient β_q equal to 100 would mean that on average, the difference between havens/non-havens real estate investment in quarter q exceeds the investment difference in 2013q1 by £100 million.

Figure 10 shows that the trend in real estate investment - both in terms of amount invested and number of transactions - from haven and non-haven countries are extremely similar between the first quarter of 2010 and the third quarter of 2013. They start to diverge immediately after, right after the G20 support for AEOI. In Figure 10 panel A, we see that after September 2013, the difference in money spent in the property

market between firms incorporated in tax havens and other foreign firms increased significantly, the former investing on average roughly £100 million Pounds more than the latter until 2016. There is a similar increase when looking at panel B, where we see that the trend in the number of properties purchased diverges immediately after September 2013. Interestingly, in both graphs, there is a first increase in investment in the treatment group compared to the control group in September 2013 and a second increase after May 2014, which correspond to the two major steps towards AEOI we have been studying so far.

In order to check that the increase in property purchases is caused by the residents of the CRS early adopters, we need to find a way to identify the purchases coming from these countries through the veil of secrecy of shell companies. To do that, we analyze the leaks and OpenLux datasets and the patterns of tax haven uses for each country that they display. We exploit the Panama Papers, the Offshore leaks, the Paradise Papers and the OpenLux and for each company look at its country of incorporation and at the country of residence of the owner(s). Then, for each country of incorporation (which are mostly tax havens), we compute the fraction of the owners living in each specific country of residence. For example, in the case of Jersey, 47% of the company owners appearing in our leaks and OpenLux database come from the UK, 10% come from Ireland, 9% from the US, 5% from India etc. Then, using the Joint Announcement list of countries, we build three groups of tax havens:

- **Highly treated tax havens:** jurisdictions that have more than 75% of their company beneficial owners coming from early adopter countries
- **Moderately treated tax havens:** jurisdictions that have between 25% and 75% of their company owners coming from early adopter countries
- **Little treated tax havens:** jurisdictions that have less than 25% of their company owners coming from treated countries **or** tax havens that don't appear in our leaks data as host for shell companies.

Figure 11 shows how the intensity of the treatment is distributed amongst the tax havens, and where the top 5 buyers of each treatment category are located (the full list of jurisdictions by treatment intensity is given in appendix table 10). As we see, 23 countries have a treatment intensity of zero, either because none of the individual owning company there come from early adopter countries or because they don't appear in our leaks-lux data as hosting shell companies. The British Virgin Islands, first country in terms of number of transactions and second in terms of value has a treatment intensity of about 0.6 and lies therefore in the moderately treated group along with Hong Kong, Panama and the Cayman Islands. The group of highly treated tax havens gathers - among others - Jersey, Guernsey, Isle of Man and Luxembourg.

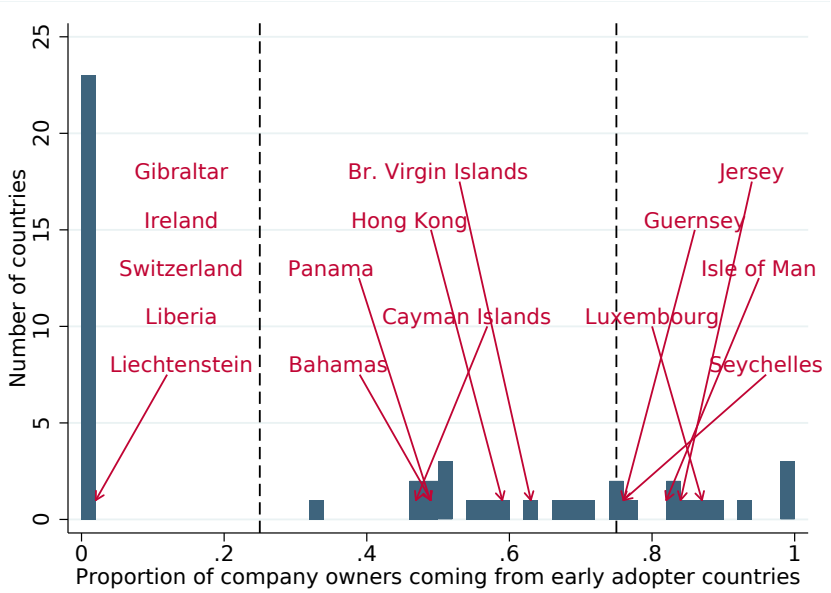


Figure 11: Distribution of "treatment intensity" amongst tax havens.

Notes: Treatment intensity in a given tax haven is computed based on the residence country of all individuals owing companies in that country and on whether the residence country is an early adopter or not. A treatment intensity of 0.5 indicates that 50% of all company owners in the tax haven are resident of countries participating to the Joint Announcement. Countries are labelled according to their importance in terms of flows of investment to the English and Welsh real estate market (e.g. British Virgin Islands companies invest more than Hong Kong companies, who invest more than Panama companies etc).

We then use a model similar to the one used before, but split the group of tax havens into the three groups described here. We estimate the following equation:

$$Y_{iq} = \sum_{j \neq 2013q1} \Big[\beta_q \cdot Quarter_{j=q} \cdot Treat_i \cdot High_i + \zeta_q \cdot Quarter_{j=q} \cdot Treat_i \cdot Moderate_i + \delta_q \cdot Quarter_{j=q} \cdot Treat_i \cdot Low_i \Big] + \gamma_i + \eta_q + v_{iq} \tag{2}$$

Where $High_i$, $Moderate_i$ and Low_i are dummy variables equal to 1 when country i is respectively a highly treated, moderately treated or little treated tax haven. We show in Figure 12 the results from (2). We can stress several elements from this figure. First, while the evolution of real estate investment for the three groups of tax havens is very similar to the control group up to the third quarter of 2013, it starts to diverge immediately after for the highly and moderately treated tax havens, both in terms of amounts invested and number of transactions. Second, for both outcome variables, the trend of the little treated tax havens is extremely close to zero over the whole period, meaning that the dynamics of property purchases for this group of tax havens is very similar to the one followed by the non-haven countries. Third, the increase in investment is the highest for the highly treated tax havens, where the response to the AEOI events seems very strong. This graph supports the claim that the increase in investment we see in Figure 10 is due to residents

	Amount invested				Number transactions			
	(1) Short term	(2) Long term	(3) Short term	(4) Long term	(5) Short term	(6) Long term	(7) Short term	(8) Long term
Post	5.726	7.667	5.728	7.671	0.740	0.894	0.741	0.895
	(9.472)	(8.745)	(8.948)	(8.241)	(2.642)	(2.430)	(2.557)	(2.335)
Post_Treated	84.254***	100.376***			12.036***	13.784***		
	(15.167)	(14.001)			(4.231)	(3.890)		
Post x Treated x high			214.098***	268.531***			35.343***	41.777***
			(23.221)	(21.383)			(6.635)	(6.058)
Post x Treated x middle			107.604***	113.345***			12.653*	12.475**
			(24.103)	(22.195)			(6.888)	(6.288)
Post x Treated x low			-2.176	-2.521			-1.606	-1.529
			(18.505)	(17.041)			(5.288)	(4.828)
Observations	9146	9146	9146	9146	9146	9146	9146	9146
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Control for ER	YES	YES	YES	YES	YES	YES	YES	YES

Table 4: Real estate investment from tax havens before and after the CRS, difference-in-differences estimates

Notes: This table shows the results of the estimation of equation 1 (columns 1-2 and 5-6) and equation 2 (columns 3-4 and 7-8). The regressions are estimated using total amount invested (columns 1-4) or number of transactions (columns 5-8) as the dependent variable. All specifications are based on all purchases recorded in the Land Registry OCOD.

of countries taking part to the Joint Announcement.

Table 4 summarizes the analysis using a difference-in-differences setting with a single post-reform dummy. We look both at short-term and longer-term effects of the AEOI events by looking at responses over the 2013q3-2014q4 period in the former case and over the 2013q3-2016q4 period in the latter case. In both cases, the reference period is the first semester of 2013[16]. We also control for exchange rates evolution, which can influence cross-border investments. Columns (1), (2), (5) and (6) are estimated in the setting where we look at investments from all tax havens compared to all non-havens purchases. In all cases, coefficients associated to Post_Treated are highly significant. The coefficient in column (2) indicates that the AEOI measures led to an average quarterly increase in real estate investment from tax havens of £100 million. Columns (3), (4), (7) and (8) show results where the treated group is split into the three sub-groups, according to the proportion of company owners that are resident in countries involved in the Joint Announcement of May 2014. Confirming the conclusion drawn in figure 12, we see that the higher the proportion of owners directly affected by the Joint Announcement in a tax haven (appearing in our leaks and OpenLux data), the higher the increase in investment after 2013 will be. Moreover, the evolution of property purchases from tax havens little treated ("Post x Treated x low") - which can be interpreted as a placebo test - is never significant.

By summing the estimated quarterly effect over the entire longer-term period, we obtain that the total average increase in real estate investment from tax havens due to the CRS reaches £1.29 billion. We multiply this figure by the number of tax havens appearing in the OCOD database (50) and get a total effect of £64.5

[16]We decided to use two quarters instead of one for our reference period in order to reduce the chance to have an abnormal level of investment in the omitted period for a specific country, but the results are highly robust to different reference periods.

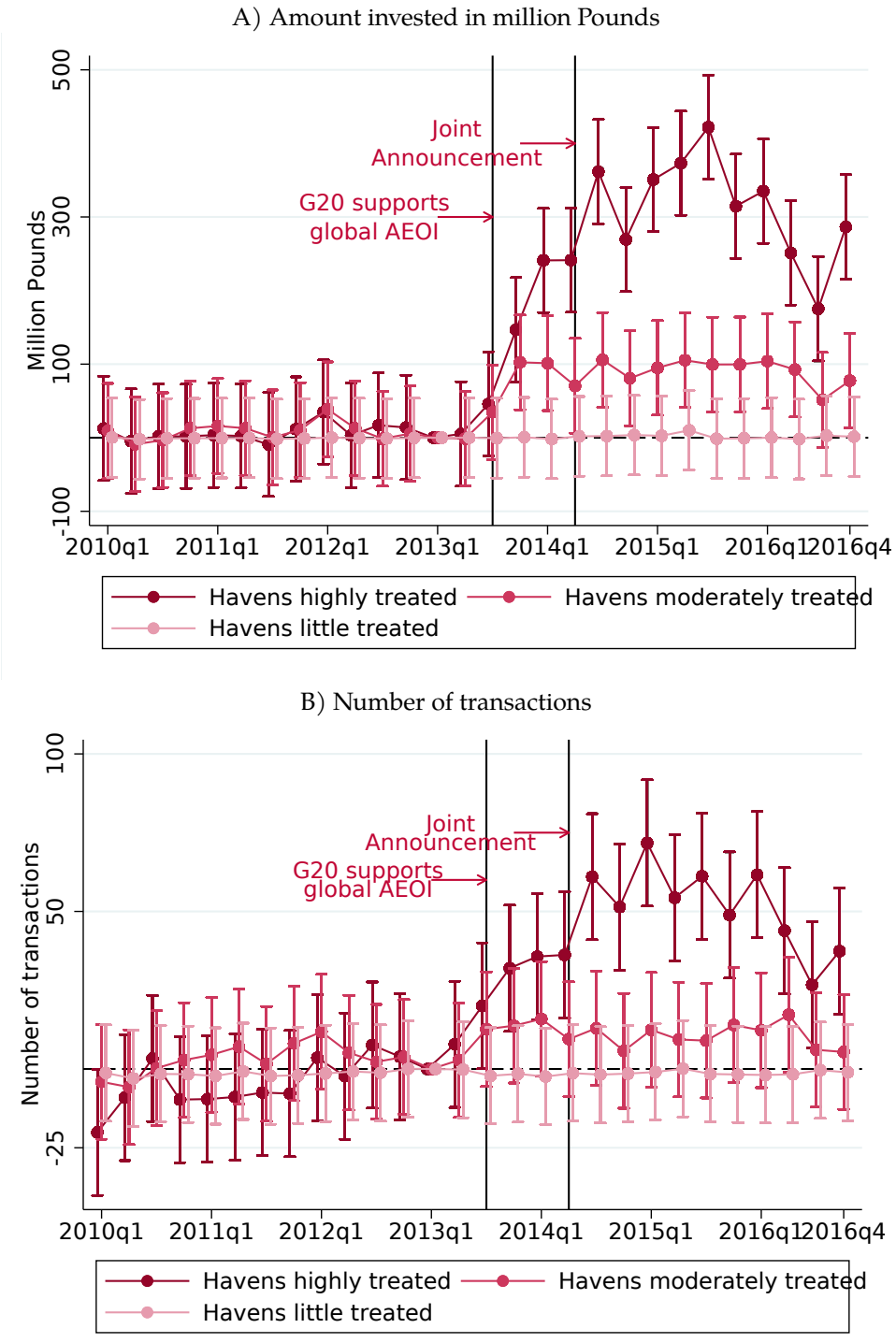


Figure 12: Difference-in-differences comparing real estate investment from companies incorporated in tax havens to companies incorporated in non-haven countries, for the three havens groups.

Notes: This figure shows the difference-in-differences coefficients comparing quarterly real estate investments from companies incorporated in highly treated havens, moderately treated havens and little treated havens, for total amount invested (Panel A) and number of transactions (Panel B). The flows are normalized at their value of 2013q1. The estimation is based on the full data provided in the Land Registry OCOD.

billion. In other words, our findings suggest that at least £64.5 billion went to the British and Welsh property markets because of the increase in tax transparency through the two AEOI events, namely the G20 support for a global model of AEOI and the Joint Announcement. To put this number into perspective, Johannesen et al. (2020) estimate that FATCA led to around $ 100 billion of additional wealth reported to the IRS through newly disclosed accounts. Converting this figure into 2015's Pounds, our estimated effect of AEOI on real estate investment in England and Wales is roughly as big as the effect estimated on reported wealth for FATCA. It also represents around 6.2% of total investments in real estate in England and Wales between 2014 and 2016.

We then restrict the analysis to properties purchased in Greater London only, instead of all over England and Wales. Table 5 reports the regression coefficients obtained from the difference-in-differences setting with a single post-reform dummy. We obtain the same results as for the full sample: there is a substantial and statistically significant effect of AEOI on the amount invested and the number of transactions. This effect is driven by tax havens that are particularly used by the residents of countries participating to the Joint Announcement. Again, coefficients for the little treated tax havens are not significantly different from zero. The results summarized in this table suggest that about half of the real estate responses to the CRS takes place in the London real estate market. More specifically, the estimated effect of the CRS in London represents 57% of the total effect for the amount invested and 33% of the increase in the number of transactions. Surprisingly, this is less than the share taken by London in total real estate transactions appearing in our database (see table 2).

	Amount invested				Number transactions			
	(1) Short term	(2) Long term	(3) Short term	(4) Long term	(5) Short term	(6) Long term	(7) Short term	(8) Long term
Post	2.323	4.415	2.324	4.417	0.167	0.265	0.167	0.265
	(5.375)	(4.961)	(5.171)	(4.767)	(1.374)	(1.264)	(1.352)	(1.239)
Post_Treated	51.449***	56.859***			5.348**	4.602**		
	(8.629)	(7.964)			(2.205)	(2.029)		
Post x Treated x high			101.296***	129.638***			11.235***	12.777***
			(13.337)	(12.291)			(3.486)	(3.194)
Post x Treated x middle			89.568***	81.049***			9.742***	5.079
			(13.842)	(12.757)			(3.618)	(3.315)
Post x Treated x low			0.574	-0.119			-0.601	-0.565
			(10.836)	(9.987)			(2.832)	(2.595)
Observations	8982	8982	8982	8982	8982	8982	8982	8982
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Control for ER	YES	YES	YES	YES	YES	YES	YES	YES

Table 5: Real estate investment from tax havens before and after the CRS, difference-in-differences estimates, London sample

Notes: This table shows the results of the estimation of equation 1 (columns 1-2 and 5-6) and equation 2 (columns 3-4 and 7-8). The regressions are estimated using total amount invested (columns 1-4) or number of transactions (columns 5-8) as the dependent variable. All specifications are based on purchases recorded in the Land Registry OCOD in the region of Greater London only.

5.2 Robustness checks

Alternative outcome variable. One potential concern with our results comes from the fact that 90% of the purchases in the registry are made by companies incorporated in tax havens, and among the latter a few of them drive a large part of the investments. The distribution of investment responses to the CRS is therefore not linear, and one can fear that our OLS estimates are massively upward biased by the few tax havens investing the most in real estate (despite the inclusion of country fixed effects in our regressions). One ideal way of dealing with this issue would be to simply use a log-transformation but there are a lot of zeros in our estimation sample and a log-specification would be misleading. Thus, we transform the outcome variable for each country i by scaling it by its pre-period value. Namely for each quarter q and country i, we scale the amount invested in each period q by the average quarterly investment in Pounds from country i between 2005 and 2010[17]. We then estimate the responses to the CRS based on the same difference-in-differences model as before, taking this new scaled measure of investment as outcome variable. Regression coefficients are given in table 6. Column (2) suggests that on average, the investment response of tax havens to the CRS is equal to 1.1 time the average of their pre-period investment. Columns (3) and (4) indicate that this effect is mostly driven by the tax havens particularly affected by the Joint Announcement of May 2014.

Inference of property prices As mentioned in subsection 3.1, prices are only available for 31% of the transactions in our database and we infer the missing prices based on those reported. One may fear that the way we infer the prices might drive our results. We try to address this issue in two ways, and report our results in table 7, obtained from the difference-in-differences setting with a single post-reform dummy. In columns (1) and (2), we estimate the longer-term effect of the CRS on amounts invested - both in level and scaled - restricting the sample to transactions for which the price is available. In both columns the coefficients suggest important responses to the CRS and are highly significant. Surprisingly, when taking amounts invested in level (column 1) as outcome variable, the estimated effect represents less than half of the effect on the whole sample, while when the investment in scaled by the pre-period average, we get an effect twice as large as the one obtained on the full sample. Columns (3) and (4) (resp. (5) and (6)) refer to regressions where the prices are inferred based on the available prices winsorized at the 99% (resp. 95%) level. The coefficients remain significant at the 0.01% and columns (3)-(4) give results very similar to the ones we obtain with our preferred method for price imputation. However, the much smaller effects estimated in columns (5) and (6) suggest that and important part of the CRS response we find is driven by extremely expensive properties, which price belongs to the top 5% of the price distribution.

[17] Our results are robust to other pre-periods.

	(1) Short term	(2) Long term	(3) Short term	(4) Long term
Post	1.504***	1.796***	1.504***	1.796***
	(0.304)	(0.280)	(0.300)	(0.277)
Post_Treated	1.324***	1.134**		
	(0.487)	(0.449)		
Post x Treated x high			3.406***	3.279***
			(0.780)	(0.718)
Post x Treated x middle			1.162	1.486**
			(0.809)	(0.745)
Post x Treated x low			0.219	-0.275
			(0.621)	(0.572)
Observations	9146	9146	9146	9146
Country FE	YES	YES	YES	YES
Control for ER	YES	YES	YES	YES

Table 6: Robustness checks - Effect of the CRS on amounts invested scaled by pre-period investment.

Notes: This table shows the results of the estimation of equation 1 (columns 1-2) and equation 2 (columns 3-4). The regressions are estimated using total amount invested scaled by pre-period investment as the dependent variable. All specifications are based on all purchases recorded in the Land Registry OCOD.

	Price reported		All transactions			
	(1) Amount	(2) Scaled	(3) Amount	(4) Scaled	(5) Amount	(6) Scaled
Post	2.921	1.761***	6.826	1.641***	3.796	1.070***
	(5.381)	(0.403)	(7.972)	(0.262)	(5.100)	(0.206)
Post x Treated	43.193***	2.165***	92.053***	1.039**	56.715***	0.674**
	(8.126)	(0.609)	(12.764)	(0.419)	(8.166)	(0.331)
Observations	7766	7766	9146	9146	9146	9146
Country FE	YES	YES	YES	YES	YES	YES
Control for ER	YES	YES	YES	YES	YES	YES
Winsorization	99.5%	99.5%	99%	99%	95%	95%

Table 7: Robustness checks - Effect of the CRS when prices are inferred in various ways.

Notes: The first two columns report the longer term effect of the CRS restricting the sample to transactions for which the price is available. Columns (3) and (4) (resp. (5) and (6)) show the results of regressions where the prices are inferred based on the available prices winsorized at the 99% (resp. 95%) level.

Accounting for correlated errors within country. If there are unobserved components affecting our outcome variables that are correlated within countries over time, our diff-in-diff estimates' standard errors might be inconsistently low (Bertrand et al. (2004), Cameron and Miller (2015))[18]. This can be the case in the presence of omitted factors influencing property purchases from a country that evolve over time. We show in Table 11 our long term estimates and their standard errors when allowing for clustered errors at the country level (columns (1), (3), (5)) and - following Bertrand et al. (2004) - in columns (2), (4) and (6) we estimate the effect by aggregating the time series into one single pre-period (2013q1-2013q2) and one single post-period (2013q3 - 2016q4). While estimated standard errors increase, which can be partly explained by the small part of our sample, our coefficients remain very significant when looking at the amount invested and significant at least at the 10% level when considering the number of transactions or the scaled outcome variable.

Using alternative tax haven lists. There is no consensus on which countries should be considered as tax havens. We use the same list of tax havens as Menkhoff and Miethe (2019), which is obtained by combining the lists of Gravelle (2009) and Johannesen and Zucman (2014). The lists contains 58 countries listed in Appendix (Table 9)[19]. In order to test whether the choice of tax havens influences our results, we look at the longer term impact of the CRS on amounts invested and the number of purchases using alternative tax haven lists (running the same regression as the one used to obtained the coefficients in Table 4 columns (2) and (6)). First, we simply add the United States and Netherlands to our standard list. These two countries are sometimes considered as tax havens, and this status might have been reinforced by the CRS in the case of the US (Casi et al. (2020) find evidence that the CRS led to a relocation of offshore deposits to the United States). Second, we use Hines and Rice (1994)'s list. Third, we restrict the list to 29 jurisdiction that bring about a consensus in the literature by keeping countries appearing in each list of the following papers: Johannesen and Zucman (2014), Dharmapala (2008), OECD (2000) Gravelle (2009), Hines and Rice (1994) and Glautier and Bassinger (1987) ("consensus list"). Finally, we use a last tax haven list consisting in our preferred list excluding all jurisdiction with more than 2 million inhabitants *except* Hong Kong, Panama, Singapore and Switzerland, which are prominent tax havens ("less 2M list"). Table 12 summarizes the estimates obtained with the alternative haven lists. We look both at the amount invested (columns (1)-(4)) and the number of transactions (columns (5)-(8)). We first see that the coefficients remain very significant. Then, while adding the US and Netherlands to our list leads to only sightly higher coefficients, we see that reducing the number of tax havens that we consider by i) using Hines and Rice's list, ii) using the "consensus list" or iii) using the "less 2M list" increases significantly the size of the coefficients. However, when multiplying the coefficient

[18] Even in the presence of country fixed effects.

[19] but seven countries from this list do not appear in OCOD as channeling real estate investments to the UK.

obtained from each of the four alternative lists and our preferred list by the number of jurisdictions contained in it, we get an average quarterly effect that lies always between £5 and £5.4 billions.

5.3 The extent of asset shifting

We estimate that about £64.5 billion poured into the English and Welsh real estate market as a result of the implementation of the CRS. According to figures from an international real estate platform[20], the UK represented about 20% of the volume of global cross-border real estate transactions in 2016. Based on the total number of transactions in the UK reported in the UK Property Statistics, we find that for year 2016, 90% of the real estate transactions in the UK took place either in England or in Wales. This implies in turn that England and Wales amount to about 18% of global cross-border real estate transactions. A simple back-of-the-envelope calculation entails that the effect of the implementation of the CRS on the global cross-border real-estate market was about £358 billion.

To get a sense of the importance of this amount, we need to compare it to the impact the CRS had on cross-border deposits or wealth parked in tax havens. We try to infer this effect in two steps: i) we estimate the amount of offshore financial wealth that was owned by the residents of the early adopter countries before the CRS, ii) based on the estimates from the literature, we estimate how much of this offshore wealth was removed from tax havens due to the CRS.

First, we compute the wealth the early adopters hold in tax havens[21]. To do this, we draw on results obtained by Alstadsæter et al. (2018), who calculate country-by-country estimates of offshore wealth. They update the offshore wealth measure of Zucman (2013) and allocate this amount to each of the world's country[22]. They obtain very heterogeneous results, with offshore wealth representing about 60% of GDP for countries like Russia, and only a few percents for countries like Japan or Denmark.

Second, we apply to this amount the estimates of the effect of the CRS on financial wealth found in the literature. Several papers studied the effect of the CRS on bank deposits, using Bank of International Settlements (BIS) deposits data (Menkhoff and Miethe, 2019; Casi et al., 2020; O' Reilly et al., 2019; Beer et al., 2019). Drawing on different analysis periods and different samples of countries, they find that the CRS caused a reduction ranging from 11.5% to 38% of bank deposits held in tax havens. Figure 13 shows the estimated effect of the CRS for each paper. Applying the estimates found for deposits to the total financial offshore wealth, we obtain a figure for the reduction in financial wealth induced by the implementation of

[20]Investment flows around the globe: cross-border property transactions in 2016, https://tranio.com/articles/investment-flows-around-the-globe-cross-border-property-transactions-in-2016$_5$321/, $retrievedonthe$27/08/2021.

[21]Out of the 46 countries committing to the CRS in May 2014, we only consider 41 and leave aside the 5 that are tax havens (Costa Rica, Luxembourg, Malaysia, Singapore, Switzerland). This is because offshore wealth is computed as the cross-border wealth held in tax havens.

[22]The complete results of the allocation are available in appendix table A.3 of their paper.

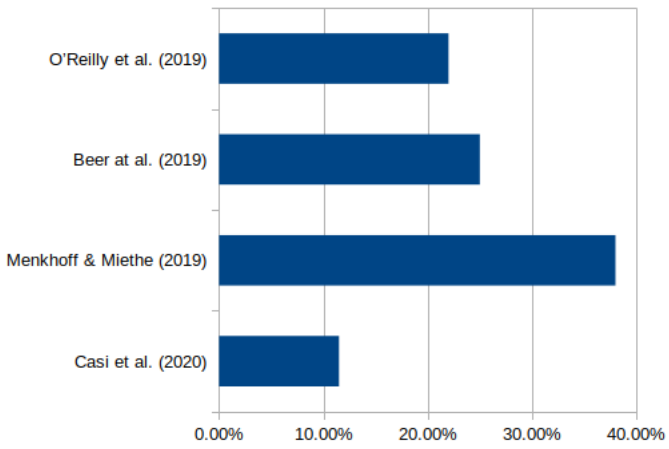


Figure 13: Estimates of the reduction in bank deposits caused by the CRS.

This figure shows the estimated reduction in bank deposits caused by the implementation of the CRS, according to the previous literature. The estimated effect is taken from the main estimation of each paper. This figure is based on the one presented in O' Reilly et al. (2019).

the CRS. Table 8 sums up our results. We find that the global surge in cross-border real estate flows caused by the CRS would represent between 37% and 121% of the reduction in offshore wealth the policy induced depending on the estimate of the CRS effect we consider.

These figures suffer from two main drawbacks. First, it is likely that the UK real estate market is particularly sensitive to changes in the international tax enforcement environment. This implies that we capture an especially strong effect of the CRS on real estate investments in the UK, and that the global figure should be less than the estimated £358 billion. One reason for that is that UK real estate, and more particularly London real estate, is globally considered as a safe-haven asset, for which demand increases even during times of economic and political uncertainty (Badarinza and Ramadorai, 2018; Sá, 2016; Knight Franck, 2016). Its high value and high liquidity make it a "safe deposit box" for investors abroad (Fernandez et al., 2016). This means that investment in UK real estate is going to rise as risk in foreign countries increase. Moreover, there are no restrictions on purchases by foreign buyers in the UK. This implies that the UK should be a destination of choice for taxpayers abroad wanting to shift their offshore portfolio from financial to real estate assets, relative to markets with foreign buyers restrictions.

Second, the four papers studying the effects of the CRS on financial assets provide estimates of the reduction of bank deposits following its implementation, not of the reduction of total offshore wealth. As a result, the figures for the reduction of offshore wealth must be taken with care. We extrapolate the results of these papers to total offshore wealth, which amounts to 4-5 times the value of offshore deposits (Zucman, 2013). Indeed, the CRS covers all types of financial assets, not only fiduciary deposits. Consequently, to avoid reporting, individuals might draw funds to invest in real estate assets from deposits, but also from

offshore bonds and equities.

Paper	Estimates	Wealth decrease (in billion £)	Real estate/financial effect
Casi et al. (2020)	11.5%	296	121%
Menkhoff and Miethe (2019)	38%	978	37%
Beer et al. (2019)	25%	643	58%
O' Reilly et al. (2019)	22%	566	63%

Table 8: Real estate effect of the CRS as a share of the financial effect of the CRS

Notes: This tables shows the reduction in bank deposits held in tax havens caused by the CRS (column 2) as estimated in four different papers. We estimate the corresponding offshore wealth decrease by multiplying this figure by the offshore wealth held by the countries participating to the Joint Announcement as estimated in Alstadsæter et al. (2018). The last column shows the ratio of our estimated global effect of the CRS on real estate investment (£358 billion) on the reduction in offshore wealth, as calculated by the four papers.

6 Conclusion

Real estate investment in England through offshore companies has been massive in the last decade, mainly for tax and secrecy reasons. In this paper, we show that part of this surge in investment can be attributed to changes in the international tax environment. The CRS, often described as a major step towards tax transparency, led to massive investments in the property market not concerned by the information exchange. Exploiting tax-related data leaks, we identify the country of residence of the buyer for 1.7% of the transactions. We show that foreign nationals reacted to the adoption of information exchange by their residence country by investing money in the property market. We then extend the analysis to the whole sample of offshore companies investing in real estate in England and show that the CRS led to more than £60 billion of additional investment in the property market in England and Wales.

Our results suggest that tax evaders responded to the CRS by shifting their assets in order to stay under the radar of tax transparency. To confirm that these additional purchases in the UK correspond to assets that have been shifted from financial accounts falling under the CRS, we need to compare the effect of AEOI on real estate assets to the effect it had on financial assets. This will be the subject of future research.

Our study contributes substantially to the literature evaluating the efficiency of the CRS. It shows that real estate needs to be included in any AEOI agreement to avoid tax evaders circumventing the rules by investing offshore money in the property market. More generally, it highlights that to be effective, exchange of information agreements must cover all assets classes. This is necessary to prevent tax dodgers from adapting their evasion strategy to the new international tax laws.

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Appendix

Anguilla	St. Vincent & Grenadines	Ireland	Marshall Islands
Antigua & Barbuda	Turks & Caicos Islands	Liechtenstein	Samoa
Aruba	U.S. Virgin Islands	Luxembourg	Nauru
Bahamas	Belize	Malta	Niue
Barbados	Costa Rica	Monaco	Tonga
British Virgin Islands	Panama	San Marino	Vanuatu
Cayman Islands	Hong Kong SAR China	Switzerland	Liberia
Dominica	Macao SAR China	Maldives	Malaysia
Grenada	Singapore	Mauritius	Austria
Montserrat	Andorra	Seychelles	Belgium
Netherlands Antilles	Guernsey	Bahrain	Chile
Sint Maarten	Jersey	Jordan	Trinidad & Tobago
Curaçao	Cyprus	Lebanon	Uruguay
St. Kitts & Nevis	Gibraltar	Bermuda	
St. Lucia	Isle of Man	Cook Islands	

Table 9: List of tax havens.

Notes: This table shows the list of tax havens we use in our main analysis. Seven countries from this list do not appear in OCOD: Aruba, Maldives, Montserrat, Nauru, Sint Maarten, Tonga and the U.S. Virgin Islands.

Highly treated	Moderately treated	Little treated
Anguilla	Bahamas	Liberia
Barbados	Belize	Liechtenstein
Cyprus	Bermuda	St. Kitts & Nevis
Grenada	British Virgin Islands	Vanuatu
Guernsey	Cayman Islands	Andorra
Isle of Man	Cook Islands	Antigua & Barbuda
Jersey	Costa Rica	Austria
Luxembourg	Hong Kong SAR China	Bahrain
Malaysia	Marshall Islands	Belgium
Malta	Mauritius	Chile
Seychelles	Niue	Curaçao
Turks & Caicos Islands	Panama	Dominica
	Samoa	Gibraltar
	Singapore	Ireland
	St. Lucia	Jordan
		Lebanon
		Macao SAR China
		Monaco
		Netherlands Antilles
		San Marino
		St. Vincent & Grenadines
		Switzerland
		Trinidad & Tobago
		Uruguay

TABLE 10: LIST OF TAX HAVENS BY INTENSITY GROUP

	(1) Amount	(2) Amount	(3) Number transactions	(4) Number transactions	(5) Scaled amount	(6) Scaled amount
Post	7.667***	5.717	0.894*	0.599	1.796***	1.781***
	(2.895)	(22.982)	(0.523)	(3.770)	(0.395)	(0.417)
Post x Treated	100.376**	103.607***	13.784*	14.269**	1.134*	1.128*
	(44.887)	(36.946)	(7.358)	(6.060)	(0.670)	(0.670)
Observations	9146	226	9146	226	9146	226
Country FE	YES	YES	YES	YES	YES	YES
Control for ER	YES	YES	YES	YES	YES	YES
Cluster at country level	YES	NO	YES	NO	YES	NO
Time series aggregated	NO	YES	NO	YES	NO	YES

Table 11: Robustness check - Results of equation 1 allowing for serial correlation of the outcome variables.

Notes: This table displays our usual regression coefficients and the estimated standard errors when allowing for serial correlation of the outcome variables. In columns (1), (3) and (5), we allow for clustered errors at the country level, taking the same sample period as before, while in columns (2), (4) and (6) we focus on the 2013q1 - 2016q4 period and aggregate the time series into one pre-period (2013q1 and 2013q2) and one post-period (2013q3 - 2016q4), following Bertrand et al. (2004). Differences in the coefficients between the two types of specifications come from the country fixed effects and the exchange rates being estimated over two different sample periods.

	Amount				Number transactions			
	(1) US + NL	(2) H & R	(3) Consensus	(4) less 2M	(5) US + NL	(6) H & R	(7) Consensus	(8) less 2M
Post	4.209	7.886	7.769	8.936	0.423	0.771	0.664	1.142
	(8.854)	(8.071)	(7.349)	(7.959)	(2.463)	(2.257)	(2.076)	(2.225)
Post x Treated	104.397***	129.188***	191.541***	133.601***	14.323***	18.267***	27.513***	18.101***
	(13.863)	(14.701)	(16.273)	(14.942)	(3.857)	(4.110)	(4.597)	(4.176)
Observations	9146	9146	9146	9146	9146	9146	9146	9146
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Control for ER	YES	YES	YES	YES	YES	YES	YES	YES

Table 12: Robustness check - Results of equation 1 using different tax havens lists.

Notes: This table tests the robustness of our coefficients over several tax havens lists. For the sake of conciseness, only the longer-term effect of the CRS (2013q3-2016q4) is estimated here. Columns (1) and (5) just add the US and Netherlands into our preferred list, columns (2) and (6) uses Hines and Rice (1994)'s list, columns (3) and (7) restrict the list to 29 countries that appear most often in tax haven lists and columns (4) and (8) restrict our preferred list to jurisdictions with less than 2 million inhabitants, except Hong Kong, Panama, Singapore and Switzerland.

Assets and ownership type	Solution to avoid reporting under CRS	Loophole that prevents the information from being reported	Literature
Direct ownership of financial assets	Moving deposits to a non-participating country (the U.S.)	Some countries are not part of the CRS (the U.S.)	- CRS: Casi et al. (2020) - IoR: Johannesen and Zucman (2014)
Direct ownership of financial assets	Selling equities for real estate in any country	Not reporting of real estate assets under the CRS	De Simone et al., 2020: effect on house prices for FATCA
Indirect ownership (through company) of financial assets	Switching from passive to active non-financial entity (NFE) (less than 50% of passive income and less than 50% of assets are used to produce passive income)	Controlling persons are identified only for Passive NFEs	No
Financial assets held in a trust managed by a financial institution (FI)	Switch to an individual trustee (as opposed to a financial institution)	Only a trust managed by an FI would be considered a reporting FI	No
Indirect ownership (through company) of financial assets	Splitting the ownership of the company such that no owner has more than 25% of the shares	The threshold to define a person ad "contolling person" of a company is typically 25% (even though this threshold might vary)	No
Direct ownership of financial assets	Holding assets via a discretionary trust with no distribution of income during the reporting period	A beneficiary from a discretionary trust will be treated as a beneficiary of the trust if such person receives a distribution in the appropriate reporting period.	No
Direct or indirect ownership of financial assets	Acquiring a residence certificate from a secrecy jurisdiction	Some tax havens refuse that any data is ever collected about their tax residents. Becoming a (fake) resident of such a tax haven would prevent any reporting	No

Table 13: Some loopholes in the CRS