Automatic for the (tax) people: information sharing and cross-border investment in tax havens*

Agustín Bénétrix[1], Lorenz Emter[2], and Martin Schmitz[3]

[1] *Trinity College Dublin, IMTCD*
[2] *European Central Bank and Central Bank of Ireland*
[3] *European Central Bank*

November 10, 2023

Abstract

This paper examines the impact of international automatic exchange of information (AEOI) treaties on cross-border investments in tax havens. Using a restricted version of the BIS Locational Banking Statistics we find that AEOIs significantly reduced cross-border deposits. A sectoral breakdown assessment reveals that households were the key driving force behind this contraction. However, we also document evidence of households' deposits shifting to non-AEOI haven countries and larger deposits by non-bank financial institutions between tax haven countries, suggesting an increased use of shell corporation networks since AEOI introduction. Extending the analysis to portfolio and direct investment, we observe changes in investment patterns vis-à-vis tax havens which are consistent with a significant impact of AEOI treaties on these forms of cross-border investment.

Keywords: cross-border banking, tax havens, international tax treaties, tax evasion
JEL Classification: G21, G28, H26, H87, K34

*Emails: Agustín Bénétrix benetra@tcd.ie, Lorenz Emter lorenz.emter@centralbank.ie and Martin Schmitz martin.schmitz@ecb.int. We are grateful to the Editor Isabelle Mejean for guidance and two anonymous referees for comments and suggestions. We appreciate insightful discussions and comments by Goetz von Peter, Swapan-Kumar Pradhan, as well as the discussion by Lorena Keller at the 2023 AEA session on "Tax havens and Global Financial Flows". We thank the seminar/workshop participants at the European Central Bank, Trinity College Dublin and the 2022 "Theories and Methods in Macroeconomics" (T2M) conference for comments. The views expressed are those of the authors and do not necessarily reflect those of the European Central Bank and/or the Central Bank of Ireland.

1 Introduction

Tax havens are generally thought of as places that harbour assets from non-residents seeking to hide ownership to limit tax liabilities. Such international tax evasion does not only reduce tax revenues and the effective taxation of the wealthy, it can also have an eroding effect on trust in state institutions and the tax system (Alstadsæter, Johannesen, & Zucman, 2019; Menkhoff & Miethe, 2019). Tax evasion via offshore tax havens is therefore of great concern to policy makers. Recent media coverage of large-scale data leaks and other whistle-blower reports fuel this concern and highlight the relevance of tax evasion via tax havens. The most prominent examples are the Panama Papers in 2016 and, more recently, the Pandora Papers. The latter highlight the prevalence of shell corporations set up in tax haven jurisdictions to disguise the ultimate ownership of financial and non-financial assets.

Governments have tried to tackle the issue through several multilateral and bilateral policy initiatives with mixed success.[1] Johannesen and Zucman (2014) show that early efforts by G20 countries to crack down on tax havens resulted in a reallocation of deposits towards tax havens with the least number of bilateral exchange treaties. This highlighted that upon-request information sharing, while having some deterring effect, experienced limited success in containing tax evasion. Menkhoff and Miethe (2019) and O'Reilly, Ramirez, and Stemmer (2019) corroborate these findings adding that the effect of information-on-request treaties dissipates over time. Menkhoff and Miethe (2019) highlight that this cannot be explained by deposit shifting alone. Tax evaders might try to put their funds into "new disguises that circumvent regulatory requirements" as suggested by their evidence of no "transitioning into legality".

Against this background, the OECD pursued a more comprehensive coverage of tax information treaties through an automatic exchange of information (AEOI) system facilitated by the Common Reporting Standard (CRS). These efforts, together with the adoption of the Foreign Account Tax Compliance Act (FATCA) by the United States Congress in 2010, resulted in 119 jurisdictions being committed to the automatic exchange of information by 2022.[2] This significantly expanded the network of bilateral treaties considered in Johannesen and Zucman (2014). Since information is exchanged automatically, the threat of enforcement became more credible.

In this paper we use restricted data on deposits held in tax haven jurisdictions from the BIS locational banking statistics. These include the non-publicly available breakdown of the non-bank counterparty sector. It distinguishes deposits held by households from those held by non-bank financial institutions (NBFIs) and non-financial corporations (NFCs). Moreover, we use data on bilateral foreign direct investment and portfolio investment, which have gone unexplored by the related literature. We combine these with information on the timing of entering AEOI treaties to assess the impact of these latest efforts to reign in offshore tax evasion during the 2014-2019 period.

First, we investigate whether it is actually deposits by households which are affected by the

[1] See Slemrod (2015) for a more general overview of the economic literature on tax administration, compliance, and enforcement.

[2] https://www.oecd.org/tax/exchange-of-tax-information/crs-mcaa-signatories.pdf [accessed 23.11.2022].

treaties or if the deposits of other sectors also reacted. Hence, we can overcome a key limitation of the existing literature only based on deposits by the entire non-bank sector. Our data allow us to also investigate the response of its sub-components. These include non-bank financial corporations, non-financial corporations, governments and households. With this information at hand, we are able to go beyond existing studies which had to rely on assumptions on the share of household deposits (Ahrens & Bothner, 2020; Johannesen & Zucman, 2014; O'Reilly et al., 2019).

Second, we assess the longer-term effects of the AEOI. Menkhoff and Miethe (2019) find that the initial effect of the AEOI treaties is similar to earlier information-on-request treaties. Since their analysis only extends to the end of 2017 the authors note that they cannot assess the longer-term effects of the AEOIs "[...] due to their novelty and the resulting lack of observations". Ending their sample in 2017 as well, Casi, Spengel, and Stage (2020) and Ahrens and Bothner (2020) investigate the short-term effect of AEOIs and find that these reduced non-bank cross-border deposits in tax havens.

Third, this paper extends the literature by analysing the effect of AEOI treaties on other financial instruments beyond deposits. These are foreign direct investment and portfolio investment, which have gone unexplored by the related literature. Due to the complexity of the global financial system, the AEOI treaties may affect other segments of international investment positions apart from bank deposits. Volumes of cross-border investment vis-à-vis other countries are disproportionately high in tax havens, also in other components of the international investment position (Lane & Milesi-Ferretti, 2018). Moreover, anecdotal evidence suggests that tax evaders typically do not just park their wealth in tax havens in the form of bank deposits but also make use of shell companies and sham foundations to further invest these funds and obfuscate ownership. In a similar vein, Heckemeyer and Hemmerich (2020) find that portfolio investment positions between tax haven and OECD countries were reduced by bilateral information upon request treaties between 2001 and 2014.[3]

Our findings suggest that the broader coverage of bilateral treaties and the threat of automatic information exchange significantly reduced cross-border deposits by non-haven non-banks in tax havens. As a novelty to the literature we show that this is driven by households, while deposits of NBFIs and NFCs in tax havens were unaffected. The impact of AEOIs on household deposits uncovered in previous studies might therefore have been underestimated. We find that bilateral household deposits from non-haven countries in haven banks decrease by 28.5 percent upon signature of the AEOI legislation, while the effect on deposits by the broader non-bank sector is found to be only 12.5 percent, similar to the 11.5 percent effect found in Casi et al. (2020). Moreover, we do find the impact of the AEOI to be persistent, in contrast to results documented for earlier bilateral initiatives for information exchange on demand, as documented by Menkhoff and Miethe (2019) and O'Reilly et al. (2019). These findings highlight that AEOI agreements are effective at curbing tax evasion, since deposits related to transparent tax avoidance strategies should not react to the threat of information exchange (Menkhoff & Miethe, 2019).

[3]Such investment patterns may arise if funds held by non-haven residents in havens were subsequently reinvested in the non-haven country of residence.

Extending the analysis to portfolio and direct investment, we observe changes in investment patterns vis-à-vis tax havens which are consistent with a significant impact of AEOI treaties on these forms of cross-border investment. In particular, we document a significantly negative effect of AEOI on portfolio investment assets reported by tax havens residents vis-à-vis non-haven residents, in line with the results in Heckemeyer and Hemmerich (2020). Similarly, the FDI liability positions of non-havens vis-à-vis havens decline significantly after joining the AEOI. Moreover, we observe that non-havens report decreasing FDI assets in tax havens after joining the AEOI, suggesting that part of these assets were related to corporate structures with a tax-evading purpose.

However, we also find some evidence of negative side effects of the AEOI. The more granular breakdown of our banking data allows us to document evidence of deposit shifting by the household sector, in line with Johannesen and Zucman (2014) for earlier treaties.[4] This suggests that the AEOI is more effective than earlier initiatives in that it is more persistent, yet it remains incomplete as long as non-participating haven countries allow households to simply shift deposits.[5] Moreover, banks in haven countries report increasing deposits from NBFIs resident in other tax havens after AEoI introduction. While in theory the collection of AEoI information requires banks to look-through financial intermediaries (such as holding companies) to identify the ultimate beneficial owners of the assets, our results suggest that this might not always be the case in practise. We interpret this as evidence that networks of shell companies used to obfuscate ultimate beneficiaries of account holders might have become more elaborate, in line with conjectures by Noked and Marcone (2023). This is corroborated by the finding that signing up to the AEoI framework is associated with a positive effect on FDI assets between tax havens. Hence, future policy initiatives should be aimed at increasing transparency regarding ultimate ownership of investments by looking-through corporate structures.

In the remainder of the paper we present the policy initiatives in Section 2, data and some stylised facts in Section 3 and the econometric approach in Section 4. The results of the econometric analysis are presented and discussed in Section 5, before Section 6 concludes.

2 Institutional Background

2.1 Earlier Initiatives on Information Sharing

As pointed out by Christensen and Tirard (2016), information sharing treaties as in place nowadays have evolved from double-taxation agreements conceived to facilitate cross-border trade and investments.

The OECD has been central in developing the global information exchange framework. Its first contribution dates to 1963 where it adopted a modified version of an OEEC publication from 1955. Article 26 of the OECD model, calling for an exchange upon request, became

[4] As pointed out by Casi et al. (2020), a lack of high-quality data prohibits the analysis of the extent to which deposits were repatriated in response to AEOI treaties.

[5] Note that other relocation channels which might be used by individuals are not studied here. For example, there is evidence that real estate and artwork might be alternative assets to facilitate cross-border tax evasion Alstadsæter, Zucman, Planterose, and Økland (2022), Bomare and Herry (2022), De Simone, Lester, and Markle (2020).

the leading standard for international exchange of information on tax matters. Years later, in 1979, the Council for Europe and the OECD issued a "Multilateral Convention on Mutual Administrative Assistance in Tax Matters", which was then ratified in 1995 by the US, Denmark, Finland, Sweden, and Norway.[6] As time went by, financial globalisation accelerated and cross-border financial links became more entrenched, giving further incentives to advance on global taxation matters and for the exchange of information to fight international tax evasion.

The year 1998 saw the OECD publication entitled "Harmful tax competition: an emerging global issue" (OECD, 1998). This started a movement toward achieving greater global transparency in tax matters. Two years later, the OECD provided a minimum standard for exchange of information upon request through its publication "Improving access to bank information for tax purposes" (OECD, 2000). This was followed by a model of tax information exchange agreement (TIEA) in 2002 that eliminated the possibility to decline information sharing requests on the basis of "bank secrecy rules". In 2005, the EU's Savings Directive (and the related agreements with Switzerland and other countries) became effective. While the information exchange was automatic, it was limited in terms of country coverage and information type (only related to interest income). That year saw an important change by the OECD to Article 26, too. It makes information exchange as wide as possible by reducing the burden of proof needed to justify information requests or the spontaneous exchange.[7]

The global financial crisis and banking scandals led policy makers to put even more emphasis on the implementation of national and international tax transparency rules. This included a push to fight tax evasion in the form of households' undeclared foreign assets. The OECD and the EU, in particular, wanted to achieve a model for cross-country exchanges of information between tax authorities. In the OECD, a first agreement in 2009 covered the information exchange on request (EOIR).This took place in the year in which leaders' at the London G20 meeting issued "The era of bank secrecy is over" statement. The information exchange agreement was a major breakthrough towards more tax transparency as it became the international standard.

The US adopted its US Foreign Account Tax Compliance Act (FATCA) in 2010 and negotiated with other countries bilateral Intergovernmental Agreements (IGAs). These provide for a reciprocal exchange of information on the financial income earned by their residents in the partner country.In 2013, some countries that signed FATCA agreements with the US (Germany, Italy, Spain and the UK) announced their intention to exchange this information among themselves too. That year saw the endorsement of the automatic exchange on information system by G20 finance ministers.

In 2014, the Common Reporting Standard (CRS) on Automatic Exchange of Information (AEoI) was approved among the OECD countries and endorsed by the G20. Based on the US FACTA model, the CRS became the backbone of the automatic exchange of financial account information framework we study in this paper.

[6] See OECD (2011) for the (amended) text.

[7] For a more detailed overview of the evolution of international treaties on exchange of information in tax matters see Christensen and Tirard (2016).

2.2 The Common Reporting Standard (CRS)

The CRS defines a set of reporting and due diligence standards to be followed by financial institutions in participating countries. The goal is to limit tax payers' evasion opportunities through shifting assets to institutions or investing in products outside the model or by interposing legal entities to hide ownership.

To this end, the model focuses on "reportable" accounts held by individuals or entities. Financial institutions in the CRS framework are not confined to depository institutions. They also include custodial institutions, brokers, certain collective investment vehicles and insurance companies. Specified insurance companies that present low risk of being used for tax evasion are excepted. An important feature of the CRS is the requirement to look through passive entities, trusts and foundations to report on relevant controlling persons.

The information exchanged through the CRS system includes interests, dividends, account balances or values, income from certain insurance products, sales proceeds from financial assets and other income generated by assets held in the account or payments made with respect to the account.

Due diligence procedures performed by the financial institution may differ depending on the account being low or high value, as well as being pre-existing or new or held by an individual or an entity. For account identification the information gathered includes name, address, jurisdiction(s), tax identity number (TIN) and date of birth (in case of an individual) or each reportable person that is an account holder. This is also the case for the controlling person that are reportable persons of an entity account.

All pre-existing individual accounts are reviewed by the financial institutions, regardless of their value. For pre-existing low-value accounts, financial institutions need to run a permanent residence tests based on documentary evidence. If this is not possible, they should determine the residence based on indicia search. For cases where this procedure yields conflicting information, a self certification is required. If this is not possible, information is reported to all reportable jurisdictions for which indicia was found. When the value of the pre-existing individual account is high, an enhanced set of due diligence procedures apply. These include a paper record search and actual knowledge test by relationship manager. When the account is new, CRS requires a self certification for all accounts, regardless of their value. This means that new accounts are subject to more stringent due diligence procedures than pre-existing accounts, making it more risky for tax evaders to respond to the threat of detection by opening new accounts.

The treatment of entity accounts is slightly different. Here a minimum threshold (usually of USD 250,000 or its local currency equivalent) to determine if the account is reportable or not can be applied. For these, financial institutions need to determine whether the entity itself is a reportable person. This may also require requesting a self certification to the controlling person. Financial institutions need to determine if the entity is a passive non-financial entity, too. If this is the case, the residence of the controlling persons through indicia search or self certification is recorded. Self certification for new accounts is required and a minimum threshold to be considered reportable account does not apply.

3 Data and Stylised facts

The AEoI commits the participating countries' authorities to collect information from their financial institutions on foreign residents' accounts and exchange this information automatically with the relevant participating countries on an annual basis.

Our dataset on AEoIs is based on the date each country joined the OECD initiative. For a group of 56 early adopter countries, the starting date is October 2014, while for individual countries that joined later we use the date when the respective national legislation was adopted (or when an official public commitment was made). Hence, we use the date individual countries sign the Multilateral Competent Authority Agreement (MCAA), thereby committing to introduce the CRS into national law.[8] The (perceived) threat of being discovered by national tax authorities once the CRS becomes effective should motivate individuals to remove funds (or further obfuscate their ownership) from tax havens after these countries commit to the exchange of information and before it actually becomes effective.

Figure 1 shows the number of country pairs included in our BIS LBS dataset becoming covered by an AEoI treaty in a given quarter. While the bulk of new AEoI relationships was formed at the end of 2014, i.e. when the early adopters announced their participation, there is still considerable time variation during our sample period.

As of the announcement date, automatic exchange of information was theoretically possible with all other countries that had already joined the initiative. Hence, this possibility should trigger residents of AEoI countries with undeclared assets in the AEoI country to immediately withdraw these assets. In the same way, we use the signature dates for bilateral agreement of the United States related to the FATCA IGA. While the first bilateral treaties under FATCA where signed before the start of our sample period in 2014Q1, e.g. with Switzerland in 2013Q1, 13 of the tax havens in our sample signed bilateral treaties to automatically exchange information with the US during our sample period. For example, the Bahamas signed a treaty in 2014Q3. This means that while some of the effect of FATCA will be absorbed by the country-pair fixed effects for treaties signed before the start of our sample period, the effect of FATCA agreements signed after 2014 will still be captured by our setup. In robustness checks, we exclude the US as a saver country – and therefore all FATCA agreements – from our sample and show that this does not materially affect our estimates of the effect of AEoI.

3.1 Offshore Investment

Our data source for cross-border deposits is the restricted version of the BIS Locational Banking Statistics (LBS) which detail the deposit liabilities of banks resident in 44 reporting countries vis-à-vis non-bank counterparties located in over 200 countries. The data on these positions are collected according to national accounts and balance of payments principles. Hence, the compilation is based on the residence of entities and the data are not consolidated at the banking group level. In 2015, the BIS started to report a more detailed breakdown of cross-

[8] See Table A.2 in the appendix for the corresponding year-quarters for the tax haven countries in our sample.

border positions by counterparty sector.[9]

These data, available quarterly from 2014 onward for most reporting countries, provide a more granular breakdown of the non-bank counterparty sector into non-bank financial institutions and non-financial counterparties. The latter include non-financial corporations, households and governments.[10] In this context, it is important to note that the BIS data identify households as counterparts only if they own financial instruments (mainly deposits) directly. If, on the other hand, other asset holding institutions (such as holdings companies, trusts or special purpose entities/shell companies) – which might be ultimately owned/controlled by households – are the direct holders of deposits, such deposits would not be attributed to the household sector in the dataset, but to the NBFI sector.[11]

The BIS LBS also breaks down banks' positions by financial instrument. For our purposes, liabilities in the form of deposits are primarily of interest. The detailed breakdown by counterparty sector and instrument is only available in the restricted version of the LBS that reporting central banks have access to.[12]

To distinguish tax haven countries from non-havens we use the list of tax havens in Johannesen and Zucman (2014) who include countries which have either strict bank secrecy laws, legal provisions restricting the access to bank information for tax purposes, or not having treaties for the exchange of information at all. The full list of tax havens can be found in appendix A. Since these criteria are not stable across time and the appropriate list of tax haven countries is subject to debate, we test the robustness of our results using an alternative list employed by Casi et al. (2020).

For our purposes, 8 out of 19 tax havens covered by the definition of Johannesen and Zucman (2014) are of particular interest. This is because they include a detailed sectoral breakdown of their banks' liabilities in the BIS LBS.

As regards other financial instruments, i.e. bilateral foreign direct investment and portfolio investment, we employ the International Monetary Fund's Coordinated Direct Investment Survey (CDIS) and Coordinated Portfolio Investment Survey (CPIS), respectively. These data are available for a wider set of countries than the BIS LBS. The full list of countries can be found in Table A.2 in the appendix. Out of the more than 40 US dollar (USD) trillion in total bilateral portfolio investment asset positions recorded in the CPIS at mid-2014, almost 40 per cent involved a tax haven as one of the counterparties. For equity investment, the share even reached around 45 per cent. Tax havens are also major counterparties in international direct

[9] See Avdjiev, McGuire, and Wooldridge (2015) and Luna and Hardy (2019) for details on the enhanced breakdown.

[10] The household sector refers collectively to households and non-profit institutions serving households (NPISH). NPISH consist of non-profit institutions which are not mainly financed and controlled by governments and which provide goods or services to households for free or at prices that are not economically significant. Examples include churches and religious societies, sports and other clubs, trade unions and political parties.

[11] The BIS LBS as such does not reveal the purpose of holding deposits in tax havens, which could be driven by tax evasion, tax avoidance or other considerations unrelated to taxes.

[12] One caveat is that the restricted version of the LBS available to reporting central banks might provide only partial coverage for some country pairs in case of confidentiality of certain observations which would only be visible to the BIS. This concern is alleviated by the fact that reporting countries considered as tax havens in the literature do typically not make use of this additional layer of confidentiality, according to information kindly provided by the BIS.

investment, being involved in 46 percent of global bilateral asset and more than 50 percent of global bilateral liability positions in 2014, which amounted to close to 28 USD trillion that year, according to the CDIS.

3.2 Tax Treaties and Offshore Deposits

In this section we provide some graphical evidence on the evolution of cross-border deposits by non-bank investors held in non-havens and havens as defined by Johannesen and Zucman (2014). Figure 2 shows the evolution of aggregate deposit liabilities of banks located in tax haven countries vis-à-vis non-banks abroad. Since the onset of the global financial crisis these have decreased significantly, from 2.9 trillion USD in 2008 to 1.6 trillion USD in 2019. Conversely, cross-border deposits in non-haven countries recovered swiftly after the global financial crisis and increased markedly, subsequently reaching 6.2 trillion in 2019 USD and thereby surpassing their pre-crisis peak of 4.8 trillion USD recorded in 2008. Focusing on the deposits held by non-haven residents during our sample period from 2014Q1 to 2019Q4, non-bank deposits in havens amounted to 1.2 trillion USD on average. By comparison, non-haven resident non-banks held on average 3.1 trillion USD in other non-haven countries during this period. The share of household deposits in total non-bank deposits of 34.7% reported above implies that non-haven resident households held approximately 416 billion USD in tax havens during the period we study.

Using data on bilateral deposits, Figure 3 shows the evolution of non-haven deposits in haven and non-haven countries centered around the specific date the possibility of AEoI between a country pair was announced. While there was a clear parallel trend before joining the AEoI, deposits in haven countries from non-haven residents began falling around the time both countries signed up for the AEoI framework. There is some evidence of anticipatory effects as the trends began to diverge approximately one year prior to joining the AEoI. Therefore, we confirm that our regression results are robust to accounting for potential anticipation effects by including lagged joining dates in the main regressions to check for pre-trends (in Section 5.4).[13]

The substantial extent to which deposits have been withdrawn from tax haven countries by savers in non-havens between 2014 and 2018 can be grasped from Figure 4. While the average decrease in deposits in tax havens held by non-haven residents was 24 percent, this masks some heterogeneity across havens. Deposits held in the Cayman Islands and the Bahamas decreased by more than 70 percent, while they increased by 50 and 24 percent in Hong Kong and Malaysia, respectively, and decreased only modestly in Bahrain (-6.3 percent) or Panama (-3.2 percent).

In summary, the graphical evidence suggests that the (threat of) automatic exchange of information coincided with a reduction of deposits by non-banks in tax havens. However, aggregate data on cross-border deposits alone cannot distinguish between tax evasion and avoidance, since the tax filings of the deposit holders remain unobserved. Given that clearly

[13]These anticipation effects do not seem to be driven by haven countries joining the AEoI framework after the early adopters in 2014 as shown in Figure A.1 in the appendix.

not all cross-border financial activities of countries categorised as tax havens are related to illegal tax evasion, it is important to run more rigorous econometric tests to establish the effect of the threat of AEoI on cross-border deposits in tax havens. Since deposits and other forms of investment driven by transparent and legal tax avoidance strategies, for example, should not react to the threat of information exchange (Menkhoff & Miethe, 2019), our panel regression analysis fully exploiting the bilateral nature of our dataset focuses on detecting those deposits and other forms of investment which are likely driven by tax evasion considerations.

3.3 The sector breakdown of deposits

In constrast to the previous literature which had to rely on analysing aggregate non-bank sector deposits, our paper draws on a more detailed sectoral breakdown. More precisely, the non-bank counterparty sector is broken down into non-bank financial institutions (NBFIs) and non-financial counterparties. The latter include non-financial corporations (NFCs), households and governments.

The breakdown reveals that the share of foreign households in banks' total cross-border liabilities vis-à-vis the non-bank sector was around 35 percent in those haven countries.[14] This number refers to the last quarter before the respective haven reporting country joined the AEoI framework during our sample period 2014Q1 and 2019Q4 (Figure 5). Being able to access these detailed data allows us to show that the share of households is considerably higher for tax havens than for the 12 non-haven countries which report the detailed sector breakdown. In those countries, cross-border liabilities vis-à-vis households account for only 10 percent. Moreover, the data reveal that the household share in the deposits reported by haven countries is lower than the minimum ad-hoc share of 50 percent reported in previous studies such as Johannesen and Zucman (2014). Liabilities vis-à-vis NBFIs account for 37 percent in tax havens, considerably lower than 55 percent in non-havens, while liabilities vis-à-vis NFCs are about similarly important in both groups of countries, at close to 30 percent.[15]

Using these data, we can study the effect of AEoI treaties across the various sub-sectors which can yield important new insights into the effectiveness of these policy initiatives. In principle, we expect deposits directly held by households to decrease because information on the owner of such an account has to be reported by the bank in which the account is maintained.

However, the effect on deposits held by any private entities classified under FATCA and CRS as "financial institutions" ("FIs") are less clear since they are less likely to report their ultimate beneficial owners as posited by Noked (2018) and Noked and Marcone (2023). In principle, these entities are required to report their beneficial owners. However, according to Noked (2018), it "[...] is unlikely that this entity will report its owner to the tax authorities where a tax evader holds financial assets through a private entity that he or she owns and manages." At the same time, banks and other FIs that maintain the financial accounts of such entities are not required to report these entities' beneficial owners. Therefore, tax evaders

[14] The non-bank sector accounts for about half of total cross-border liabilities of reporting banks resident in tax havens.

[15] Liabilities vis-à-vis the general government sector are negligible in both groups of countries and not of interest in the rest of our analysis.

could simply hold financial assets through private entities classified as FIs in order to avoid reporting.[16]

As shown by Sharman (2010), setting up anonymous shell companies with corporate bank accounts might not be easy given "know your customer" requirements for financial institutions, but still possible in many cases.[17] Deposits by such FIs, such as holdings companies, trusts or special purpose entities/shell companies be attributed to the to the NBFI sector in our dataset. Hence, the effect of AEoI on deposits by this counterparty sector are unclear a priori and this paper is the first one providing some evidence in this regard.[18]

Finally, in the BIS LBS the NFC sector comprises entities for which the production of market goods or non-financial services is the *principal* activity. Since it is unlikely that a substantial fraction of tax evaders can set up an entity with such production activities we do not expect an effect of AEoI on deposits held by the NFC sector even when the beneficial owner is correctly identified and reported to the tax authorities.

4 Empirical Strategy

4.1 Estimation Strategy for Deposits

Our goal is to test whether entering a bilateral automatic exchange relationship had a statistically significant impact on cross-border positions held in tax haven countries. To this end, we build on Johannesen and Zucman (2014) and estimate the following regression specification

$$ln(Dep_{ijt}) = \alpha + \beta * Sig_{ijt} + \gamma_{ij} + \theta_{jt} + \phi_i + \epsilon_{ijt}, \tag{1}$$

where Dep_{ijt} is the *log* of deposits in reporting country i from counterparty (or "saver") country j. Sig_{ijt} is a dummy variable equal to one from quarter t in which both countries of a given country pair entered a bilateral exchange relationship (see Section 2 for further details).

[16] For example, there are more than 84,000 registered financial institutions in the Cayman Islands https://www.finance.senate.gov/chairmans-news/wyden-investigation-uncovers-major-loophole-in-offshore-account-reporting.

[17] The case of Harald Joachim von der Goltz, a U.S. taxpayer who was sentenced to prison in September 2020 in the wake of the Panama Papers Investigation serves as a prime example. "[...] von der Goltz evaded his tax reporting obligations by setting up a series of shell companies and bank accounts, and hiding his beneficial ownership of the shell companies and bank accounts from the IRS. These shell companies and bank accounts made investments totaling tens of millions of dollars. [...] von der Goltz engaged the services of Mossack Fonseca [...] to create a sham foundation and shell companies formed under the laws of Panama and the British Virgin Islands to conceal from the IRS and others the ownership by von der Goltz of accounts established at overseas banks, as well as the income generated in those accounts." Von der Goltz [...] also falsely claimed that von der Goltz's elderly mother was the sole beneficial owner of the shell companies and bank accounts at issue because, at all relevant times, she was a Guatemalan citizen and resident, and — unlike von der Goltz — was not a U.S. taxpayer." https://www.justice.gov/opa/pr/us-taxpayer-panama-papers-investigation-sentenced-prison [accessed 16.08.2021]

[18] According to Noked and Marcone (2023) the following steps are required to circumvent CRS reporting: "1) Establish a shell company in a CRS partner jurisdiction (even those in well-known tax haven jurisdictions such as Bermuda or the British Virgin Islands). 2) Fill out form 8957 with the IRS to register the shell company as an FI and obtain a GIIN. 3) You may register the shell company as an FI in its jurisdiction. However, even if this registration is not done, it is unlikely that this will be detected without an investigation by the relevant jurisdiction. 4) Open an account at a bank in Switzerland or another CRS partner jurisdiction in the name of the shell company now registered as an FI. 5) Use the account held by the "shell bank" to receive, hold and transfer any financial assets without CRS reporting by the bank."

Country pair, reporting country, and saver country time fixed effects are denoted by γ_{ij}, ϕ_i, and θ_{jt}, respectively. Pair fixed effects control for time-invariant factors like distance and common language, while saver country time fixed effects control for unobserved developments specific to saver countries. More specifically, the inclusion of saver-country-time fixed effects means that we compare for the same saver country in the same quarter deposits in havens that joined the AEoI, with havens that did not join the AEoI. Hence, we control for all factors in saver countries that might drive supply of deposits in tax havens more generally. For example, non-haven saver countries have started various domestic amnesties and voluntary disclosure programs during the period studied which could drive part of the reduction in cross-border deposits in haven countries depicted in Figure 2 (Menkhoff & Miethe, 2019).[19] Standard errors are robust to autocorrelation and heteroscedasticity and clustered at the country-pair level as in related literature. We use this empirical setup in all regressions and outline any changes to the specification in the text.[20]

We start our analysis in the first quarter of 2014, the time period from which the granular breakdown of the non-bank sector becomes available in the BIS LBS data. While O'Reilly et al. (2019) run their analysis for the broader non-bank sector since 2009 and also explicitly estimate the impact of IoR treaties, we control for the impact of previous treaties with the pair fixed effects γ_{ij}. Having said this, the effect of these treaties dissipated from 2010 onward as shown by Menkhoff and Miethe (2019) and O'Reilly et al. (2019).

The coefficient of interest in all our estimations is β. We expect β to be statistically different from zero and negative for deposits in tax havens from non-banks resident in non-haven countries. Since the information exchanged refers to individual account holders, we expect the effect of AEoI to be mainly present for household deposits. Interbank deposits should not be affected (Menkhoff & Miethe, 2019), while those from NFCs and NBFIs could be affected negatively if they are related to tax evasion strategies through shell corporations, in particular if authorities are aware of the ultimate beneficiaries of the accounts. However, if evaders manage to successfully obfuscate their ownership these types of deposits might not be affected or may even increase after AEoI introduction.[21]

4.2 Estimation Strategy for portfolio investment and FDI

We extend the analysis of the effect of AEoI to cross-border portfolio equity and foreign direct investment (FDI) positions. Hence, Dep_{ijt} represents the log of portfolio and direct investment between country i and j, respectively in these estimations.

[19] Note that the effect of these programs is somewhat ambiguous since they might also increase tax evasion in certain cases, as found for voluntary disclosure by Langenmayr (2017) or decrease the number of undisclosed offshore accounts as documented for US enforcement efforts by Johannesen, Langetieg, Reck, Risch, and Slemrod (2020). Additional examples of relevant policy initiatives by important saver countries would be the US Tax Cuts and Jobs Act (TCJA) which became effective in January 2018, as well as the sixth amendment to the EU directive on administrative cooperation and the fifth amendment to the EU anti-money laundering directive which became effective in June 2018.

[20] Note that this empirical framework differs from the case study design employed by Casi et al. (2020). We show that our results are robust to using the alternative specification in Appendix B.

[21] NFC and NBFI deposits would also not be affected in case they are not related to tax evasion purposes, of course.

While the impact of bilateral automatic exchange relationship on cross-border deposits is of a first-order nature, it is conceivable that the AEoI also has effects – even if of a more indirect nature – on other components of international financial positions. These effects may be partly linked to signalling effects showing that the involved haven country is ready to fight tax avoidance in a broader sense. In addition, despite the complexity of the international financial system and the imperfect data to fully grasp the various actors behind cross-border linkages, our analysis may reveal some patterns for bilateral cross-border positions after joining the AEoI framework which are consistent with a significant impact of the AEoI in terms of decreasing the extent of tax evasion schemes or diverting funds to other jurisdictions.

Since bilateral data on these alternative forms of bilateral investment positions are available at semi-annual and annual frequency only, respectively, we collapse Sig_{ijt} to the respective frequency. In order to still be able to compare investment positions in tax havens and non-havens before and after joining the AEoI framework, we start our sample period in 2014H1 for portfolio investment and in 2013 for FDI.

4.2.1 Portfolio Investment

Our empirical strategy for bilateral portfolio investment patterns focuses on outward portfolio investment by entities resident in haven countries to uncover the bilateral effects of AEoI between countries i and j. Our specification isolates the effect on the bilateral investment between these two countries (in line with Heckemeyer and Hemmerich (2020)).

In particular, we expect β to be negative and significant for portfolio investment assets reported by tax havens vis-à-vis non-havens, due to the fact that cross-border investments by tax haven entities are usually carried out on behalf of foreign (non-haven) residents. Non-haven residents might not just park their money in deposit accounts in banks resident in haven countries in order to earn interest rate income at the local deposit rate. Additional capital income might be sought by investing funds linked to the bank account in an investment fund or a special purpose entity (SPE)/financial holding company which might or might not reside in the same haven country. These entities (in particular in the case of SPEs/holding companies), could even be owned by non-haven residents, which if recorded properly would be a non-haven FDI asset in the haven country (see Section 4.2.2).

The cross-border portfolio investment position by such tax haven entities is recorded in CPIS as outward portfolio investment of the tax haven. To the extent that these investments reflect intermediated savings from non-haven residents it is very plausible that the investments are biased towards the home market of the underlying (non-haven) investor. In fact, Beck et al. (2023) show such biases towards domestic securities within the euro area for investments channelled via investment funds based in Ireland and Luxembourg.

It is important to keep in mind that under AEoI the reporting obligations regarding account holders are on the financial institutions in whose custody accounts securities are held and not necessarily the investing firms (e.g. investment funds), as detailed in Section 2.2. While the CPIS data employed in our analysis records the investments of, e.g., an investment fund resident in Switzerland made on behalf of underlying German investors in German securities

(as investment by Switzerland in Germany), the financial institution (custodian) through which the Swiss investment fund holds the securities could in principle be resident in another country (e.g. in the Philippines).[22] If this other country does not participate in the AEoI, the German tax resident might be less afraid of being detected by German tax authorities and might, hence, not discontinue the investment scheme via Switzerland. In such a setup one might not expect to find a significant coefficient on β as the AEoI between Switzerland and Germany would not matter for German tax residents. However, it is more likely that German ultimate owners hold shares (via Swiss investment funds) in custody in a Swiss bank (Zucman, 2013).

It could, however, also be the case that a financial institution such as a holding company resident in a tax haven holds deposits and other financial assets on behalf of the non-haven resident. In that case this financial institution would be responsible for submitting information on the accounts to the relevant tax authorities and not the bank at which the deposits are kept (Noked & Marcone, 2023). Faced with the prospect of AEoI between the haven country in which the financial institution managing her financial assets resides and her country of residence, the non-haven resident using such a scheme may want to discontinue it. This could be due to fear of being detected as a tax evader in case the financial institution reports information on the ownership of the assets. As argued by Noked and Marcone (2023) the financial institution might simply not comply with the AEoI in case it is owned by the non-resident and investigating each case might be challenging for authorities given the vast number of financial institutions resident in haven countries. However, by committing to AEoI in the first place the tax haven country might signal that tax avoidance using this particular haven country may become more difficult in the future.

Taken together, we expect the the investment by the haven country in the non-haven country (i.e. the home country of the underlying investor) to decline, showing a negative β in our estimation, in line with De Simone et al. (2020), Hanlon, Maydew, and Thornock (2015), Heckemeyer and Hemmerich (2020).

4.2.2 Foreign direct investment

FDI positions in and out of tax havens have grown substantially in past decades which can be mainly linked to the corporate structures of multinational enterprises (Lane & Milesi-Ferretti, 2018) and their profit-shifting activities (Tørsløv, Wier, & Zucman, 2023). Less attention has been devoted however to the question on the extent to which FDI positions vis-à-vis tax havens may reflect tax evasion activities. To explore this question, we consider bilateral FDI asset and liability positions between havens and non-havens, as well as among havens.

There are various channels through which joining the AEoI framework could affect FDI between haven and non-haven countries.

First, a non-haven resident could have set up an SPE/holding company in a haven country. Upon both countries joining the AEoI framework, the non-haven resident may decide to close down such an entity as it becomes less suited for tax evasion purposes as details about the ultimate owner (because of the controlling ownership characteristic) should be collected by the

[22] The Philippines are FATCA compliant but not committed to the CRS.

tax haven and potentially exchanged by the authorities. Of course, this will only be visible in FDI data if such entities and the ownership links are recorded properly.

Second, following the reasoning for portfolio investment, we test if FDI assets reported by havens vis-à-vis non-havens – and the mirror statistics, namely FDI liabilities reported by non-havens vis-à-vis havens – react to joining the AEoI framework. If FDI assets of a haven country are partly due to SPEs or holding companies owned by non-haven residents, these assets may be partly invested in the home countries of the non-haven. Hence, we would expect reduced bilateral investment from a haven in the respective non-haven country once the AEoI between the two comes into force, as the non-haven investor may become afraid of being caught and close down the haven entity.[23]

Third, if FDI investments between haven countries were related to the setting up of sham corporations, which continue to successfully hide the true owner as haven countries may not exchange information among themselves even upon both entering the AEoI, there might be no or even a positive effect on these bilateral FDI positions.

5 Findings

In this section we present the results of our econometric analysis. We start by detailing the estimated effects of AEoI on bank deposits, the most widely looked-at measure in the literature. We extend the existing literature by providing results for the full sectoral breakdown of bilateral deposit data available in the restricted version of the BIS LBS. Subsequently, we complement our results for bank deposits by presenting estimates of the effect of AEoI on other forms of investment channelled through tax havens, i.e. portfolio and direct investment and show that our results are robust to various alternative specifications.

5.1 Deposits

5.1.1 Deposits by non-banks

To establish comparability with estimates in the literature, we start by showing the results for non-bank deposits (Table 1). Column 1 reveals that deposits in haven countries decrease after a country pair has joined the AEoI framework.[24] In column 2 we restrict the sample to country pairs that include only non-haven saver countries.[25] This leads to a larger coefficient, highlighting that AEoI treaties induce non-banks to reduce their deposits in haven countries. On average, the signature of an AEoI treaty reduces non-bank deposits by 12.5 per cent.[26] This is similar in magnitude to the effect of information on demand treaties estimated by Johannesen and Zucman (2014) who found that non-bank deposits decrease by 11 per cent.

[23] Such investments can be in the form of listed shares, unlisted shares and investment fund shares which are all in the scope of FDI if they exceed the 10% ownership threshold in the destination company or fund.

[24] We focus on AEoI commencements, rather than announcement dates. Casi et al. (2020) and O'Reilly et al. (2019) find the former to have a larger and more significant impact.

[25] Note that we do not restrict the non-haven sample to OECD and EU countries only like in Casi et al. (2020), as tax evasion and illicit capital flows to offshore havens are also prevalent in other countries (Andersen, Johannesen, & Rijkers, 2021).

[26] $exp(-0.134) - 1 = -0.125$.

Casi et al. (2020) find that the "CRS induced a reduction of 11.9 per cent in cross-border deposits parked in traditional offshore countries". Moreover, we find that non-bank deposits between haven countries (column 3) and those from haven countries in non-havens (column 4) are not affected by the signature of AEoI treaties, as expected.

Finally, column 5 sheds light on the timing of the response to AEoI signature. Following Johannesen and Zucman (2014) we include a dummy equal to one in the quarter t of the announcement of a country pair becoming subject to AEoI (contemp.), dummies equalling one in quarter (q) + 1, q + 2, and q + 3 respectively, and a dummy equal to one in all quarters after q + 3. This allows for the fact that AEoI treaties may not enter into force immediately after a country commits to signing it into national law and provides an estimate of the longer-term effect of AEoI treaties.[27] We find that the strongest quarterly impact occurs immediately after the announcement, while the effect seems to dissipate somewhat over time, as found in Menkhoff and Miethe (2019), while remaining significantly negative.

5.1.2 Deposits by sub-sectors

To gain deeper insights on the effect of AEoI treaties we make use of the restricted version of the bilateral BIS data, which provides a breakdown of the non-bank sector into sub-sectors.

Table 2 shows the estimation results for deposits by households. For comparability reasons column 1 reports a re-estimated coefficient for non-bank deposits taking the smaller sample of country pairs that include the household sector breakdown. The estimate is similar to the one reported in column 2 of Table 1, albeit slightly larger.

Column 3 of Table 2 highlights that households reduced their deposits in haven countries particularly strongly. Our estimates show that this contraction equals to 28.5 per cent. A reduction in household deposits of this proportion would imply that non-haven households withdrew approximately 70 USD billion from our sample of haven countries.[28] Applying the share of household deposits revealed by haven countries reporting the detailed sector breakdown to non-bank deposits in all tax havens reporting BIS LBS data during our sample period we can extrapolate our estimate to the approximately 416 USD billion in deposits that non-haven households held in tax havens. This implies that non-haven households withdrew approximately 119 USD billion in deposits from tax havens. This is larger than what is obtained when using the Johannesen and Zucman (2014) approximation. The latter relies on multiplying the non-bank deposits estimate by two. This is equivalent to assuming that 50 per cent of all non-bank deposits in tax havens belong to households. In addition, column 6 shows that the effect of the AEoI on deposits from households is very persistent. Moreover, it even becomes stronger over time, as confirmed by our alternative specification replicating the case study design of Casi et al. (2020), presented in Figure B.1.

As noted by Menkhoff and Miethe (2019) such estimates can be considered lower bounds of the effect of the AEoI because of the limited, albeit representative, sample of tax havens

[27] Comparing signature dates to the dates of CRS introduction into national law published by Casi et al. (2020), the average gap between committing to the CRS and introducing it into national law is 4 quarters.

[28] We estimate this by applying this share to the 245 USD billion in deposits that non-haven households held in reporting havens in our sample prior to the latter joining the AEoI.

reporting BIS LBS data, as well as the fact that wealth stored in financial institutions other than banks is not considered.

As expected, we do not find a significant effect of AEoI signatures on household deposits reported by tax havens vis-à-vis other tax haven residents (column 4), but perhaps surprisingly there is a significant negative coefficient for haven resident household deposits held in non-haven banks (column 5). This may imply that tax haven resident entities had deposited funds in non-haven banks, including funds of residents of non-havens, but disguised as those of tax haven residents. This finding is also consistent with the reaction to IoR treaties which Menkhoff and Miethe (2019) found for deposits from non-banks resident in tax havens to non-haven banks.[29]

The fact that we document a decline in these deposits for the household sector only implies, on the one hand, that funds by non-haven residents posing as (or using) haven residents became vulnerable to detection by the AEoI treaties and were withdrawn in response. On the other hand, since, as we document below, we do not find a similar effect for haven deposits in non-havens from NBFIs or NFCs, the threat of detection might not have been as large for shell companies or trusts.

Table 3 repeats the exercise for deposits of non-bank financial institutions. Deposits in haven countries from such companies which are resident in non-haven countries are not affected by the AEoI treaties, as evident from columns 1 and 2. However, column 3 shows that deposits in haven countries from non-bank financial institutions in other haven countries increase significantly when both countries are part of the AEoI.

This points to the possibility that networks of shell companies in haven countries became more elaborate after haven countries joined the AEoI. In turn, this might make it more difficult for tax authorities in non-haven countries to identify the ultimate owner of deposits due to the complex corporate structures employed.

As posited by Menkhoff and Miethe (2019) shell companies with beneficial owners related to the real owner are an example of such structures. The real owner would retain an element of control. Such a construction would help to circumvent AEoI treaties as the true identity of the ultimate owner of deposits would not be revealed to the tax haven resident banks and can thus not be submitted to tax authorities in the relevant non-haven countries. The recent revelation from the "Shell Bank" loophole constituting the largest alleged individual tax evasion scheme in US history is another striking example of how such structures could be used to circumvent the reporting duty under FATCA or CRS.[30] Along these lines, Noked (2018) also highlights the potential misuse of closely-held private companies and family trusts to transform third-party reporting in self reporting entities. His contribution is in line with our finding above and very

[29]The authors argue that "the ownership structure of shell companies, private foundations, and trusts, as well as the connected bank accounts, is theoretically vulnerable to detection if, for example, the tax evader is documented as a beneficial owner. Thus, while single deposits cannot be followed through the tax haven cloud, the analysis of inbound deposits provides a second angle for tax authorities in home countries to tackle tax evasion. They can take the occurrence of such inbound deposits to investigate their ownership and look for evidence of illegal behavior." (Menkhoff & Miethe, 2019, p. 54)

[30]The "Shell Bank" loophole in FATCA was exploited by billionaire Robert Brockman and his associates. It involved the conversion their shell corporations into IRS approved financial institutions that could self certify to the IRS reporting of their offshore accounts. This loophole allowed offshore banks to accept funds for U.S persons without reporting them to the IRS. For further details see https://www.finance.senate.gov/imo/media/doc/Mirabaud%20Report.pdf

relevant for this literature as they provide the first indirect evidence of the use of this channel to avoid the CRS reporting duty.

Table 4 shows that deposits by non-financial corporations are not affected by the AEoI framework, which highlights once more the importance of looking at the data for deposits by households directly. As expected, no significant results are found for deposits by banks (Table 5), as interbank deposits do not play a role in personal income tax evasion (Johannesen & Zucman, 2014).

5.1.3 Deposit shifting

The importance of using the granular breakdown of deposit data is further underlined when we turn to an analysis of deposit shifting. Table 6 takes into account potential deposit shifting behavior by tax evaders in non-haven countries, following Johannesen and Zucman (2014). We introduce in columns 1–4 a treaty coverage variable that simply counts the number of treaties signed by saver country j with all havens other than reporting haven country i. A positive and significant coefficient on this variable would indicate that an additional AEoI treaty with another haven country increases the deposits held by saver country j's residents in tax haven i, as noted and found by Johannesen and Zucman (2014) in the case of information-on-request treaties. Notably we need to drop the time-varying saver country fixed effects due to their collinearity with the treaty coverage variable in this specification.

The fact that we do not find a significant effect of the AEoI treaties for non-bank deposits in Table 6 (column 2) might suggest that deposit shifting did not occur for these new forms of information exchange. However, making use of the more granular breakdown of deposits, we find evidence that deposit shifting by households indeed took place. Column 4 suggests that such shifting occurs to the benefit of havens which did not sign up to the AEoI framework (yet). For example, an additional treaty signed by Germany generates an increase of 3.1 percent in deposits from households resident in Germany in a haven that did not sign up to AEoI, according to our estimates. By contrast, the havens for which an automatic exchange of information with Germany is in place see deposits reduced by a further 1.7 percent. These results are robust to using a measure of treaty coverage which weighs treaties according to their importance.[31] As column 8 shows, this measure of treaty coverage yields similar results to those obtained with the count measure.

The fact that we document deposit shifting in the data implies that the reduction of deposits in tax havens through AEoI estimated in the existing literature might be too large. Indeed, a complete reallocation of deposits to non-signing havens would be consistent with the evidence as, like in other papers in the literature, the estimates are based on a comparison of deposits by non-haven residents in havens that signed up for AEoI to those that did not sign up (yet) in a given quarter.

[31] Following Johannesen and Zucman (2014), we compute the share of j's deposits in tax havens deposited in i at the beginning of our sample, i.e. in 2014Q1. These shares "measure the relative importance of haven i to tax evaders of country j and are exogenous to recent policy developments" (Johannesen & Zucman, 2014, p. 81). For each haven-non-haven pair (i, j), we use the shares to weigh each treaty concluded by j with havens other than j.

In column 8 of Table 6, the "Signed" variable appears in three places, hence all three coefficients need to be accounted for when computing the total effect of entering an additional treaty on bilateral deposits. Assuming that treaty coverage = 0.28 (which is the mean share of non-haven countries' bilateral deposits covered by AEoI treaties during our sample period) the total coefficient on Signed is -0.213.[32] The estimated coefficients imply that the effect of signing an additional treaty increases in the share of bilateral deposits of non-havens that are already covered by AEoI. Hence, our results suggest that casting a wider net of AEoI will make the policy more effective.

However, the fact that deposits can be shifted to non-participating havens means that the overall estimate of the effect of AEoI signature also includes an increase in deposits in those havens which do not sign up for AEoI in addition to the reduction of deposits in havens that sign up. If we were to set (1-Signed) to 0, i.e. assume that there is no deposit shifting because all havens signed up for AEoI, we would get an estimate of -0.149 for signed, i.e. roughly half of our estimate obtained in Table 2. This means that the reduction in deposits in tax havens in response to AEoI signatures might be around 14 percent whereas deposits in non-participating havens increase by 7.6 percent.[33]

The fact that an additional treaty with other havens increases the effect of the bilateral signature of an AEoI type treaty indicates that the wider the web cast by this latest effort to curb international tax evasion, the more effective the measure becomes. However, our results also imply that households reacted to AEoI in a similar manner documented by Johannesen and Zucman (2014) in that they shifted deposits to non-participating havens. As no evidence of deposit shifting is found in the sample for non-bank deposits, which is available for a larger group of countries, this highlights the importance of using granular data to evaluate the effects of AEoI. However, since the household breakdown is not available for the full sample of countries we cannot draw strong conclusions regarding the presence of deposit shifting in the wider sample of countries. Policymakers should, hence, encourage making more granular data available for research purposes.

5.2 Portfolio Investment

We proceed with the analysis for portfolio equity assets (presented in Table 7). Consistent with the mechanisms outlined in Section 4.2.1 the results show a significantly negative coefficient for joining AEoI treaties on bilateral portfolio investment assets reported by tax haven residents vis-à-vis non-haven residents (column 2), which also drives the results in column 1 (bilateral portfolio investment assets reported by tax haven residents vis-à-vis all countries). Encouragingly and supporting our hypothesis, there are no significant coefficients for the other country pairs considered (haven vis-à-vis haven (column 3) and non-haven vis-à-vis haven (column 4).

Thus, even though we cannot be sure which of the underlying channels and schemes are driving our results, we find that AEoI treaties between countries i and j have a significant im-

[32] $-0.0102 + 0.28 * (-0.135 - 0.263) = -0.213$. This coefficient is comparable to the coefficient found in column 3 of Table 2, albeit somewhat smaller. Indeed, it is close to the coefficient in column 7 of Table 6 which shows the result without time-varying saver-country fixed effects.

[33] Coefficient estimates translate to $exp(-0.149) - 1 = -0.138$ and $\exp(0.28 \cdot 0.263) - 1 = 0.076$, respectively.

pact on bilateral portfolio investment assets reported by tax haven residents vis-à-vis non-haven residents. The observed reductions in bilateral portfolio investments of haven countries may hence be carried out via investment funds resident in the haven counties or via SPEs/holding companies. In both cases, the results suggest that the underlying funds reflect savings of the respective non-haven country j. The reductions may be motivated by fears of being detected of tax evasion or due to signalling effects that tax avoidance using this particular haven country may become more difficult. Moreover, our findings are in line with Heckemeyer and Hemmerich (2020) who found a negative effect on OECD-bound portfolio investment from tax havens for the earlier information-on-request treaties, while De Simone et al. (2020) document such effects for the case of FATCA.

5.3 Foreign Direct Investment

Starting with the assets side of FDI (Table 8), we find evidence for the first and third channels through which AEoI treaties may affect bilateral FDI positions. In support of the first channel we observe that non-havens report decreasing FDI asset positions in tax havens after joining the AEoI (column 4). This suggest that part of these assets may have been related to corporate structures with a tax-evading purpose such as SPEs. Moreover, even if these assets were not directly linked to tax evasion, the mere existence of AEoI treaties may have induced investors to withdraw FDI funds from haven countries to avoid triggering investigations or because they signal that the haven country is ready to fight tax avoidance more broadly.

In support of the third channel, we observe a positive effect on FDI assets between tax havens (column 3) which would be consistent with the "network of sham corporations" in tax havens which we also observe in bank deposits of NFBIs.

Turning to the liability side, non-havens joining the AEoI framework report decreasing FDI liability positions vis-à-vis havens (Table 9). This could be interpreted as evidence for the second channel, in line with the findings for portfolio equity. Thus, the FDI assets of the haven country may indeed be partly due to SPEs or holding companies owned by non-haven residents, which in turn invest in companies resident in the home countries of the non-haven investors. Upon signing an AEoI between the two countries the non-haven investor may have closed down the haven SPE (as observed in channel 1) and hence reduced bilateral assets by the haven country are recorded in the investor's home country.

5.4 Robustness

In order to test the robustness of our results for cross-border deposits we start by adding a measure of financial linkages in the regression analysis, following Menkhoff and Miethe (2019). These are time-varying bilateral financial weights reflecting the relative importance of a tax haven for its (non-haven) counterpart in total cross-border bank claims. Hence, these weights also control to some extent for systematic shifts in the international financial system which might render tax havens less attractive investment destinations during our sample period, irrespective of the AEoI (Menkhoff & Miethe, 2019). Moreover, the weights alleviate concerns that our results might be driven by changes in relatively small bilateral observations. Columns

1 and 6 of Table A.3 show that these weights are statistically significant, but do not change the coefficients of interest in any meaningful way.

In a second robustness check, we account for the possibility that various leaks of information on account holders in tax haven countries that occurred during our sample period were actually driving the reduction of deposits in haven countries.[34] We test this hypothesis by including a dummy variable equal to 1 for haven and non-haven country pairs in the quarter after the leak occurred in the respective tax haven.[35] As shown in columns 2 and 7 of Table A.3 the results remain robust.

Third, we exclude a potentially important country pair outlier, i.e. the deposits of the US in Cayman Islands as US savers decreased their deposits in the Caymans substantially during our sample period, more than in any other country pair observation in our sample. However, as shown in columns 3 and 8 of Table A.3, the estimates of the effect of AEoI treaties are not affected by the exclusion of these observations.[36]

A fourth robustness check tests whether our results depend on the classification of tax havens based on Johannesen and Zucman (2014). As an alternative, we use the narrower list of tax havens in Casi et al. (2020), which does not classify Austria, Belgium, Chile, Macao, Malaysia, and Curacao as havens. While the coefficient for non-bank deposits is slightly reduced in size and, in fact, very close to the one reported in Casi et al. (2020) (Table A.3, column 4), the coefficient estimate for household deposits is virtually unaffected by the change in sample (column 9).[37]

A fifth robustness check, depicted by the event study graphs in the appendix B, highlights that our results are robust to employing the alternative methodology by Casi et al. (2020). More precisely, this shows that our results are robust to restricting the sample of saver countries to OECD and EU countries and to ending our sample in 2017Q3.

In a final robustness check, we test whether anticipation effects are affecting our results. To do so, we include a dummy equal to one in the two quarters prior to a given country pair becoming part the AEoI framework. The estimates of the effects of AEoI signature remain highly statistically significant and virtually unchanged in size, as shown in Table A.3 columns 5 and 10. For non-bank deposits we do not find any evidence of anticipation effects, whereas there is some evidence of households on non-haven countries beginning to withdraw deposits from havens in anticipation of the AEoI.[38]

Turning to the robustness checks for foreign direct and portfolio investment, we start by excluding the US from the sample to alleviate concerns that the Tax Cuts and Jobs Act (TCJA) might be driving our results, particularly for FDI (Heinemann et al., 2018). Table

[34] O'Donovan, Wagner, and Zeume (2019) show, for example, that companies reduced tax avoidance in response to the Panama Paper leaks.

[35] 2014q1 for Switzerland, 2015q4 for Luxembourg, 2016q2 for Panama, 2016q4 for Bahamas, see Ahrens and Bothner (2020). The results are also robust if we do not lag the leak variables (not reported).

[36] Since the US is an important saver country which also had a major corporate tax reform with the Tax Cuts and Jobs Act (TCJA) becoming effective during our sample period (in January 2018), we also make sure that our results are robust to excluding the US completely from the sample.

[37] Casi et al. (2020) restrict the sample of saver countries to OECD and EU countries. We obtain results very similar to the ones depicted in Table A.3 when replicating this approach.

[38] The results remain also intact when we vary the forward length between 1 and 4 quarters.

A.4 in the appendix shows that the results for FDI assets are virtually unchanged when the US is excluded. Moreover, the results on decreasing assets by non-haven countries in havens also holds when we end the sample in 2017. The reduced sample size renders the coefficient on FDI assets between tax havens insignificant, but hardly changes its size. As depicted in Column 5 of Table 9, excluding the US from the sample also does not affect the results on FDI liabilities. Similarly, the results for household deposits and portfolio investment assets remain virtually unchanged when the US is excluded from the sample, as depicted in Table A.5 in the appendix.

6 Conclusion

We examine the impact of Automatic Exchange of Information (AEoI) treaties on the dynamics of cross-border investments held in tax havens. To this end, we use restricted data on deposits from the BIS Locational Banking Statistics as well as portfolio investment and foreign direct investment data from the IMF.

Using these more detailed data, including more countries and a longer time period, we contribute to the literature along several dimensions.

First, we show that the AEoI significantly reduced cross-border deposits held by non-resident households in tax havens, while deposits of non-bank financial institutions and non-financial corporations were unaffected. In particular, we find that bilateral household deposits from non-haven countries decrease by 28.5 percent upon signature of the AEoI legislation. The effect on deposits by the broader non-bank sector is found to be only 12.5 percent, similar to the 11.5 percent effect found in Casi et al. (2020).

Second, we find that the impact of the AEoI on cross-border deposits is persistent, in contrast to results documented for earlier bilateral initiatives based on exchange of information on demand, as documented by Menkhoff and Miethe (2019).

Third, we document evidence of deposit shifting by the household sector to havens not participating in AEoI, in line with Johannesen and Zucman (2014) for earlier information on demand treaties.

Forth, we document a significantly negative effect of AEoI on portfolio investment assets reported by tax haven residents vis-à-vis non-haven residents, in line with the results in Heckemeyer and Hemmerich (2020) for earlier information on demand treaties. Moreover, we show that FDI liability positions of non-havens vis-à-vis havens decline significantly after joining the AEoI. Furthermore, we observe that non-havens report decreasing FDI asset positions in tax havens after joining the AEoI, suggesting that part of these assets were related to corporate structures with a tax-evading purpose.

Fifth, we also find some evidence of negative side effects of the AEoI. The more granular breakdown of our banking data allows us to document evidence of deposit shifting by the household sector, in line with Johannesen and Zucman (2014) for earlier treaties. Banks in haven countries report increasing deposits from NBFIs resident in other tax havens after AEoI introduction. We interpret this as evidence that networks of shell companies used to

obfuscate ultimate beneficiaries of account holders might have become more elaborate. This is corroborated by the finding that signing up to the AEoI framework is associated with a positive effect on FDI assets between tax havens. Hence, future policy initiatives should be aimed at increasing transparency regarding ultimate ownership of investments, by looking through corporate structures.

Taken together, our results suggest that the implementation of automatic information exchange is effective in limiting tax evasion by less sophisticated investors. However, it might not be equally effective for those who are able to use more complex administrative structures, such as shell companies, trusts, etc., as also argued by Johannesen and Zucman (2014). Moreover, our results imply that the AEoI is more effective than earlier initiatives in that it is more persistent but remains incomplete as long as non-participating haven countries allow households to shift deposits. Hence, future policy initiatives should be aimed at widening the network of AEoI treaties, as well as increasing transparency regarding ultimate ownership of investments by looking-through corporate structures.

References

Ahrens, L., & Bothner, F. (2020). The big bang – tax evasion after automatic exchange of information under FATCA and CRS. *New Political Economy*, *25*(6), 849–864.

Alstadsæter, A., Zucman, G., Planterose, B., & Økland, A. (2022). Who owns offshore real estate? evidence from dubai.

Alstadsæter, A., Johannesen, N., & Zucman, G. (2019). Tax evasion and inequality. *American Economic Review*, *109*(6), 2073–2103.

Andersen, J. J., Johannesen, N., & Rijkers, B. (2021). Elite capture of foreign aid: Evidence from offshore bank accounts. *Journal of Political Economy*, forthcoming.

Avdjiev, S., McGuire, P., & Wooldridge, P. D. (2015). Enhanced data to analyse international banking. *BIS Quarterly Review September*.

Beck, R., Coppola, A., Lewis, A., Maggiori, M., Schmitz, M., & Schreger, J. (2023). The geography of capital allocation in the euro area. *Available at SSRN: https://ssrn.com/abstract=4398898*.

Bomare, J., & Herry, S. L. G. (2022). Will we ever be able to track offshore wealth? evidence from the offshore real estate market in the uk. *Sciences Po Economics*.

Casi, E., Spengel, C., & Stage, B. M. (2020). Cross-border tax evasion after the common reporting standard: Game over? *Journal of Public Economics*, *190*, 104240.

Christensen, I., Henry, & Tirard, J.-M. (2016). The amazing development of exchange of information in tax matters: from double tax treaties to FATCA and the CRS. *Trusts & Trustees*, *22*(8), 898–922.

De Simone, L., Lester, R., & Markle, K. (2020). Transparency and tax evasion: Evidence from the foreign account tax compliance act (fatca). *Journal of Accounting Research*, *58*(1), 105–153.

Hanlon, M., Maydew, E. L., & Thornock, J. R. (2015). Taking the long way home: US tax evasion and offshore investments in US equity and debt markets. *The Journal of Finance*, *70*(1), 257–287.

Heckemeyer, J. H., & Hemmerich, A. K. (2020). Information exchange and tax haven investment in OECD securities markets. *National Tax Journal*, *73*(2), 291–330.

Heinemann, F., Olbert, M., Pfeiffer, O., Schwab, T., Spengel, C., & Stutzenberger, K. (2018). Implications of the us tax reform for transatlantic fdi. *Intereconomics*, *53*(2), 87–93.

Johannesen, N., Langetieg, P., Reck, D., Risch, M., & Slemrod, J. (2020). Taxing hidden wealth: The consequences of us enforcement initiatives on evasive foreign accounts. *American Economic Journal: Economic Policy*, *12*(3), 312–46.

Johannesen, N., & Zucman, G. (2014). The end of bank secrecy? An evaluation of the G20 tax haven crackdown. *American Economic Journal: Economic Policy*, *6*(1), 65–91.

Lane, P. R., & Milesi-Ferretti, G. M. (2018). The external wealth of nations revisited: International financial integration in the aftermath of the global financial crisis. *IMF Economic Review*, *66*(1), 189–222.

Langenmayr, D. (2017). Voluntary disclosure of evaded taxes — increasing revenue, or increasing incentives to evade? *Journal of Public Economics*, *151*, 110–125.

Luna, P. G., & Hardy, B. (2019). Non-bank counterparties in international banking. *BIS Quarterly Review September*.

Menkhoff, L., & Miethe, J. (2019). Tax evasion in new disguise? Examining tax havens' international bank deposits. *Journal of Public Economics*, *176*, 53–78.

Noked, N. (2018). Facta, crs, and the wrong choice of who to regulate. *Fla. Tax Rev.*, *22*, 77.

Noked, N., & Marcone, Z. (2023). Closing the "shell bank" loophole. *Virginia Journal of International Law*, *64*(1).

OECD. (1998). *Harmful tax competition: An emerging global issue*. Organisation for Economic Co-operation and Development.

OECD. (2000). *Improving access to bank information for tax purposes*. Organisation for Economic Co-operation and Development.

OECD. (2011). *The multilateral convention on mutual administrative assistance in tax matters*. doi:https://doi.org/https://doi.org/10.1787/9789264115606-en

O'Donovan, J., Wagner, H. F., & Zeume, S. (2019). The value of offshore secrets: Evidence from the Panama Papers. *The Review of Financial Studies*, *32*(11), 4117–4155.

O'Reilly, P., Ramirez, K. P., & Stemmer, M. A. (2019). *Exchange of information and bank deposits in international financial centres* (OECD Taxation Working Papers No. 46). OECD Publishing.

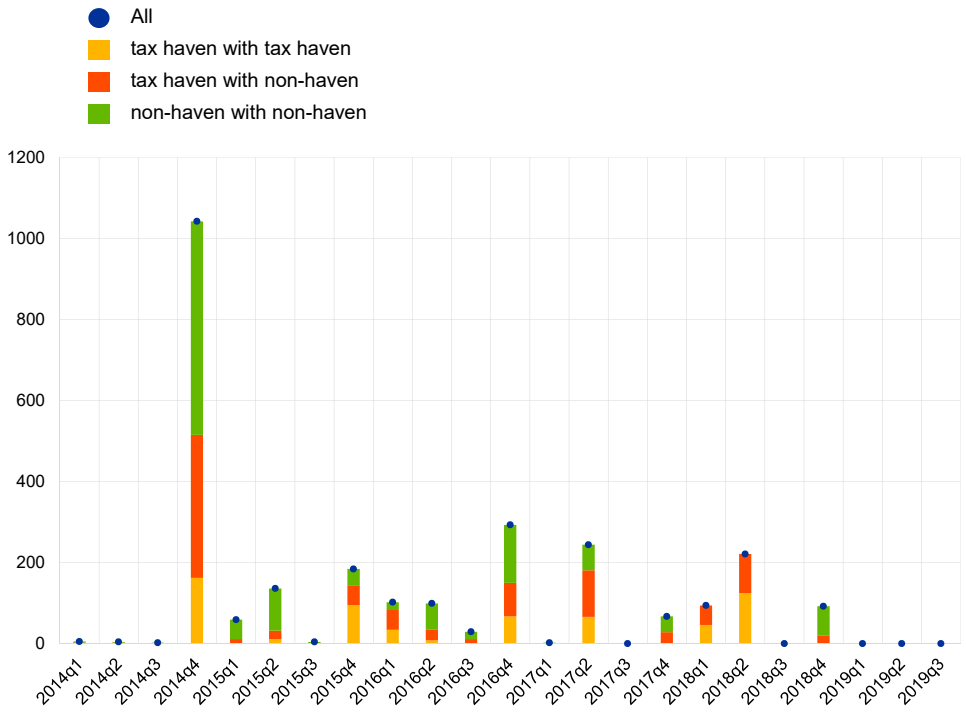
Sharman, J. C. (2010). Shopping for anonymous shell companies: An audit study of anonymity and crime in the international financial system. *Journal of Economic Perspectives*, *24*(4), 127–40.

Slemrod, J. (2015). Tax compliance and enforcement: New research and its policy implications. *Ross School of Business Working Papers*, *1302*.

Tørsløv, T., Wier, L., & Zucman, G. (2023). The missing profits of nations. *Review of Economic Studies*, *90*(3), 1499–1534.

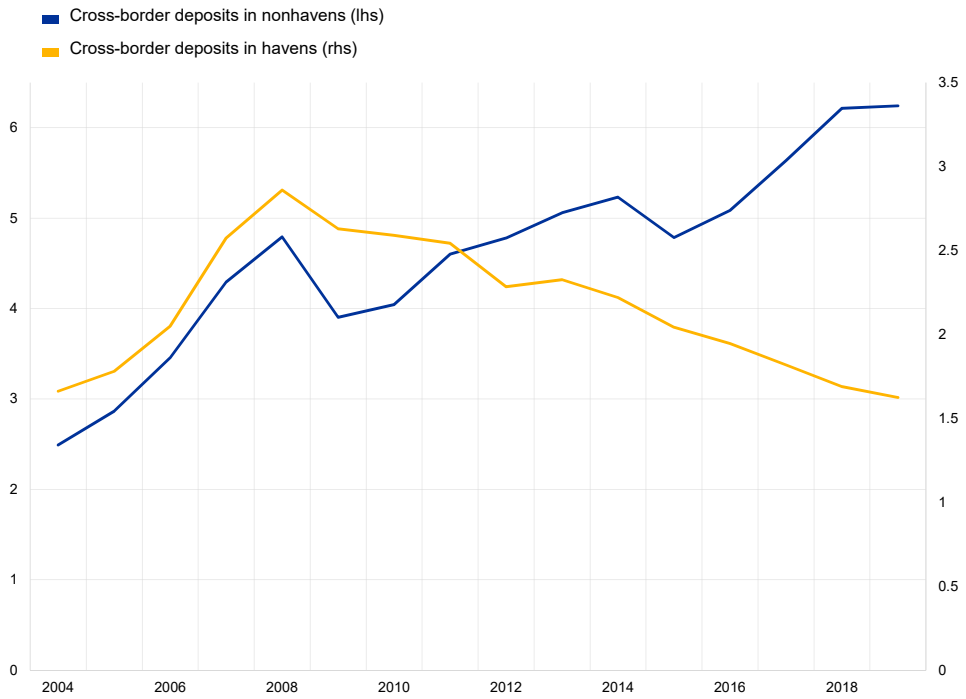
Zucman, G. (2013). The missing wealth of nations: Are europe and the us net debtors or net creditors? *The Quarterly journal of economics*, *128*(3), 1321–1364.

Figure 1: New automatic information exchange relationships over time



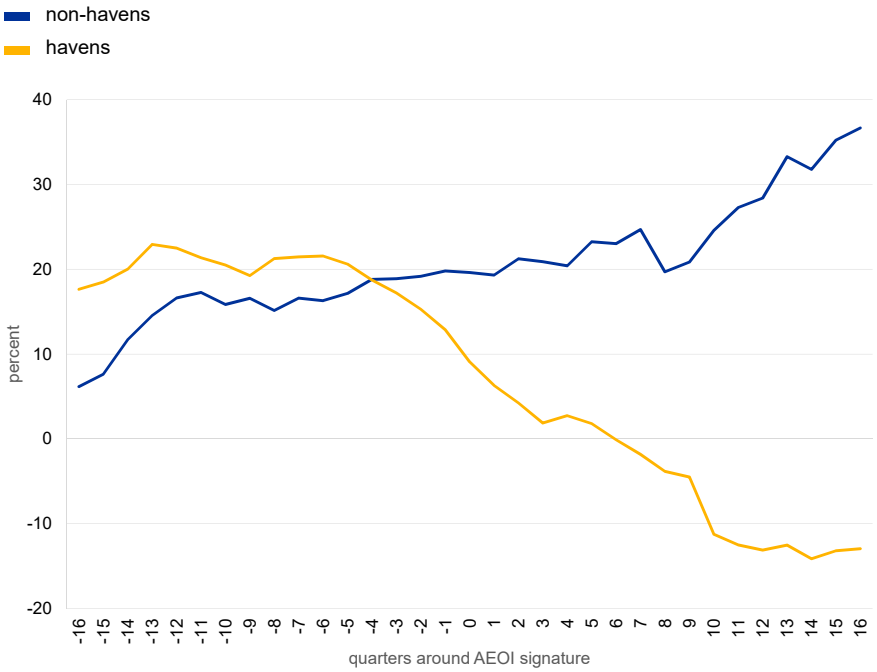
Note: Number of country pairs in the BIS LBS becoming covered by an AEOI treaty in the respective quarter. Tax haven classification according to Johannesen and Zucman (2014).

Figure 2: Non-bank cross-border deposits in haven and non-haven countries, 2004 -2019 (trillions USD)



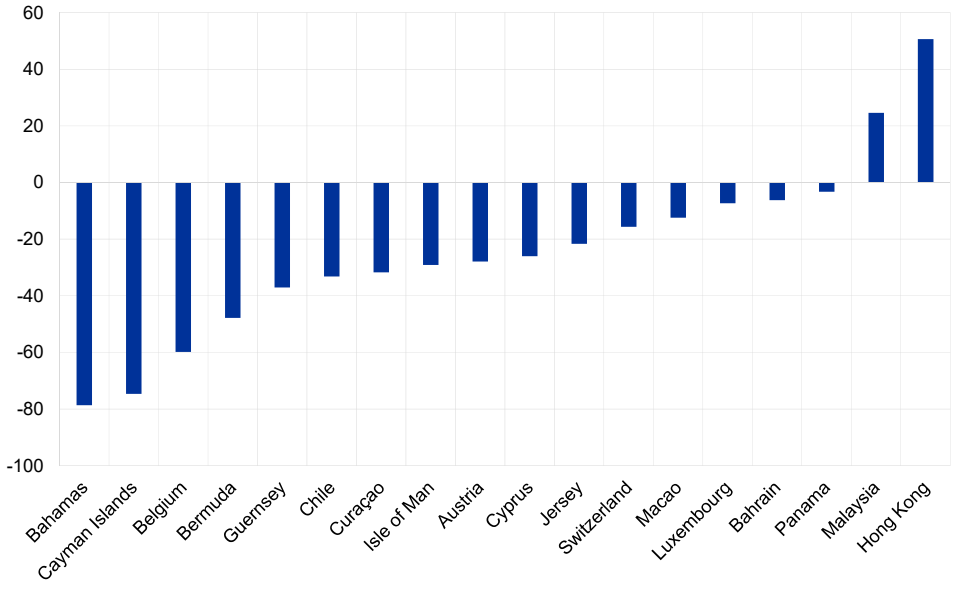
Note: sum of yearly averages of quarterly cross-border deposit liabilities vis-à-vis non-banks across individual reporting countries. Tax havens classified according to Johannesen and Zucman (2014). Source: BIS, authors' calculations.

Figure 3: Non-haven deposits in haven and non-haven countries around joining the AEOI



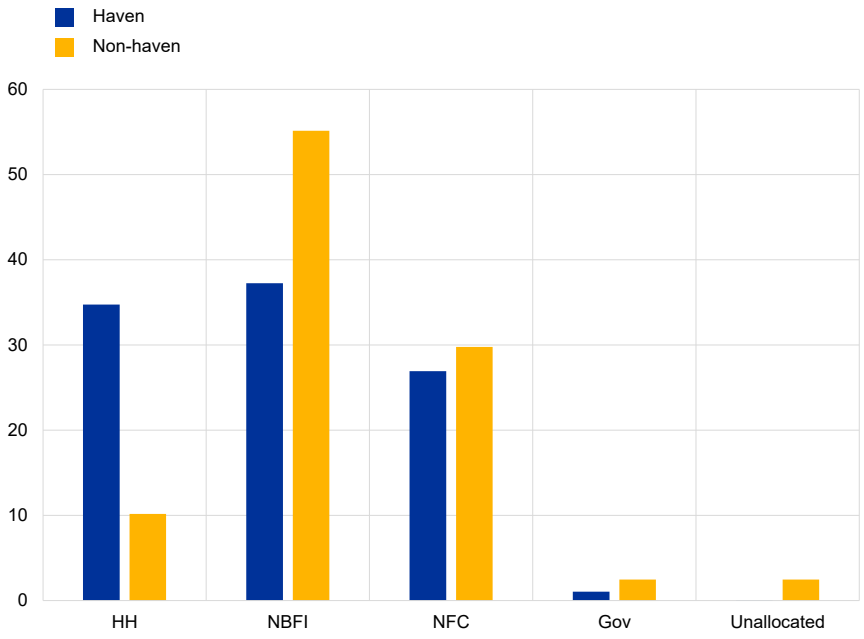
Note: Average deviation from country pair long term mean (since 2000) in bilateral non-bank deposits. t=0 signature of AEOI. Tax havens classified according to Johannesen and Zucman (2014).

Figure 4: Non-bank deposit growth by tax haven, 2014Q1 -2018Q4 (percent)



Note: Percentage change in deposits from all non-haven countries between 2014Q1 and 2018Q4. Tax havens classified according to Johannesen and Zucman (2014).

Figure 5: Share of liabilities vis-à-vis individual sectors



Note: Share of cross-border liabilities vis-à-vis households (HH), non-bank financial institutions (NBFI), non-financial corporations (NFC), and general government (GOV) sectors in all liabilities vis-à-vis non-banks (NB) reported by banks resident in haven and non-haven countries in the last quarter before joining the AEOI framework. Tax haven classification according to Johannesen and Zucman (2014). See table A.1 for details on the country sample.

Table 1: Log of non-bank deposits in reporting country i from saver country j

	(1)	(2)	(3)	(4)	(5)
Signed	-0.098**	-0.134***	0.060	-0.012	
	(0.044)	(0.046)	(0.119)	(0.105)	
Signed (contemp.)					-0.162***
					(0.046)
Signed (+1 quarter)					-0.140***
					(0.048)
Signed (+2 quarters)					-0.123**
					(0.052)
Signed (+3 quarters)					-0.121**
					(0.053)
Signed (>3 quarters)					-0.115*
					(0.065)
Obs.	57,782	50,810	6,972	8,354	50,810
R^2	0.94	0.94	0.93	0.94	0.94
Time period	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4
Reporting	Haven	Haven	Haven	Non-haven	Haven
Saver	All	Non-haven	Haven	Haven	Non-haven
Pair FE	yes	yes	yes	yes	yes
Reporting FE	yes	yes	yes	yes	yes
Saver time FE	yes	yes	yes	yes	yes

Note: Signed is a dummy equal to 1 if there exists a treaty providing for automatic information exchange between i and j in quarter q. Signed (contemp.) is a dummy equal to 1 in the quarter q when the legal event establishing information exchange between i and j occurs; signed (+1 quarter) is a dummy equal to 1 in q +1, and so on. Robust standard errors (clustered at the country-pair level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Log of deposits in reporting country i from saver country j vis-à-vis non-banks and households

	(1) Non-banks	(2)	(3)	(4) Households	(5)	(6)
Signed	-0.186*	-0.299***	-0.336***	-0.145	-0.375**	
	(0.101)	(0.081)	(0.091)	(0.181)	(0.180)	
Signed (contemp.)						-0.204**
						(0.082)
Signed (+1 quarter)						-0.240***
						(0.080)
Signed (+2 quarters)						-0.438***
						(0.106)
Signed (+3 quarters)						-0.463***
						(0.108)
Signed (>3 quarters)						-0.555***
						(0.135)
Obs.	26,489	29,557	26,489	3,068	4,485	26,489
R^2	0.96	0.96	0.95	0.95	0.95	0.95
Time period	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4
Reporting	Haven	Haven	Haven	Haven	Non-haven	Haven
Saver	Non-haven	All	Non-haven	Haven	Haven	Non-haven
Pair FE	yes	yes	yes	yes	yes	yes
Reporting FE	yes	yes	yes	yes	yes	yes
Saver time FE	yes	yes	yes	yes	yes	yes

Note: Signed is a dummy equal to 1 if there exists a treaty providing for automatic information exchange between i and j in quarter q. Signed (contemp.) is a dummy equal to 1 in the quarter q when the legal event establishing information exchange between i and j occurs; signed (+1 quarter) is a dummy equal to 1 in q +1, and so on. Robust standard errors (clustered at the country-pair level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Log of non-bank financial institution deposits in reporting country i from saver country j.

	(1)	(2)	(3)	(4)	(5)
Signed	0.038	-0.086	0.401*	-0.107	
	(0.117)	(0.133)	(0.231)	(0.160)	
Signed (contemp.)					-0.065
					(0.114)
Signed (+1 quarter)					-0.006
					(0.132)
Signed (+2 quarters)					-0.133
					(0.152)
Signed (+3 quarters)					-0.128
					(0.162)
Signed (>3 quarters)					-0.152
					(0.186)
Obs.	15,139	12,036	3,103	4,707	12,036
R^2	0.90	0.90	0.91	0.93	0.90
Time period	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4
Reporting	Haven	Haven	Haven	Non-haven	Haven
Saver	All	Non-haven	Haven	Haven	Non-haven
Pair FE	yes	yes	yes	yes	yes
Reporting FE	yes	yes	yes	yes	yes
Saver time FE	yes	yes	yes	yes	yes

Note: Note: Signed is a dummy equal to 1 if there exists a treaty providing for automatic information exchange between i and j in quarter q. Signed (contemp.) is a dummy equal to 1 in the quarter q when the legal event establishing information exchange between i and j occurs; signed (+1 quarter) is a dummy equal to 1 in q +1, and so on. Robust standard errors (clustered at the country-pair level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Log of non financial corporation deposits in reporting country i from saver country j.

	(1)	(2)	(3)	(4)	(5)
Signed	0.132	0.132	0.136	0.239	
	(0.125)	(0.139)	(0.283)	(0.206)	
Signed (contemp.)					0.014
					(0.136)
Signed (+1 quarter)					0.085
					(0.132)
Signed (+2 quarters)					0.191
					(0.163)
Signed (+3 quarters)					0.228
					(0.160)
Signed (>3 quarters)					-0.050
					(0.220)
Obs.	19,763	16,850	2,912	4,316	16,850
R^2	0.91	0.90	0.91	0.92	0.90
Time period	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4
Reporting	Haven	Haven	Haven	Non-haven	Haven
Saver	All	Non-haven	Haven	Haven	Non-haven
Pair FE	yes	yes	yes	yes	yes
Reporting FE	yes	yes	yes	yes	yes
Saver time FE	yes	yes	yes	yes	yes

Note: Note: Signed is a dummy equal to 1 if there exists a treaty providing for automatic information exchange between i and j in quarter q. Signed (contemp.) is a dummy equal to 1 in the quarter q when the legal event establishing information exchange between i and j occurs; signed (+1 quarter) is a dummy equal to 1 in q +1, and so on. Robust standard errors (clustered at the country-pair level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Log of bank deposits in reporting country i from saver country j

	(1)	(2)	(3)	(4)	(5)
Signed	0.086	0.117	0.002	-0.046	
	(0.081)	(0.082)	(0.214)	(0.167)	
Signed (contemp.)					0.127
					(0.085)
Signed (+1 quarter)					0.131
					(0.092)
Signed (+2 quarters)					0.101
					(0.094)
Signed (+3 quarters)					0.162
					(0.103)
Signed (>3 quarters)					0.025
					(0.110)
Obs.	25,255	21,088	4,167	6,326	21,088
R^2	0.90	0.91	0.87	0.90	0.91
Time period	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4
Reporting	Haven	Haven	Haven	Non-haven	Haven
Saver	All	Non-haven	Haven	Haven	Non-haven
Pair FE	yes	yes	yes	yes	yes
Reporting FE	yes	yes	yes	yes	yes
Saver time FE	yes	yes	yes	yes	yes

Note: Signed is a dummy equal to 1 if there exists a treaty providing for automatic information exchange between i and j in quarter q. Signed (contemp.) is a dummy equal to 1 in the quarter q when the legal event establishing information exchange between i and j occurs; signed (+1 quarter) is a dummy equal to 1 in q +1, and so on. Robust standard errors (clustered at the country-pair level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Deposit shifting

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Treaty coverage: Number				Treaty coverage: Share			
	Non-bank		Household		Non-bank		Household	
Signed	-0.213***	-0.004	-0.217***	0.064	-0.228***	-0.114	-0.248***	-0.102***
	(0.055)	(0.098)	(0.064)	(0.071)	(0.052)	(0.070)	(0.028)	(0.030)
Treaty coverage	-0.002		-0.002		-0.009		-0.014	
	(0.004)		(0.005)		(0.059)		(0.027)	
Treaty coverage x Signed		-0.014*		-0.017***		-0.114		-0.135***
		(0.007)		(0.005)		(0.082)		(0.029)
Treaty coverage x (1-Signed)		0.005		0.031***		0.074		0.263***
		(0.005)		(0.009)		(0.072)		(0.057)
Observations	44,140	44,140	25,740	25,740	44,140	44,140	22,204	22,204
R-squared	0.94	0.94	0.96	0.96	0.94	0.94	0.95	0.95
Time period	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4
Reporting	Haven	Haven	Haven	Haven	Haven	Haven	Haven	Haven
Saver	Non-haven	Non-haven	Non-haven	Non-haven	Non-haven	Non-haven	Non-haven	Non-haven
Pair FE	yes	yes	yes	yes	yes	yes	yes	yes
Reporting FE	yes	yes	yes	yes	yes	yes	yes	yes
Saver FE	yes	yes	yes	yes	yes	yes	yes	yes

Note: The dependent variable is the log of deposits by non-banks or households held by savers of country j in banks of tax haven i at the end of quarter t. Signed is a dummy equal to 1 if there exists a treaty providing for automatic information exchange between i and j in quarter q. In columns 1–4, Treaty coverage counts the number of treaties that j has with tax havens other than i. In columns 5–8 treaty coverage measures the share of the deposits held in 2014 by residents of country j in BIS-reporting havens that are covered by a treaty in quarter q. Robust standard errors (clustered at the country-pair level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Log of portfolio equity assets of reporting country i in country j

	(1)	(2)	(3)	(4)
Signed	-0.163***	-0.138**	-0.218	0.046
	(0.062)	(0.065)	(0.139)	(0.091)
Observations	13,140	9,602	3,538	9,002
R-squared	0.94	0.94	0.93	0.95
Time period	2014h1-2019h2	2014h1-2019h2	2014h1-2019h2	2014h1-2019h2
Reporting	Haven	Haven	Haven	Non-haven
Host	All	Non-haven	Haven	Haven
Pair FE	yes	yes	yes	yes
Reporting FE	yes	yes	yes	yes
Host time FE	yes	yes	yes	yes

Notes: Signed is a dummy equal to 1 if there exists a treaty providing for automatic information exchange between i and j in quarter q. Signed is a dummy equal to 1 in the quarter q when the legal event establishing information exchange between i and j occurs. Robust standard errors (clustered at the country-pair level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Log of FDI assets of reporting country i in country j

	(1)	(2)	(3)	(4)
Signed	0.116	-0.050	0.646**	-0.155**
	(0.106)	(0.098)	(0.309)	(0.073)
Observations	4,043	3,233	810	5,929
R-squared	0.97	0.97	0.96	0.95
Time period	2013-2019	2013-2019	2013-2019	2013-2019
Reporting	Haven	Haven	Haven	Non-haven
Host	All	Non-haven	Haven	Haven
Pair FE	yes	yes	yes	yes
Reporting FE	yes	yes	yes	yes
Host time FE	yes	yes	yes	yes

Notes: Signed is a dummy equal to 1 if there exists a treaty providing for automatic information exchange between i and j in quarter q. Signed is a dummy equal to 1 in the quarter q when the legal event establishing information exchange between i and j occurs. Robust standard errors (clustered at the country-pair level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 9: Log of FDI liabilities in reporting country i from saver country j

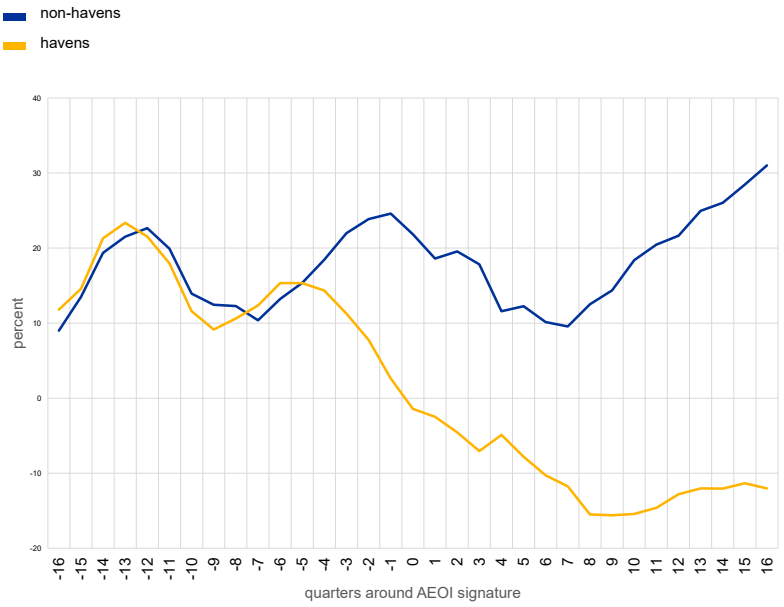
	(1)	(2)	(3)	(4)	(5)
Signed	0.033	0.008	0.118	-0.142**	-0.148**
	(0.071)	(0.088)	(0.096)	(0.064)	(0.066)
Observations	4,156	3,106	1,050	8,505	8,333
R-squared	0.97	0.97	0.95	0.96	0.95
Time period	2013-2019	2013-2019	2013-2019	2013-2019	2013-2019
Reporting	Haven	Haven	Haven	Non-haven	Non-haven (excl. US)
Saver	All	Non-haven	Haven	Haven	Haven
Pair FE	yes	yes	yes	yes	yes
Reporting FE	yes	yes	yes	yes	yes
Saver time FE	yes	yes	yes	yes	yes

Notes: Signed is a dummy equal to 1 if there exists a treaty providing for automatic information exchange between i and j in quarter q. Signed is a dummy equal to 1 in the quarter q when the legal event establishing information exchange between i and j occurs. Robust standard errors (clustered at the country-pair level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Appendix

A Additional Figures and Tables

Figure A.1: Non-haven deposits in haven and non-haven countries around joining the AEOI, excluding late joiners



Note: Average deviation from country pair long term mean (since 2000) in bilateral non-bank deposits. t=0 signature of AEOI for countries which joined in 2014. Tax havens classified according to Johannesen and Zucman (2014).

Table A.1: Reporting country sample BIS LBS

Non-haven		**Haven**	
Australia	Korea*	Austria	Hong Kong SAR
Brazil	Mexico	Bahamas*	Isle of Man*
Canada*	Netherlands*	Bahrain	Jersey
China	Philippines	Belgium*	Luxembourg*
Chinese Taipei*	Portugal*	Bermuda*	Macao SAR
Denmark*	Saudi Arabia	Cayman Islands	Malaysia
Finland	South Africa*	Chile	Panama
France*	Spain	Curacao	Singapore
Greece	Sweden*	Cyprus*	Switzerland*
India	Turkey	Guernsey*	
Indonesia	United Kingdom*		
Ireland*	United States		
Italy*			

Note: Reporting countries in our sample of cross-border non-bank deposit data. Countries for which the enhanced sectoral breakdown is available in the restricted BIS LBS prior to announcing AEOI indicated by *. Tax haven classification according to Johannesen and Zucman (2014).

Table A.2: Reporting country sample CPIS and CDIS

Non-haven		**Haven**	Signed CRS
Albania	Latvia	Aruba	2014Q4
Algeria*	Lithuania	Austria	2014Q4
Armenia*	Mali*	Bahamas	2016Q4
Argentina	Mexico	Bahrain†	2017Q2
Australia	Moldova	Barbados†	2015Q4
Azerbaijan*	Lebanon	Belgium	2014Q4
Bangladesh	Mongolia	Bermuda†	2014Q4
Belarus	Montenegro*	Cayman Islands†	2014Q4
Benin*	Morocco*	Chile	2014Q4
Bhutan*	Mozambique*	Curacao*	2014Q4
Bolivia	Myanmar*	Costa Rica	2015Q2
Bosnia*	Namibia*	Cyprus	2014Q4
Botswana*	Nepal*	Guernsey†	2014Q4
Brazil	Netherlands	Gibraltar†	2014Q4
Bulgaria*	New Zealand	Hong Kong SAR	2018Q2
Burkina Faso	Niger*	Isle of Man†	2014Q4
Cabo Verde*	Nigeria*	Jersey†	2014Q4
Cambodia*	North Macedonia	Luxembourg	2014Q4
Canada	Norway	Macao SAR	2018Q2
China	Pakistan	Malaysia	2016Q1
Colombia	Paraguay*	Malta	2014Q4
Croatia*	Peru†	Panama	2018Q1
Czech Rep.	Philippines	Seychelles*	2014Q4
El Salvador*	Poland	Singapore	2017Q2
Côte d'Ivoire*	Portugal	Sint Maarten*	2014Q4
Denmark	Romania	Switzerland	2015Q4
Egypt†	Russia	Uruguay	2016Q4
Estonia	Rwanda*		
Finland	Senegal*		
France	Serbia*		
Georgia*	Saudi Arabia†		
Germany	Slovakia		
Ghana*	Slovenia		
Greece	South Africa		
Guatemala*	Spain		
Honduras	Sri Lanka*		
Hungary	Sweden		
Iceland	Tajikistan*		
India	Tanzania*		
Indonesia	Thailand		
Ireland	Togo*		
Israel	Uganda*		
Italy	Turkey		
Japan	Ukraine		
Kazakhstan	United Kingdom		
South Korea	United States		
Kosovo*	Venezuela		
Kuwait	West Bank and Gaza		
Kyrgyz Rep.*	Zambia*		

Notes: Reporting countries in our sample of cross-border portfilio (CPIS) and direct investment (CDIS) data. The last column specifies the date individual tax haven countries signed the Multilateral Competent Authority Agreement (MCAA), thereby committing to introduce the CRS into national law. Countries reporting in CDIS but not CPIS denoted by *, countries reporting in CPIS but not CDIS denoted by †. Tax haven classification according to Johannesen and Zucman (2014).

Table A.3: Robustness checks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
			Non-bank deposits						Household deposits			
	MM weights	Leaks	No KY-US	No US	Casi haven	Anticipation	MM weights	Leaks	No KY-US	No US	Casi haven	Anticipation
Signed	-0.172***	-0.180***	-0.146***	-0.134***	-0.101*	-0.199***	-0.281***	-0.297***	-0.365***	-0.399***	-0.364***	-0.322***
	(0.050)	(0.053)	(0.054)	(0.055)	(0.054)	(0.060)	(0.092)	(0.095)	(0.110)	(0.106)	(0.110)	(0.103)
MM weight	0.037**					0.014***						
	(0.015)					(0.005)						
Signed (-2 quarters)						-0.069						-0.118*
						(0.056)						(0.062)
Observations	34,203	46,203	33,481	31,354	35,518	46,203	20,054	25,306	20,760	24,405	21,260	25,306
R-squared	0.95	0.94	0.95	0.95	0.94	0.95	0.97	0.96	0.96	0.96	0.96	0.96
Time period	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4	2014q1-2019q4
Reporting	Haven	Haven	Haven	Haven	Haven	Haven	Haven	Haven	Haven	Haven	Haven	Haven
Saver	Non-haven	Non-haven	Non-haven	Non-haven	Non-haven	Non-haven	Non-haven	Non-haven	Non-haven	Non-haven	Non-haven	Non-haven
Pair FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Reporting FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Saver time FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Notes: Signed is a dummy equal to 1 if there exists a treaty providing for automatic information exchange between i and j in quarter q. MM weight denotes bilateral financial weight of counterparty j constructed using total claims against all international counterparties, as used in Menkhoff and Miethe (2019). Columns 2 and 8 include dummy variables equal to 1 for haven and non-haven country pairs in the quarter after the a leak occurred in the respective tax haven, i.e. 2014q1 for CH, 2015q4 for LU, 2016q2 for PA, 2016q4 for BH, see Ahrens and Bothner (2020). Columns 3 and 9 exclude the Cayman Island – US country pair. Columns 4 and 10 exclude the US from the sample. Columns 5 and 11 use a narrower list of tax havens as in in Casi, Spengel, and Stage (2020), which does not classify Austria, Belgium, Chile, Macao, Malaysia, and Curacao as havens. Columns 6 and 12 include a dummy equal to 1 two quarters prior to AEOI signature. *** p<0.01, ** p<0.05, * p<0.1.

Table A.4: Log of FDI assets of reporting country i in country j, excluding US

	(1)	(2)	(3)	(4)
Signed	0.131	-0.039	0.646**	-0.176**
	(0.108)	(0.099)	(0.309)	(0.079)
Observations	3,964	3,154	810	5,682
R-squared	0.97	0.97	0.96	0.95
Time period	2013-2019	2013-2019	2013-2019	2013-2019
Reporting	Haven	Haven	Haven	Non-haven (excl. US)
Host	All (excl. US)	Non-haven (excl. US)	Haven	Haven
Pair FE	yes	yes	yes	yes
Reporting FE	yes	yes	yes	yes
Host time FE	yes	yes	yes	yes

Notes: Signed is a dummy equal to 1 if there exists a treaty providing for automatic information exchange between i and j in quarter q. Signed is a dummy equal to 1 in the quarter q when the legal event establishing information exchange between i and j occurs. Robust standard errors (clustered at the country-pair level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.5: Log of portfolio equity assets of reporting country i in country j, excluding US

	(1)	(2)	(3)	(4)
Signed	-0.162**	-0.136**	-0.218	0.023
	(0.063)	(0.066)	(0.139)	(0.099)
Observations	12,948	9,410	3,538	8,686
R-squared	0.94	0.94	0.93	0.95
Time period	2014h1-2019h2	2014h1-2019h2	2014h1-2019h2	2014h1-2019h2
Reporting	Haven	Haven	Haven	Non-haven (excl. US)
Host	All (excl. US)	Non-haven (excl. US)	Haven	Haven
Pair FE	yes	yes	yes	yes
Reporting FE	yes	yes	yes	yes
Host time FE	yes	yes	yes	yes

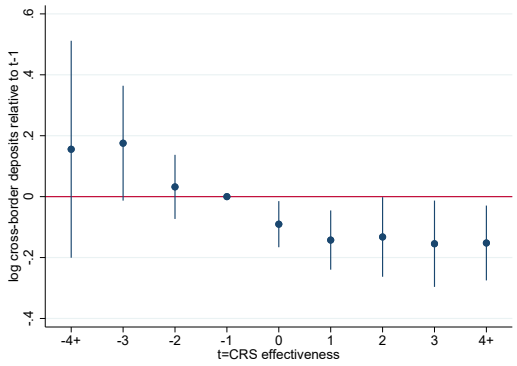
Notes: Signed is a dummy equal to 1 if there exists a treaty providing for automatic information exchange between i and j in quarter q. Signed is a dummy equal to 1 in the quarter q when the legal event establishing information exchange between i and j occurs. Robust standard errors (clustered at the country-pair level) in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

B Case study design following Casi et al. (2020)

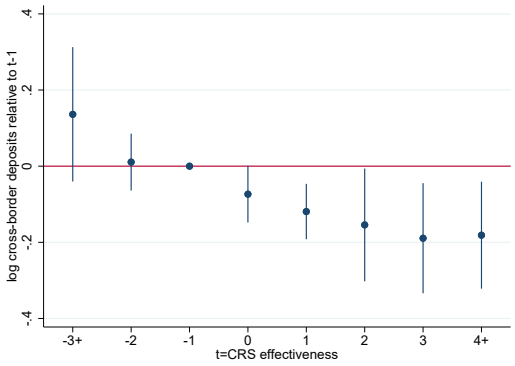
To test the robustness of our results to the econometric specification we replicate the case study design in Casi et al. (2020). Hence, we run the following regression specification:

$$ln(Dep_{ijt}) = \sum_{k=-4}^{4} \beta_k D_{it}^k * Haven_i + \gamma_{ij} + \theta_{jt} + \epsilon_{ijt} \tag{2}$$

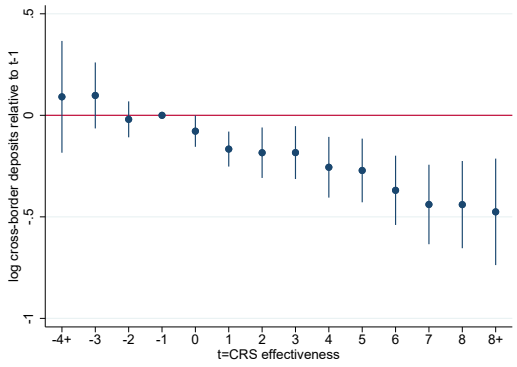
Dep_{ijt} is the *log* of deposits in reporting country i from counterparty or "saver" country j, where saver countries are restricted to be OECD and EU member states. Dummies D_{jt}^k indicate a point in time k periods from the AEOI treatment and its interaction with $Havens_i$, which is a dummy taking the value of one when the reporting country is a tax haven. Here, the AEOI treatment is the passage of the CRS law in reporting country i at time t, as detailed in table 1 of Casi et al. (2020). The indicator for period $t-1$ is omitted, serving therefore as a benchmark, and indicators at the endpoints are binned. Country-pair and saver country time fixed effects are denoted by γ_{ij} and θ_{jt}, respectively. Pair fixed effects control for time-invariant factors like distance and common language, while saver country time fixed effects control for unobserved developments specific to saver countries. Standard errors are robust to autocorrelation and heteroscedasticity and clustered at the reporting country level. Finally, ϵ_{ijt} is the error term.



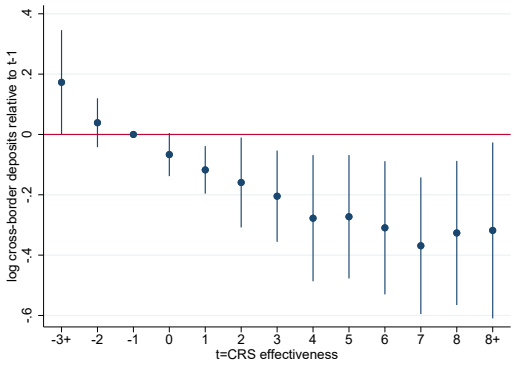
(a) Non-bank deposits, '14Q4-'17Q3



(b) Household deposits, '14Q4-'17Q3



(c) Non-bank deposits, '14Q1-'19Q4



(d) Household deposits, '14Q1-'19Q4

Figure B.1: Robustness checks - Event study à la Casi, Spengel, and Stage (2020).
Notes: The figures depict the coefficients of the interaction term in equation 2. Hence, each coefficient captures the change in cross-border deposits held in tax havens versus nonhavens around the CRS event dates (in event time) in Casi, Spengel, and Stage (2020). Each indicator term marks one quarter over the sample period relative to the quarter before the CRS event date (t = 0). Coefficient estimates are plotted with their 95% confidence intervals. Reporter-country time fixed effects as well as country-pair fixed effects are included. Standard errors are clustered at the reporting country level. Panels (a) and (b) show results for the sample period used in Casi, Spengel, and Stage (2020) while panels (c) and (d) depict results for an extended sample period.