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Escaping the exchange of information: Tax evasion via citizenship-by-investment ☆

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ABSTRACT

With automatic exchange of tax information among countries now common, tax evaders have had to find new ways to hide their offshore holdings. One such way is citizenship-by-investment, which offers foreigners a new passport for a local investment or a fixed fee. We show analytically that high-income individuals acquire a new citizenship to lower the probability that their tax evasion is detected through information exchange. Using data on cross-border bank deposits, we find that deposits in tax havens increase after a country starts offering a citizenship-by-investment program, providing indirect evidence that tax evaders use these programs.

1. Introduction

Over the last decade, the OECD and G20 countries launched various initiatives to promote international tax transparency. In the wake of these activities, countries have signed more than 3000 bilateral tax information exchange treaties; more than 100 countries have committed to automatically exchanging tax information with each other. This information exchange has become the primary policy instrument to enforce the taxation of capital income across borders.

Several recent papers show that while tax information exchange decreases offshore tax evasion at the bilateral level, many tax evaders do not repatriate their funds but instead find other ways to hide their money (see, e.g. Johannesen and Zucman, 2014; Miethe and Menkhoff, 2019). For example, tax evaders shift illicit funds to non-compliant havens, hide behind corporate shells (Johannesen and Zucman, 2014) or invest in alternative assets, such as residential real estate and artwork (De Simone et al., 2020; Alstadsæter and Økland, 2022; Johannesen et al., 2022). Our paper studies an additional strategy: The use of citizenship-by-investment programs to circumvent tax information exchange.

Citizenship-by-investment (CBI) programs offer citizenship rights in return for a financial investment in the country or a donation as low as US$100,000. If a tax evader uses the acquired citizenship to open a bank account in a tax haven, the tax haven will exchange tax information with the country of acquired citizenship, not the actual country of (tax) residency.[1] Thus, CBI programs enable tax evaders to escape tax information exchange.

In this study, we first illustrate the interplay between tax information exchange and CBI programs in an analytical model.

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[1] In principle, tax information exchange according to the OECD's Common Reporting Standard should be based on tax residency, not on citizenship. However, evaders can use passports to pretend tax residency. For example, passports are usually accepted as proof of tax residency when opening a bank account online. We discuss this in more detail in Section 2.2.

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The model frames tax evasion as a rational decision. Individuals can evade taxes by transferring money to a tax haven. The risk that the home country detects this tax evasion depends on whether the tax haven exchanges tax information with it and on whether the individual has acquired a foreign citizenship. The high-tax country can pressure the tax haven to agree to information exchange by threatening to impose sanctions. We show that high-income individuals evade taxes, and the wealthiest evaders acquire a new citizenship to lower the detection probability when evading taxes. CBI programs have two effects on tax evasion: First, they decrease detection probabilities for the individual who uses them (and thus, from the high-tax country's point of view, they reduce expected fines). Second, they make it less likely that countries exchange tax information, as the CBI country siphons off part of the potential revenue gain from information exchange.

To confirm the main assumption behind our model, namely that CBI programs can be (mis)used to circumvent tax information exchange, we turn to the data. We use bilateral, quarterly information on cross-border bank deposits provided by the Bank for International Settlements (BIS) in their Locational Banking Statistics.

To understand how we can use this data in our context, consider the example of a German with a bank account in Guernsey. He does not declare the capital income received on this money to the German tax authorities, thus evading capital income taxes. In the BIS data, the money in this account is part of the German deposits in Guernsey. In 2016, he realized that both Germany and Guernsey had signed up to the OECD's Common Reporting Standard and would start to automatically exchange tax information in 2017. Thus, his account would come to light. To avoid this, he acquires Dominican citizenship for US$100,000 and uses his new passport to open a new bank account in Guernsey. He transfers all his funds to the new account. In 2017, Guernsey will report the account information to Dominica (where capital income is not taxed) instead of Germany. In the BIS data, the money is now part of the Dominican deposits in Guernsey.

Our empirical study will thus test whether the deposits in tax havens originating from countries offering CBI programs increase after such programs have been set up. Using an event study approach and regressions with country-pair and time fixed effects, we find that tax haven deposits from CBI countries increase by about half after the introduction of CBI programs, compared to deposits from countries not offering CBI.

Our results are robust to using alternative estimators and alternative control groups, to controlling for a large number of factors potentially affecting cross-border capital flows, to different definitions of tax havens, and to different samples. We find no significant effect for residency-by-investment (RBI) programs, which offer (tax) residency but not full citizenship. One potential explanation for this non-finding is that citizenship documents are usually required to open bank accounts, even in tax havens. It is also possible that RBI programs are used to circumvent tax information exchange, but in ways not visible in our data, e.g., because the money is invested in the RBI country itself.

Our paper adds to two strands of literature. First, it contributes to the literature on individual tax evasion (see Sandmo, 2005; Slemrod, 2007; Alm, 2012, for reviews). Recently, several papers in this literature have evaluated the success of tax information exchange as an instrument to fight offshore tax evasion: TIEAs (Johannesen and Zucman, 2014; Hanlon et al., 2015; Heckemeyer and Hemmerich, 2020), the EU Savings Directive (Johannesen, 2014; Caruana-Galizia and Caruana-Galizia, 2016), the U.S. Foreign Account Tax Compliance Act (FATCA, De Simone et al., 2020; Ahrens and Bothner, 2020), and the OECD's Common Reporting Standard (Miethe and Menkhoff, 2019; Casi et al., 2020) all decreased offshore tax evasion at the bilateral level. However, several of these studies have found that many tax evaders did not repatriate their funds but found new ways to hide their money offshore (Johannesen, 2014; Johannesen and Zucman, 2014; Casi et al., 2020; De Simone et al., 2020). Overall, there is no evidence that information exchange led to a transition to legality. Our paper contributes to this literature by pointing out a novel way in which tax evaders can circumvent information exchange.

In a concurrent paper, Ahrens et al. (2022) analyze whether tax evaders engage in regulatory arbitrage to circumvent information exchange from a political science perspective. They study citizenship- and residency-by-investment programs as well as anonymous trusts and shell corporations as options for such regulatory arbitrage. They find only weak evidence that tax evaders use citizenship- and residency-by-investment programs. The results differ from ours as the sample, the treatment group, and the treatment dates differ. First, Ahrens et al. (2022) use a smaller sample, studying deposits in only twelve countries (30 in our study). Among these twelve countries are only two tax havens, while we use all ten tax havens available in the BIS data. Second, they use a much larger treatment group of 43 countries offering citizenship- or residency-by-investment programs. In contrast, we focus on six countries offering CBI programs especially suited for tax evaders. Lastly, they use the first quarter of 2014 as the treatment date for all countries, arguing that the CRS started to affect cross-border investments at this date. In contrast, we use the country-specific introduction of the CBI program. Thus, while the overall topic is similar, our paper is more narrowly focused on using CBI for offshore tax evasion and reaches rather different conclusions.

As a second contribution, our paper also adds to the small literature studying the economic implications of CBI programs. Xu et al. (2015) discusses recent developments and implications of such programs for the real economy, i.e., risks to macroeconomic and financial stability for the mostly small countries offering such programs. Konrad and Rees (2020) focus on CBI programs in the European Union. Because of free movement in the EU, these programs automatically give a right to settle in any country within the EU. The authors argue that individual EU countries sell their citizenship at prices lower than what would be optimal from an EU perspective, as they do not consider the effect of their CBI programs on other EU countries. Our analytical model argues that the proliferation of tax information exchange made it attractive to offer CBI for tax reasons. It points out that individuals acquiring citizenship via a CBI program do not necessarily relocate to their new country of citizenship. This idea complements the literature above, which primarily focused on the implications of people relocating after acquiring the new citizenship.

Section 2 provides some background information on tax information exchange and CBI programs, and Section 3 illustrates their interplay in a simple model. Section 4 presents the data and empirical setting and answers some methodological questions before presenting descriptive evidence. Section 5 discusses the results of an event study of the earliest four CBI programs and regression evidence on all programs, shows how CBI and automatic information exchange interact, and discusses results on residency-by-investment programs. Section 6 concludes.

2. Background

2.1. Tax information exchange

After the financial crisis of 2007–2008, the OECD and G20 countries launched various initiatives to fight offshore tax evasion. A major focus of these initiatives were tax information exchange

agreements (TIEAs). In 2009, the G20 decided to sanction tax havens as long as they had not concluded at least twelve TIEAs. Since then, more than 3000 such treaties have been signed worldwide (Miethe and Menkhoff, 2019). Bilicka and Fuest (2014) show that tax havens mostly signed TIEAs with countries with whom they have strong economic ties. Johannesen and Zucman (2014) examine this first wave of tax information exchange and confirm that it had some of the intended effect: The treaties led to fewer deposits in the reporting tax havens. However, funds were not repatriated but instead shifted to less compliant havens.

Critics found fault with these early information exchange agreements as they only included information exchange on request. In this context, building on the principle of the U.S. Foreign Account Tax Compliance Act (FATCA), the OECD developed the Common Reporting Standard (CRS) Multilateral Competent Authority Agreement (MCAA). While countries agreed to this reporting standard multilaterally, they sign up bilaterally, enabling automatic exchange of bank data for tax purposes. As of August 2020, there are over 4200 bilateral exchange relationships within the CRS.[2] All of the studied CBI countries and the tax havens in which we observe deposits have joined the CRS.[3]

The information collected via the CRS includes information on the account holder (name, address, date/place of birth, country of tax residence, and tax identification number), the total balance of the account at the end of the year, and any interest or dividend income received. It does not comprise information on money paid into the account. Thus, the relevant authorities cannot retrace where the initial deposits came from.

Miethe and Menkhoff (2019) and Casi et al. (2020) document that signing up to the CRS reduced bank deposits in reporting tax havens significantly. However, their results also point out that tax evaders found new ways to hide their true income. In 2017, the OECD started to investigate arrangements circumventing tax information reporting. In this process, the OECD (2018a,b) identified CBI programs as a major risk for information exchange under the CRS.

2.2. Citizenship-by-investment programs

Citizenship-by-investment (CBI) programs offer a structured path to obtain a country's citizenship for a financial investment in its economy or a contribution to its public sector. At the end of 2018, twelve jurisdictions offered a well-defined path to citizenship via investments.[4] Most of the current programs were launched or fundamentally reformed after 2013, that is, after the first wave of TIEAs described above.[5]

At the end of 2018, the OECD (2018a,c) published a list of eight CBI programs deemed to be a high risk to tax information reporting. This list includes all programs offered by CRS-committed countries that do not require individuals to spend a significant amount of time in the jurisdiction and that give access to favorable tax treatments. The OECD defines a favorable tax treatment as giving access to a personal income tax rate of less than 10% on offshore financial assets; or exempting foreign source income or giving a beneficial tax treatment for foreign investors that have obtained residence or citizenship by such programs; and/or the respective jurisdictions having chosen not to receive CRS information. Our empirical analysis focuses on the countries from this OECD list.[6] The OECD did not analyze CBI programs in the context of information exchange on request, but tax evaders likely used CBI to provide an additional layer of secrecy against these earlier tax information exchange initiatives as well.

Table 1 gives an overview of the programs on the OECD list, including the requirements for citizenship. All these programs have no or only ceremonial requirements in addition to the monetary investment. The required investments differ substantially. Some programs grant citizenship in return for investments in the local economy (e.g., Cyprus). Other programs require donations to government accounts or quasi-governmental funds (e.g., the National Development Fund in Antigua and Barbuda). Some programs require combinations of economic investments and donations; others allow investors to choose between different options. In all programs, applicants must pay application and registration fees to cover processing and due diligence. The cost of obtaining a new citizenship ranges from about US$100,000 (Dominica, St. Lucia) to about €2.5 million (Cyprus).

Some countries in Table 1 have had CBI programs for a long time but recently carried out reforms that made these programs (more) attractive for tax evaders. In these cases, Table 1 lists the requirements and application numbers after the reform. In particular, the reforms significantly lowered the required minimum investment (in Cyprus from about €25 million in 2007 to €2.5 million in 2013) or abolished residency requirements (Vanuatu) or personal interviews (Dominica).

High net-worth individuals from all over the world are on the demand side of CBI. Accurate statistics on numbers and origins of applicants are sparse. Xu et al. (2015) identify two main groups of applicants: Individuals from China, Russia, and the Middle East interested in visa-free travel or searching for a safe haven in the context of a deteriorating geo-political climate; and individuals from high-income countries motivated by tax planning. The various reasons to buy a passport may be complementary: An individual acquiring a passport to circumvent tax information exchange may also use it for visa-free travel, and might take such aspects

[2] See www.oecd.org/tax/automatic-exchange/international-framework-for-the-crs.

[3] Among the CBI countries, the CRS became effective in 2016 in Cyprus and Malta, in 2017 in St. Lucia, Grenada, and Vanuatu, and in 2019 in Dominica. Among the tax havens which report information on foreign deposits, the CRS became effective in 2016 in Austria, Belgium, Guernsey, Isle of Man, Jersey, and Luxembourg; in 2017, it became effective in Chile, Hong Kong, Macao, and Switzerland.

[4] Table 1 and footnote 6 list those countries. Several other countries have legal provisions allowing CBI (e.g., Austria, Bulgaria, Cap Verde, Croatia, or Romania). However, in these countries, the requirements to obtain citizenship are not well-defined or require very long waiting periods. For example, Austria considers people with "outstanding" achievements for citizenship; Bulgaria requires a 3–5 year waiting period. We do not study these programs further.

[5] Already during the 1980s, 1990s, and early 2000s, several countries—primarily small island states in the Caribbean and the Pacific—ran programs selling passports. These early programs were widely associated with fraud, corruption, and money laundering (see Shachar, 2017). As a result of international and domestic pressure and the threat of economic sanctions, these countries either shut down their programs or reformed them fundamentally.

[6] Cambodia, Jordan, Moldova, and Turkey also offered well-defined CBI programs during our observation period but are not on the OECD list. Each of these programs has some characteristics making it unattractive for tax evaders or irrelevant to our empirical results. *Cambodia* requires knowledge of Khmer history and language. *Jordan* requires to relinquish all other passports, making it the only CBI country that does not allow dual citizenship. Additionally, Jordan started its program only in 2018:Q2, shortly before our data ends in 2018:Q4. *Moldova* introduced its programs only in 2018:Q3. *Turkey* is a large country with a comparatively high stock of foreign deposits, making it unlikely that the deposits of tax evaders using this CBI program are visible in the aggregate data we use for our analysis. Individuals using these non-high-risk CBI programs are more likely motivated by non-tax reasons (e.g., business opportunities, education access for children, better lifestyle, higher security) or the desire to live in that country. We thus expect that these programs are used less to circumvent tax information exchange. In untabulated analyses using these four countries as the treated group (available upon request), we find no significant increase in deposits in tax havens after these countries introduced their CBI programs.

Table 1
High-risk CBI programs.

	Program operative in...	Minimum investment	Language test?	Residence requirement?	Issued passports
Antigua and Barbuda	2013:Q2	US$150,000 donation to the National Development Fund or US$200,000–1.5 million investment (government-approved real estate or business projects)	No	Five days on Antigua or Barbuda within five years of obtaining citizenship	4,373 (as of 2019)
Cyprus	Orig. 2002, major reform in 2013:Q2*	2014: €2 million investment (government-approved building, land development, infrastructure projects, in companies or alternative investment funds) *and* €500,000 real estate	No	Applicants must be registered as residents for at least 6 months before obtaining citizenship (but no physical residency necessary)	2,657 (2014-2019)
Dominica	Orig. 1993, major reform in 2014:Q4**	2014: US$100,000 donation (Economic Diversification Fund) or US$200,000 investment (government-approved real estate)	No	No	6,000–10,000 (as of 2018)
Grenada	2014:Q1***	US$150,000 donation (National Transf. Fund) or US$350,000 investment (government-approved real estate)	No	No	2,894 (as of 2019)
Malta	2014:Q1	€650,000 donation to the National Development and Social Fund *and* €350,000 purchase or €16,000 p.a. rent of real estate *and* €150,000 investment in government bond, stocks, or special purpose vehicles	No	Establishing official residence a year before application by purchasing or leasing property; no physical residency if buying property	3,708 (as of 2019)
St. Kitts and Nevis	1984:Q1	US$150,000 donation (Sust. Growth Fund) or US$400,000 investment (government-approved real estate)	No	No	16,544 (as of 2018)
St. Lucia	2016:Q1	US$100,000 donation (National Economic Fund) or investment of US$300,000 (government-approved real estate projects) or of US$500,000 (government bonds) or of US$3.5 million (government-approved enterprise projects)	No	No	631 (as of 2019)
Vanuatu	2017:Q1****	US$130,000 contribution (Development Supporting Program)	No	No	1,000-3,000 (as of 2018)

* Frequent reforms between 2007 and 2013. In May 2013, the minimum investment was lowered to €2 million (before: up to €25 million). Application numbers significantly increased thereafter. The program was discontinued at the end of 2020.
** Reform abolished interview requirements, added more investment options, and lowered prices for some applicants.
*** Legislation approved in Aug. 2013, but applications only possible from Jan. 2014 onwards.
**** Several earlier programs, but these either had waiting periods of several years, residency requirements, or tight quotas on application numbers. The Vanuatu Development Support Program started in 2017 is also the first of these programs with a substantial number of applications.

Note: List includes only CBI programs classified as high-risk CBI programs by OECD (2018a,c). Information on required investments is for a single main applicant. In each program, additional government, processing and passport fees apply (in most cases US$25,000–50,000). *Sources:* Antigua and Barbuda: Antigua and Barbuda Citizenship by Investment Act, 2013; Cyprus: Section 11A of the Civil Registry Laws of 2002–2019; Dominica: Commonwealth of Dominica Citizenship by Investment Regulations, S.R.O. 37 of 2014; Grenada: Grenada Citizenship by Investment Act 2013; Malta: Maltese Individual Investor Programme, Legal Notice 47 of 2014; St. Kitts and Nevis: 1984 Citizenship Act, Part II Section 3 (5); St. Lucia: St. Lucia Citizenship-by-Investment Act No. 14 of 2015; Vanuatu: Chapter 112 of Vanuatu's Citizenship Act and Government Regulation No 215. Information on issued passports from IMI (2020), Nesheim (2018) and official statistics.

into account when deciding which passport to buy.[7] The Cypriot and Maltese programs are particularly attractive for investors looking for visa-free travel opportunities, potentially in addition to tax planning.

The last column of Table 1 gives an overview of the existing estimates on the uptake of CBI programs. The available data indicates that about 40,000 individuals have used these programs to acquire citizenships between 2013 and 2018/2019. While this is not a very high absolute number, given the very high net worth[8] of many tax evaders and the low population of many countries offering CBI programs, it is plausible that the deposits of these individuals are visible in the aggregate data discussed in Section 4.1.

How can CBI programs be used for tax planning? Most countries offering such programs tax personal income at low rates or even exempt foreign source income. However, individuals are supposed to pay capital income tax in their country of (tax) residence, which is unaffected by acquiring a new citizenship (assuming the individual does not relocate to their new 'homeland'). Similarly, tax information exchange under the CRS is based on tax residence, not citizenship. Therefore, acquiring a new citizenship without moving to the respective country does not affect the tax legally owed to an individual's actual country of residence. It does, however, facilitate tax evasion by providing the individual with the means to circumvent tax information exchange.[9]

The current CRS due diligence procedures require that taxpayers provide self-certification of their tax residence when opening a new bank account or when a residence test is required for a pre-existing account.[10] The financial institution can ask account

[7] Individuals may also use CBI to obtain secrecy for other reasons than taxation, e.g., to hide funds related to money laundering, corruption or drug crime. As taxes on such income (and the interest on it) are commonly also evaded (otherwise, the tax information could be used for detection), the existence of such motives does not fundamentally change the argument in this paper.

[8] Alstadsæter et al. (2019) show that households in the top 0.01% of the wealth distribution own about half of the total deposits in tax havens.

[9] A large majority of OECD countries allows dual citizenship. Even a home country prohibiting dual citizenship does not necessarily make this strategy impossible. The tax evaders may simply choose not to report the new passport to their home country (analogously to not reporting their offshore wealth despite the legal requirement to do so). The penalty for acquiring a second passport in secret is usually, in the first instance, only a fine (except in China, where individuals lose Chinese citizenship when acquiring another one).

[10] Such a self-certification can be based on a yes/no response; for instance, banks can ask an account holder whether (i) the jurisdiction in which the account is being opened or (ii) the country that issued their passport is their sole tax residence, and ask additional questions only if the answer is no to both options (www.oecd.org/tax/exchange-of-tax-information/CRS-related-FAQs.pdf, p. 7).

holders to provide supporting "documentary evidence" (such as a passport, an ID card, or a residence certificate). According to the CRS, financial institutions have to reject a self-certification or documentary evidence only if they have reason to know that the self-declaration or provided evidence is unreliable or incorrect. Financial institutions are not required to search for additional information. Thus, if an individual does not want to disclose their actual tax residence, they can misuse residency supporting documents (such as a passport) obtained via a CBI program to pretend tax residency in that country. As a consequence, the account information collected under the CRS will then be falsely sent to the CBI jurisdiction (or, if the CBI country has chosen not to receive CRS information, no account information will be reported).[11] Thus, CBI programs offer tax evaders a tool to undermine the CRS due diligence procedures and to circumvent tax information reporting. In similar spirit, tax evaders likely used CBI to avoid detection by earlier TIEAs, which had even fewer due diligence procedures in place.

3. Model

We illustrate the interplay between tax information exchange and CBI in a simple model where we represent tax evasion and the purchase of a new citizenship as rational decisions (following Allingham and Sandmo, 1972). We focus on individuals living in a high-tax country. These individuals can evade capital income taxes by transferring money to a tax haven. To fight against this form of tax evasion, the government of the high-tax country can attempt to force the tax haven to share information, e.g., by signing up to the CRS. Individuals can sidestep these detection efforts by acquiring citizenship of a third country.[12] Our model abstracts from all non-tax reasons to acquire a new citizenship.

In more detail, the high-tax country first attempts to coerce the tax haven to exchange tax information. To do so, the high-tax country can impose sanctions on the tax haven, which cost the haven C. These sanctions come at a cost to the high-tax country itself, which we denote by αC, with $\alpha \geqslant 0$. Thus, the sanctions may be more costly for the high-tax country than for the tax haven ($\alpha > 1$) or less costly ($\alpha < 1$).

Depending on the success of imposing tax information exchange ($s \in \{\text{CRS}, \text{no CRS}\}$), the tax haven sets a revenue-maximizing fee f_s for hiding a tax evader's account. A third country ("CBI country") observes whether there is tax information exchange and offers its citizenship for a donation c_s. Based on the tax haven fee f_s and the cost of citizenship c_s, individuals—who differ in their income—decide whether to evade taxes and whether to acquire a new citizenship.

Tax information exchange and citizenship acquisition influence the probability that the tax authorities in the high-tax country detect the tax evasion. Without the CRS, the tax authorities have little or no information about accounts held in the tax haven, so the detection probability is low.[13] With the CRS, tax authorities obtain information on the haven accounts of their citizens, increasing the detection probability. If the tax evader acquires the citizenship of the CBI country, the information does not reach the high-tax country's tax authorities, bringing the detection probability back to the level without tax information reporting. To summarize,

$$\begin{aligned} p_{\text{no CRS, no CBI}} &= p_L, & p_{\text{no CRS, CBI}} &= p_L, \\ p_{\text{CRS, no CBI}} &= p_H, & p_{\text{CRS, CBI}} &= p_L, \end{aligned} \tag{1}$$

with $p_L < p_H$.

We solve the model by backward induction and start by considering individuals' decisions on evading taxes and acquiring a new citizenship.

Individual decisions. Individuals decide by maximizing their expected utility, which—depending on their decisions—is

$$EU(\text{no evasion, no CBI}) = y_i - ty_i, \tag{2a}$$
$$EU(\text{no evasion, CBI}) = y_i - ty_i - c_s, \tag{2b}$$
$$EU(\text{evasion, noCBI}) = y_i - p_{s,\text{ no CBI}} \cdot Fty_i - f_s, \tag{2c}$$
$$EU(\text{evasion, CBI}) = y_i - p_{s,\text{ CBI}} \cdot Fty_i - f_s - c_s. \tag{2d}$$

y_i is the capital income of individual i, t the applicable tax rate, and F the fine imposed on the amount of evaded tax when detected. As is standard in the literature, we assume that $p_H F < 1$, i.e., that tax evasion is worthwhile in expectation in the absence of fixed cost. s denotes the state of the world, i.e., whether the tax haven has signed up to the CRS. For simplicity, we assume risk-neutral individuals.[14]

Citizenship decision. First consider the decision to acquire a new citizenship. Note that when not evading taxes, individuals will not acquire a new citizenship, as $EU(\text{no evasion, no CBI}) \geqslant EU(\text{no evasion, CBI})$. Individuals who evade taxes will buy a new citizenship if the expected gain from reducing detection probabilities is higher than the cost of citizenship. Comparison of Eqs. (2c) and (2d) shows that a tax evader will acquire a new citizenship if

$$y_i > \frac{c_s}{(p_{s,\text{ no CBI}} - p_{s,\text{ CBI}})Ft} \equiv \hat{y}_{CBI}. \tag{3}$$

As acquiring a new citizenship entails a fixed cost, only individuals with sufficiently high income do so (in line with empirical evidence, see Alstadsæter et al., 2019; Londoño-Vélez and Ávila-Mahecha, 2021).

There is only an incentive to buy a citizenship when the tax haven is exchanging information with the high-tax country: Acquiring a new citizenship is only beneficial in the tax evasion context if it lowers detection probabilities, and in the absence of information exchange, the new citizenship is not necessary.[15] Correspondingly, if there is tax information exchange, more individuals acquire a new citizenship if $p_H - p_L$ is high.

Evasion decision. We first consider the case where the marginal evader does not acquire a new citizenship (case 1). Comparing Eqs. (2a) and (2c) shows that individuals will evade taxes if

$$y_i > \frac{f_s}{(1 - p_{s,\text{ noCBI}}F)t} \equiv \hat{y}_e. \tag{4}$$

More individuals evade taxes when the tax rate t is higher or when the fine for tax evasion F or the tax haven fee f_s is lower.

[11] A CBI country participating in the CRS and "mistakenly" receiving a report about an account belonging to a new citizen who is not a tax resident in the CBI country is formally committed to passing on the information to the tax residence country. However, to be able to forward account information to other competent tax authorities, the tax authority of the CBI country would need to have information on where this person is tax resident. In practice, this can easily be avoided, e.g., by not filing a tax return in the CBI country. Anecdotal evidence by experts indicates that such data transfers are indeed rare in practice.

[12] In principle, the tax haven could also offer the citizenship itself (instead of a third country doing so). Such a model yields similar results. We discuss the difference in footnote 18. We opt for modeling the tax haven and the CBI country as separate countries to link the model more closely to the empirical part.

[13] In practice, bilateral TIEAs had similar effects, albeit increasing detection probabilities by less as information exchange was mostly on request. For better readability, we will focus on the CRS in this section.

[14] This assumption not only allows for analytical tractability but also reflects the fact that many tax evaders are very wealthy (Alstadsæter et al., 2019) and are thus likely not very risk averse when facing small risks (relative to their wealth). In addition, we only model capital income; the degree of risk aversion also depends on income from other sources insofar as risk aversion varies with income and wealth. This modeling choice also follows prior literature, e.g. Srinivasan (1973); Kleven et al. (2011); Langenmayr (2017).

[15] To see this in Eq. (3), note that in the absence of information exchange, $p_{\text{no CRS, no CBI}} = p_{\text{no CRS, CBI}} = p_L$. In this case, $\hat{y}_{CBI} \to \infty$.

Next, consider the case where the marginal evader acquires a new citizenship (case 2). Comparing Eqs. (2a) and (2d) shows that, in this case, individuals will evade taxes if

$$y_i > \frac{f_s + c_s}{(1 - p_{s,\ \text{CBI}}F)t} \equiv \widehat{y}_{eCBI}. \tag{5}$$

We will discuss which case is relevant after deriving the optimal tax haven fee f^* and cost of citizenship c^*, to which we turn next.

Citizenship-by-investment program. The CBI country observes whether the tax haven has signed up to the CRS and anticipates that some individuals from the high-tax country will acquire its citizenship if the other two countries exchange tax information. Issuing an additional passport has a small cost, δ, which we can interpret as the cost of processing, due diligence, and the passport itself. The CBI country decides on the donation required for citizenship, c_s, to maximize fiscal revenues,

$$T^{\text{CBI}} = \begin{cases} \int_{\widehat{y}_{CBI}}^{\infty} c_s - \delta dG(y_i) = (c_s - \delta)[1 - G(\widehat{y}_{CBI})] & \text{in case 1,} \\ \int_{\widehat{y}_{eCBI}}^{\infty} c_s - \delta dG(y_i) = (c_s - \delta)[1 - G(\widehat{y}_{eCBI})] & \text{in case 2,} \end{cases} \tag{6}$$

where $G(y_i)$ denotes the cumulative distribution function of income y_i. In case 1, the marginal person acquiring a new citizenship has a higher income than the marginal evader; in case 2, the marginal buyer of citizenship is identical to the marginal evader.

Maximizing Eq. (6) yields the first-order condition describing the optimal required donation for citizenship

$$\frac{\partial T^{\text{CBI}}}{\partial c_s} = \begin{cases} \left[1 - G\left(\hat{y}_{CBI}\left(c_s^*\right)\right)\right] - \frac{\left(c_s^* - \delta\right) g\left(\hat{y}_{CBI}\left(c_s^*\right)\right)}{\left(p_{s,\ \text{no CBI}} - p_{s,\ \text{CBI}}\right) Ft} = 0 & \text{in case 1,} \\ \left[1 - G\left(\hat{y}_{eCBI}\left(c_s^*\right)\right)\right] - \frac{\left(c_s^* - \delta\right) g\left(\hat{y}_{eCBI}\left(c_s^*\right)\right)}{\left(1 - p_{s,\ \text{CBI}}F\right) t} = 0 & \text{in case 2.} \end{cases} \tag{7}$$

These equations illustrate the key tradeoff for the CBI country: A higher cost of the citizenship brings in additional revenue from those buying it (first term of Eq. 7), but the country also loses revenue because fewer people buy the citizenship (second term of Eq. 7). Implicit differentiation of Eq. (7) shows that the CBI country can require a higher donation if t is high, as then the potential gain from decreasing detection probabilities is high. If the marginal evader chooses CBI (case 2), the CBI country lowers its required donation in response to an increased fine to make evasion and thus CBI more attractive. If the CBI decision is independent of the evasion decision (case 1), a higher fine in the high-tax country leads to a higher required donation for CBI, as the higher fine makes lowering detection probabilities more attractive.

Tax Haven Services. The tax haven (or banks within it) sets a fee for hiding accounts. It chooses this fee to maximize revenues,

$$T^{\text{Haven}} = \begin{cases} \int_{\widehat{y}_e}^{\infty} f_s dG(y_i) = f_s[1 - G(\widehat{y}_e)] & \text{in case 1,} \\ \int_{\widehat{y}_{eCBI}}^{\infty} f_s dG(y_i) = f_s[1 - G(\widehat{y}_{eCBI})] & \text{in case 2.} \end{cases} \tag{8}$$

The first-order condition that implicitly determines the optimal fee is

$$\frac{\partial T^{\text{Haven}}}{\partial f_s} = \begin{cases} \left[1 - G\left(\hat{y}_e\left(f_s^*\right)\right)\right] - \frac{f_s^* g\left(\hat{y}_e\left(f_s^*\right)\right)}{\left(1 - p_{s,\ \text{no CBI}}F\right) t} = 0 & \text{in case 1,} \\ \left[1 - G\left(\hat{y}_{eCBI}\left(f_s^*\right)\right)\right] - \frac{f_s^* g\left(\hat{y}_{eCBI}\left(f_s^*\right)\right)}{\left(1 - p_{s,\ \text{CBI}}F\right) t} = 0 & \text{in case 2.} \end{cases} \tag{9}$$

Again, in both cases, the first term shows how the fee revenue from *existing* evaders adjusts when the fee is changed. The second term depicts the revenue effects of changes in the *number of evaders*. The fee is lower if the detection probability for tax evasion is higher (see Appendix A.1).

We are now able to describe individuals' equilibrium behavior and determine which of the two cases is relevant. As we show formally in Appendix A.1, whether the marginal evader also acquires a new citizenship depends on whether the CBI country faces costs for issuing passports. If there are no such costs ($\delta = 0$), the symmetry of the maximization problems of the CBI country and the tax haven implies that $c^* = f^*$ if the high-tax country receives tax information. Both countries maximize their revenue by offering a passport/a tax evasion opportunity to all those individuals who would also evade taxes if there was no CBI. Thus, if $\delta = 0$, case 2 is relevant, and the marginal evader acquires a new passport.

If there is a positive cost of issuing new passports ($\delta > 0$), it is no longer optimal for the CBI country to set the fee so low that all evaders acquire a passport. Thus, the marginal evader no longer acquires one (case 1). We summarize these results in Proposition 1.

Proposition 1 (*Tax evasion and citizenship-by-investment decisions*).

1. If there is no tax information exchange, individuals with income $y_i > \widehat{y}_e = \frac{f^*_{noCRS}}{(1-p_L F)t}$ evade taxes.
2. If there is tax information exchange and the cost of issuing passports for the CBI country is positive, individuals with income $y_i > \widehat{y}_e = \frac{f^*_{CRS}}{(1-p_H F)t}$ evade taxes. The marginal evader does not acquire a new passport. Individuals with income $y_i > \widehat{y}_{CBI} = \frac{c^*_{CRS}}{(p_H - p_L)Ft}$ acquire the citizenship of the CBI country.
3. If there is tax information exchange and passports can be issued without cost, individuals with income $y_i > \widehat{y}_{eCBI} = \frac{f^*_{CRS} + c^*_{CRS}}{(1-p_L F)t}$ evade taxes and acquire a new citizenship.
4. In equilibrium, the number of individuals evading taxes is independent of the detection probability.

Proof. See Appendix A.1.

In equilibrium, the number of individuals evading taxes is independent of the detection probability. This is the case because the tax haven always takes the same share of the gain from evading taxes. If the detection probability rises, the tax haven lowers its fee correspondingly. Given the linearity of the utility function, it is always the same individual who is indifferent between evading taxes or not.[16]

To summarize, high-income individuals evade taxes. If tax information is exchanged, the richest evaders acquire the citizenship of the CBI country to lower the detection probability to the level without tax information exchange. On the other hand, if tax information is not exchanged, there is no incentive to acquire a new citizenship. Fig. 1 illustrates individual behavior in equilibrium.

Tax Information Exchange. High-tax countries have historically pressured tax havens to sign tax information exchange agreements (Bilicka and Fuest, 2014). One form of pressure could be threatening to disrupt economic relations or even imposing formal sanctions. Such pressure may come at a cost to the high-tax country, e.g., because it has to forego valuable trading activities with the tax haven. In our model, such sanctions impose costs of C on the tax haven when non-compliant; these costs disappear when it agrees to exchange tax information. Therefore, the tax haven agrees to exchange information if

$$T^{\text{Haven}}_{\text{CRS}} \geqslant T^{\text{Haven}}_{\text{no CRS}} - C. \tag{10}$$

The threat of sanctions imposes costs of αC (with $\alpha \geqslant 0$) on the high-tax country. The high-tax country can also decide not to pressure the tax haven, accepting that the latter does not sign up to the CRS. Tax revenue of the high-tax country is

[16] While $\frac{d\widehat{y}_e}{dp} = 0$, $\frac{d\widehat{y}_{eCBI}}{dp} = \frac{\delta F}{(1-pf)^2 t}$, i.e., $\frac{d\widehat{y}_{eCBI}}{dp}$ is only zero when $\delta = 0$, but this is the only case in which case 2 occurs in equilibrium.

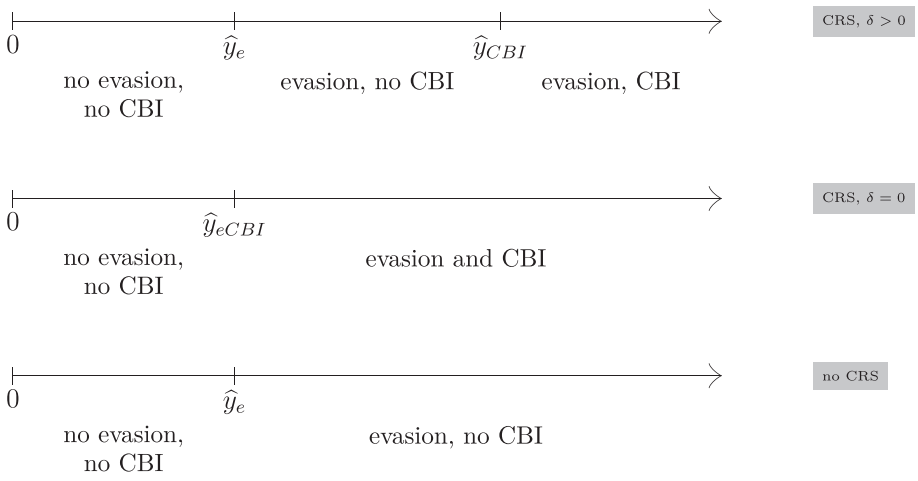

Fig. 1. EVASION AND CBI DECISIONS. *Note:* Figure summarizes individual decisions for individuals with different income y_i, taking into account how f^* and c^* are set in equilibrium.

$$T^{\text{High-tax}} \begin{cases} T^{\text{High-tax}}_{\text{noCRS}} & \text{if no CRS,} \\ T^{\text{High-tax}}_{\text{CRS}} - \alpha C & \text{if CRS.} \end{cases} \tag{11}$$

To maximize revenues, the high-tax country solves the following maximization problem:

$$\begin{aligned} \max_{C} \quad & T^{\text{High-tax}}_{\text{CRS}} - \alpha C \\ \text{s.t.} \quad & T^{\text{Haven}}_{\text{CRS}} \geqslant T^{\text{Haven}}_{\text{no CRS}} - C \\ & T^{\text{High-tax}}_{\text{no CRS}} \leqslant T^{\text{High-tax}}_{\text{CRS}} - \alpha C. \end{aligned} \tag{12}$$

Proposition 2 summarizes the solution of this maximization problem.

Proposition 2 (*Tax Information Exchange*).

1. The high-tax country is willing to pressure the tax haven to sign up to the CRS if $\frac{T^{\text{High-tax}}_{\text{CRS}} - T^{\text{High-tax}}_{\text{no CRS}}}{T^{\text{Haven}}_{\text{CRS}} - T^{\text{Haven}}_{\text{no CRS}}} \geqslant \alpha$.
2. In a world without CBI programs, $\frac{T^{\text{High-tax}}_{\text{CRS}} - T^{\text{High-tax}}_{\text{no CRS}}}{T^{\text{Haven}}_{\text{CRS}} - T^{\text{Haven}}_{\text{no CRS}}} > 1$. Then, as long as the cost of the sanctions to the high-tax country is lower or equal to their cost to the tax haven ($\alpha \leqslant 1$), the high-tax country will successfully pressure the tax haven. If CBI programs exist, tax information exchange does not necessarily occur even when $\alpha \leqslant 1$.
3. If the high-tax country puts pressure on the tax haven, the optimal C^* is $C^* = T^{\text{Haven}}_{\text{no CRS}} - T^{\text{Haven}}_{\text{CRS}}$, i.e., just large enough to make the tax haven sign up to the CRS.

Proof. See Appendix A.2.

The high-tax country is only willing to put pressure on the tax haven if its gain in revenue is sufficiently higher than the revenue loss of the tax haven. In a world without CBI, the high-tax country will always gain more.[17] With CBI in place, the CBI country siphons off part of the additional fee and fine payments after tax information exchange.[18]

[17] Without CBI, tax information exchange implies that the high-tax country detects evaders with a higher probability. Evaders thus pay more fines (in expectation). Therefore, there is always a surplus to be shared between the two countries.

[18] Here, the results in a model where the tax haven itself offers CBI differs. Then, signing up to the CRS is more attractive, as the tax haven can still capture a larger share of the rents from tax evasion. If the CBI country is a different country, the tax haven has to share these rents with the CBI country. A tax haven offering CBI will sign up to the CRS in all cases in which it did so in the benchmark model without CBI.

4. Empirical setting

In the following, we empirically test one of the main assumptions from the model presented above: That in the face of increased detection probabilities due to tax information exchange, some tax evaders use CBI programs to disguise their origin and dodge tax information exchange. Therefore, we expect to see more flows of money to tax havens that seemingly originate from countries with a CBI program. We first discuss our data (Section 4.1), and then present our empirical strategy (Section 4.2).

4.1. Deposit data

In our empirical test, we use bilateral data on cross-border bank deposits from the Locational Banking Statistics (LBS) of the Bank for International Settlements (BIS). As of 2017, the LBS cover 94% of the cross-border interbank relationships (BIS, 2019), but not all of this data is publicly available. The available bilateral data on deposits of the non-bank sector cover foreign deposits in 30 countries (as of 2018). These deposits originate in 200 jurisdictions around the world. We use information on deposits of the non-bank sector, as deposits of financial institutions cannot constitute individual tax evasion. Thus, an example observation in our data set would be the deposits of Maltese residents held in Switzerland in the first quarter of 2018.

This quarterly data set has been widely used as a proxy for offshore tax evasion (see e.g. Johannesen and Zucman, 2014; Langenmayr, 2017; Miethe and Menkhoff, 2019; Casi et al., 2020) and is the major source of information on money in tax havens. However, it also has limitations. First, as the BIS allocates deposits to origin countries on an immediate counterparty basis, the data does not show the ultimate beneficiary of deposits (IMF, 2013; BIS, 2019). For example, if a Maltese resident has a (shell) company in Panama, which in turn owns a Swiss bank account, the BIS assigns the deposits to Panama. Second, it is not possible to distinguish between individuals or entities within the non-financial sector, and not all deposits are used for tax evasion.[19] Zucman (2013) suggests that at least 50% of the deposits held in tax havens belong to households. While there are few reasons to hold money in tax havens besides tax evasion, some of the capital income received on these deposits may be declared and taxed in the investor's home

[19] Johannesen and Zucman (2014) show effects that are consistent with the extensive use of shell companies for tax evasion purposes. Consequently, parts of the deposits of the non-bank sector in the LBS likely belong to corporations or shell companies.

country. Third, the LBS only include bank deposits and do not cover portfolio securities, which are the largest form of offshore wealth (Zucman, 2013; Alstadsæter et al., 2018). For these reasons, any quantitative interpretation of our results needs to be made with caution, in particular when assessing the amount of tax evaded via CBI. Nevertheless, this data is the best available bilateral data source for the wealth hidden offshore.

We use a panel of 36 quarters, ranging from 2010:Q1 to 2018:Q4. We start our analysis in 2010 because the bilateral coverage is worse beforehand, and because deposit data may be affected by the financial crisis of 2007–2008. As there are still some missing values, especially in the early years, this is an unbalanced panel.[20] Each of the 30 countries reports bilateral information on the foreign deposits held there by up to 200 other countries. These include six countries with high-risk CBI programs (Cyprus, Dominica, Grenada, Malta, St. Lucia, and Vanuatu); data on deposits from Antigua and Barbuda and St. Kitts and Nevis are not available.[21]

In Table A.1 in the appendix, we list all 30 reporting countries in our sample and provide descriptive statistics on cross-border bank deposits held in each. Among these 30 countries are 10 tax havens following the definition of Johannesen and Zucman (2014). Johannesen and Zucman (2014) define this tax haven list based on bank secrecy to study tax evasion by individuals. Their tax haven list includes 52 jurisdictions and is thus longer than most other definitions of tax havens. We use it as our baseline, because including a de facto non-haven as a tax haven leads to more conservative estimates. In a robustness test, we define tax havens more restrictively, using a consensus list of tax havens based on the studies of Hines and Rice (1994); Dharmapala (2008); Gravelle (2009) and Johannesen and Zucman (2014).[22] We also show that our results are robust to excluding each tax haven individually.

Table 2 shows some country-average descriptive statistics on cross-border bank deposits. In our dataset, the average deposit per origin country i (i.e., at the bilateral level) is US$1.21 billion. The average bilateral deposit in non-tax-haven countries is about twice as large (US$1.51 billion) than the average in tax havens (US$717 million). This relationship reverses when we only consider deposits stemming from citizens of countries offering CBI programs: For these, the bilateral deposits in havens (US$353 million) are more than twice as large as the deposits in non-havens (US$168 million). This pattern is similar in the full sample and in the sample for which we have information on country-level control variables (discussed in Section 4.2). The total foreign deposits in one of the BIS reporting countries in our sample average US$211 billion.

4.2. Estimation strategy

To understand our estimation strategy, consider the following example. A French woman has money in a bank account in the Cayman Islands. She does not declare the capital income received on this money to the French tax authorities, evading capital income taxes. In the BIS statistics, this deposit is part of the French deposits in the Cayman Islands.

While France and the Cayman Islands have had a tax information exchange agreement since 2009, our tax evader found the probability of being detected very low, as the agreement only enabled exchanging information on request, and she was certain that the French tax authorities had no knowledge of her Cayman Islands account. In 2016, she realized that both France and the Cayman Islands had signed up to the CRS and would start exchanging information on bank accounts automatically. In this process, her Cayman Islands bank account would likely come to light.

To avoid this, she acquires the citizenship of St. Lucia for US $100,000. She opens a new bank account in the Cayman Islands, using her St. Lucia passport for identification and ticking the box that she is tax resident there.[23] She transfers the money from the old account to the new one and closes the old one. The BIS now considers the deposits as a St. Lucian deposit in the Cayman Islands. When St. Lucia starts receiving tax information in 2018, it learns about the Cayman Islands bank account. However, as St. Lucia only taxes individuals with a permanent home in St. Lucia (or who are present there for more than 183 days/year), it does not impose capital income taxes. St. Lucia has no information that she is tax resident in France and thus cannot pass on the information.

If CBI programs are routinely used in this way, we should see an increase in deposits in tax havens originating from CBI countries after these countries introduced their CBI programs.[24] We employ two strategies to test this empirically: First, we implement an event study approach with a control group to analyze the dynamics of the response to the introduction of the earlier CBI programs. Second, we estimate the average effect of the introduction of CBI programs on deposits using a two-way fixed effects approach. Both approaches exploit the evolution of deposits over time (before vs. after the introduction of the CBI program) and across countries (CBI countries vs. a control group of countries which did not implement such a program).[25]

Our empirical strategy relies on the CBI countries not changing other laws facilitating offshore tax evasion around the time they introduced or reformed the CBI programs. While some countries (esp. Grenada) made concurrent changes to laws affecting international companies and trusts, these changes did not facilitate offshore tax evasion.

Event study estimation. We explore the dynamics of introducing a CBI program by estimating an event study with a control group,

[20] We use this unbalanced panel for the main analyses. However, we cannot use it to meaningfully compare deposits over time or between country groups. Thus, for the descriptive analyses, we impute the missing values using inverse distance weighted interpolation (Stata's mipolate idw command by Cox, 2015). In a robustness check, we also re-run our main regressions using the imputed dataset and find very similar results (see Fig. 7).

[21] All countries with high-risk CBI programs also adopted the CRS. In our main analysis, we do not consider Cambodia, Jordan, Turkey, and Moldova, i.e., countries with well-defined CBI programs that were not classified as high-risk programs by the OECD (see the discussion in Section 2.2). We drop these programs from the empirical analysis, as it is not clear whether they should be in the treatment or control group.

[22] The consensus list of tax havens includes Guernsey, Hong Kong, Isle of Man, Jersey, Luxembourg, Macao, and Switzerland. Johannesen and Zucman (2014) additionally include Austria, Belgium, and Chile.

[23] She may also use a bank account in St. Lucia, but this would not be observable in the BIS data. In untabulated analyses (available upon request), we consider time trends of domestic deposits in Cyprus, Malta, and Vanuatu for the non-bank sector and aggregate deposits of Eastern Caribbean countries, finding no structural breaks when the CBI programs were introduced. It may be that the increase after CBI is too small relative to domestic deposits to be observable in the aggregate data. However, it is also plausible that most evaders follow the method described above and keep the money in the haven where they originally had an account (which minimizes the detection risk associated with international money transfers). Note that none of the CBI countries is a major destination for private wealth held offshore. In 2015, the offshore wealth held in all our CBI countries together was less than 1.7% of total offshore wealth (see Tab. A2b in the online appendix of Alstadsæter et al., 2018).

[24] Note that relocating funds to non-CRS-compliant tax havens would look differently in the data: If the French woman in our example relocated the deposits in the Cayman Islands to a different tax haven, the deposits would still show up in the data as originating from France. Our empirical strategy, however, studies deposits that (seem to) originate in a CBI country.

[25] Note that some countries in the control group are also affected by the CBI programs, as some of their residents obtain a second citizenship. Then deposits from these countries nominally change the country of ownership, leading to slightly lower deposits in the control group. In principle, this leads to inflated estimates of the effect of CBI programs. However, we study relative changes using a log-transformed model, and the CBI countries are much smaller than the average control group country. Thus, the error from "double-counting" relocated deposits is of negligible magnitude.

Table 2
Descriptive statistics for deposit data.

Deposits in:	All reporting countries			Havens		Non-Havens	
Variable	Obs.	Mean	SD	Obs.	Mean	Obs.	Mean
Full sample							
Average bilateral deposits (million US$)	171,360	1,211.0	12,998.9	64,908	716.5	106,452	1,512.5
Thereof: Deposits from CBI countries	4,932	242.1	1,057.1	1,980	353.0	2,952	167.8
Sample with control variables available							
Average bilateral deposits (million US$)	129,528	1,279.1	13,345.2	48,600	841.3	80,928	1,542.0
Thereof: Deposits from CBI countries	4,932	242.1	1057.1	1,980	353.0	2,952	167.8

Note: This table shows descriptive statistics on bilateral foreign deposits in million US$ in the reporting countries considered in our analysis (all and split into tax havens and non-havens according to the definition by Johannesen and Zucman, 2014). Data from 2010:Q1 to 2018:Q4. This table uses imputed deposit values for country pairs missing information on deposits for parts of the sample period; imputed by inverse distance weighted interpolation.
Data: BIS Locational Banking Statistics 2019.

$$ln(deposits)_{ijt} = \sum_{q=-8}^{16} \alpha_q CBI_{it+q} + \alpha_c' X_{it} + \gamma_{ij} + \lambda_t + \epsilon_{ijt}, \quad (13)$$

where $ln(deposits)_{ijt}$ represents deposits held by residents of jurisdiction i in jurisdiction j at the end of quarter t. ϵ_{ijt} denotes the error term. We cluster standard errors by country pair to account for serial correlation in the data.

Our main variable of interest is CBI_{it+q}, an indicator variable equal to one if country i introduces a CBI program suitable for hiding information from tax information exchange $q \in [-8, 16]$ quarters away. We consider only programs with well-defined criteria for gaining citizenship and listed as high-risk schemes by OECD (2018c). We thus use all programs listed in Table 1 (except for Antigua and Barbuda and St. Kitts and Nevis, for which we observe no deposit data). For countries that carried out major reforms of long-existing programs (Cyprus, Dominica, and Vanuatu), we use the reform date. In a robustness test, we also re-estimate Eq. (13) using information on high-risk residency-by-investment programs (see Section 5.5). Countries that do not have a CBI program form the control group. The specification allows for eight $(\alpha_{-1}, \alpha_{-2}, \ldots, \alpha_{-8})$ pre-treatment (lead) effects and sixteen $(\alpha_{+1}, \alpha_{+2}, \ldots, \alpha_{+16})$ post-treatment (lag) effects. We thus estimate Eq. (13) only for the four countries which introduced their programs sufficiently early (Malta, Cyprus, Dominica, Grenada), so that data on sixteen post-reform quarters is available. This choice allows us to analyze long-run dynamics. In Fig. A.1 in the appendix, we re-estimate Eq. (13) for all six countries, but with only eight post-treatment quarters.

We include country-pair fixed effects γ_{ij} in our estimation to capture time-invariant country-pair specific factors (e.g., distance or language). We also incorporate a full set of time fixed effects λ_t. In several specifications, we also control for time-varying origin-country-specific characteristics and events, X_{it}, which may be associated with changes in cross-border capital flows. In particular, we use information on economic variables such as GDP and GDP per capita (to control for international investment possibilities) and the consumer price index (to control for high inflation as a reason for capital flight). Furthermore, country characteristics such as capital account openness (Chinn and Ito, 2006; Chinn and Ito, 2008), banking crises (Laeven and Valencia, 2018) and financial sector development influence whether individuals can and want to invest abroad. In addition, previous literature has shown that oil and gas rents, political systems, political stability and corruption (Andersen et al., 2017) or armed conflicts and natural disasters (Andersen et al., 2022) influence cross-border deposits. We account for incentives to evade taxes created by a country's tax system by controlling for the total revenue from individual taxes on income, capital gains and profit relative to GDP. All these factors affect the incentive to deposit money abroad and may confound the effect of introducing CBI programs. Following Andersen et al. (2017), we also control for exchange rate fluctuations to alleviate the mismeasurement of deposits (which are reported in US$). Table A.2 in the appendix describes how we measure these factors and provides data sources, and Table A.3 provides descriptive statistics. We are able to obtain data on these control variables for 145 jurisdictions.

The α_q coefficients capture the differential deposit trend between treatment and control groups for each quarter $q \in [-8, 16]$ quarters away from the introduction of the CBI program. We drop the last pre-treatment indicator from the regression, standardizing the coefficient α_{-1} to 0. Thus, all other α_q coefficients measure deposit changes compared to the level of deposits in the quarter before the introduction of the CBI program. Since the introduction of a CBI program is a country-specific point in time, we have to limit the effect window to a finite number of leads and lags; we bin the endpoints of the time window.[26]

In our main analysis, we limit our sample to deposits held in tax havens. If CBI programs are (mis-) used to avoid tax information reporting, the estimated α_q coefficients will be positive for quarters after the program's introduction. We expect that the effect on deposits remains or increases over time, as more tax evaders take advantage of the programs over time. Time lags may occur because application and approval times vary among programs (and applicants) or because the incentives to use such programs change when tax evaders' home countries start automatic information exchange under the CRS. The lead coefficients shed light on the common trend in deposits between the residents of CBI countries (treatment) and residents of non-CBI countries (control) group before the introduction of CBI programs; insignificant pre-treatment coefficients are indicative of a common trend before the programs' introduction.

We also provide results for non-haven deposit countries, which are less likely to be used for tax evasion. While evaders can also use the identifying documents obtained under a CBI program to open a bank account in a non-haven, this strategy is less suited for tax evasion for two reasons. First, all non-haven countries for which we observe bilateral deposit data levy withholding taxes on capital income, and only rarely do double tax treaties with the CBI countries provide relief.[27] Thus, if evaders invest in these non-havens, they usually have to pay withholding taxes, despite claiming tax residency in the CBI country. Second, banks in non-havens are likely more careful when ascertaining tax residency and follow the OECD guidelines on the CRS implementation more closely, yielding a

[26] To bin the last lead (lag) dummy implies that the indicator *q-8* (*q+16*) stands for treatment at time *q-8* (*q+16*) or more quarters in the past (in the future).

[27] None of the non-havens reporting bilateral deposits has a double tax treaty with Dominica, St. Lucia or Vanuatu; only the UK has one with Grenada. There are several double tax treaties with Malta or Cyprus, but the majority of these do not exempt capital income from withholding taxes.

higher risk of detection. Thus, we do not expect to find an effect for non-haven countries.[28]

Two-way fixed effect estimation. In addition, we estimate a two-way fixed effects model,

$$ln(deposits)_{ijt} = \beta_1 CBIP_{it} + \beta_c' X_{it} + \gamma_{ij} + \lambda_t + \epsilon_{ijt}, \quad (14)$$

with variables as defined above. $CBIP_{it}$ is an indicator variable equal to one if country i offers a CBI program suitable for hiding information from tax information exchange in quarter t. We also re-estimate Eq. (14) using information on high-risk residency-by-investment programs.

Interaction with CRS introduction. So far, we have focused on the introduction of CBI programs as the treatment to study whether tax evaders use these programs to hide their money from information exchange. However, the incentive to use a CBI program increased after countries started to exchange information automatically (instead of upon request).

To investigate the link between the use of CBI programs and automatic information exchange more closely, we exploit the introduction of the CRS as a major event that substantially affected the incentives of evaders to use the newly introduced CBI programs. Thus, instead of (indirectly) studying whether evaders use CBI programs, we now ask if automatic information exchange affected evaders' incentives to use CBI programs. To do so, we use a generalized difference-in-differences (DID) approach in the full sample (i.e., deposits in havens and non-havens), exploiting differences in deposit dynamics between the treatment and the control group before and after the introduction of the CRS. The corresponding specification is

$$\begin{aligned} ln(deposits)_{ijt} &= \delta_1 PostCRS_{jt} \times Haven_j \times CBIP_{it} + \delta_2 Haven_j \times CBIP_{it} \\ &\quad + \delta_3 PostCRS_{jt} \times Haven_j + \gamma_{ij} + \lambda_t + \epsilon_{ijt}. \end{aligned} \quad (15)$$

As above, $CBIP_{it}$ is a dummy variable equal to one if country i offers a CBI program (i.e., indicating where the deposits come from). $PostCRS_{jt}$ is a dummy variable for observations after the CRS treatment date (i.e., indicating the introduction of the CRS). $Havens_j$ is a dummy variable equal to one if country j is a tax haven (i.e., indicating the type of country in which the deposits are held). All other variables are as defined above.

$Haven_j \times CBIP_{it}$ indicates deposits in havens from a country with an active CBI program. $PostCRS_{jt} \times Haven_j$ captures the effect of the introduction of the CRS on deposits held in tax havens. Previous literature has estimated significant negative effects for δ_3 (see, e.g., Casi et al., 2020). The main interaction of interest is $PostCRS_t \times Haven_j \times CBIP_{it}$, which indicates deposits in havens from a country with an active CBI program after the introduction of the CRS. If the increase in haven deposits originating from CBI countries is related to the implementation of the CRS, δ_1 should be positive.

4.3. Estimation method

Empirical settings with variation in treatment timing and effect heterogeneity across treated units—such as our setting—can lead to inaccurately estimated treatment effects in both static or dynamic model specifications (Callaway and Sant'Anna, 2021; Goodman-Bacon, 2021; Sun and Abraham, 2021; de Chaisemartin and D'Haultfœuille, 2020; de Chaisemartin and D'Haultfœuille, 2022). In event studies where treated units receive the treatment at different times, the panel can never be balanced in both calendar time and time relative to the initial treatment period. Thus, effects from other periods can "contaminate" the coefficients on the leads or lags in the standard event study model (Sun and Abraham, 2021). These problems make the estimated interaction terms in event studies a weighted linear combination of treatment-timing-group specific average treatment effects. Thus, the interaction terms do not necessarily capture the dynamic treatment effect from its corresponding period but can pick up spurious effects from treatments in other periods. As a result, the estimated effects can no longer be interpreted causally.

Similar issues arise in the two-way fixed effects model. We can interpret this model as a weighted average of all possible 2x2 DID estimates across treated and not (yet) treated units of observation (Goodman-Bacon, 2021). However, some of the weights in this aggregation may become negative, leading to inaccurate results (Sun and Abraham, 2021; de Chaisemartin and D'Haultfœuille, 2020; de Chaisemartin and D'Haultfœuille, 2022). Negative weights can arise when 'already-treated' (or 'not-yet treated') observations act as control group (Goodman-Bacon, 2021).

In our setting, we compare only six treated countries with two hundred control countries. Thus, we rarely compare 'treated' with 'not yet treated' or 'now treated' with 'already treated in the past'. Consequently, all weights resulting from comparisons within our five treatment timing groups (note that Malta and Grenada both introduced their programs in 2014:Q1) are small; therefore, variation in treatment timing and treatment effect heterogeneity should be of low relevance for our results. We confirm this with the de Chaisemartin and D'Haultfœuille (2020) test for negative weights, finding that only approximately 10% of the weights are negative in our haven and non-haven samples (with a sum of −0.025 and −0.027, respectively). Additionally, following Goodman-Bacon (2021), we decompose our estimator into its sources of variation (see Fig. 2 and Table A.4).[29] The decomposition shows that our estimates rely almost exclusively on comparing treated with never-treated groups.

Overall, these test results suggest that variation in treatment timing and heterogeneous treatment effects are not a substantial concern in our setting. Thus, we use the standard event study and two-way fixed effect estimators as benchmark specifications in our empirical analysis. Nevertheless, we implement two alternative estimation methods as robustness tests: first, the heterogeneity-robust DID estimator for staggered treatment timing as proposed by Callaway and Sant'Anna (2021), and second, the interaction-weighted event study estimator as proposed by Sun and Abraham (2021).

4.4. Descriptive evidence

Before turning to the regression results, we provide descriptive evidence on the evolution of foreign deposits over time for the different country groups.

In Fig. 3, we plot the development of aggregate deposits originating from different groups of countries: First, countries that introduced a CBI program during our sample period; second, all countries that never introduced a CBI program (i.e., the main control group); and third, all tax havens without a CBI program. We use the last group as an alternative control group, as all CBI countries are havens themselves, and international investment patterns may significantly diverge between havens and non-havens. We hypothesize that tax evaders acquired new citizenships with the help of CBI programs and used the new citizenship to circumvent

[28] Investors using CBI for non-tax reasons may, of course, be investing in non-haven countries.

[29] In more detail, Goodman-Bacon (2021) proposes decomposing the two-way fixed effect estimator into all possible 2x2 DID estimators that compare timing groups with each other or with the control group. Fig. 2 shows the estimated average treatment effect for each 2x2 DID estimate and its weight in the overall two-way fixed effect estimate.

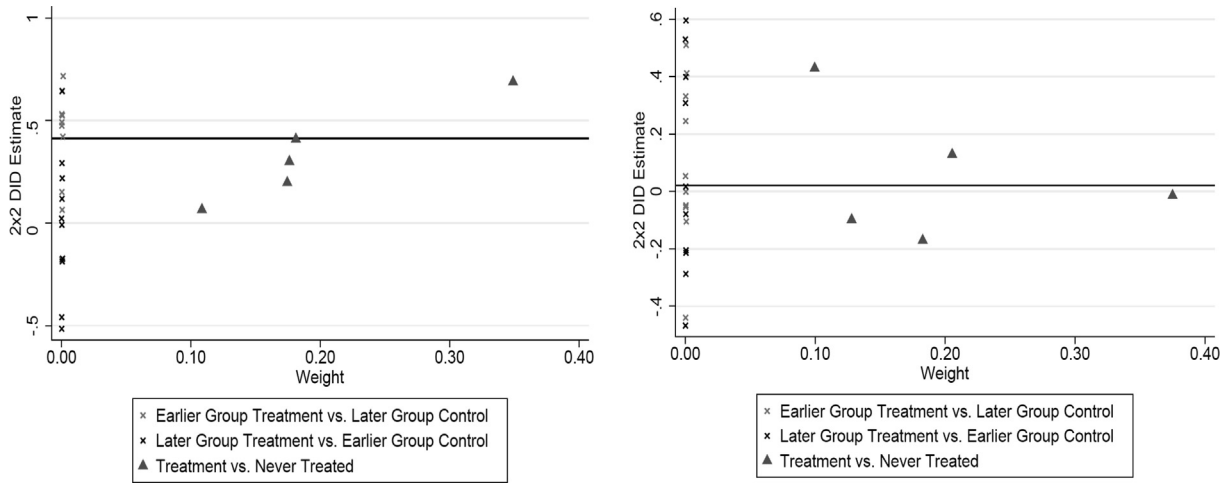

Fig. 2. BACON DECOMPOSITION. *Note:* Figures show the Bacon decomposition (Goodman-Bacon, 2021), decomposing the difference-in-differences estimation results for deposits in tax havens (left panel) and non-havens (right panel) regarding variation in treatment timing, estimated using Goodman-Bacon et al. (2019). Note that while we have six treated countries, there are only five treatment timing groups, as Malta and Grenada introduced their CBI programs in the same quarter. As the Bacon decomposition requires a balanced panel, we impute missing deposit values with inverse distance weighted interpolation. *Data:* BIS Locational Banking Statistics 2019.

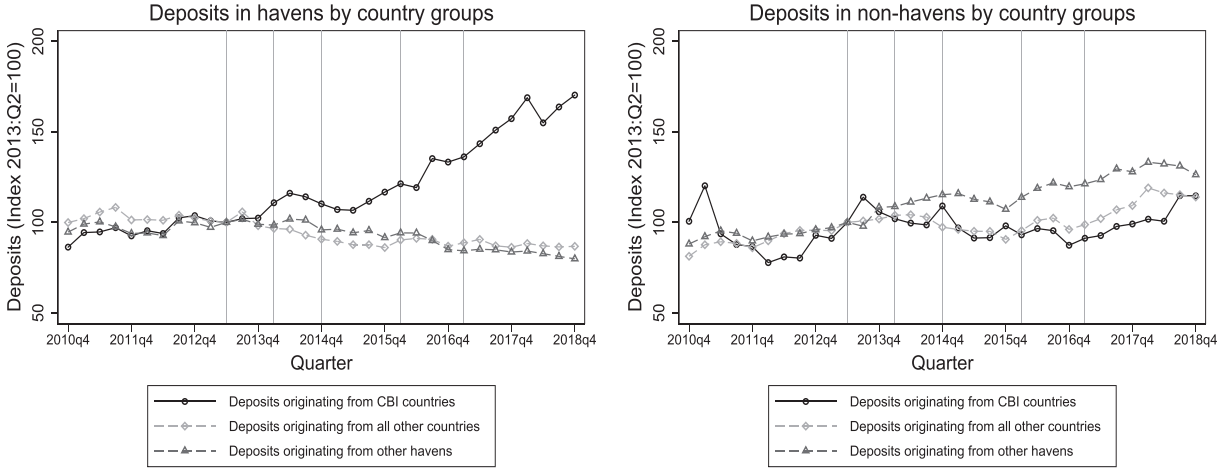

Fig. 3. TIME TRENDS OF HAVEN DEPOSITS. *Note:* Graph shows the evolution over time of aggregated deposits from CBI countries, all origin countries, and other havens held in the tax havens (left panel) and non-havens (right panel). Introduction/reform dates of the CBI programs (gray vertical lines): Cyprus 2013:Q2, Grenada 2014:Q1, Malta 2014:Q1, Dominica 2014:Q4, St. Lucia 2016:Q1, Vanuatu 2017:Q1. Values for country pairs lacking information for parts of the sample period are imputed using inverse distance weighted interpolation. *Data:* BIS Locational Banking Statistics 2019.

tax information exchange. In that case, we should see deposits from CBI countries in tax havens increase after the countries introduced a CBI program compared to the control groups.

Consistent with our predictions, Fig. 3 (left panel) shows that tax haven deposits owned by citizens of high-risk CBI countries increase after the introduction of the CBI programs. At the same time, their non-haven investments remain relatively constant (right panel). Before the introduction of the CBI programs, aggregate deposits between CBI countries and all non-CBI countries or non-CBI havens developed similarly. However, since the introduction of the first CBI programs, we observe a strong increase in haven deposits originating from CBI countries. In contrast, haven deposits from all non-CBI countries or non-CBI havens tend to decrease.

To which tax havens do the additional deposits from CBI countries flow? Fig. 4 shows the flows of additional deposits originating from CBI countries after these countries introduced their CBI programs by destination haven country. The largest flows (in absolute numbers) go to Switzerland, followed by Luxembourg. However, the absolute increases are not equal to the rates of increase; the percentage increases of deposits are much more equally distributed.

We will now explore this data further to see whether tax evaders use CBI programs to hide from tax information exchange.

5. Results and discussion

5.1. Event study regressions

Fig. 5 depicts the results of estimating Eq. (13). The left panel shows the results from regressions in the full sample without country-level control variables, and the right panel results from regressions with these control variables. We drop St. Lucia and Vanuatu from this analysis, as they introduced CBI programs too close to the end of the sample period to investigate long-term dynamics (Fig. A.1 in the appendix shows our results for re-estimating Eq. (13) including Vanuatu and St. Lucia but for eight

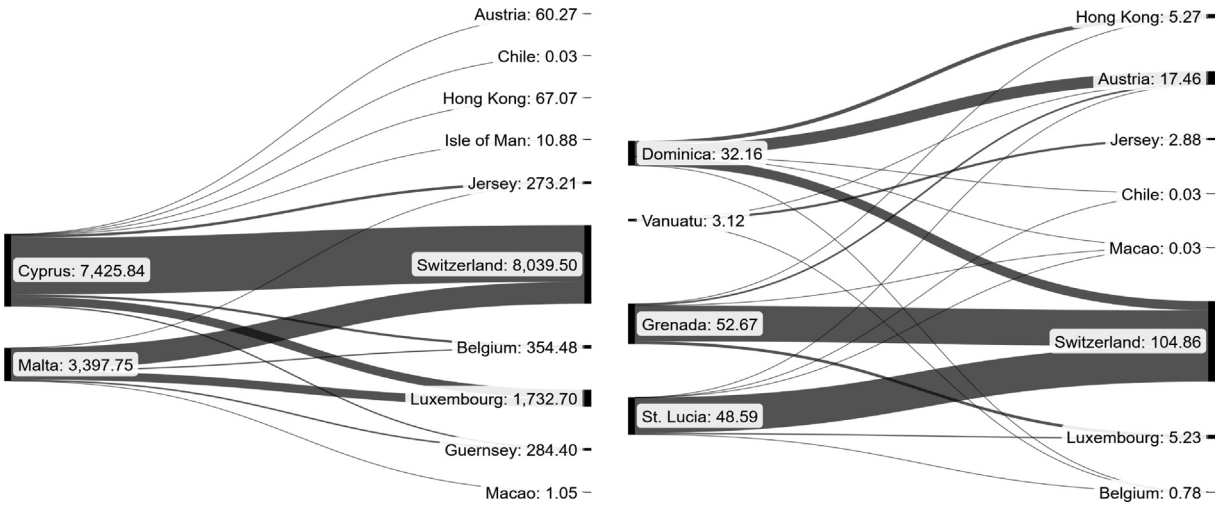

Fig. 4. DEPOSIT FLOWS FROM CBI COUNTRIES TO TAX HAVENS. *Note:* Graph shows the net flows of deposits from CBI countries to havens after the introduction of the CBI program (mean deposits of CBI country *i* in haven *h* in 2017/2018 minus mean deposits of CBI country *i* in haven *h* before CBI program introduction). Negative net flows after CBI program introduction are set to 0. Values for country pairs lacking information for parts of the sample period are imputed using inverse distance weighted interpolation. *Data:* BIS Locational Banking Statistics 2019.

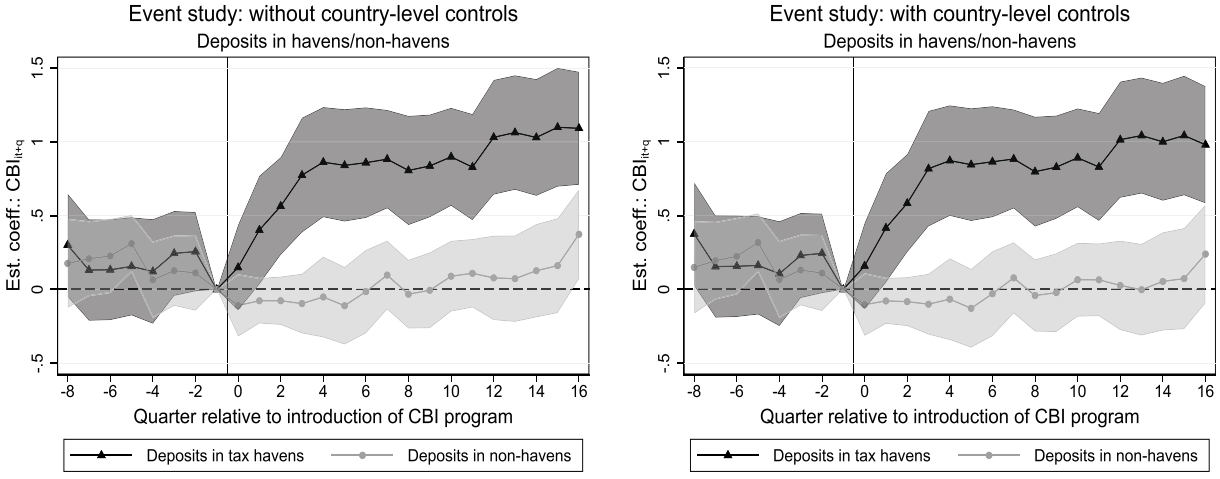

Fig. 5. EVENT STUDY: CITIZENSHIP-BY-INVESTMENT PROGRAMS. *Note:* Event studies for deposits in non-haven and haven countries from countries that introduced/reformed a CBI program in 2013/2014 (Grenada, Malta, Cyprus, Dominica). Control group: Countries that do not have a CBI program in sample period. Left panel shows results without control variables, right panel with control variables. 90% confidence intervals based on standard errors clustered by country pair. *Data:* BIS Locational Banking Statistics 2019 and sources listed in Table A.2.

post-treatment quarters only); the results in Table 3 also include all six programs.

In both panels, the estimated coefficients for the pre-treatment period are close to zero and statistically insignificant for deposits in both havens (dark gray line) and non-havens (light gray line). After the introduction of CBI programs, we find that foreign deposits in tax havens increased significantly, while they did not change in non-haven countries. The coefficients increase most rapidly in the first five quarters after the introduction of the programs and start to be significantly different from zero already in the second quarter.

Next, in Fig. 6, we provide robustness tests for our event study results using alternative control groups (left panel) and alternative estimation methods (right panel). In the left panel of Fig. 6, we show results for two additional control groups. As all of the CBI countries we study are tax havens, one may worry that the effect we find is not specific to CBI countries but arises from a common trend among all tax havens. To exclude this possibility, we re-estimate Eq. (13) in a sample where 41 tax havens without a CBI program form the control group (defining tax havens as in Johannesen and Zucman, 2014). The results are very similar.

Second, all CBI countries allow setting up anonymous trusts and foundations or have lax beneficial ownership registration requirements for companies. One may thus be concerned that foreigners primarily use CBI countries to set up trusts, foundations, or shell corporations to hide offshore funds and that the financial secrecy offered by these vehicles drives our results rather than CBI. To exclude this possibility, we re-estimate Eq. (13) using as the control group 56 jurisdictions that allow setting up trusts, foundations, or shell corporations quickly and anonymously.[30] The results for deposits among these jurisdictions are, again, very similar to the main results.

[30] We define this control group based on the second and third "Key Financial Secrecy Indicator" from the 2018 Financial Secrecy Index (Tax Justice Network, 2018), similarly to Ahrens et al. (2022).

Table 3
Panel regressions: citizenship-by-investment programs.

Sample	Full	Controls available			
Deposits in	Havens				Non-havens
	(1)	(2)	(3)	(4)	(5)
$CBIP_{it}$	0.488***	0.463***	0.416***	0.351***	−0.055
	(0.126)	(0.127)	(0.126)	(0.118)	(0.138)
Add. controls	–	–	✓	✓	✓
Country-pair FE	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	–	✓
Time×country j FE	–	–	–	✓	–
Observations	49,333	37,861	37,861	37,861	57,159
Country pairs	1,803	1,350	1,350	1,350	2,248
R^2	0.032	0.028	0.032	0.174	0.010

Note: Table shows results of OLS panel regressions. Dependent variable is the *ln* of foreign deposits held by individuals from jurisdiction i in BIS reporting jurisdiction j at the end of year–quarter t. We consider the deposits held by residents (non-banks) of 200 (in col. 1) or 145 (in cols. 2–5) countries i in 10 haven and 20 non-haven jurisdictions j (see the country list in Table A.1). Sample period from 2010:Q1 to 2018:Q4. $CBIP_{it} = 1$ if there is a (reformed) CBI program in jurisdiction i in year–quarter t. Additional controls as described in Table A.2. Col. (1) uses the full BIS country-by-country sample; cols. (2)–(5) the sample for which data on control variables is available. Standard errors (clustered by country pair) in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.
Data: BIS Locational Banking Statistics 2019 and sources listed in Table A.2.

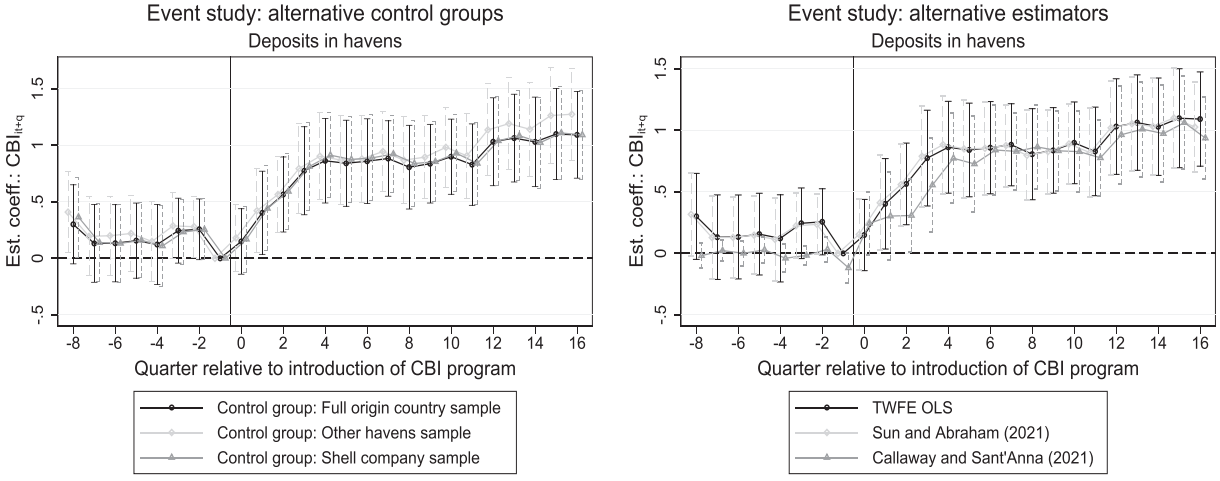

Fig. 6. EVENT STUDY: ROBUSTNESS. *Note:* Event studies for deposits in haven countries from countries that introduced/reformed a CBI program in 2013/2014 (Grenada, Malta, Cyprus, Dominica). Left panel shows results without control variables for alternative control groups, right panel shows results without control variables for alternative estimation methods. 90% confidence intervals based on standard errors clustered by country pair. *Data:* BIS Locational Banking Statistics 2019.

In the right panel of Fig. 6, we show estimation results using two "new" estimation methods. As discussed in Section 4.3, we implement the heterogeneity-robust DID estimator for staggered treatment timing by Callaway and Sant'Anna (2021) and the interaction-weighted event study estimator as proposed by Sun and Abraham (2021). Again, all results are similar to our results using the standard event study specification as in Eq. (13). In Fig. A.1 in the appendix, we show results and these robustness checks for all six countries, but with only eight post-treatment quarters.

5.2. Two-way fixed effect regressions

Table 3 presents results from estimating the fixed effects specification described in Eq. (14).[31] In col. (1), we report the results for deposits in tax havens for all country pairs for which we have bilateral deposit data for the non-bank sector. In this specification, we do not use country-level control variables (but include country-pair and time fixed effects). We find a positive and significant coefficient of about 0.49, showing that bank deposits from CBI countries in tax havens increase after the introduction of a CBI program. In col. (2), we estimate the same specification for the smaller sample of origin countries for which our control variables are available. The effect is largely unchanged, indicating that using the smaller sample does not introduce selection issues. In col. (3), we add the country-level control variables to control for other time-varying country characteristics that may influence tax haven deposits. In col. (4), we additionally control for time-varying characteristics of the tax havens by adding country j–quarter fixed effects. The estimated effect remains very similar across all specifications. Translating the log changes into marginal effects, bank deposits from CBI countries in tax havens increase by 42–63% after the introduction of a CBI program in all specifications.

If CBI programs are indeed used to circumvent tax information exchange, the effect should be limited to tax havens. However, if individuals use their new citizenship for foreign investments for

[31] Table A.5 in the appendix shows that these results are robust to different ways of clustering standard errors.

non-tax reasons, we would observe a similar pattern also for deposits in non-haven countries. Col. (5) reports results for deposits in non-haven countries. For these deposits, the effect of CBI programs is a relatively precisely estimated zero.[32]

We next provide different robustness tests for our two-way fixed effect estimation results. For each robustness tests, we provide results using the standard estimator and two alternative estimators for staggered treatment timing and potential treatment effect heterogeneity (Callaway and Sant'Anna, 2021; Sun and Abraham, 2021).

First, we replicate the results from col. (1) of Table 3 with all three estimators. The estimated coefficients using alternative estimators are similar to those in Table 3. Second, we provide results for alternative control groups (as in Section 5.1): (i) tax havens without CBI programs, and (ii) non-CBI countries allowing to set up anonymous trusts and foundations or have lax beneficial ownership registration requirements. The estimated coefficients are again similar.

Third, the main specification uses the relatively comprehensive tax haven list by Johannesen and Zucman (2014). In the fourth row of Fig. 7, we use a more restrictive tax haven definition, using only the countries included in all recent tax haven lists (Hines and Rice, 1994; Dharmapala, 2008; Gravelle, 2009; Johannesen and Zucman, 2014). In our sample, the two lists differ in their decisions to include Austria, Belgium, and Chile, which Hines and Rice (1994), Dharmapala (2008), and Gravelle (2009) do not consider tax havens. The estimated coefficients are again similar.

Fourth, we test the stability of our results using imputed data of our dependent variable instead of the original BIS data to keep the estimation sample balanced and as large as possible. The results in the last row of Fig. 7 are again similar.

To investigate potential heterogeneity between the tax havens in our sample, we re-estimate Eq. (14) but drop one reporting country j at a time (starting again from the Johannesen and Zucman (2014) tax haven list). If a single country is highly relevant to our results, the coefficient for our sample excluding that country should be of a smaller magnitude. For example, banks in only some of the tax havens in our sample might not 'correctly' check the tax residency of their account holders (e.g., by accepting passports as proof of tax residency).[33] In these regressions, we again find very similar results (see Table A.6 in the appendix). All estimates are not significantly different from each other, indicating that no single tax haven drives the results.

One may also be concerned that a particular CBI country drives our results. We assess the sensitivity of our results in this direction by re-estimating Eq. (14) and dropping one CBI country at a time. We also test for the joint relevance of the European CBI countries by (i) excluding Cyprus and Malta from the treatment group and (ii) keeping only Cyprus and Malta as the treated countries. In a further test, we only keep Dominica, Grenada, and St. Lucia to see whether our results also hold for the Caribbean islands only. Lastly, we exclude the CBI countries where the treatment dummy indicates a reform (and not the introduction) of a CBI program (Cyprus, Dominica, and Vanuatu). As before, if a single CBI country or the excluded group of CBI countries is highly relevant to our results, the coefficient for the sample excluding these countries would be of a smaller magnitude. We find qualitatively similar results in all ten subgroups (see Table A.7 in the appendix). While the estimated coefficients excluding Malta appear somewhat smaller, none of the estimates is significantly different from the others. Malta's importance may arise from its being an early and well-marketed program or from attracting wealthier individuals.

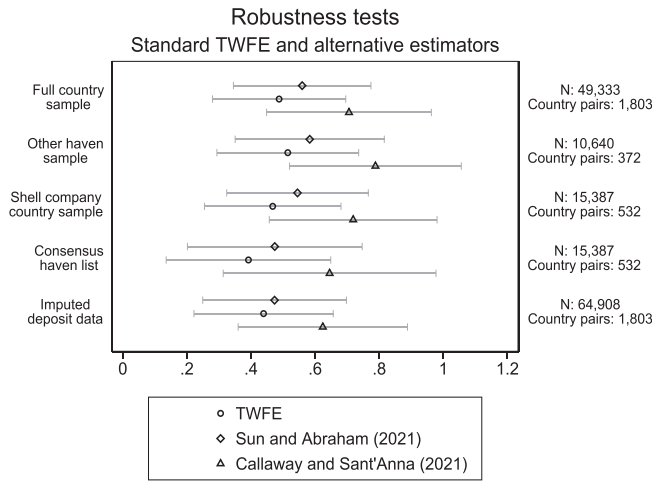

Fig. 7. PANEL REGRESSIONS: ROBUSTNESS. *Note:* Graph shows results of OLS panel regressions (without controls) using alternative estimation methods for different samples. Full country sample: Specification from col. (1) of Table 3; other haven sample: only includes deposits originating from tax havens; shell company country sample: only includes deposits originating from countries offering trust and shell corporations; consensus haven list: uses only Guernsey, Hong Kong, Isle of Man, Jersey, Luxembourg, Macao and Switzerland as tax havens; imputed deposit data: considers the full BIS country-by-country sample with imputed deposit data. Dependent variable is the *ln* of foreign deposits held by individuals from jurisdiction i in BIS reporting jurisdiction j at the end of year–quarter t. We consider the deposits held by residents (non-banks) of 200 (full country sample, consensus haven list, and sample with imputed deposit data), 41 (other haven sample), or 56 (shell company country sample) countries i in 10 haven jurisdictions j (7 haven jurisdiction for the consensus haven list). Sample period from 2010:Q1 to 2018:Q4. 90% confidence intervals based on standard errors clustered by country pair. *Data:* BIS Locational Banking Statistics 2019.

5.3. Effect size

Our empirical analysis shows an increase in deposits in tax havens originating from CBI countries after these countries introduced CBI programs. But, is this a large effect?.

Based on the two-way fixed effects regression, the additional deposits in tax havens from CBI countries correspond to about a quarter of the GDP of the CBI countries—certainly a large change for these countries. In absolute numbers, deposits in tax havens from CBI countries increased by around US$10 billion after the introduction of the CBI programs.[34] This corresponds to about 0.7% of the total offshore bank deposits in 2008 as estimated by Zucman (2013).

However, the event study shows that the effect grows over time. Based on the results from Fig. 5, which shows an estimated log change of about one 15 quarters after CBI introduction, deposits of "early" CBI countries (Cyprus, Dominica, Grenada, Malta) in havens increased on average by about 170% ($exp(\alpha_g) - 1 = exp(1) - 1 = 1.7$). This implies an increase in deposits by US$27.9 bn. in absolute terms or about 67% of CBI countries' aggregated GDP. This increase corresponds to about 2% of the total offshore bank deposits in 2008 as estimated by Zucman (2013).

[32] Also when splitting the non-haven sample into low-tax vs. high-tax countries (based on a capital-gains tax rate of 20%), we find insignificant coefficients very close to zero.

[33] Indeed, when following online options to open bank accounts in tax havens, they usually verify citizenship via online video identification but only require that the applicant checks a box that they are tax resident in this country.

[34] To calculate the increase of deposits in dollar terms, we multiply the average marginal effect from Table 3, col. (1), $exp(\alpha_g) - 1 = exp(0.488) - 1 = 63\%$, by the average total deposits held in tax havens by residents of CBI countries before the introduction of the CBI programs (US$16.409 bn.). Using one of the alternative control groups yields similar results.

Note, however, that we do not observe deposits held in the CBI country itself. In addition, our sample comprises only ten tax havens as deposit countries, compared to 52 havens on the Johannesen and Zucman (2014) list. Ten additional tax havens from this list report aggregate deposit statistics in the Locational Banking Statistics (but no bilateral information), and the remaining tax havens have only comparatively low levels of cross-border deposits. We can use this information to roughly estimate that we miss between 40–45% of the total amount of deposits hidden via CBI programs in other tax havens. Thus, our estimates are a lower bound of deposits hidden via CBI.

In addition, as discussed in Section 4.1, the deposits do not correspond to the total amount of money held in the tax havens. CBI can also be used to hide capital income derived from stocks and other securities from tax information exchange, as the same information reporting requirements apply, e.g., to brokerage accounts. Lastly, complex multi-haven structures and shell corporations make any quantification challenging.

5.4. Citizenship-by-Investment and the CRS

Our results indirectly show that tax evaders use CBI programs to hide investments in tax havens. This additional level of secrecy was necessary in particular after the start of the automatic exchange of tax information. We thus expect that the use of CBI programs to hide deposits in a specific tax haven increases after this haven has joined the CRS.

To test this hypothesis, we estimate Eq. (15) to analyze the effect of the CRS on the use of CBI programs. As it is not unambiguous when the CRS started to affect deposits, we use three alternative CRS treatment dates following Casi et al. (2020). First, we set the treatment date to 2016:Q1, i.e., when the CRS became effective for most countries. Second, we use two country-specific dates: the date of the introduction of the CRS and the date when the CRS became effective.[35]

Table 4 presents the results.[36] In line with the results of previous studies (e.g., Casi et al., 2020), the negative coefficients for $PostCRS_{jt} \times Haven_j$ show that deposits in havens decrease after the introduction of the CRS. Consistent with our predictions, we find positive coefficients on $PostCRS_{jt} \times Haven_j \times CBIP_{it}$. Thus, tax haven deposits owned by citizens of countries with an active CBI program increase significantly after the introduction of the CRS. These results provide evidence that the increase in haven deposits originating from CBI countries is indeed related to the introduction of the CRS. Further, we find that haven deposits increase after a CBI program was introduced compared to haven deposits from non-CBI countries, bolstering the findings in our main analysis.[37]

5.5. Residency-by-investment programs

While only a few countries have CBI programs, many more countries have some form of "residency-by-investment" (or "Golden Visa") program, which provides residence rights (but not citizenship) in return for investments or financial transfers. While there are many motives to make use of RBI programs,[38] individuals could also, in principle, use documents obtained under such a program to pretend tax residency in this country. However, as banks usually require a passport to open an account, the individual would have to disclose their original citizenship (which may also be their true tax residency), leading to a higher risk of detection.[39]

Nevertheless, while many RBI programs in large economies are costly and require actual physical presence, some RBI programs have the potential to be (mis-) used to circumvent tax information reporting. These schemes are also reported in the OECD (2018a,c) list of high-risk programs. The criteria for high-risk RBI programs are similar to those for CBI programs discussed in Section 2.2. As of October 2018, the OECD list includes RBI programs by the Bahamas, Bahrain, Barbados, Colombia, Malaysia, Mauritius, Monaco, Montserrat, Panama, Qatar, Seychelles, Turks and Caicos Islands, and the United Arab Emirates. Among these, Bahrain, Barbados, Colombia, Panama, Seychelles, and the United Arab Emirates introduced or substantially reformed their programs between 2010 and the end of 2018 (i.e., within our sample period). We analyze whether these programs have been misused for tax information exchange, estimating specifications analogous to Eq. (13) and Eq. (14).

Fig. 8 depicts the results of estimating Eq. (13). The left panel shows the results from regressions in the full sample without country-level control variables, and the right panel results from regressions with control variables. We drop Bahrain (2018:Q2) and Colombia (2017:Q4) from this analysis, as they introduced RBI programs too close to the end of the sample period to investigate long-term dynamics. Table A.8 in the appendix shows the results for re-estimating Eq. (14) including Bahrain and Colombia in a static two-way fixed effects specification, and Fig. A.2 in the

Table 4
Panel regressions: Post-CRS dynamics.

Specification	2016:Q1 (1)	Country introduction (2)	Country effective (3)
$PostCRS_{jt} \times Haven_j \times CBIP_{it}$	0.220**	0.283***	0.271**
	(0.108)	(0.106)	(0.109)
$Haven_j \times CBIP_{it}$	0.290**	0.212	0.236*
	(0.141)	(0.136)	(0.136)
$PostCRS_{jt} \times Haven_j$	−0.302***	−0.230***	−0.238***
	(0.031)	(0.028)	(0.028)
Country-pair FE	✓	✓	✓
Time FE	✓	✓	✓
Observations	122,364	122,364	122,364
Country pairs	4,760	4,760	4,760
R^2	0.013	0.010	0.011

Note: Table shows results of OLS panel regressions (without controls). Dependent variable is the *ln* of foreign deposits held by individuals from jurisdiction *i* in BIS reporting jurisdiction *j* at the end of year–quarter *t*. In col. (1), $PostCRS_{jt}$ is an indicator variable for the period after January 1, 2016; in col. (2) it indicates the introduction of the CRS law in country *j*; and in col. (3) it indicates the period after the CRS took effect in country *j*. We consider the deposits held by residents (non-banks) of 200 countries *i* in 30 jurisdictions *j* (see the country list in Table A.1). $CBIP_{it} = 1$ if there is a (reformed) CBI program in jurisdiction *i* in year–quarter *t*. Sample period from 2010:Q1 to 2018:Q4. Standard errors (clustered by country pair) in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.
Data: BIS Locational Banking Statistics 2019.

[35] For the country-specific dates of the introduction of the CRS (date on which the CRS law was published in the official gazette) and when the CRS became effective (date on which domestic financial institutions began to collect account information), see Casi et al. (2020), Table 1.

[36] We carry out a series of robustness checks similar to those presented in Fig. 7. All estimated coefficients are very similar. These results are available on request.

[37] Note that most country-specific CRS introduction dates are in 2015, and most CBI introduction dates are close to or after these CRS introduction dates. Thus, in this specification, there are not many observations with a country *i* with an active CBI program and a tax haven as country *j* before the country-specific CRS introduction dates, making it difficult to separately identify $Haven_j \times CBIP_{it}$ and $PostCRS_{jt} \times Haven_j \times CBIP_{it}$.

[38] In a study of European RBI programs, Surak (2022) finds that mobility and visa-free access are the predominant motives to participate in these programs.

[39] Anecdotal evidence suggests that RBI programs are much more frequently used to set up shell companies and to avoid taxation by holding money in the RBI country itself (e.g., as evidenced by the Panama Papers). Consequently, RBI programs can help tax evaders to convert their cross-border bank deposit reportable under the CRS to a domestic bank deposit. Unfortunately, we can not investigate whether deposits in the RBI country itself increase after the introduction of the programs using BIS data.

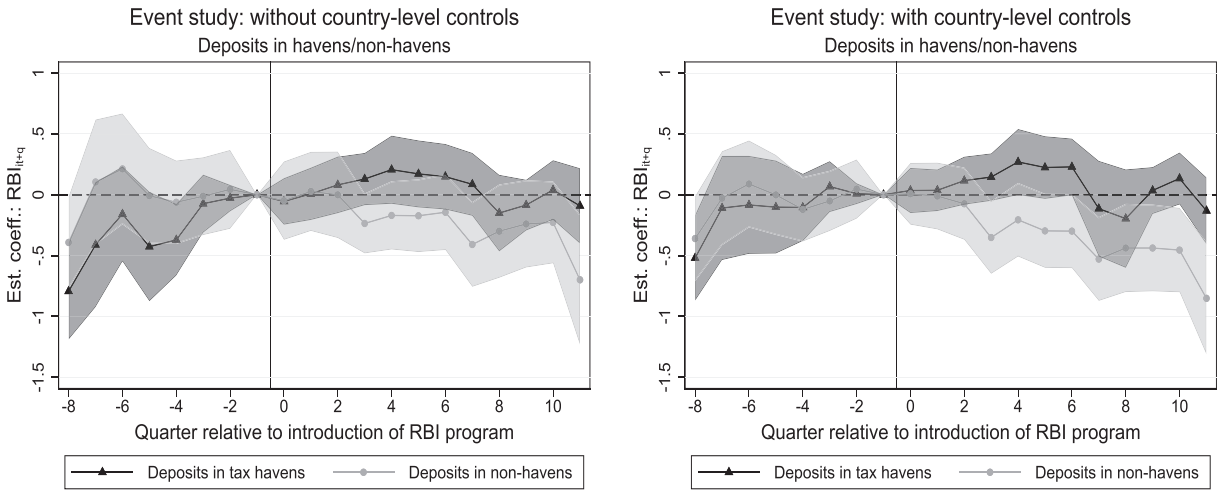

Fig. 8. EVENT STUDY: RESIDENCY-BY-INVESTMENT PROGRAMS. *Note:* Event studies for deposits in non-haven and haven countries from countries that introduced/reformed an RBI program between 2012:Q1 and 2016:Q1 (Barbados (2012:Q1), Panama (2012:Q2), Seychelles (2013:Q4), and the United Arab Emirates (2016:Q1)). Control group: Countries that do not have a RBI/CBI program in sample period. Left panel shows results without control variables, right panel with control variables. 90% confidence intervals based on standard errors clustered by country pair. *Data:* BIS Locational Banking Statistics 2019 and sources listed in Table A.2.

appendix shows robustness tests for the dynamic event study specification using alternative control groups and estimation methods. We also re-estimate Eq. (15) to analyze the effect of the CRS on the use of RBI programs and again find no evidence that RBI programs are used to circumvent the CRS.

Overall, we find little evidence of increases in deposits in tax havens after these countries introduced their RBI programs. Thus, while RBI programs can potentially be misused to circumvent information exchange, we cannot confirm this empirically.[40]

6. Conclusion

Our paper argues that tax evaders can use CBI programs to circumvent tax information exchange. Intensifying tax information exchange posed an incentive for several countries to introduce CBI programs during the last decade. Our analytical model suggests that CBI programs are used by relatively wealthy tax evaders. As they lower the probability that evasion is detected, they decrease expected tax revenues. Our empirical results provide indirect evidence that CBI programs are indeed misused for tax evasion. Analyzing the deposits of CBI countries in tax havens, we find that these deposits increase by about US$28 billion in the four years after the introduction of the CBI programs. This result is in line with the idea that some citizens naturalized under a CBI program use their new citizenship to conceal their actual tax residency from tax information exchange. They hide income and assets in offshore bank accounts, unrecorded by competent fiscal authorities.

The insights of our paper are particularly relevant to the ongoing fight against international tax evasion, which is based on tax information exchange. Addressing the potential misuse of CBI programs is one key challenge to ensure the functioning of tax information exchange. Our results underline the necessity to formulate suitable strategies to ensure that tax information is exchanged with the true country of tax residency, and not a third country offering a new form of concealment services.

One option to address this challenge would be to ensure that financial institutions in tax havens indeed ascertain the true tax residency of the account holder, e.g., by ensuring they require tax residency supporting documents in addition to passports for individuals with passports from CBI countries. To this end, it would be helpful if passports obtained via a CBI program were marked as such. An alternative option would be to require CBI countries to pass on information obtained via the CRS to their new citizen's actual country of tax residency and have obligations to inform themselves of their citizens' country of tax residency.

[40] Note that all countries with a high-risk RBI program are large economies compared to our group of CBI countries and, in absolute numbers, have a substantially larger stock of foreign deposits. Thus, it is less likely that the additional haven deposits owned by tax evaders using the RBI programs of these countries to circumvent information exchange become visible in the aggregate data we use in our analysis (see Section 4.1). Consequently, even if some tax evaders use these high-risk RBI programs to circumvent tax information exchange, we might not be able to identify the corresponding changes in cross-border bank deposits originating from RBI countries.

Data availability

Data will be made available on request.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A

A.1. Proof of Proposition 1

We first study how the detection probability influences the number of evaders, starting with case 1. For ease of notation, we drop all subscripts. We take the total differential of Eq. (4) and rearrange it to obtain

$$\frac{d\hat{y}_e}{dp} = \frac{\partial \hat{y}_e}{\partial f}\frac{df}{dp} + \frac{\partial \hat{y}_e}{\partial p} = \frac{1}{(1-pF)t}\frac{df}{dp} + \frac{fF}{(1-pF)^2 t}. \tag{A.1}$$

Implicit differentiation of Eq. (9) shows that

$$\frac{df}{dp} = -\frac{fF}{1-pF}. \tag{A.2}$$

Inserting (A.2) in (A.1) shows that $\frac{d\hat{y}_e}{dp} = 0$, i.e., that the number of evaders is independent of the detection probability in case 1.

In case 2, we take the same approach. We rearrange the total differential of (5) to

$$\begin{aligned}\frac{d\hat{y}_{eCBI}}{dp} &= \frac{\partial \hat{y}_{eCBI}}{\partial f}\frac{df}{dp} + \frac{\partial \hat{y}_{eCBI}}{\partial c}\frac{dc}{dp} + \frac{\partial \hat{y}_e}{\partial p} \\ &= \frac{1}{(1-pF)t}\frac{df}{dp} + \frac{1}{(1-pF)t}\frac{dc}{dp} + \frac{(f+c)F}{(1-pF)^2 t}.\end{aligned} \tag{A.3}$$

Implicit differentiation of Eqs. (9) and (7) shows that

$$\frac{df}{dp} = -\frac{fF}{1-pF}; \quad \frac{dc}{dp} = -\frac{(c-\delta)F}{1-pF}. \tag{A.4}$$

Inserting (A.4) in (A.3) shows that

$$\frac{d\hat{y}_{eCBI}}{dp} = \frac{\delta F}{(1-pf)^2 t} > 0, \tag{A.5}$$

Thus, if the marginal evader does CBI, the number of individuals evading taxes is lower when the detection probability is higher, as long as there is a cost of issuing passports. In this case, the CBI country is not willing to compensate the marginal evader fully for the higher detection probability.

Which of the two cases is the relevant one in equilibrium? First, consider the situation without tax information exchange. Then, it holds trivially that marginal tax evader does not acquire a new citizenship; without tax information exchange, CBI has no advantage. Formally, if follows from Eq. (3) that $\hat{y}_{\text{CBI}} \to \infty$.

With tax information exchange, assume for now that $\delta = 0$. Then, $c^* = f^*$, as the maximization problems of the CBI country and the tax haven are identical in case 2 with $\delta = 0$. Next, denote the fee that the tax haven would set in case 1 with $p = p_L$ as $f^1_{p_L}$, and its fee in case 2 with $p = p_L$ as $f^2_{p_L}$ (and $c^2_{p_L}$ denotes the cost of CBI in this case). As $\frac{d\hat{y}_e}{dp} = \frac{d\hat{y}_{eCBI}}{dp} = 0$ with $\delta = 0$, it follows from comparing Eqs. (4) and (5) that $f^1_{p_L} = f^2_{p_L} + c^2_{p_L}$. Thus, with $\delta = 0$, the marginal evader is indifferent between acquiring a new citizenship or not. Thus, with $\delta = 0$, case 2 is relevant.

This situation changes when $\delta > 0$. Then, comparison of Eqs. (7) and (9) shows that $f^1_{p_L} < f^2_{p_L} + c^2_{p_L}$, i.e., for the same detection probability, more individuals are willing to evade taxes in case 1. Thus, with $\delta > 0$, case 1 is relevant.

A.2. Proof of Proposition 2

The Lagrangian corresponding to the maximization problem in (12) is

$$\begin{aligned}\mathcal{L} = T^{\text{High-tax}}_{\text{CRS}} - \alpha C + \lambda_1\left(T^{\text{Haven}}_{\text{CRS}} - T^{\text{Haven}}_{\text{no CRS}} + C\right) \\ + \lambda_2\left(T^{\text{High-tax}}_{\text{CRS}} - \alpha C - T^{\text{High-tax}}_{\text{no CRS}}\right).\end{aligned} \tag{A.6}$$

The Karush–Kuhn–Tucker necessary conditions for optimality are

$$\frac{\partial \mathcal{L}}{\partial C} = -\alpha + \lambda_1 - \lambda_2\alpha \leqslant 0, \tag{A}$$

$$\frac{\partial \mathcal{L}}{\partial \lambda_1} = T^{\text{Haven}}_{\text{CRS}} - T^{\text{Haven}}_{\text{noCRS}} + C \geqslant 0, \tag{B}$$

$$\frac{\partial \mathcal{L}}{\partial \lambda_2} = T^{\text{High-tax}}_{\text{CRS}} - \alpha C - T^{\text{High-tax}}_{\text{noCRS}} \geqslant 0, \tag{C}$$

$$C = 0 \quad \bigvee \quad -\alpha + \lambda_1 - \lambda_2\alpha = 0, \tag{I}$$

$$\lambda_1 = 0 \quad \bigvee \quad T^{\text{Haven}}_{\text{CRS}} - T^{\text{Haven}}_{\text{no CRS}} + C = 0, \tag{II}$$

$$\lambda_2 = 0 \quad \bigvee \quad T^{\text{High-tax}}_{\text{CRS}} - \alpha C - T^{\text{High-tax}}_{\text{no CRS}} = 0, \tag{III}$$

$$C, \lambda_1, \lambda_2 \geqslant 0. \tag{N}$$

There are two potential solutions that solve the equation system given by conditions (I)–(III). First, $\lambda_1 = \lambda_2 = 0$ and $C = 0$. However, this contradicts Eq. (B), as $T^{\text{Haven}}_{\text{no CRS}} > T^{\text{Haven}}_{\text{CRS}}$. Thus, the only solution is $\lambda_1 = \alpha, \lambda_2 = 0$ and $C = T^{\text{Haven}}_{\text{no CRS}} - T^{\text{Haven}}_{\text{CRS}}$. This solution fulfills conditions (A)–(C) for $\alpha \leqslant \frac{T^{\text{High-tax}}_{\text{CRS}} - T^{\text{High-tax}}_{\text{noCRS}}}{T^{\text{Haven}}_{\text{CRS}} - T^{\text{Haven}}_{\text{noCRS}}}$. For larger values of $\alpha, T^{\text{High-tax}}_{\text{no CRS}} > T^{\text{High-tax}}_{\text{CRS}}$, i.e., it is then optimal for the high-tax country to forgo pressuring the tax haven to sign up to the CRS.

A.3. Additional Tables and Figures

Figs. A.1, A.2 and Tables A.1, A.2, A.3, A.4, A.5, A.6, A.7, A.8.

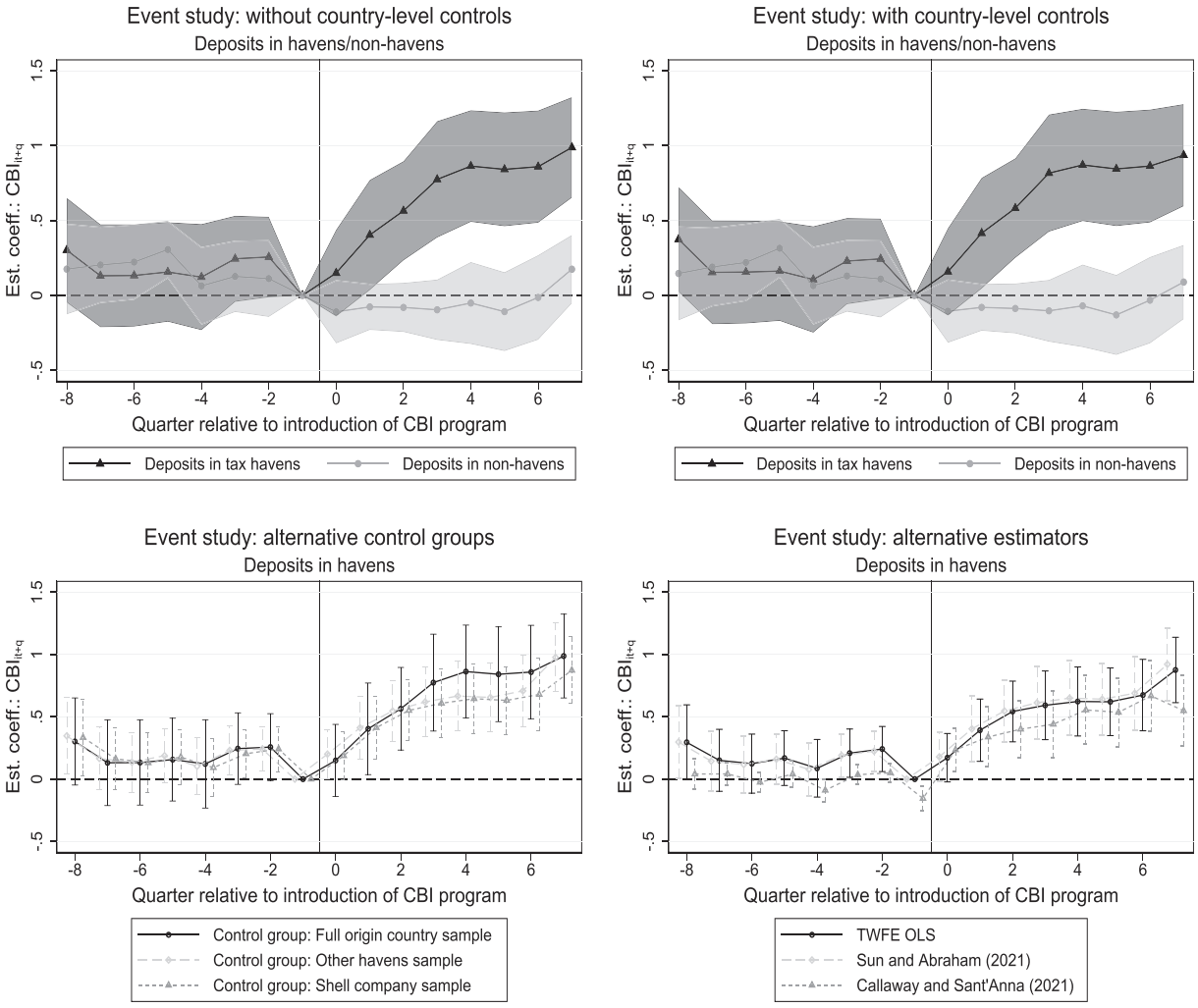

Fig. A1. EVENT STUDY: CITIZENSHIP-BY-INVESTMENT PROGRAMS (ALL PROGRAMS). *Note:* Event studies for deposits from CBI countries held in banks of non-haven and haven countries. Control group: Countries which do not have a CBI program in sample period. Upper left panel shows main results without control variables, upper right panel with control variables. Lower left panel shows results without control variables for alternative control groups, lower right panel for alternative estimation methods. 90% confidence intervals based on standard errors clustered by country pair. *Data:* BIS Locational Banking Statistics 2019 and sources listed in Table A.2.

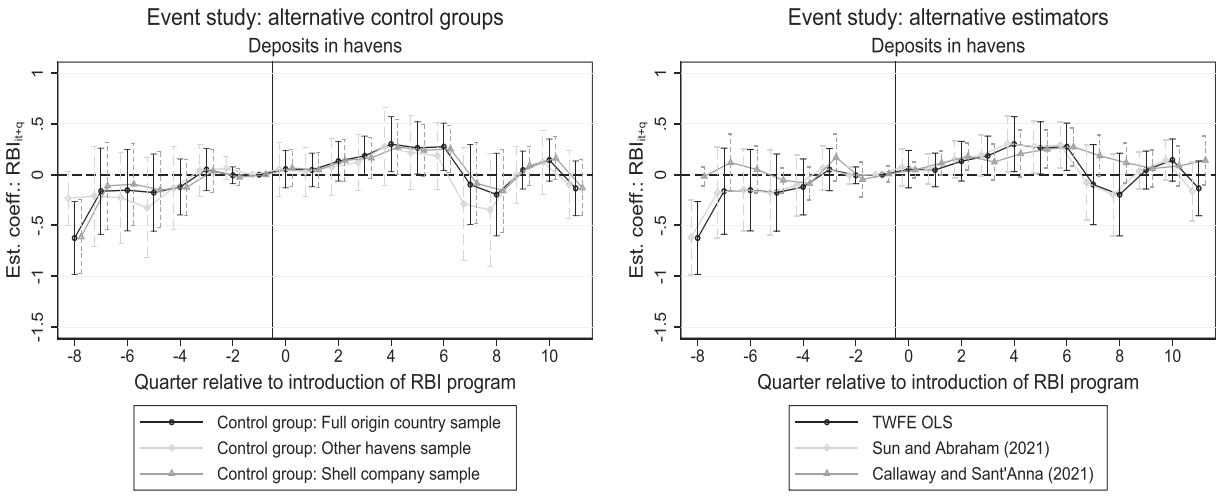

Fig. A2. EVENT STUDY: RESIDENCE-BY-INVESTMENT PROGRAMS. *Note:* Event studies for deposits in tax haven from countries that introduced/reformed a RBI program in 2012:Q1–2016:Q1 (Barbados (2012:Q1), Panama (2012:Q2), Seychelles (2013:Q4), and the United Arab Emirates (2016:Q1)). Control group: Countries which do not have a RBI/CBI program in sample period. Left graph shows results for alternative control groups, right panel for alternative estimation methods. 90% confidence intervals based on standard errors clustered by country pair. *Data:* BIS Locational Banking Statistics 2019.

Table A.1
Descriptive statistics on foreign deposits.

Country	Obs.	Avg. foreign deposits by origin country, m. US$	Total foreign deposits (avg. 2010–2018), m. US$
N-haven countries			
Australia	7,272	478.32	96,620.77
Brazil	2,304	71.94	4,604.00
Canada	6,840	597.13	113,455.30
Chinese Taipei	7,308	238.91	48,499.21
Denmark	7,308	231.23	46,940.32
Finland	5,292	225.97	33,218.21
France	7,056	2,393.22	469,071.50
Greece	1,260	417.44	14,610.29
Ireland	6,696	514.41	95,680.51
Italy	6,156	466.48	79,767.93
Japan	4,284	2,596.37	308,968.40
Mexico	576	201.53	3,224.50
Netherlands	3,960	2,802.55	308,280.50
Philippines	5,544	13.62	2,097.02
South Africa	5,220	40.44	5,863.13
South Korea	6,156	104.65	17,895.29
Spain	7,056	431.89	84,649.49
Sweden	6,876	256.73	49,036.20
United Kingdom	7,380	7,762.94	1,591,402.00
United States	5,112	7,787.46	1,105,820.00
Tax havens (based on Johannesen and Zucman, 2014**)**			
Austria	7,092	300.69	59,236.49
Belgium	7,308	1,103.21	223,952.50
Chile	4,500	49.63	6,203.69
Guernsey	6,624	224.43	41,295.66
Hong Kong	7,092	1,590.14	313,256.80
Isle of Man	7,272	158.03	31,922.42
Jersey	6,912	364.61	70,004.69
Luxembourg	7,200	693.08	138,616.30
Macao	5,616	159.14	24,825.08
Switzerland	7,308	1,942.30	394,287.60

Note: This table shows foreign deposits in the reporting countries considered in our analysis from 2010:Q1 to 2018:Q4. *Avg. foreign deposits by origin country* is the average of foreign deposits at the bilateral level in million US$. *Total foreign deposits* is the deposit volume in million US$ held by foreigners summed over all origin countries in the data. This table uses imputed deposit values for country pairs missing information on deposits for parts of the sample period; imputed by inverse distance weighted interpolation. *Data:* BIS Locational Banking Statistics 2019.

Table A.2
Data description for country-level controls.

Variables	Description
Quarterly nominal GDP	Quarterly nominal GDP in domestic currency from the IMF; if no quarterly data available we impute from annual data (also from IMF or, if unavailable, from UNSTATS 2019 or National Statistical Offices). To do so, we define continental regions using the UN geoscheme (see the UN Statistics Division methodology description https://unstats.un.org/unsd/methodology/m49/) and calculate average quarterly GDP shares of annual GDP using countries from those continental regions for which quarterly data are available (to reflect seasonal differences). Domestic currencies converted to US$ using IMF data.
Quarterly nominal GDP per capita, domestic currency	Quarterly GDP (see above) divided it by population data (World Bank's World Development Indicators 2019 or National Statistical Offices). For years not covered, we impute annual population data using average population growth rates of the respective country.
Consumer price index (CPI) % change	Quarterly CPI from IMF, completed by information from the National Statistical Offices of Guernsey, Jersey and the Isle of Man as well as by data provided by the CIA World Factbook for Andorra, Argentina, Bermuda, Eritrea, French Polynesia, Liechtenstein, Marshall Islands, Turkmenistan, Turks and Caicos Islands, Tuvalu and Uzbekistan. We impute based on annual (average) CPI percentage change values if no quarterly data is available. We impute still missing values (because no annual data available) by nearest neighbor interpolation using Stata's mipolate idw command, provided by Cox (2015).
Chinn-Ito financial openness index 2018	Index measuring a county's degree of capital account openness. For detailed information see Chinn and Ito (2006, 2008) and web.pdx.edu/ ito/Chinn-Ito_website.htm.
Armed Conflicts	Binary indicator that equals 1 if state-based, non-state or one-sided armed conflicts resulted in at least 100 deaths within a quarter, 0 otherwise (UCDP/PRIO Armed Conflict Database, UCDP Georeferenced Event Dataset (GED) Global version 20.1).
Taxes on income, profits and capital gains	Total revenue from taxes on income, capital gains and profit taxes on individuals relative to GDP (ICTD/UNU-WIDER Government Revenue Database). For countries lacking information, we impute the revenues by multiplying the total revenue from taxes on income, capital gains and profit taxes with the sample's average share of these revenues from individuals. For countries lacking information in single years, we impute the revenues by inverse distance weighted interpolation using Stata's mipolate idw command, provided by Cox (2015).
Natural disasters	Binary indicator that equals 1 if a natural disaster affected at least 0.1% of the population or caused total damages of at least 0.5% of GDP within a quarter, 0 otherwise (The International Disaster Database; EM-DAT, CRED/UCLouvain, Brussels, Belgium www.emdat.be).
Systemic financial crises	Binary indicator that equals 1 if a systemic banking crisis, a currency crisis, a sovereign debt crisis or a sovereign debt restructuring have taken place within a calendar year, 0 otherwise. For detailed information on the data see Laeven and Valencia (2018).
Oil and gas rents	Rents from oil and gas production to GDP (World Bank: World Development Indicators). For countries lacking information on oil and gas rents we impute a 0.
Financial sector development	Domestic credit relative to GDP (World Bank: World Development Indicators). For countries lacking information in single years, we impute the revenues by inverse distance weighted interpolation with Stata's mipolate idw command by Cox (2015).
Control over corruption	Measure for the perceived extent to which public power is exercised for private gain ranging from −2.5 to 2.5, i.e., highly corrupt to not corrupt (World Governance Indicators).
Political stability	Measure for the perceived likelihood of political instability and politically motivated violence ranging from −2.5 to 2.5, i.e., highly unstable to highly stable (World Governance Indicators).
Exchange rate effect	We compute average currency shares of haven deposits for each country using information on currency-specific stocks of deposits from BIS Locational Banking Statistics. We then combine this information with exchange rate information from the IMF International Financial Statistics to construct a variable that expresses the percentage change in haven deposits caused by exchange rate changes.

Table A.3
Descriptive statistics for control variables.

Variable	Mean	SD
GDP (billion US$)	158	515
GDP per capita (US$)	4,149	5,181
CPI (% change)	4.34	5.79
Taxes on income, profits and capital gains	4.04	3.68
Exchange rate effect	−0.32	1.82
Capital account openness	0.59	1.59
Financial sector development	63.68	47.52
Financial crisis	0.04	0.18
Political stability	0.03	0.90
Control over corruption	0.13	1.01
Oil/gas rents	2.75	7.53
Natural disaster	0.12	0.32
Armed conflicts	0.06	0.24
Observations	129,528	

Note: This table shows sample mean and standard deviation (SD) for the control variables. Data from 2010:Q1 to 2018:Q4.
Data: See Table A.2.

Table A.4
Bacon decomposition.

	Tax havens		Non-havens	
DID comparison	weight	average DID estimate	weight	average DID estimate
Earlier group treatment vs. later group control	0.006	0.446	0.005	0.154
Later group treatment vs. earlier group control	0.004	0.030	0.004	0.034
Treatment vs. never treated	0.989	0.413	0.991	0.020
DID estimate	0.412		0.021	

Note: Table shows results of the Bacon decomposition for decomposing difference-in-differences estimation results with variation in treatment timing (Goodman-Bacon, 2021), estimated using Goodman-Bacon et al. (2019). As the Bacon decomposition requires a balanced panel, we impute missing deposit values with inverse distance weighted interpolation.
Data: BIS Locational Banking Statistics 2019.

Table A.5
Robustness: Different Standard Error Calculations

Sample	Full	Controls available			
Deposits in	Havens				Non-havens
	(1)	(2)	(3)	(4)	(5)
Coefficient on $CBIP_{it}$	0.488	0.463	0.416	0.351	−0.055
Conventional SE	(0.047)	(0.046)	(0.048)	(0.045)	(0.042)
SE clustered by country pair	(0.126)	(0.127)	(0.126)	(0.118)	(0.138)
SE clustered by country *i*	(0.155)	(0.159)	(0.145)	(0.137)	(0.133)
SE clustered by country *i* and country *j*	(0.122)	(0.138)	(0.133)	(0.125)	(0.136)
Add. controls	–	–	✓	✓	✓
Country-pair FE	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	–	✓
Time×country *j* FE	–	–	–	✓	–
Observations	49,333	37,861	37,861	37,861	57,159
Country pairs	1,803	1,350	1,350	1,350	2,248
R^2	0.032	0.028	0.032	0.174	0.010

Note: Table shows results of OLS panel regressions. Dependent variable is the *ln* of foreign deposits held by individuals from jurisdiction *i* in BIS reporting jurisdiction *j* at the end of year–quarter *t*. We consider the deposits held by residents (non-banks) of 200 (in col. 1) or 145 (in cols. 2–5) countries *i* in 10 haven and 20 non-haven jurisdictions *j*. Sample period from 2010:Q1 to 2018:Q4. $CBIP_{it} = 1$ if there is a (reformed) CBI program in jurisdiction *i* in year–quarter *t*. Additional controls as described in Table A.2. Col. (1) uses the full BIS country-by-country sample; cols. (2)–(5) the sample for which data on control variables is available. Standard errors in parentheses, in the first line conventional, in the second clustered by country pair (as in the main text), in the third clustered by country *i*, and in the fourth clustered two-way by country *i* and by country *j*.
Data: BIS Locational Banking Statistics 2019 and sources listed in Table A.2.

Table A.6
Robustness: Relevance of Individual Tax Havens

Country *j* dropped	(1) None	(2) Austria	(3) Belgium	(4) Chile	(5) Guernsey	(6) Hong Kong	(7) Isle of Man	(8) Jersey	(9) Luxembourg	(10) Macao	(11) Switzerland
$CBIP_{it}$	0.488***	0.487***	0.468***	0.437***	0.384***	0.504***	0.552***	0.556***	0.519***	0.459***	0.530***
	(0.126)	(0.142)	(0.139)	(0.125)	(0.099)	(0.129)	(0.141)	(0.145)	(0.142)	(0.127)	(0.142)
Country-pair FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	49,333	43,499	42,608	47,424	45,664	46,327	43,051	43,277	42,809	46,923	42,415
Country pairs	1,803	1,612	1,606	1,683	1,624	1,611	1,607	1,617	1,609	1,652	1,606
R^2	0.032	0.039	0.033	0.031	0.035	0.034	0.027	0.031	0.035	0.033	0.031

Note: Table shows results of OLS panel regressions (without controls). Each specification drops one reporting tax haven. Dependent variable is the *ln* of foreign deposits held by individuals from jurisdiction *i* in BIS reporting jurisdiction *j* at the end of year–quarter *t*. We consider the deposits held by residents (non-banks) of 200 countries *i* in 10 haven jurisdictions *j* (see the country list in Table A.1). Sample period from 2010:Q1 to 2018:Q4. $CBIP = 1$ if there is a (reformed) CBI program in jurisdiction *i* in year–quarter *t*. Standard errors (clustered by country pair) in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.
Data: BIS Locational Banking Statistics 2019.

Table A.7
Robustness: Relevance of Individual CBI Countries

Country i dropped	(1) None	(2) Dominica	(3) Cyprus	(4) Grenada	(5) Malta	(6) St. Lucia	(7) Vanuatu	(8) Cyprus and Malta	(9) Dominica, Grenada, St. Lucia and Vanuatu	(10) Cyprus, Malta and Vanuatu	(11) Cyprus, Dominica and Vanuatu
$CBIP_{it}$	0.488***	0.515***	0.454***	0.517***	0.335***	0.521***	0.575***	0.242**	0.875***	0.330***	0.625***
	(0.126)	(0.144)	(0.151)	(0.139)	(0.104)	(0.149)	(0.133)	(0.122)	(0.236)	(0.121)	(0.203)
Country-pair FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	49,333	49,105	49,029	49,107	49,049	49,091	49,131	48,745	48,435	48,543	48,599
Country pairs	1,803	1,794	1,793	1,794	1,794	1,793	1,795	1,784	1,767	1,776	1,776
R^2	0.032	0.033	0.032	0.033	0.032	0.032	0.033	0.032	0.034	0.032	0.033

Note: Table shows results of OLS panel regressions (without controls). Specifications (2)–(7) drop one CBI country each; in col. (8) we drop the European CBI countries Cyprus and Malta; in col. (9) we drop all countries except the European CBI countries Cyprus and Malta; in col. (10) we drop all countries except the Caribbean CBI countries; in col. (11) we drop Cyprus, Dominica and Vanuatu, as they reformed a pre-existing CBI program and did not introduce a new program. Dependent variable is the *ln* of foreign deposits held by individuals from jurisdiction i in BIS reporting jurisdiction j at the end of year–quarter t. We consider the deposits held by residents (non-banks) of 200 countries i in 10 haven jurisdictions j (see the country list in Table A.1). Sample period from 2010:Q1 to 2018:Q4. $CBIP_{it} = 1$ if there is a (reformed) CBI program in jurisdiction i in year–quarter t. Standard errors (clustered by country pair) in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.
Data: BIS Locational Banking Statistics 2019.

Table A.8
Panel Regressions: High-risk RBI Programs

Sample	Full	Control variables available			
Deposits in	Havens				Non-havens
	(1)	(2)	(3)	(4)	(5)
$RBIP_{it}$	0.117	0.211	0.165	0.156	−0.332*
	(0.154)	(0.156)	(0.150)	(0.130)	(0.189)
Add. controls	–	–	✓	✓	✓
Country-pair FE	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	–	✓
Time×country j FE	–	–	–	✓	–
Observations	46,728	35,518	35,518	35,518	53,779
Country pairs	1,710	1,265	1,265	1,265	2,114
R^2	0.034	0.031	0.034	0.179	0.011

Note: Table shows results of OLS panel regressions. Dependent variable is the *ln* of foreign deposits held by individuals from jurisdiction i in BIS reporting jurisdiction j at the end of year–quarter t. We consider the deposits held by residents (non-banks) of 190 (in col. 1) or 145 (in cols. 2–5) countries i in 10 haven and 20 non-haven jurisdictions j (see the country list in Table A.1). Sample period from 2010:Q1 to 2018:Q4. $RBIP_{it} = 1$ if there is a (reformed) RBI program in jurisdiction i in year–quarter t. Treated countries are Bahrain (2018:Q2), Barbados (2012:Q1), Colombia (2017:Q4), Panama (2012:Q2), Seychelles (2013:Q4), and the United Arab Emirates (2016:Q1). Additional controls as described in Table A.2. Col. (1) uses the full BIS country-by-country sample; cols. (2)–(5) the sample for which data on control variables is available. Standard errors (clustered by country pair) in parentheses, $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.
Data: BIS Locational Banking Statistics 2019 and sources listed in Table A.2.

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