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# Lost in Information: National Implementation of Global Tax Agreements\*

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## Abstract

This paper studies how national implementation shapes individual responses to global agreements by looking at the introduction of the multilateral standard for automatic information exchange on financial assets, i.e., the Common Reporting Standard (CRS). We utilize rich micro-level data on all bank transfers to Norway. This provides us with unparalleled detail on hidden ownership structures. These data show a significant increase in cash repatriation from tax havens post-CRS implementation. Yet, we document substantial heterogeneity in responses down to a null result if CRS enforcement is weak. Relying on macroeconomic data on cross-border bank deposits, we employ model averaging techniques to establish the most important characteristics of the receiving countries that make the CRS more effective. Our results suggest that a highly digitized tax administration triggers twice the drop in tax haven deposits compared to a tax administration relying on paper tax returns. These results have implications for global policy initiatives more broadly.

*JEL classification:* H26, G21, F42

*Keywords:* Global Tax Agreements, Tax Evasion, Financial Flows, Tax Enforcement

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# 1 Introduction

Global challenges require global policies and coordination, often in the form of multilateral agreements. From climate change to sanction enforcement and tax evasion, governments mandate supranational regulators to design multilateral responses. In the context of international taxation, policymakers made substantial progress. In an unparalleled display of international coordination, more than 100 countries signed up to a common reporting standard (CRS). The goal of the CRS is to make the use of haven-held financial accounts unattractive for tax evasion. The CRS increases the threat of detection of such accounts by automatically reporting their beneficial ownership, value, and income type to the relevant tax authority. These positions can be substantial: Zucman (2013) shows that tax havens hold 8% of global GDP in offshore wealth, of which the owners reported only 10% to tax administrations pre-CRS (Alstadsæter et al., 2019a).

In this study, we introduce novel data sources and empirical strategies to establish if, and more importantly, under what circumstances, the CRS worked. As such, we provide useful take-aways for implementing global agreements in other areas as well. Pre-CRS, the prevalent offshore tax evasion setups relied on hiding financial assets through several layers of ownership in tax havens. Our results show that the CRS effect on these assets varies dramatically with the level of local enforcement in the CRS information-sending country. Results range from a 73% increase in potentially legalized tax haven transfers to a null result if CRS enforcement is weak. Turning to the countries receiving CRS information, a highly digitized tax administration triggers twice the drop in tax haven deposits compared to a tax administration relying on paper tax returns. This explicit treatment of previously overlooked heterogeneity in CRS enforcement on both sides of the information exchange explains the mixed results of the previous literature.

While the automatic exchange of information goes well beyond previous and largely unsuccessful information on request treaties, results on its effectiveness have been mixed. Initial reactions mirrored information on request treaties (Menkhoff and Miethe, 2019; Casi et al., 2020), yet significant loopholes exist and are exploited. These include the US as a non-participating jurisdiction (Casi et al., 2020) but also citizenship by investment programs (Langenmayr and Zyska, 2023) and assets that are not covered by the CRS such as real estate (Bomare and Herry, 2022). There are more optimistic studies, however, that show the effectiveness of the CRS (O'Reilly et al., 2019), especially in conjunction with amnesties (Baselgia, 2023; Londoño Vélez and Tortarolo, 2022).

Previous work has analyzed the CRS as a binary event in which countries participate or not. This is a reasonable starting point since it is based on a standardized global agreement designed by one institution, the OECD. Yet, countries have degrees of freedom when introducing the CRS nationally. Information-sending countries need to translate the international agreement into the respective national legal systems, train their financial institutions to report the correct data, and monitor and sanction them if they do not. Tax havens can thus send CRS-related data with very

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different informational value.<sup>1</sup> We create a new dataset building on cross-country monitoring efforts that captures these implementation differences. A second channel of heterogeneity is the capacity of the tax administrations receiving the CRS information. They differ in willingness, prioritization, or simply resources.<sup>2</sup> We create a new dataset codifying a large survey on tax administration characteristics to analyze this heterogeneity in the receiving country. Both of these dimensions, the sending and the receiving level, directly affect the perceived probability of detection and with this compliance (Allingham and Sandmo, 1972). International tax evaders, who concentrate in the top 0.01% of the income distribution (Alstadsæter et al., 2019a) can be expected to afford financial service providers who will be aware of these national enforcement differences.

Despite their secretive nature, it is possible to study the enforcement heterogeneity across different tax haven-sending countries. We combine our hand-coded CRS enforcement dataset with a unique daily transaction-level dataset that covers all cross-border bank transfers into Norwegian bank accounts for the implementation period of the CRS (2014-2018). The transaction-level dataset enables us to overcome a main limitation in the literature so far, namely the inability to look through ownership chains structured through several tax havens. Such chains, for example, a Panamanian shell company owning a Swiss bank account, are the preferred structure to evade earlier regulation attempts (documented in Johannesen and Zucman, 2014; Johannesen, 2014; Menkhoff and Miethe, 2019). After the CRS introduction, this chain is CRS exposed as the bank has to report ultimate ownership. The Norwegian bank transfer data includes information on the direct owner of that Swiss bank account wiring funds to Norway, be it domestic in Switzerland, held from the U.S., or Panama. For the first time, we are, therefore, able to study such CRS-exposed accounts explicitly for 41 tax havens.

Using event studies with staggered adoption and binned endpoints, we document a substantial increase in transfers from CRS-exposed accounts with the start of CRS data collection. We compare these developments to a falsification group of transfers from tax haven bank accounts that are owned domestically, where we find no reactions. This approach controls for event time trends in affected tax havens beyond the global calendar time trend. The average CRS reaction hides substantial heterogeneity depending on the CRS enforcement level of the tax haven, as documented in our enforcement dataset. Transfers of CRS-exposed accounts in tax havens with strong local enforcement to Norway increase by up to 73%. If local enforcement is weak, we cannot document any responses to CRS activation, a striking null result.

Even if all information was sent accurately as intended by the CRS, a threat of detection is only credible if the receiving country's tax administration makes use of it. However, tax administrations

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<sup>1</sup>For an overview of the heterogeneity of CRS national implementation, see (Casi et al., 2019). The OECD has also monitored the CRS national implementation over the past years. See the results of the assessment here: <https://www.oecd.org/publications/peer-review-of-the-automatic-exchange-of-financial-account-information-2022-36e7cded-en.htm>.

<sup>2</sup>See Slemrod (2019) for an overview of the tax enforcement literature.

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differ in effectiveness. This can be due to different levels of digitization, resources, staff numbers, experience of employees, levels of audits, priorities, and many other dimensions. Well-informed tax evaders or their financial service providers likely predict such impediments. Using Norwegian data to study information-sending countries' CRS enforcement allows us to keep receiving country characteristics fixed at a high tax authority capacity level.

To vary the receiving country's tax authority capacity, we turn to a global sample of macroeconomic data on bilateral bank deposits from the Bank for International Settlements (BIS). We compare deposits of receiving countries that activate the CRS in tax havens to deposits in non-havens and bilateral nodes that have not activated the CRS. Our identification builds on and goes beyond the previous literature (Andersen et al., 2022). Beyond a dynamic global calendar time trend, we pin down three dynamic event time trends around CRS activation: a tax haven trend, a non-haven trend, and an EU trend to capture the numerous EU directives aimed at information exchange. Intuitively, this creates a control group of both non-activating country pairs and deposit developments outside of tax havens, which are important to account for the global financial cycle adequately.

Our baseline estimate of the average response to CRS activation indicates a 26% decrease in tax haven deposits. In order to study receiving country heterogeneity, we dissect this effect, comparing, for example, the reaction of French deposits in tax havens to that of Norwegian deposits in tax havens. Based on our novel dataset of tax administration characteristics, we then correlate these receiving country-specific coefficients across a large number of different tax administration characteristics and standard macroeconomic variables. We employ model averaging techniques to identify the most robust correlations. This methodology identifies the level of digitization as most robustly correlated with strong CRS effects, even more so than tax administrations' overall resources. We confirm this by differentiating countries along this dimension in staggered adoption event studies. We document that highly digitized receiving countries experience almost twice the drop in tax haven deposits compared to receiving countries that are not as digitized. This is in line with a lower threat of detection for tax evaders who are aware of the limited capacity on the side of their tax administration that receives CRS reports.

We probe the credibility of our results in the sending and receiving country analysis with several robustness tests: dropping each country in turn, changing the control, excluding high GDP countries, or excluding conduit countries. We acknowledge as the main limitation of our study that CRS enforcement is not exogenously assigned, especially resource-rich countries should have more capacity to enforce. With the latter two exclusion tests, we demonstrate that it is not resource-rich countries that drive our results.

The CRS is an example of an ambitious global cooperation with the potential to reach its declared original goal. We show that the success of this agreement varies drastically with local implementation. Depending on tax haven implementation, our results range from stronger effects

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than previously thought to a null result. If, on the other side of the exchange, the receiving country is not expected to make good use of the information transmitted, effects drop by almost half. This shows that even in the presence of a multilateral standard, an inter-country peer review process, and high salience for policy-makers around the world, governments can unilaterally undermine global agreements. These results have implications for international cooperation on environmental policy, sanction enforcement, trade policy, tax policy at the UN level, or any agreement moderating between global and national policy goals. This study can serve as a useful blueprint for both the design and the analysis of such agreements.

Overall, this paper contributes to the understanding of which elements make global agreements work best. In this way, we contribute to the literature studying behavioral responses to global policies in the context of climate change (see for example Nordhaus, 2015; Esty, 2008; Roelfsema et al., 2020), sanctions (see for example Drezner, 2000; Elliott and Hufbauer, 1999; Neuenkirch and Neumeier, 2015) and taxation (see the literature reviews from Beer et al., 2020; Hoopes et al., 2023; De Simone and Stomberg, 2023). Our findings primarily related to previous work showing mixed results for the CRS effectiveness in reducing offshore tax evasion (Menkhoff and Miethe, 2019; Casi et al., 2020; Langenmayr and Zyska, 2023; Bomare and Herry, 2022; O'Reilly et al., 2019; Baselgia, 2023; Londoño Vélez and Tortarolo, 2022). We go beyond aggregated average effects and show that substantial differences in local CRS implementation exist and can shape its effectiveness.

The rest of the paper follows convention: Section 2 introduces the institutional setting. Section 3 introduces the transaction level data, the macroeconomic stock dataset, as well as our newly collected institutional datasets on enforcement stringency and tax administration characteristics. Section 4 outlines our empirical improvements together with the results before section 5 concludes.

## 2 Institutional Background

Recent estimates suggest that approx. USD 12.2 billion is evaded using offshore accounts, and most of such unreported wealth and related income can be attributed to the top 0.1% highest earners (Alstadsæter et al., 2019a; Leenders et al., 2023). The prevailing policy tool to increase the threat of detection in the context of cross-border tax evasion is the information exchange across countries (Dharmapala, 2016). Administrative cooperation across countries using information exchange agreements has existed for long, but 1998 represents the most crucial year on the route toward international tax transparency. In that year, the OECD report on harmful tax competition triggered an international debate, which culminated in the launch of a comprehensive model for tax information exchange agreements (TIEA) (Christensen III and Tirard, 2016). There is a vast empirical literature on the impact of early initiatives in the field of information exchange.

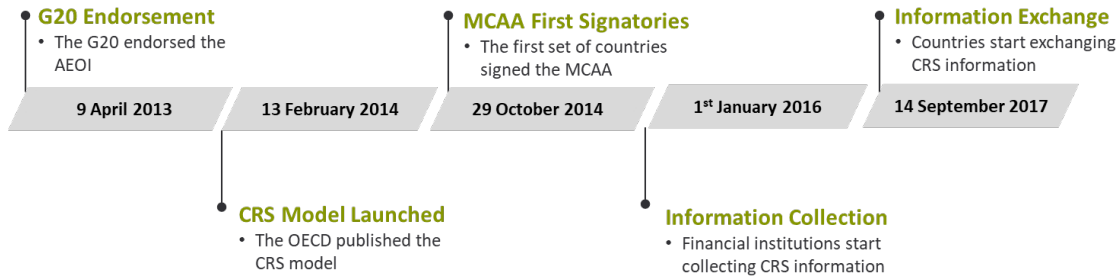
Overall, empirical evidence suggests that tax evaders' reactions to these early TIEAs were short-lived (Menkhoff and Miethe, 2019), and new channels and locations for circumventing the

information exchange on financial assets exist (Huizinga and Nicodème, 2004; Johannesen and Zucman, 2014). Similarly, the introduction in 2003 of the first multilateral approach for the exchange of information on interest income on an automatic basis with the European Savings Directive (Directive 2003/48/EC) did not lead to an end to cross-border tax evasion in the EU. Instead, tax evaders relocated their deposits to non-EU tax havens (Johannesen and Zucman, 2014; Caruana-Galizia and Caruana-Galizia, 2016; Martínez-Toledano and Roussille, 2023).

In 2010, the United States was the first to develop a standard for the automatic exchange of information covering a broad set of financial assets. By introducing FATCA, the U.S. introduced a system forcing foreign financial institutions to collect and transfer information on financial assets owned by U.S. citizens to the IRS De Simone et al. (2020). The OECD member states reacted by demanding the same information on their residents. On 21 July 2014, the OECD published the final version of its global standard for the AEOI, the so-called CRS. In this study, we focus on the CRS, given its global dimension.

Currently, around 120 countries have committed to the introduction of the CRS.<sup>3</sup> Most countries have already passed a national law implementing the CRS locally and started exchanging information, which takes place in September of each year.<sup>4</sup> In Figure 1, we provide an overview of the key events around the CRS implementation. As of 2022, the CRS comprises 4,900 bilateral relationships, and, according to the OECD, members reported 47 million offshore accounts with a total value of around EUR 4.9 trillion.<sup>5</sup>

Figure 1: CRS Timeline of Events



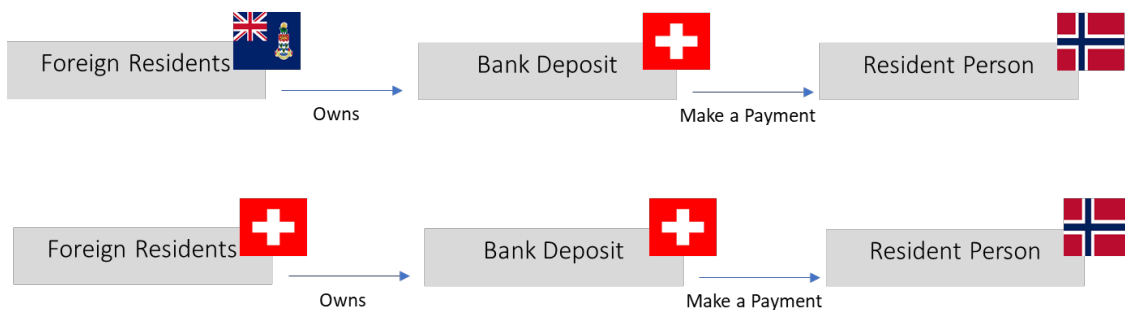
The CRS presents certain key features, making it substantially different from any initiative in the field of information exchange launched so far. First of all, it constitutes a multilateral approach, which is similar to the EU Savings Directive, but it differs from FATCA and from classical bilateral tax information exchange agreements (TIEAs). In particular, it requires financial institutions to automatically collect detailed financial account information on non-resident taxpayers if both

<sup>3</sup>For a list of all countries, see the OECD report available at <https://www.oecd.org/tax/exchange-of-tax-information/crs-mcaa-signatories.pdf>

<sup>4</sup>In appendix A.1, we provide a detailed overview of the legislative steps to become a CRS participating jurisdiction.

<sup>5</sup>For all statistics, see <https://web.archive.oecd.org/2019-06-06/522576-implementation-of-tax-transparency-initiative-delivering-concrete-and-impressive-results.htm>

Figure 2: Norwegian Currency Registry - Cross-Border Bank Transfer Data



*Note:* The figure shows an example of the type of cross-border bank transfers considered in our analysis. For example, in the treated group, we consider a bank transfer from a Swiss bank account to a Norwegian bank account where the Swiss bank account is owned by a resident from the Cayman Islands (i.e. a foreign bank account). While, in the control group, we consider a bank transfer from a Swiss bank account to a Norwegian bank account where the Swiss bank account is owned by a resident from Switzerland (i.e. a domestic bank account).

their jurisdiction and the client’s resident jurisdiction have a CRS system in place. Furthermore, participating jurisdictions automatically exchange information with any counterpart that has CRS implemented into national law. In this way, there is no requirement to negotiate single treaties on a country-by-country basis. In contrast to normal TIEAs and FATCA, under CRS, financial data are exchanged automatically rather than upon request. Finally, the CRS not only has a larger country coverage compared to the EU Savings Directive but also a broader scope. Reportable financial institutions need to provide detailed information on accounts held on behalf of non-resident taxpayers, which is not limited to interest income. To sum up, the CRS, with its multilateral approach, broad scope, and extensive country coverage, is the most powerful policy tool launched so far in the field of information exchange.

Although the CRS is a global model, its success lies in how countries introduce it locally, both at the level of the sending as well as at the level of the receiving countries. In this study, we shed light on how different country characteristics, including local enforcement and tax authority capacity, shape taxpayers’ responses to the CRS.

### 3 Data

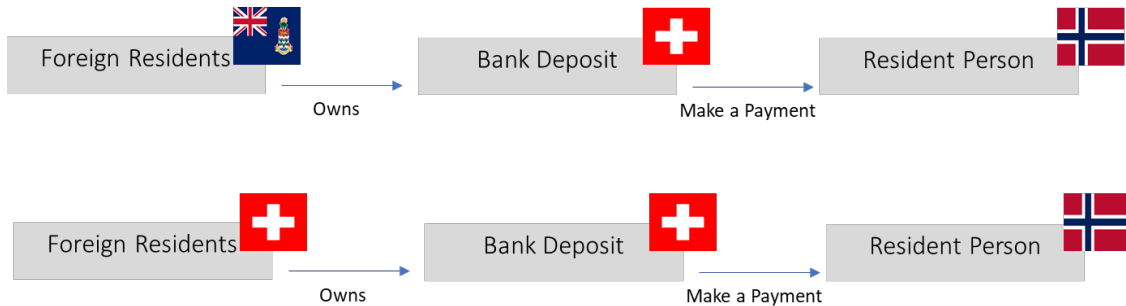
#### 3.1 Microdata on cross-border bank transfers - sending country analysis

The micro-level data comprises real-time daily payments from and to Norway obtained from the Norwegian tax authority’s currency register for the period 2010-2018. We can identify the country in which the foreign bank account is located, as well as the residence country in which the direct owner of the foreign bank account is located. One unit of observation is the number and value of transfers to Norway from a bank account located in country  $j$ , held by an owner located in country



z (where j may equal z). For example, we can observe the value of a hypothetical transfer made on January 1st, 2010, from a bank account located in Switzerland to a bank account located in Norway, and we can see if the owner of the Swiss bank account is resident in Switzerland or another country as shown in figure 3.

Figure 3: Norwegian Currency Registry - Cross-Border Bank Transfer Data



*Note:* The figure shows an example of the type of cross-border bank transfers considered in our analysis. For example, in the treated group, we consider a bank transfer from a Swiss bank account to a Norwegian bank account where the Swiss bank account is owned by a resident from the Cayman Islands (i.e., a foreign bank account). While in the control group, we consider a bank transfer from a Swiss bank account to a Norwegian bank account where the Swiss bank account is owned by a resident from Switzerland (i.e., a domestic bank account).

For our analysis, we exclusively consider transfers from tax havens to Norway and compare the change in transfers from bank accounts located in a tax haven where the direct foreign owner is located in a different tax haven (our treated group, which we call *cross-haven transfers*) to the one from bank accounts located in a tax haven where the direct owner is located in the same haven (our control group, which we call *within tax haven transfers*). We have observations from 41 tax havens. For example, we compare a transfer from a bank account in Switzerland that has a direct owner located in the Cayman Islands to a transfer from a bank account in Switzerland that has a direct owner situated in Switzerland. Our treated group exclusively comprises transfers from bank accounts located in tax havens<sup>6</sup> with a direct owner in another tax haven to a Norwegian bank account so as to isolate those bank transfers made through several layers of secrecy involving the use of shell companies.

This transaction-level data enables us to overcome three limitations of the data from the Bank for International Settlements (BIS). In the BIS data, only the owner country of the bank account is observable, but not transfers. The Norwegian transfer data allows us to observe where funds from havens are directed. Second, the Norwegian bank transfer data enables us to trace the ownership of the foreign bank account and isolate those transfers to Norway through layers of secrecy using shell companies. Third, in the Norwegian data, we observe increases in transfers to Norway from a haven within individual accounts. In contrast, in the BIS data, we only observe changes to the

<sup>6</sup>The list of tax havens is taken from Johannesen and Zucman (2014) and Gravelle (2015).

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total stock of deposits held by different counterparty countries in a haven country. This allows us to control for individual country fixed factors. A limitation of the Norwegian data is that it covers mostly Norwegian residents. Therefore, we use the BIS macro data in the second part of the analysis to exploit variation in the receiving country, the country of residence of the secrecy seeker, or the tax evader.

Finally, the Norwegian microdata enables us to distinguish between individual and corporate-owned Norwegian bank accounts.<sup>7</sup> The prior literature suggests that individuals will conduct offshore transactions likely through a holding company. Even beyond Norway, indirect ownership via holding companies offers both non-tax and tax advantages, including protecting personal assets from external parties like creditors and family members and tax-free consumption within a holding company without taking on the economic risks associated with the original company's activities (Alstadsæter et al., 2019b). Norwegian individuals have even stronger incentives to indirectly accumulate income and wealth via holding companies after a 2006 reform that introduced an exemption for capital gains and dividend income when income is corporate-owned.<sup>8</sup> Thus, for the purpose of our main analysis, we exclusively focus on transfers to indirectly owned company accounts, as holding wealth via holding companies is, for the above-stated reasons, common in Norway.

We expect most tax evaders to have no transfer to the respective Norwegian bank account throughout the pre-CRS period but to make transfers as a reaction to the CRS activation.<sup>9</sup> To ensure that we keep individual-level observations for quarters where there is no bank transfer and especially that we do not lose observations where we only have transfers post-CRS, we construct a balanced sample by filling every individual-country-pair observation with a zero if no bank transfer occurs in a certain quarter-year for a specific individual-country-pair observation. To make the analysis feasible from a computational point of view, given the size of the final dataset, we exclude very small cross-border bank transfers, which create noise in our data but most likely do not relate to a post-CRS repatriation activity. Specifically, we exclude single transfers below NOK 10,000 (approx. USD 1,000) and transfers where the total value across our sample period is below NOK 50,000 (approx. USD 5,000).

### 3.2 Macro data on cross-border bank deposits - receiving country analysis

The macro-level analysis uses the outstanding volume of cross-border deposits in foreign countries, including tax havens, accessible through the Bank for International Settlements Locational Banking

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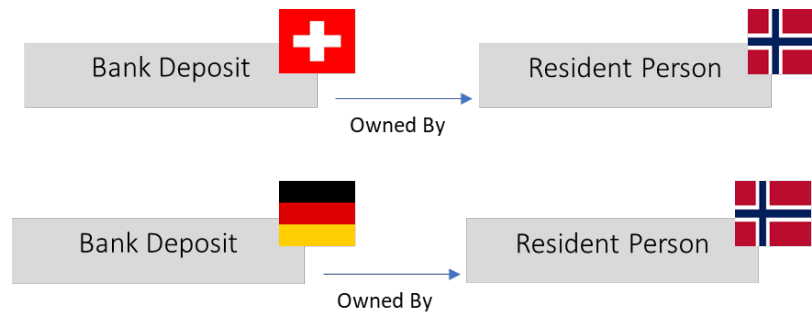
<sup>7</sup>At the level of the foreign bank account, we lack any information on the ownership type.

<sup>8</sup>For evidence on the substantial post-2005 increase in indirect ownership among Norwegian residents, see Alstadsæter et al. (2014, 2016, 2019b)

<sup>9</sup>Transfers could be due to one-time repatriations of offshore wealth or repeated declarations of current income streams. Note that although the declaration of CRS-exposed assets might be immediate on CRS activation, we do not expect immediate transfers on the declaration as there is a lag between tax declaration (legalization) and tax payments. Only the latter would require transfers.

Statistics (LBS). The BIS provides bilateral quarterly data on deposits held by individuals and entities that are not residents of the country where the reporting bank is located. For example, we observe the total amount of deposits Norwegian residents own in active banks in Switzerland or Germany, as shown in Figure 4. Although these data present certain limitations in terms of country coverage and granularity<sup>10</sup>, they have a comprehensive coverage within countries that are included in the database and across the world and are therefore widely used in the literature on cross-border tax evasion (Johannesen and Zucman, 2014; Menkhoff and Miethe, 2019; Casi et al., 2020; Langenmayr and Zyska, 2023).<sup>11</sup>

Figure 4: Bank for International Settlement - Cross-Border Bank Deposits Data



*Note:* The figure shows an example of the type of cross-border bank deposits considered in our analysis. For example, in the treated group, we consider bank deposits located in Switzerland (tax haven bank deposit) and owned by a Norwegian resident. While in the control group, we consider bank deposits located in Germany (non-tax havens bank deposits) and owned by a Norwegian resident.

At the BIS LBS, we get access to bilateral-level data for 29 reporting deposit countries and 212 residence countries. For the purpose of this analysis, we use all tax haven locations for which data at the bilateral level is publicly available in the BIS dataset. That includes Austria, Belgium, Chile, Cyprus, Guernsey, Hong Kong, Isle of Man, Jersey, Luxembourg, Macau, and Switzerland.<sup>12</sup> As the residence country of the owner of the deposits, we select all countries available in the BIS database. We have a total of 212 residence countries in the sample that we use for our analysis.<sup>13</sup> We limit the sample period to 2014-2018 to exclude possible effects of the introduction of FATCA and the financial crises in the pre-period as well as the global Covid-19 pandemic in the post-period and to have a comparable sample period in both parts of our analysis (the Norwegian Micro Data used in the sender analysis is only available until the end of 2018). All our results are robust to a larger sample period ranging from after the financial crisis in 2009 to before the Covid-19 pandemic in 2019.

<sup>10</sup>For an overview on the limitations, see e.g., Casi et al. (2020)

<sup>11</sup>For more details on the data, see Table A6.2 from BIS, available at <http://stats.bis.org/statx/srs/table/A6.2>.

<sup>12</sup>The list of tax havens is taken from Johannesen and Zucman (2014) and Gravelle (2015).

<sup>13</sup>Balancing reduces the number of countries in our sample. We perform our analysis on an unbalanced sample but results are similar when using a balanced sample.

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### 3.3 Institutional Data on the CRS and on Tax Authority Capacity

*Data on the CRS introduction:* We rely on the data from Casi et al. (2020), which we update by manually collecting information on the exact CRS effective date at the country level as stated in national laws. The OECD provides on its website the link to each CRS national law for all adopters.<sup>14</sup> When the information is not available through the OECD database, we search it using news alerts from the Customer & Investor Tax Transparency (CITT) News Blog by PwC.<sup>15</sup>

*Data on the CRS enforcement:* For detailed institutional information on the local enforcement of the CRS, we use the OECD peer review reports. The OECD global forum issued the first report in 2020, presenting the results of a comprehensive assessment of the domestic and international legal frameworks of each jurisdiction to verify their completeness. The representative of each CRS participating country was asked to evaluate a peer along two main dimensions. The first dimension covers the quality of the domestic legal framework: this meant, for example, a check of whether countries do not exclude risky financial assets in the list of reportable assets or that the list of reportable financial institutions is in line with the OECD model. The second dimension measures the extent to which countries exchange information internationally. In our analysis, we exclusively focus on the former because no substantial variation is reported in the latter category. Specifically, only two countries, Sint Maarten and Trinidad and Tobago, score poorly with respect to their international network of information exchange. Thus, we use the first dimension, which displays sufficient variation (quality of legal framework) for our analysis.

In 2022, the OECD global forum issued a second report presenting the results of a comprehensive assessment of the effectiveness of the CRS implementation in practice, including operational frameworks for financial institutions and information transmission systems. From the peer review reports, we extract the following dimensions of CRS local enforcement: communication effort, reporting verification, quality verification, and issued penalties. The communication effort indicator captures activities like direct regular communication with financial institutions, holding meetings with relevant stakeholders, and dedicated conferences with accountants and auditors.<sup>16</sup> These communication activities occurred around the CRS activation. Reporting verification and quality verification include, for example, detailed analysis of the population of reportable financial institutions, onsite and offsite inspections, desk-based checks to verify the quality of the reported information, and comprehensive reviews.<sup>17</sup> Such activities, as well as possible penalties for non-

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<sup>14</sup>For more information, see <https://www.oecd.org/tax/automatic-exchange/crs-implementation-and-assistance/crs-by-jurisdiction/>

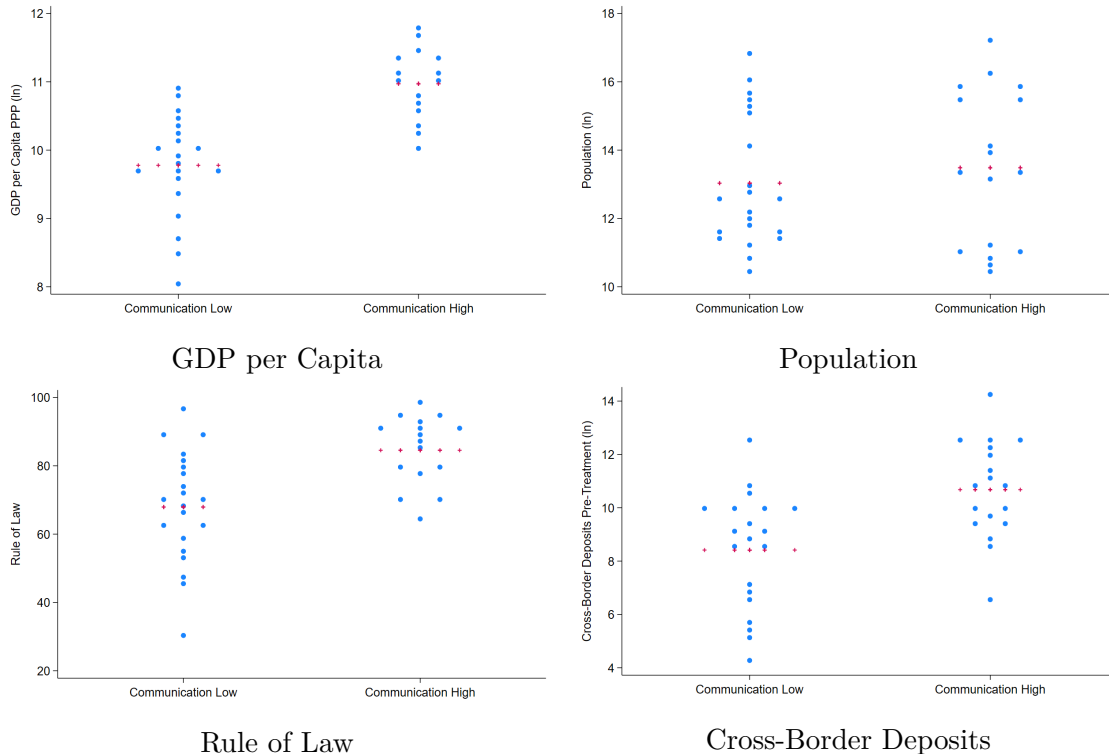
<sup>15</sup>For more information, see <https://blogs.pwc.de/en/citt/about-this-blog/>

<sup>16</sup>This is an example taken from the case of Norway, see [https://www.oecd-ilibrary.org/sites/36e7cded-en/1/3/3/75/index.html?itemId=/content/publication/36e7cded-en&\\_csp\\_=3814d1aa5db508be3a9f2af46257d0f4&itemIGO=oecd&itemContentType=book](https://www.oecd-ilibrary.org/sites/36e7cded-en/1/3/3/75/index.html?itemId=/content/publication/36e7cded-en&_csp_=3814d1aa5db508be3a9f2af46257d0f4&itemIGO=oecd&itemContentType=book)

<sup>17</sup>This is an example taken from the case of Norway, see [https://www.oecd-ilibrary.org/sites/36e7cded-en/1/3/3/75/index.html?itemId=/content/publication/36e7cded-en&\\_csp\\_=3814d1aa5db508be3a9f2af46257d0f4&itemIGO=oecd&itemContentType=book](https://www.oecd-ilibrary.org/sites/36e7cded-en/1/3/3/75/index.html?itemId=/content/publication/36e7cded-en&_csp_=3814d1aa5db508be3a9f2af46257d0f4&itemIGO=oecd&itemContentType=book)

compliance, occur after the first round of data is collected and sent by the financial institutions to tax authorities. This means that any of the above-mentioned latter activities occurred around one year after the CRS activation in the respective country. We use the enforcement activity that occurred around CRS activation, communication, and outreach to financial institutions for our analysis based on the CRS activation shock.

Figure 5: Sending Country Analysis: Havens' Country Characteristics and CRS Communication Effort

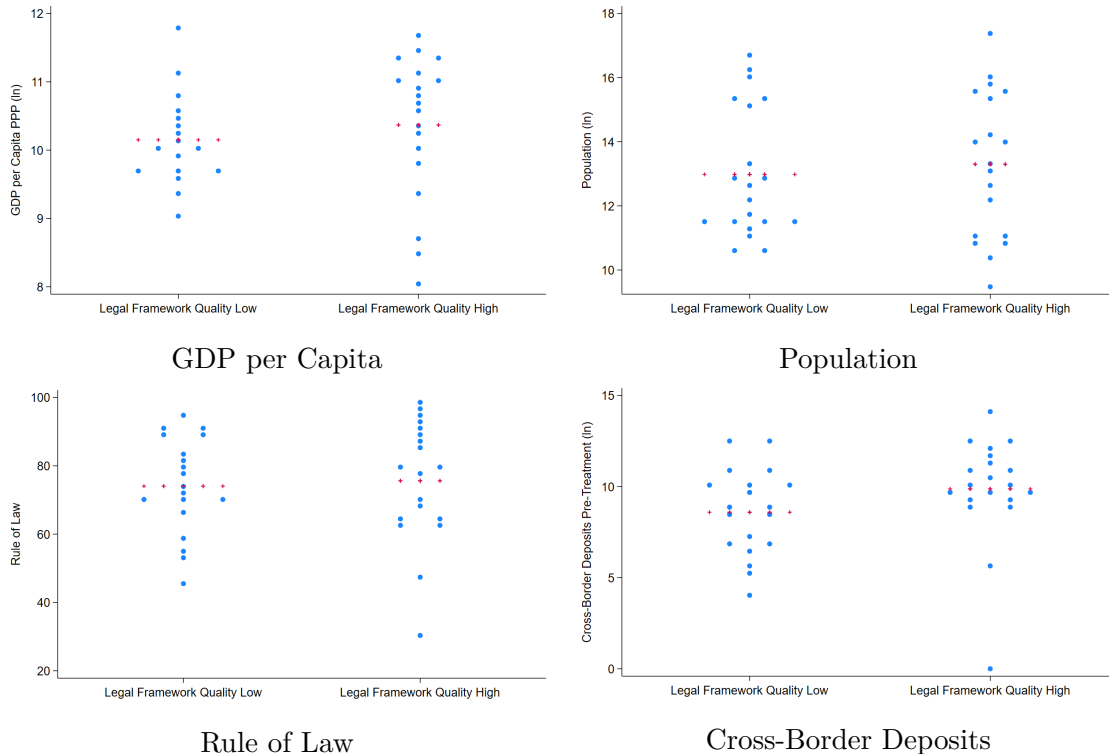


Notes: The figure shows in dot plots the relationship of the CRS communication by tax haven countries measured in a binary dummy (high versus low communication) with key country characteristics: GDP per capita in natural log, population in natural log, a rule of law index ranging between 0-100, and the top 10 percent income share in percent. Each dot denotes a tax haven country. Red crosses denote the mean values of each country characteristic by low (0) and high (1) communication.

Figure 5 shows the relationship of CRS communication effort indicator with tax haven country characteristics relevant for tax evasion and economic development: GDP per capita, population, a rule of law index, and the stock of cross-border deposits pre-treatment. The figure indicates that high CRS communication effort is positively associated with GDP per capita and the stock of cross-border deposits pre-treatment. The corresponding pairwise correlations are between 0.3-0.6 and statistically significant, just at the 10% significance level. There is no statistically significant correlation between population size and rule of law and communication efforts. Nevertheless, the correlation coefficient on the rule of law is 0.45. Figure 6 shows the relationship of our legal framework implementation quality indicator with the equivalent tax haven country characteristics.

The figure indicates no significant correlations with the three investigated country characteristics. The pairwise correlations are statistically insignificant at the 10% level, and the correlation coefficients are below 10%. Only the stock of cross-border deposits held in tax havens pre-treatment is positively associated with a high-quality legal framework, with a correlation coefficient of about 0.2 and statistical significance at the 10% level.

Figure 6: Sending Country Analysis: Havens' Country Characteristics and CRS Legal Framework Implementation



Notes: The figure shows in dot plots the relationship of the CRS legal framework implementation by tax haven countries measured in a binary dummy (high versus low-quality implementation) with key country characteristics: GDP per capita in natural log, population in natural log, a rule of law index ranging between 0-100, and the top 10 percent income share in percent. Each dot denotes a tax haven country. Red crosses denote the mean values of each country characteristic by low (0) and high (1) communication.

We notice that most conduit countries in our sample are classified as high enforcement countries (especially seven out of eight show high communication effort). Conduit countries only partially drive the correlations between high communication effort and legal framework quality with GDP per capita and cross-border deposit stock. When we drop conduits, correlations are reduced in size but still statistically significant at the 10 percent level.<sup>18</sup> In the results section, we probe whether the correlations between CRS enforcement and economic size drive our findings by excluding conduit

<sup>18</sup>We classify countries as conduit countries based on the lists provided by Lejour (2020) and Bolwijn et al. (2018), which include all the larger economies among the tax havens in our sample, namely Austria, Belgium, Hong Kong, Ireland, Luxembourg, Singapore, and Switzerland.

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or high GDP per capita havens from our regression analysis.

**Data on tax authority capacity:** To study the capability of the CRS-information-receiving countries to uncover tax evasion, we use a comprehensive OECD report on tax authority characteristics for the years 2018 and 2019 OECD, 2021. This report includes 101 different variables.

The OECD makes these variables available as 24 formatted tables in Excel corresponding to tables D.1. to D.24. in OECD (2021). We downloaded the 24 files<sup>19</sup> to build a merged dataset of comprehensive tax authority characteristics. To obtain the final data inputs, we proceed in three steps. First, pre-merging, we went through each table to unify the 24 table formats and assign unique names and identifiers to each variable. Second, after merging, we identified multicollinear sets of variables and complementarities between variables (e.g., age groups). Third, we selected the variables with sufficient country coverage and with relevance for our analysis (excluding variables relating to social security payments and value added tax).<sup>20</sup> In all three steps, we proofread by a second author.

Next, we ran a model averaging exercise with these country characteristics, the procedure we describe below in section 4.2. The goal of the model averaging is to identify the variables that are highly correlated with receiving country CRS effectiveness after controlling for general country characteristics. Out of the 24 candidate variables, the model-averaging exercise identifies digitization of the tax authority as the most relevant variable for CRS local enforcement effectiveness. Figure 7 shows the relationship of tax authority digitization measured as the country-level PIT e-filing rate with key country characteristics: GDP per capita, population, a rule of law index, and the top 10 percent income share. High e-filing rates indicated by red squares in each sub-figure are evenly distributed across these indicators, suggesting no strong relationship with other central country characteristics. The unreported correlation coefficients between the e-filing rate and these country characteristics range between -0.02 and 0.22 and are not statistically significant at the 10%-significance level.

### 3.4 Summary Statistics

We provide summary statistics for the variables used in our analysis in Table 1 for the sending country analysis and Table 2 for the receiving country analysis.

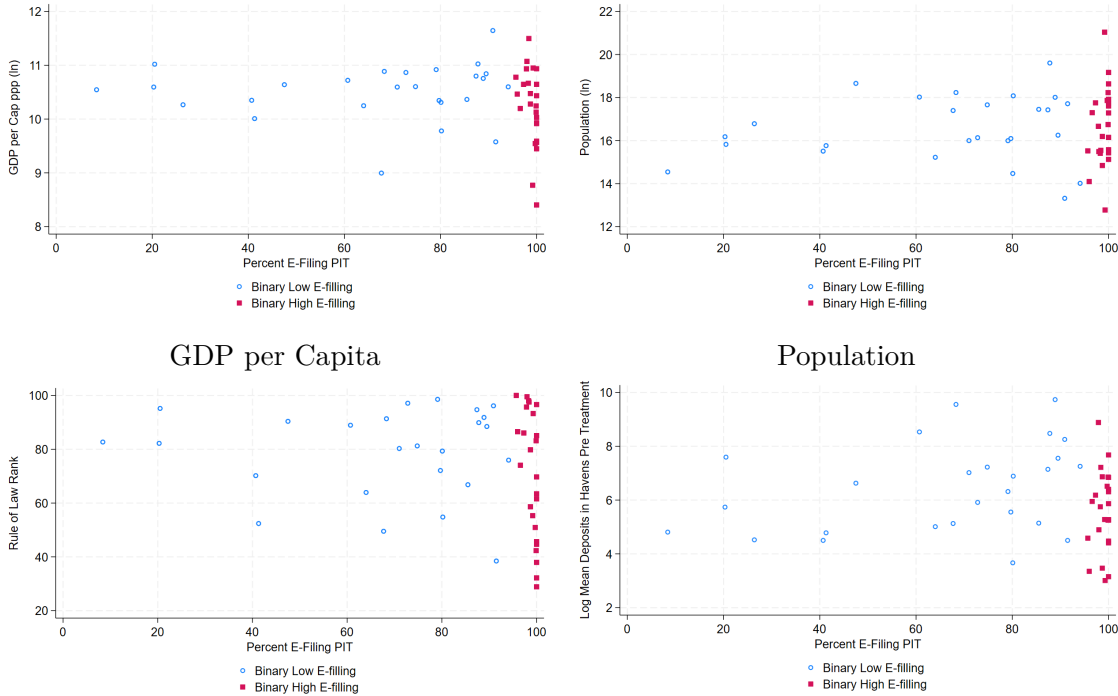
In Table 1, we present the data of all Norwegian bank transfers at the individual-country-pair and year-quarter level. In panel A, we show the summary statistics for all transfers to Norway from tax havens. We have a total of 120,958 bank transfers across our sample period that originate from a tax haven, and 98% of them originate from a within-haven transfer. As expected, transfers through several layers of tax havens (the cross-haven transfers) are less frequent, as we observe

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<sup>19</sup>The report provides a link to each file in the footnotes to the tables.

<sup>20</sup>To allow more researchers to readily use the 101 OECD variables, we will make available upon publication this merged and prepared dataset including a table mapping our dataset to the OECD 2021 report.

Figure 7: Receiving Country Analysis: Country Level Personal Income Tax E-Filing Rate by Country Characteristics



Rule of Law

Haven Cross-Border Deposits

Notes: The figure shows in scatter plots the relationship of the PIT e-filing rate with key country characteristics: GDP per capita in natural log, population in natural log, a rule of law index ranging between 0-100, and the top 10 percent income share in percent. High e-filing rates (above the sample median) are indicated by red squares in each sub-figure, and low e-filing rates (below the sample median) are indicated by blue circles.

approximately 2,000 such transfers throughout our sample period. The median (mean) number of quarterly across-haven transfers to the same Norwegian bank account is 1 (2.6) (e.g., we observe on average between 2 to 3 transfers to the same Norwegian bank account from all bank accounts in tax haven X where the owner is in tax haven Y). The value of cross-haven transfers varies substantially: the median quarterly value of an individual-country-pair transfer is approx. NOK 150K (around USD 15K). This masks some large transfers as the mean value is approx. NOK 3 million (around USD 300K).<sup>21</sup> In panel B of Table 1, we exclusively consider cross-haven transfers and show how the number and value of transfers differ across high and low CRS enforcement countries. Although the frequency of transfers is larger for the high CRS enforcement countries<sup>22</sup>, the median value is similar across the groups and comparable to all transfers (including the within-haven transfers).

In Table 2, we show the descriptive statistics on the receiving country analysis. This part of our

<sup>21</sup>Note that in our analysis, we take into consideration large outliers by taking the natural logarithm of the value of the bank transfer.

<sup>22</sup>See appendix A.1, for the list of which tax haven is in which group of enforcement intensity.



Table 1: Sending Countries Analysis - Summary Statistics

Panel A - Overview on all haven transfers to Norway				
Variable	Obs	Mean	Median	St Dev
<b>All Transfers</b>				
Number of Transfers	120,958	6.76	2.00	51.56
Value of Transfers	120,958	11.66	0.14	249.92
<b>Cross-Haven Transfers</b>				
Number of Transfers	2,211	2.58	1.00	3.97
Value of Transfers	2,211	2.97	0.15	20.28
<b>Within-Haven Transfers</b>				
Number of Transfers	118,747	6.84	2.00	52.04
Value of Transfers	118,747	11.82	0.14	252.22
Panel B - Overview on cross-haven transfers to Norway				
Variable	Obs	Mean	Median	St Dev
<b>Communcation High</b>				
Number of Transfers	2,000	2.68	1.00	4.13
Value of Transfers	2,000	3.22	0.15	21.28
<b>Communcation Low</b>				
Number of Transfers	211	1.64	1.00	1.73
Value of Transfers	211	0.64	0.13	3.37
<b>Legal Framework High</b>				
Number of Transfers	1,531	2.89	1.00	4.61
Value of Transfers	1,531	3.40	0.14	23.43
<b>Legal Framework Low</b>				
Number of Transfers	680	1.86	1.00	1.67
Value of Transfers	680	2.01	0.15	10.00

*Notes:* The table shows the descriptive statistics for the outcome variables in our sending country analysis, the bank transfers from tax havens to Norway in million NOK (short: transfers). The observations are aggregated at the individual-country-pair-year-quarter level. Panel A shows all transfers divided into cross-haven and within-haven transfers. Panel B shows only cross-haven transfers divided into transfers from tax havens with high enforcement and low enforcement levels. Cross-haven transfers mean transfers to Norway from a bank account located in a tax haven, and the owner of the bank account is located in another tax haven. Within-haven transfers mean transfers to Norway from a bank account located in a tax haven, and the owner of the bank account is located in the same tax haven.

analysis is based on the macro cross-border deposit data by the BIS. Table 2 panel A shows that deposits located in non-haven countries are, on average, considerably larger than in haven countries, which is likely the fact because non-haven countries include some of the largest economies (e.g., the United States) while haven countries usually constitute small jurisdictions. Limiting our sample to

Table 2: Receiving Countries Analysis - Summary Statistics

Panel A - Overview on cross-border deposits				
	Obs	Mean	Median	Std. Dev.
All Cross-Border Deposits	81,450	1,243.91	8.82	14,115.43
Cross-Border Deposits in Havens	36,847	582.07	9.84	3966.14
Cross-Border Deposits in Non-Havens	44,603	1790.66	8.00	18713.41

Panel B - Overview on cross-border deposits in havens				
	Obs	Mean	Median	Std. Dev.
High E-Filing Receiving Country	5,200	594.51	35.78	2,057.08
Low E-Filing Receiving Country	31,647	580.03	7.68	4,197.60

*Notes:* The table shows the descriptive statistics for the outcome variable in our receiving country analysis, the cross-border loans, and deposits in million USD (short: deposits) aggregated at the country-pair-year-quarter level provided by the BIS. Panel A shows all cross-border deposits divided into cross-border deposits located in non-haven countries versus haven countries. Panel B shows only cross-border deposits located in haven countries after CRS effectiveness divided into haven deposits held by counterparties with high e-filing rates versus those with low e-filing rates.

cross-border deposits located in haven countries, as shown in Panel B of Table 2, we observe that haven deposits held by residence countries with high e-filing rates are, on average, similar to those with low e-filing rates. Another observation is that deposits are right skewed, with the median deposits regularly falling far below the mean in deposits, even more so for low-filing rate countries than high e-filing rate countries.

## 4 Empirical Analysis

The theory of crime (Becker, 1968), extended to tax evasion (Allingham and Sandmo, 1972) points to the central role of a threat of detection on top of the penalty for evasion for a tax evaders' decision. This threat of detection varies depending on the quality of the reports received from the sending country and the ability of the receiving country to use the information. Our empirical analysis treats both of these dimensions in turn.

### 4.1 Sending Country Analysis

**Methodology:** The first part of the analysis allows us to investigate whether the effect of the CRS differs depending on in which countries individuals hold their tax haven accounts (the sending country), holding constant the characteristics of the receiving country. It comprises a difference in difference and an event study analysis utilizing the microdata on transfers from tax havens to Norway.

The event study design takes the following form with quarterly intervals and binning-up of coefficients before and after two years around the event date:

$$transfer_{ijz,t} = \alpha_{ijz} + \gamma_t + \sum_{k=-8}^{k=8} \beta_1^k CRS_{j,t-k} * Treated_{i,j,z} + \epsilon_{ijz,t}. \quad (1)$$

Where  $transfer_{ijz,t}$  is either (1) a binary equal to one for a transfer to a Norwegian bank account  $i$  from a bank account located in country  $j$  with an owner from country  $z$  at time  $t$  (Probability of Transfers) or (2) the logarithm of the sum of those transfers (Value of Transfers).  $CRS$  is the indicator variable for the quarter when the CRS becomes effective in the respective deposit countries, i.e., the date when financial institutions start collecting the information required under the CRS (as in the macro analysis below).  $Treated$  denotes those transfers that are made from a tax haven bank account that is held by an owner located in a different tax haven. Since under the CRS only information on foreign deposits is collected, we compare changes in bank transfers to Norway from tax havens with direct foreign owners in another tax haven, i.e., cross-haven accounts (treated group) after CRS activation versus before, to transfers from within-haven accounts, i.e., controlling for tax haven specific trends with transfers from tax havens with a direct owner in the same tax haven (control).

We include account-deposit country-direct owner country fixed effects ( $\alpha_{ijz}$ ) and time fixed effects ( $\gamma_t$ ) to control for unobserved differences at the unit level and general shocks to (tax haven) cross-border deposits. The unit of analysis is an account-deposit country-direct owner country combination: a Norwegian account ( $i$ ) potentially receives transfers from more than one country ( $j$ ), each with a different owner country ( $z$ ). We balance the sample by setting transfers of a unit ( $ijz$ ) to zero if no transfer is recorded. The coefficients of interest show the average within change in transfers to Norway from cross-haven accounts compared to within-haven accounts after the CRS ( $\beta_1$ ).

The corresponding difference-in-difference regression equation takes the following form:

$$transfer_{ijz,t} = \alpha_{ijz} + \gamma_t + \beta_1 Treated_{i,j,z} \times CRS_{j,t} + \epsilon_{ijz,t} \quad (2)$$

CRS-exposed accounts mirror the shell company structures frequently used in cross-border tax evasion by high net-worth individuals (see e.g. Johannesen and Zucman (2014)). There is substantial evidence of such offshore bank accounts held by individuals indirectly through shell companies.<sup>23</sup> The typical setup includes a passive investment entity like a trust in a tax haven and, through that, ownership of financial assets in several other tax haven bank accounts (Collin, 2021). To illustrate, one notable case characterized as “*the largest tax evasion case brought against an individual in U.S. history*”: It pertains to a former CEO of an Ohio-based software company accused of concealing approximately USD 2.7 billion in income from the Internal Revenue Service thanks to a private entity in Bermuda through holding financial assets in Switzerland (US Senate Finance Committee,

<sup>23</sup>As visible from, e.g., the Panama Papers in 2016, the Paradise Papers in 2017, the Pandora Papers in 2021, and the Suisse Secrets in 2022.

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2022). This is the type of scheme that we capture in our data using the cross-haven transfers to a Norwegian account from tax haven accounts with a direct owner in another tax haven.

The within-haven transfers, on the other hand, allow us to compare transfers from a tax haven account that has a direct owner in that same tax haven. These accounts are dominated by transfers for trade reasons. Even if held for other reasons, domestically owned accounts are non-reportable under the CRS. It is theoretically possible, however, that they are ultimately owned by non-residents, even though the direct ownership is domestic. In that case, they are subject to CRS reporting. Consequently, a limited subset of these transfers could react to the CRS, making our estimates a lower bound.<sup>24</sup> We show empirically that there is no change in transfers for this group around CRS activation. In a robustness test, we instead consider transfers from non-tax havens to Norway as the control group. Results are unchanged (appendix A.3). We prefer within-haven transfers because they enable us to dynamically control for time trends in transfers from tax havens around the CRS.

**Results:** In Figure 8, we show graphically the event study results for the reaction of bank transfers from tax havens to Norway, while in Table 3 column 1, we display the results from our difference-in-difference regression analysis. In both, we investigate the change in cross-border transfers from accounts held in 41 tax havens through a foreign owner versus a domestic owner. Cross-haven transfers are transfers where the owner of the foreign account is located in a tax haven, which differs from the one where the foreign account is located. In the event study, we estimate quarterly CRS treatment coefficients, each of which marks the change in bank transfers from cross-havens versus within-haven bank accounts in one quarter over the sample period relative to the quarter one year before the CRS treatment event date ( $t=-4$ ), with quarters before  $t-8$  and after  $t+8$  binned at the endpoints. In the top panel of Figure 8, we display the results of the the event study. At the bottom of Figure 8, we show coefficients from two regressions, one for treated and control transfers, to study the trends in each group individually. The coefficients for cross-haven transfers are indicated in red, and those for within-haven transfers in blue. We display the results together with the 95% confidence interval.

Post-CRS, we find a four percentage point increase in the probability of a bank transfer to Norway from a cross-haven account compared to the change in the probability of a bank transfer to Norway from a within-haven account. When looking at the transfers over time in Figure 8, all coefficients in the pre-period ( $t-1$  to  $t-8+$ ) are statistically indistinguishable from the benchmark quarter, supporting the validity of the parallel-trends assumption in our analysis. Post-CRS, we observe an immediate and statistically significant increase in the probability of bank transfers to Norway from cross-haven accounts (red line). At the same time, there is no change in the probability of bank transfers to Norway from within-haven accounts in tax havens (blue dots). From  $t=3$ , the

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<sup>24</sup>Concerning a double counting of the effect, there is no compelling rationale to expect a relocation of financial assets owned by non-residents into this placebo group. If anything, it would be more exposed to CRS reporting.

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coefficient significantly differs from zero at the 5-percent level and remains significant until the end of the sample period. The coefficient size continues to increase until the end of the sample window. Similarly, we detect an increase in the total value of bank transfers to Norway from cross-haven accounts of about 62.6% compared to the change in the value of bank transfers to Norway from within-haven accounts.<sup>25</sup> The increase is immediate and persistent over our sample period, as visible in Table 3 Column 1 and Figure 8.

In percentage terms, the effect size is larger compared to previous studies on the impact of the CRS on illicit financial flows. Yet, we look at bank transfers and not stocks of bank deposits as in, for example, Menkhoff and Miethe (2019) and Casi et al. (2020), and importantly, thanks to the granularity of our data, we can distinguish the CRS-exposed transfers, those done under several layers of secrecy, such as bank transfers from Switzerland from a bank account where the owner is located in the Cayman Islands, from the most comparable non-CRS-exposed transfers, those which are motivated more likely by trade across countries.

Having established the ability of our data to capture a reaction to the CRS, the core of our analysis lies in investigating possible heterogeneous responses depending on the local CRS enforcement level. In Table 3 column (2)-(5) and figure 9, we study how tax haven variation in CRS-related communication efforts and the CRS legal framework shapes the probability of bank transfers to Norway. We split our sample into countries with high communication effort if the OECD report attests "substantial" communication and outreach activities for that country (we coded as 2) and countries with low if the OECD report attests "no" or "some" communication and outreach activities (we coded as 0 and 1 respectively).<sup>26</sup>

We find that the increase in the probability of transfers to Norway from foreign accounts compared to domestic ones is driven by bank transfers from tax havens which exhibit a strong communication effort, while we find no statistically significant change in bank transfers from tax havens with low communication effort (the coefficient size is also close to zero) as visible in Table 3 column (2) and (3) and 3 column (2) and (3). Results are confirmed in the event study figure 9.

Differences across how the national CRS law has been drafted (captured by the legal framework variable) shape responses to the CRS activation to a lesser degree than communication effort as visible in 3 column (4) and (5) and 3 column (6) and (7) and Table 9. We split our sample into countries with a high legal framework quality if the OECD Peer Review reports the country's legal framework as "In Place" and countries with a low legal framework quality if the OECD Peer Review reports the country's legal framework as "In Place but Needs Improvement" or "Not in Place".

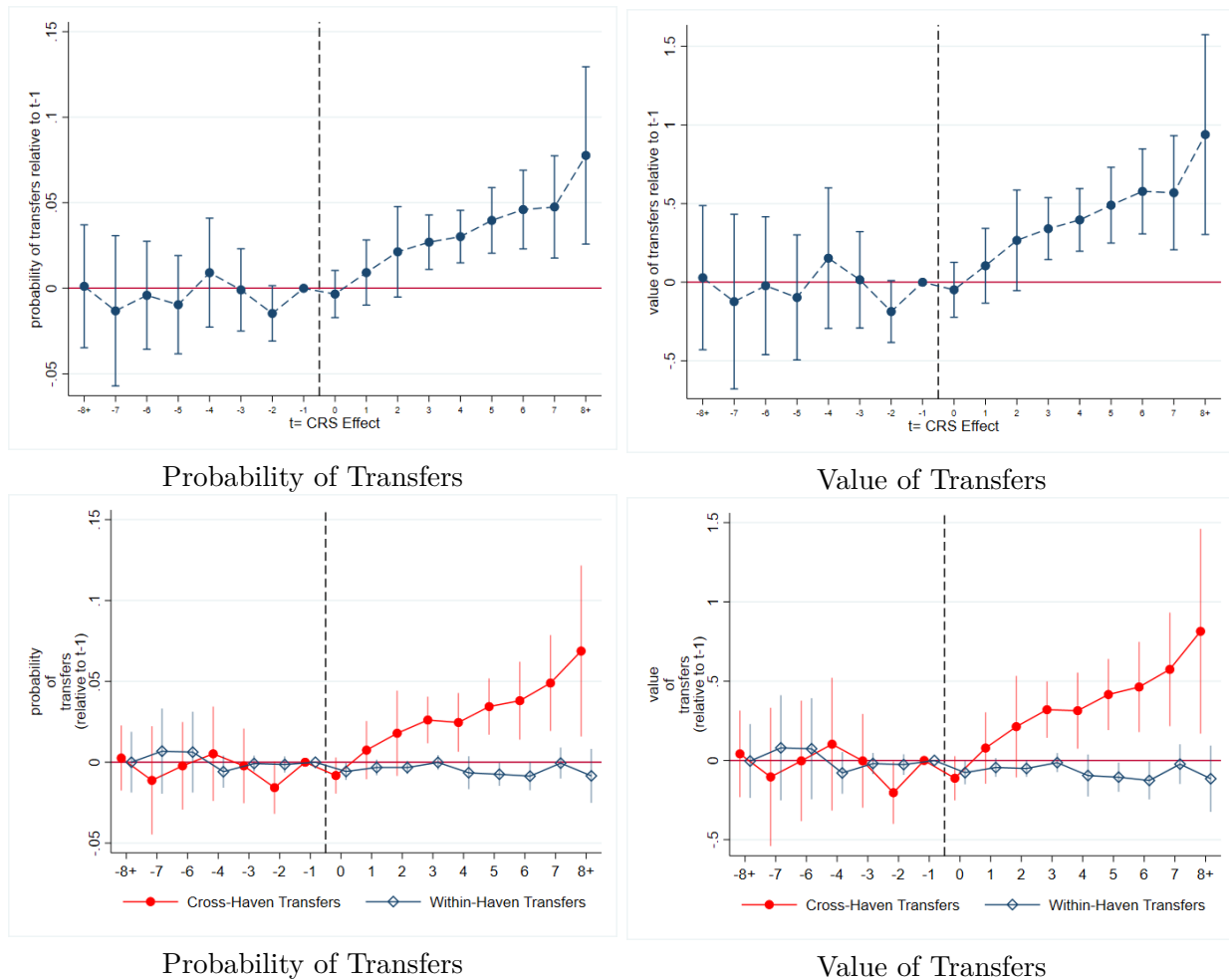
Although only the coefficient for the high legal framework quality is statistically significantly different from zero, the size of the coefficients across the different enforcement levels is close (4.5 percent versus 2.9 percent). As visible in the event study in figure 9, changes in transfers from

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<sup>25</sup>This is computed as  $62.6\% = e^b - 1$ , where  $b = -0.486$ .

<sup>26</sup>See appendix A.1 for details on the coding exercise we perform based on the OECD peer review narrative.

Figure 8: Sending Country Analysis - Changes in Cross-Border Bank Transfer



Notes: The figure plots the regression coefficients,  $\beta_k$ , and 95 percent confidence intervals (the vertical lines). The dependent variable is either (1) a dummy equal to one if a transfer to a Norwegian bank account  $i$  from a bank account located in a tax haven  $j$  with an owner from tax haven  $z$  at time  $t$  occurred or (2) the logarithm of the sum of the transfers to a Norwegian bank account  $i$  from a bank account located in a tax haven  $j$  with an owner from country  $z$  at time  $t$ . The treatment indicator takes the value of 1 in the quarter when the CRS took effect in the tax haven  $j$ . The top panels provide the regression coefficients, each of which marks the quarterly change in cross-havens bank transfers (treated) versus within-havens bank transfers (control) relative to the CRS event date. The bottom panels display the treated and control coefficients separately. The red line includes only cross-haven transfers, which means the tax havens  $j$ , where the bank account is located, is different from  $z$ , i.e., the tax havens where the owner of the foreign bank account is located. The blue line includes only within haven transfers, which means the tax havens where the bank account  $j$  is located are the same as  $z$ , i.e., the tax havens where the owner of the foreign bank account is located. We include the treatment at the event time as well as eight leads and eight lags of the treatment indicator. The lead and lag dummies are binned at the beginning and end of the event window (after two years). We use a balanced sample. Standard errors are clustered at the deposit-country level. Top panel specifications include country-pair-individual and time-fixed effects, while bottom panel specifications include country-pair-individual fixed effects.

high and low legal framework quality countries move together across our sample period, even post-CRS, although the reaction to high-quality legal frameworks as compared to lower-quality legal

Table 3: Sending Country Analysis - Changes in Cross-Border Bank Transfer

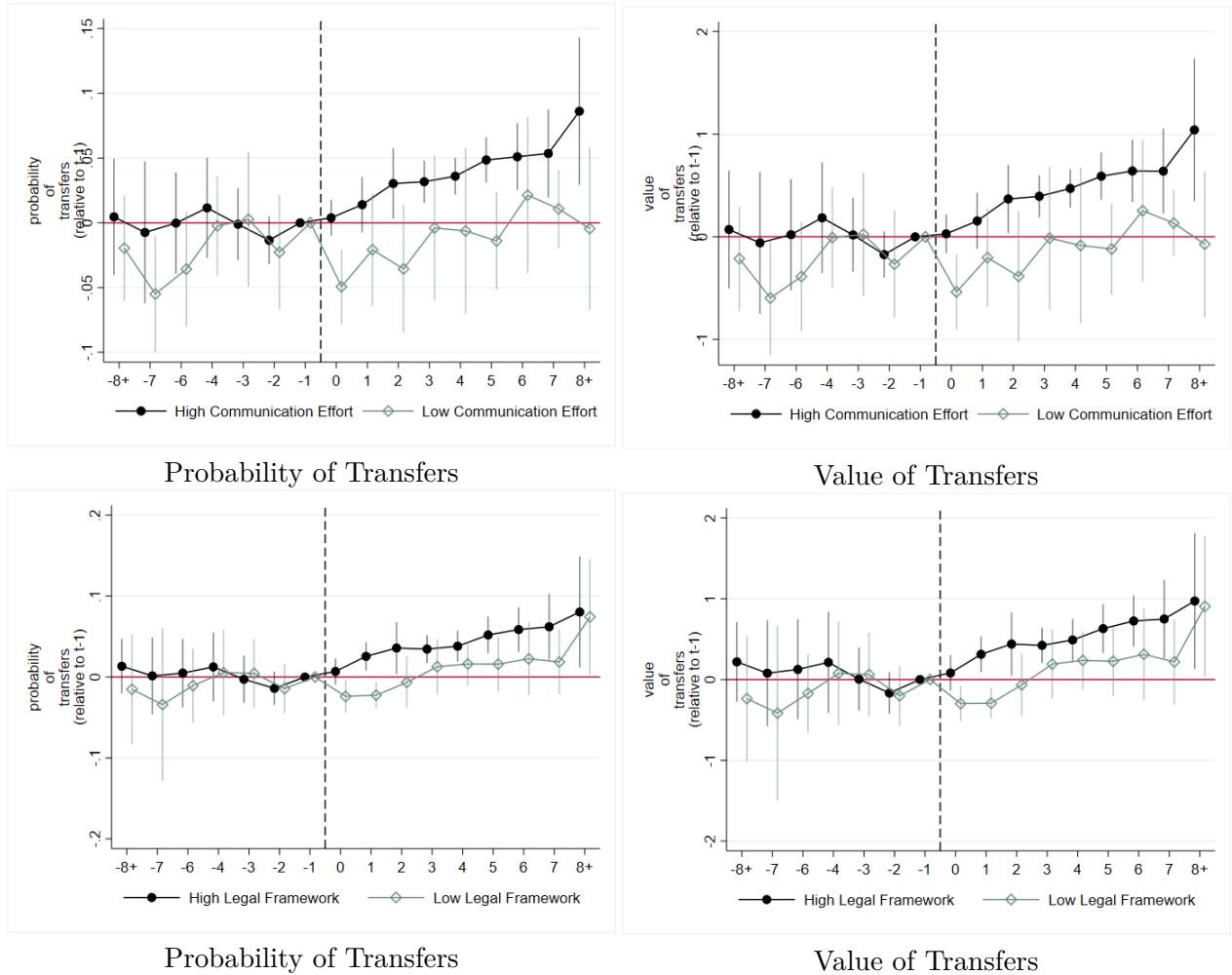
Panel A - Probability of Transfers					
Sample	(1) All Transfers	(2) Communication Split High	(3) Low	(4) Legal Enforcement Split High	(5) Low
Variables	Probability of Transfer				
PostCRS*CrossHavensTransfers	0.041** (0.017)	0.047** (0.020)	0.007 (0.009)	0.045** (0.018)	0.029 (0.035)
Observations	949,120	810,160	138,960	547,960	401,160
R-squared	0.368	0.371	0.347	0.364	0.373
Fixed Effects	Country-Pair-Individual, Quarter-Year FE				
Clustering	Deposit Country				
Panel B - Value of Transfers					
Sample	(1) All Transfers	(2) Communication Split High	(3) Low	(4) Legal Enforcement Split High	(5) Low
Variables	Value of Transfer				
PostCRS*ForeignDeposits	0.486** (0.219)	0.548** (0.251)	0.093 (0.098)	0.506* (0.244)	0.391 (0.407)
Observations	949,120	810,160	138,960	547,960	401,160
R-squared	0.411	0.414	0.388	0.407	0.418
Fixed Effects	Country-Pair-Individual, Quarter-Year FE				
Clustering	Deposit Country				

*Notes:* The table reports the main difference-in-difference estimates for the sender analysis. The dependent variable in Panel A is a dummy equal to one if a transfer to a Norwegian bank account  $i$  from a bank account located in a tax haven  $j$  with an owner from country  $z$  at time  $t$  occurred. The dependent variable in Panel B is the logarithm of the sum of the transfers to a Norwegian bank account  $i$  from a bank account located in a tax haven  $j$  with an owner from country  $z$  at time  $t$ . The unit of observation is the individual bank transfer, and the sample period goes from the first quarter of 2014 to the last quarter of 2018. The sample is balanced. PostCRS is an indicator variable for the period after the CRS took effect in the deposit country  $j$ . CrossHavensTransfers is a dummy taking the value of one when  $j$ , i.e., the tax havens where the bank account is located, is different from  $z$ , i.e., the tax havens where the owner of the foreign bank account is located. Standard errors are clustered at the deposit-country level, and all specifications include year-quarter and country-pair-individual fixed effects. Standard errors are reported in parentheses.

frameworks appears more immediate and more robust throughout most of the post-period.

An identification challenge is that CRS enforcement is not exogenously assigned. In section 3.3, we observe that almost all conduit tax havens in our sample are classified as high-communication effort countries and that high communication effort is correlated with higher GDP. To rule out

Figure 9: Sending Country Analysis - National Enforcement Test



Notes: The figure plots the regression coefficients,  $\beta_k$ , and 95 percent confidence intervals (the vertical lines). The dependent variable is either (1) a dummy equal to one if a transfer to a Norwegian bank account  $i$  from a bank account located in a tax haven  $k$  with an owner from tax haven  $j$  at time  $t$  occurred or (2) the logarithm of the sum of the transfers to a Norwegian bank account  $i$  from a bank account located in a tax haven  $j$  with an owner from tax haven  $z$  at time  $t$ . *CRS* takes the value of 1 in the quarter when the CRS took effect in the deposit country  $j$  and *Treated* takes the value of 1 if  $j$ , i.e., the tax havens where the bank account is located, is different from  $z$ , i.e., the tax havens where the owner of the foreign bank account is located (if it is a cross-haven transfer). The black line includes only transfers from high enforcement tax havens (either high communication effort or high legal framework) and the grey line includes only transfers from low enforcement tax havens (either low communication effort or low legal framework). We include the treatment at the event time as well as eight leads and eight lags of the treatment indicator. The lead and lag dummies are binned at the beginning and end of the event window (after two years). We use a balanced sample. Standard errors are clustered, and all specifications include country-pair-individual and time fixed effects.

that conduit countries are driving the differences in effects we observe, in Appendix A.4, we drop conduit countries from the analysis. Results are qualitatively unchanged. Moreover, the difference between the high and low communication effort groups post-treatment becomes even more apparent.



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Second, we test in Appendix A.4 whether our results hold if we restrict our samples of high and low enforcement to only low GDP countries. Also, these findings are consistent with our baseline results. In unreported event studies, we rule out that results are dominated by one haven country by dropping a haven country at a time.

Overall, the results suggest that CRS implementation quality in the country sending CRS information matters for CRS effectiveness even when the information-receiving country features high tax enforcement, as in Norway. This is especially the case for communication and outreach activity relating to the CRS and less so for variation in legal framework quality.

## 4.2 Receiving Country Analysis

In the sending country analysis, we look at differences in characteristics of CRS-information-sending countries (tax havens) holding constant the receiving country.<sup>27</sup> The following second part of the analysis allows us to investigate whether the effect of the CRS differs depending on the enforcement capacity of the receiving country. Even when well implemented, the CRS could be less effective if the secrecy seeker or tax evader knows that her home country cannot make proper use of the data it receives. In this analysis, we rely on the BIS LBS macro data on cross-border held deposits and the OECD survey data on countries' tax administration capacity.

To elicit which receiving country characteristics are most important for the ability of an information-receiving country to make use of the CRS information, we conduct a Model Averaging exercise that establishes robust correlations without relying on the selection of one particular model, potentially driven by ad-hoc modeling choices.

As the basis for the model averaging exercise, we first estimate the average effect of the CRS introduction by receiving country. For this purpose, we turn to a difference-in-difference specification that builds on and extends the literature studying the effectiveness of the CRS (Menkhoff and Miethe, 2019; O'Reilly et al., 2019; Casi et al., 2020). We then corroborate the findings of the model averaging exercise by turning again to the difference-in-difference specification and event studies showing that the changes to the CRS are stronger in receiving countries with high capacity, as predicted in the model averaging. The event studies are used to evaluate the common trends assumption pre-treatment and to assess the dynamics of the changes following the CRS implementation.

**Methodology:** The starting point of our receiving country analysis is an event study exercise showing a reaction of international tax evaders to bilateral CRS implementation in international bilateral bank deposits. This empirical specification builds on an established identification strategy (Johannessen and Zucman, 2014) and has been used for early analyses of the CRS (Menkhoff and Miethe, 2019; O'Reilly et al., 2019; Casi et al., 2020). With several years passed since most CRS

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<sup>27</sup>The receiving country was always Norway, a country with a very developed tax authority, i.e., with high enforcement capacity

activations, we can now corroborate early findings. We also exploit the BIS data more fully. We compare the change in the outstanding volume of cross-border deposits in tax havens - non-haven country pairs that activate the CRS (treated) as compared to the change in the outstanding volume of cross-border deposits in non-tax havens (control) after the introduction of the CRS (treatment). Tax haven - non-haven country pairs that did not activate the CRS are used to pin down the global tax haven time trend while an EU-country pair dummy pins down the role of the EU Tax Savings Directives (Johannessen, 2014). The event study design takes the following form, where we bin treatment-relative time coefficients at the endpoints after eight quarters:

$$\begin{aligned} \log(\text{deposits})_{ij,t} = & \alpha_{ij} + \gamma_t + \sum_{k=-8}^{k=8} \delta_1^k \text{CRS}_{ij,t-k} + \sum_{k=-8}^{k=8} \delta_2^k \text{CRS}_{ij,t-k} * \text{EU}_{ij} + \\ & \sum_{k=-8}^{k=8} \delta_3^k \text{CRS}_{ij,t-k} * \text{TH}_i + \sum_{k=-8}^{k=8} \delta_4^k \text{CRS}_{ij,t-k} * \text{TH}_i * \text{EU}_{ij} + \epsilon_{ij,t}. \end{aligned} \quad (3)$$

Where  $\log(\text{deposits})_{ij,t}$  is the logarithm of the deposits held by residents from country  $i$  in country  $j$  at calendar time  $t$ , CRS is the indicator variable for the period when the CRS is activated in the respective countries, i.e., the date when financial institutions start collecting the information required under the CRS around which we construct event time.  $\text{TH}_i$  is a dummy taking the value of one when country  $i$  is a tax haven (treated sending country). While  $\text{EUPair}_{ij}$  is a dummy taking the value of one when country  $i$  and counterparty  $j$  are both EU member states. Including this dummy enables us to control for the fact that within the EU, information on financial accounts was already automatically exchanged thanks to the Savings Directive (European Council (2003)) and the Directive on Administrative Cooperation 1 (European Council (2011)), see also (Casi et al., 2020). We add country-pair ( $\alpha_{ij}$ ) and calendar time ( $\gamma_t$ ) fixed effects to control for unobserved differences between country-pairs and general shocks to cross-border deposits. The coefficients of interest show the average within change in cross-border deposits in tax havens after the activation of the CRS ( $\delta_3$ ) compared to the left-out event time dummy at  $k = -1$ .

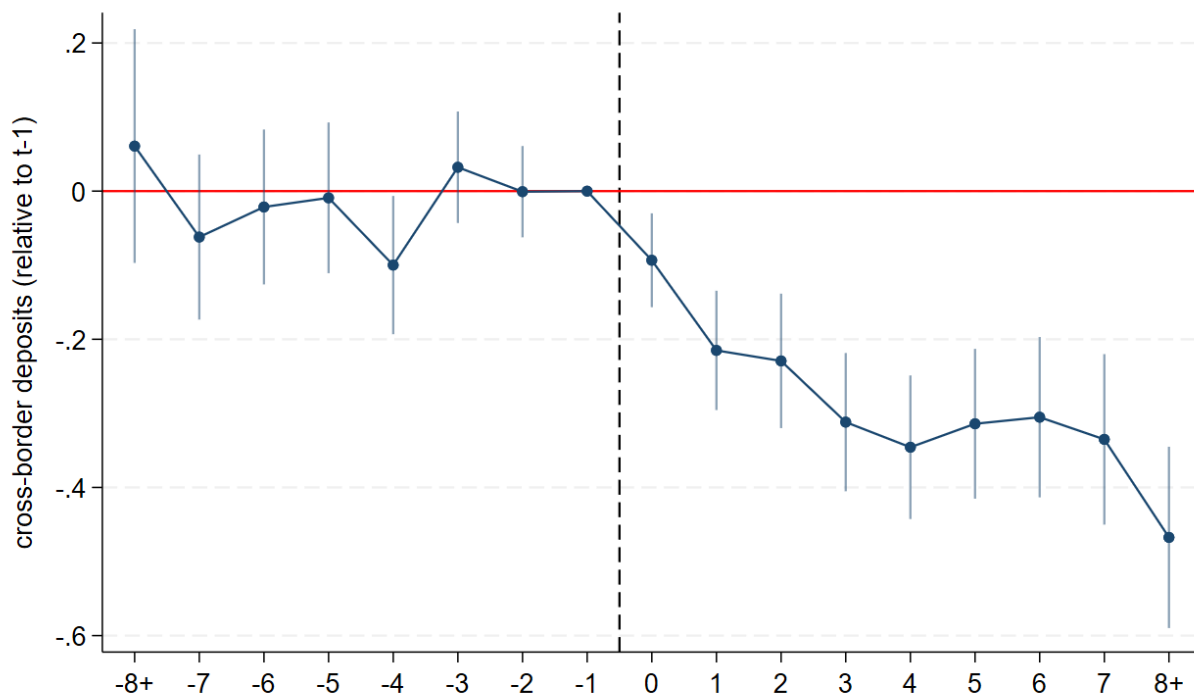
To compare this CRS effect across receiving countries and employ our model averaging routine, we also turn to a difference-in-differences exercise to establish receiving country-specific CRS effects. We run the following general difference in difference regression where notation follows the event study above:

$$\begin{aligned} \log(\text{deposits})_{ij,t} = & \alpha_{ij} + \gamma_t + \beta_1 \text{CRS}_{ij,t} + \\ & \beta_2 \text{CRS}_{ij,t} \times \text{EUPair}_{ij} + \beta_3 \text{CRS}_{ij,t} \times \text{TH}_i + \\ & \beta_4 \text{CRS}_{ij,t} \times \text{EUPair}_{ij} \times \text{TH}_i + \epsilon_{ij,t}. \end{aligned} \quad (4)$$

**Results:** In Figure 10, we report the results from our analysis of changes in cross-border de-

posits in tax havens pre versus post-CRS. Results show a stable pre-trend, followed by a statistically significant decrease in cross-border deposits in tax havens compared to cross-border deposits in non-tax havens after the CRS is implemented. For transparency, we plot the coefficients and standard errors of the binned endpoints as well; they show that country pairs that eventually implemented the CRS experienced higher changes of bilateral deposits in earlier years. However, the stable pre-trend makes us confident that we identify the contemporaneous impact of CRS implementation. We report the results from the corresponding difference-in-difference regression analysis in Column 1 of Table 4. We observe a 25.6% reduction in cross-border deposits in tax havens post-CRS compared to the change in cross-border deposits in non-tax havens in our sample. We return to this event study and this difference-in-differences specification further below after analyzing the correlation between the receiving country-specific CRS effect and different characteristics of a receiving country's tax administration.

Figure 10: The CRS Effect on Cross-Border Deposits Revisited



Notes: The figure shows regression coefficients, each of which marks the quarterly change in bilateral cross-border deposits located in tax havens (treated) versus non-havens (control) from deposit holders relative to the CRS event date. We plot the 95% confidence band for each coefficient. The outcome variable is the logged cross-border deposits measured at the country pair level. We control for country pair and time-fixed effects as well as for EU-Pair treatment. Standard errors are clustered at the country-pair level. The event study coefficients are binned at the endpoints (binned coefficients are shown).

The bilateral dimension of this dataset allows us to establish receiving country-specific CRS

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effects. For example, many reporting countries report the size of bank deposits from Norwegian counterparties, some of which introduce the CRS, and some of which do not. Interacting our baseline diff-in-diff dummy with a dummy variable for Norwegian counterparties and another one for each counterparty country provides a receiving country-level CRS effect relative to non-CRS adopters. Essentially, we're taking apart the average CRS effect into its receiving country contributors. Deposits in tax havens from Norway, for example, drop by more than -60% while the effect for deposits from the United Kingdom is close to the average effect. However, we do not suggest to interpret each receiving country coefficient in isolation since receiving-country-specific shocks can drive some of the results. Instead, using the coefficients for all receiving countries in combination, such shocks cancel out and we can infer robust correlations with tax administration characteristics. In the following section, we provide evidence that can explain some of this receiving country-level difference in CRS reactions.

### **Identifying relevant tax administration characteristics through Model Averaging**

In the context of the CRS, it is this threat of detection that a receiving country can influence through its tax administration. Due to different characteristics, it could use CRS reports better or worse and might or might not signal a credible threat of detection. But which attributes of a receiving country's tax administrations dominate this perceived probability of detection? In contrast to the sending country analysis, in which we directly measure CRS-implementation quality, it is not clear which of the multi-dimensional local tax authority capacity characteristics we can measure are relevant here. Is it its size and total resources? The general conditions in an economy? The allocation of staff to tax evasion-specific functions? The level of digitalization? The age or experience of staff? Arguably, all of these can have some impact. It is also unclear which variables beyond the most relevant ones should be included as auxiliary regressors that can, however, have a substantial impact on the main results in small macroeconomic samples. The model averaging exercise outlined below provides guidance on which of these characteristics dominate the receiving country-level CRS effect we have established above without a potentially ad hoc variable selection.

The new OECD survey data on the comparative Tax Administration Series (TAS) includes country-level information on 59 economies on several dozen variables, some of which are derived from the same underlying question. On top of our outcome variable, the receiving country's CRS effect, this dataset provides a unique source of explanatory variables about tax administration characteristics. However, it provides little time variation (only two years of data is available), and coverage is not global. Our method, therefore, also shows one way the TAS can be informative for an empirical exercise even without substantial within-country variation. Since not every variable is available for every country, there is a trade-off between including more countries and including more series to construct the balanced panel required for our model averaging approach. We take a middle-ground approach, iteratively dropping the least well-covered variable or country, whichever discards less information, until we arrive at a balanced dataset including 29 countries and  $K = 24$

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variables on tax administration characteristics. To this, we add data on GDP per capita, its growth rate, CPI inflation, the top 10% income share, unemployment, the Gini coefficient, the old age dependency ratio, openness ((exports + imports)/GDP), the number of full-time equivalents working at the tax administration, as well as total population and total workforce. This adds up to 35 variables. If we want to avoid ad hoc modeling choices concerning the model size and which variables to include, this list creates a potential model space of  $2^K$  or 34,359,738,368 possible models  $M_j$  where  $j = 1, 2, \dots, 2^K$ . Instead of claiming that we have found the one true model amongst these millions of possible combinations, model averaging approaches this model space agnostically and allows every potential combination of variables and all model lengths.

In order to avoid calculating all models, we employ a commonly used  $MC^3$  algorithm, which selects itself through the model space. This is done in a hybrid Bayesian-Frequentist approach where we entertain a prior on the model size, and the model averaging is based on Bayesian econometrics. The models we run, however, are frequentist. This combines the advantages of well-understood, easy-to-communicate coefficient estimates with the possibility to show posterior inclusion probabilities for each variable.

Following Ley and Steel (2009), we use beta-binomial priors on the model space, with a prior model size of 4 variables. These priors place relatively little density around the mean, making them unlikely to dominate the results, but intuitively, they give larger models a lower weight. Based on a measure of the model fit, the BIC, in order to make use of the BIC approximation in Raftery (1995), the algorithm then selects itself through the model space. Drawing or dropping variables informed by the model size and the total number of variables, the algorithm is more likely to update to a new candidate model if it fits better than the current one. This disciplines the algorithm into relatively well-fitting areas of the model space and ensures that we do not estimate numerous very poorly fitting models.

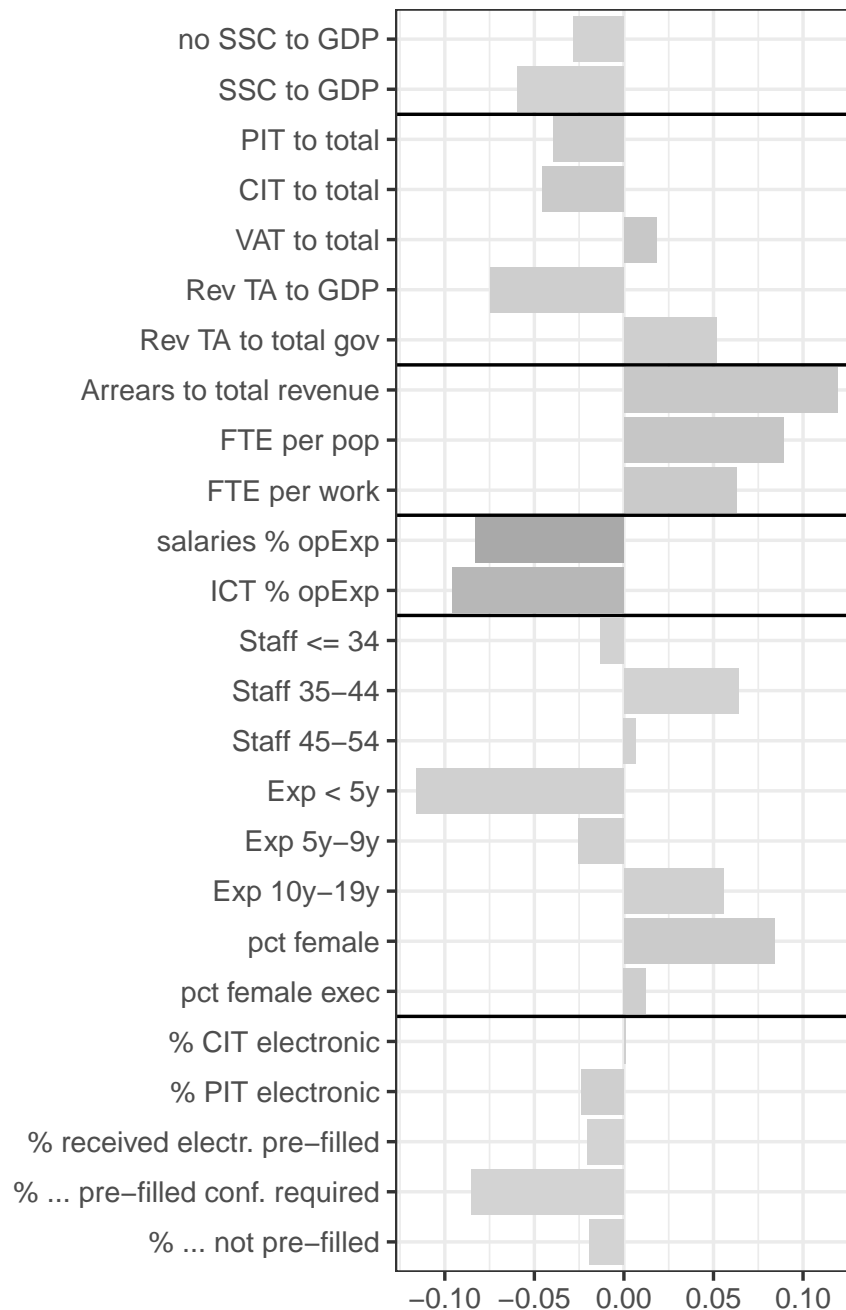
Each model visited by the algorithm has a posterior probability that is a function of the model fit and our prior on the model size. This posterior probability is used to weigh the coefficients of each model. Across all models visited, we will then have coefficients from models with very different variable combinations that allow us to compare the performance of each variable across the model space. As a second measure of variable relevance, we ignore the coefficients and report the relative posterior success of all models that include a variable in question. This posterior inclusion probability is reported in our main results together with the posterior coefficients.

Intuitively, the results below can be read as correlations while controlling for all other variables in the balanced dataset. While none of the regressions will control for all variables, all variables will be used with each other variable at some point and, if they don't contribute substantial independent variation, be weighed down by their low model fit. Finally, our algorithm starts from an empty model. In order to eliminate the impact of this starting model, the first 1% of all estimated models are discarded as a burn-in following convention.

## Results of Model Averaging

Using this method, we can compare the effect of an essentially arbitrary number of potential correlates of the receiving country's CRS effect: our outcome variable.

Figure 11: Importance of Tax Administration Characteristics



Notes: The figure plots the coefficients (in grey bars) for our model averaging exercise. The outcome variable is the receiving country-level CRS effect, and the model averaging routine runs a large number of models with different variable specifications. These are then weighted by the relative model fit.

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Figure 11 summarizes the results. It plots the posterior coefficient size and shades by posterior inclusion probability (pip) with higher pip shaded darker. Since the CRS effect we estimate is negative, we are looking for negative correlations indicating stronger CRS effects. We start with a set of variables describing the general conditions in which a Tax Administration operates. First, a variable counts the tax to GDP ratio excluding social security contributions ('no SSC to GDP'). This is a measure of the reliance of a country on tax income and, hence, a measure of the salience of tax evasion for public funding. Social security contributions ('SSC to GDP'), on the other hand, are not connected to international tax evasion. A country with a higher ratio of the former relies more heavily on tax revenue compared to other income sources and should also exhibit stronger enforcement effects. Our results confirm this for tax and social security contributions, but the pip is low. Next, we include three variables defining the revenue sources of the tax system: Personal income tax (PIT to total), corporate income tax (CIT to total), and value added tax (VAT to total), all in relation to total tax revenue. Social security contributions in percent of total tax revenue had to be dropped due to limited coverage across countries. Together with 'other taxes', which is the fifth category the OECD provides, it forms the left-out category of these ratios that would otherwise sum up to one for each country. We find negative correlations for personal income tax and corporate income tax, again with low pip values. It should be noted here that the limited coverage of our sample makes the corporate income tax variable less informative than it would be in a global sample. The top end of the 'CIT to total' distribution is dominated by a few South American countries, the outlier being Colombia, which had effective disclosure programs in place that could be driving this effect (Londoño-Vélez and Ávila-Mahecha, 2021). Most OECD countries have similar and small ratios here, meaning there is little CIT variation to leverage.

Another set of variables concerns the relative size of the tax administration. A larger and better-funded tax administration, in percent of GDP ('Rev TA to GDP'), indicates a larger capacity of tax enforcement in relation to the economic activity of an economy. We find that this measure is correlated with a more substantial CRS effect. Using the same revenue variable relative to the total government size ('Rev TA to total gov'), however, is correlated with a weaker CRS effect. This indicates that the size of the administration in relation to economic activity is more critical for effective enforcement than its size in relation to the rest of the government. We also have access to one measure for tax administration efficiency or assertiveness in the ratio of total Arrears to total revenue ('Arrears to total revenue'). A higher value here indicates less enforcement stringency; taxes are not collected even when taxes are owed. Indeed, we find that a higher value of this measure is correlated with a lower CRS effect. Turning to staff instead of funds, the OECD data provides the number of full-time equivalents a tax administration employs. Concerning total population ('FTE per pop') we see a mitigating correlation with the CRS effect. This is consistent with the interpretation that the absolute number of people working at a tax administration does not drive strong CRS reactions. This is not surprising given that only a small fraction of the tax

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administration staff will be employed in international tax enforcement. The same measure but in relation to the working population ('FTE per work') has a low pip with a smaller coefficient.

Next, we zoom into the allocation of resources within the tax administration for which two variables are available. In percent of all operating expenditures, the OECD dataset includes total salaries paid ('salaries % opExp') and total expenses for information and communication technologies ('ICT % opExp'). We find an effect of salaries on CRS reactions with a high pip. ICT expenditure has an even stronger impact. Tax administrations that invest in modern technologies seem to trigger stronger responses from evaders when the CRS becomes active.

The OECD dataset also includes a number of variables indicating the age and experience structure of the staff working at the tax administration. This data is used in ratios again. We look at age ('Staff <= 34', 'Staff 35 - 44', 'Staff 45 - 54'), leaving out the ratio of staff of more than 54 years of age to avoid summing up to 1. We also use length of service or experience ('Exp < 5y', 'Exp 5y - 9y', 'Exp 10y - 19y'), leaving out the ratio of staff with more than 19 years of experience. None of these variables have high posterior inclusion probabilities. Experience seems to point towards younger workers triggering stronger reactions, again with low pip. We do not find evidence of a strong relationship between gender and tax enforcement, with low pip for both. If anything, a higher percentage of female staff is correlated with less reaction to the CRS. However, all results on staff characteristics presented here are quite noisy and should be corroborated by other studies before being interpreted.

Last, we turn to the mode of tax collection. Arguably, electronic filing of tax returns creates a stronger threat of detection: It indicates a modern tax administration and a digitalized paper trail could be easily accessible years later. First, electronic CIT filing shows no strong effect.<sup>28</sup> For the PIT e-filing rate, however, there is substantial variation (25th and 50th percentile at 72% and 95.7%, respectively) and we find a correlation with CRS implementation with a relatively high pip. Going further, we use the information on the channel of PIT filing: Against the ratio of paper PIT returns, we compare the three reported modes of pre-filled filing: The form is electronically pre-filled, though potentially requiring confirmation ('% received electr. prefilled') or it is not pre-filled ('% ... not prefilled'). When compared to paper PIT returns, pre-filled all these e-filing results seem to point in the same direction. Electronic filing and especially automatic electronic filing are correlated with stronger CRS effects.

All in all, our results indicate that the total size of a tax administration, whether counted in staff or resources, is less relevant. Instead, and beyond general conditions such as a high tax-to-GDP ratio, the resource allocation within the tax administration dominates. Variables that in some way capture ICT-related investments, be it as part of the tax administrations' expenditure or electronic filing rates, are robustly correlated with stronger CRS effects of the receiving country.

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<sup>28</sup>Again, CIT variation is low in our sample. Almost all of our sample has a very high electronic CIT filing rate (25th and 50th percentile at 96.3% and 99.5% e-filing, respectively).



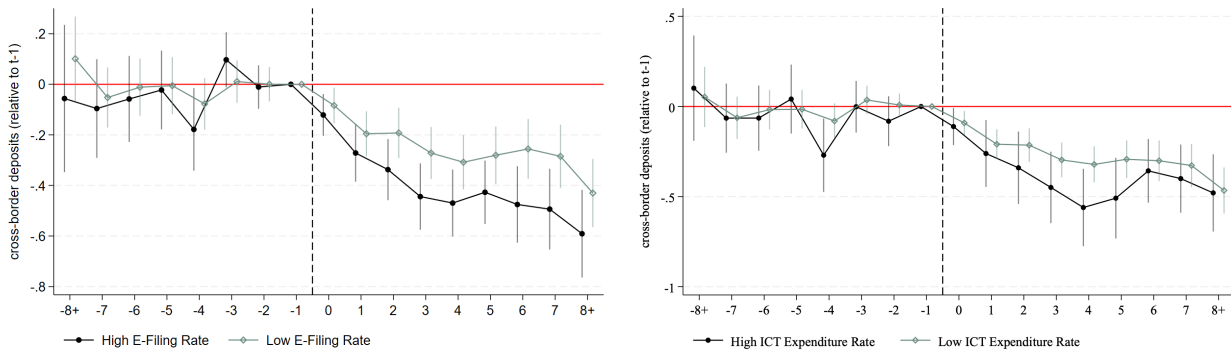
This is particularly interesting in light of the efficiency trade-off a tax administration faces when comparing its expenditure with its enforcement success.

One caveat we would like to highlight is that this exercise does not establish the optimal design of a tax administration in a cost-benefit analysis. Instead, these results can inform the debate where the limited funds of tax administrations seem best invested to lead to international enforcement success.

### Results on ICT resource allocation

Having established ICT reliance in tax collection (measured either as PIT E-filing rate or ICT expenditure rate) as the most robust correlate with CRS enforcement reactions, we now return to the event study and diff-in-diff methodology introduced above to study this result in more detail. We run the same regressions as before but test for the relevance of local tax authority capacity in the receiving country. We split treated receiving countries into high and low e-filing rate countries at the median e-filing value in our sample and high and low ICT expenditure relative to operating expenditure.<sup>29</sup>

Figure 12: Receiving Country Analysis - Changes in Cross-Border Deposits by Personal Income Tax E-filing Rate



Panel A: PIT E-Filing Rate

Panel B: ICT Expenditure Rate

The figure shows regression coefficients and associated 95% confidence bands, each of which marks the quarterly change in cross-border deposits located in tax havens (treated) versus non-havens (control) relative to the CRS event date. The outcome variable is the logged cross-border deposits measured at the country pair level. We control for country pair and time-fixed effects as well as for EU-Pair treatment. Standard errors are clustered at the country-pair level. The event study coefficients are binned at the endpoints (binned coefficients are shown). In panel A, in the black plot, the sample is limited to those receiving countries with above median percentage of PIT e-filing rate, versus in the grey plot, the sample is limited to those receiving countries with below median percentage of PIT e-filing rate or missing PIT e-filing rate. In panel B, in the black plot, the sample is limited to those receiving countries with above 75th percentile ICT expenditure to total operating expenditure ratio (ICT expenditure rate), versus in the grey plot, the sample is limited to those receiving countries with below the 75th percentile ICT expenditure to total operating expenditure ratio.

In Figure 12, we show event study results for the split regression on the e-filing rate and ICT

<sup>29</sup>In both cases, missing values are set to zero, this choice does not affect the outcomes.

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expenditure rate. We plot the CRS treatment coefficients, each of which marks the change in cross-border deposits held in the tax havens versus non-tax havens in one quarter over the sample period relative to the quarter before the CRS treatment event date ( $t=-1$ ), with quarters before  $t-8$  and after  $t+8$  binned at the endpoints. We highlight the coefficients for receiving countries with a high e-filing (ICT expenditure) rate in black and those for countries with a low e-filing (ICT expenditure) rate in grey-green. We display the results together with 95% confidence intervals.

In both graphs, except  $t=-4$ , all coefficients in the pre-period ( $t-1$  to  $t-8+$ ) are statistically indistinguishable from the benchmark quarter and show no trend over time, supporting the validity of the parallel-trends assumption in our analysis. In panel A, the split on e-filing rates, we observe that after the CRS treatment date, there is an immediate and statistically significant decrease in cross-border deposits in tax havens compared to the non-tax-havens if the receiving country has a high e-filing rate. From  $t=3$ , the coefficient size levels off at about  $-.5$  and is significant until the end of the sample period. In the low e-filing rate countries, we also observe a decrease in cross-border deposits in tax havens compared to the non-tax havens after treatment, but the effect levels off earlier, and the size of the decrease following the periods after  $t=1$  is larger for receiving countries with a high e-filing rate compared to receiving countries with a low e-filing rate and stays larger until the end of the sample period. In panel B, we observe that after the CRS treatment, there is an immediate reduction in cross-border deposits in both high and low ICT expenditure receiving countries, and in the short-term, the high ICT expenditure receiving countries appear to exhibit a stronger CRS effect, which partially reverses after  $t=5$ . Overall, the difference in effects is stronger in the e-filing rate split, for which reason we focus on this split in the remainder. Figure 7 above showed substantial country-level variation in the PIT e-filing rate and that this country characteristic is uncorrelated with GDP per capita, Rule of Law, Population, and tax haven exposure.

In Table 4 columns (2) - (4), we confirm the results on the relevance of local enforcement capacity in the receiving country in the difference-in-difference regression analysis. We split treated receiving countries into high and low e-filing rate countries as in panel A of the event study figure before. We find that the CRS treatment effect is stronger in the receiving countries with a high e-filing rate. The coefficient size is substantially larger. In both samples, the coefficients are statistically significantly different from zero. To test whether the difference in effect sizes is statistically significant, we run, in column 4, the same test in the full sample with a triple interaction on the e-filing dummy instead of splitting the sample and find that this triple interaction is statistically significant with a p-value of 9%. In combination, our results show that the effect of the CRS is economically and statistically significantly stronger in high e-filing receiving countries when compared to low e-filing receiving countries.

Taken together with our findings from the sending country analysis, we show that not only the CRS implementation in the sending country matters for CRS effectiveness but also the capacity of

Table 4: Receiving Country Analysis - Changes in Cross-Border Deposits by Personal Income Tax E-filing Rate

	(1)	(2)	(3)	(4)
	Cross-Border Deposits (log)			
Sample	Full Sample	High E-Filing	Low E-Filing	Full Sample
PostCRS * Haven	-0.296*** (0.041)	-0.408*** (0.076)	-0.260*** (0.049)	-0.260*** (0.049)
High E-filing * PostCRS * Haven				-0.149* (0.090)
Controls (EUPair*CRS*Haven)	X	X	X	X
Baseline Interactions	X	X	X	X
Observations	81,450	11,764	69,686	81,450
R-squared	0.957	0.955	0.956	0.957
Fixed Effects	Country Pair, Quarter-Year			
Clustering	Country Pair			

*Note:* The table reports the main difference-in-difference estimates for the receiver analysis. The dependent variable is the logarithm of the sum of the cross-border deposits held in country  $i$  by deposit country  $j$  at time  $t$ . The unit of observation is the aggregated deposits at the country-pair level, and the sample period goes from the first quarter of 2014 to the last quarter of 2018. The sample comprises tax haven as well as non-haven deposits. Haven is an indicator for deposits held in tax havens. PostCRS is an indicator variable for the period after the CRS took effect in the bilateral country-pair  $i,j$ . We control for heterogeneity in treatment effects for EU country pairs  $i,j$ . Standard errors are clustered at the country-pair level, and all specifications include year-quarter and country-pair fixed effects. Standard errors are reported in parentheses.

the receiving country to use the information received. Thus, despite the CRS being drafted as a homogenous instrument across multiple countries, local implementation and tax authority capacity seem to matter significantly for its effectiveness.

### 4.3 Results Discussion and Limitations

With our findings, we provide evidence that notable differences exist in reactions to the CRS depending on the country that is implementing the CRS locally. While some haven-to-non-haven country pairs show almost no response to CRS activation, in others, the effects are substantial. It is important to note that we do not claim causality for the influence of country characteristics that we can isolate, although we add the aforementioned robustness analysis to exclude plausible alternative explanations. In our information-sending country analysis, we find that CRS enforcement is correlated with the size of the local economy (e.g., GDP) and being a conduit country, therefore, we test the robustness of our findings to excluding high GDP countries or conduit countries. In the receiving country analysis, we identified tax authority digitization as an important determinant of

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CRS effectiveness, and we find that tax authority digitalization is not correlated with the Rule of Law, GDP per Capita, or a country's inequality. Yet, it may be correlated with other observable or unobservable country factors. In particular, we do not take a stance on whether it is tax authority capability or willingness that results in the CRS being more or less effective. Willingness and capability are intrinsically intertwined; if one nation is less willing to enforce the CRS, it will allocate fewer resources to its implementation, thus hindering its effectiveness.

Beyond these limitations, what our study demonstrates is that the CRS effectiveness varies significantly across countries, and this variation correlates plausibly with the countries' tax authority capacity and the local CRS implementation. In this way, our results provide the first evidence that caution is necessary when drawing conclusions on the effectiveness of a global tax agreement from a single-country analysis and that local enforcement plays a vital role in assessing taxpayers' response to the introduction of tax transparency initiatives.

## 5 Conclusion

Our results shed light on how the characteristics of sending and receiving countries relate to the success of the CRS as a global tax agreement. We find substantial differences in local CRS effectiveness.

On the sending country level, we build a novel dataset relying on newly published OECD Peer Review reports on CRS enforcement. Using daily bank transfer data from tax havens to Norway, we investigate heterogeneous reactions to the CRS depending on local enforcement. On the receiving country level, we operationalize a new dataset from the OECD Tax Administration Survey with approximately 100 variables on the capacity of the tax administration. Relying on macro data on cross-border bank deposits, we tailor model averaging routines holding other observable country characteristics as if fixed to establish the critical characteristics of the receiving countries, making the CRS more effective.

Our sending country analysis of transfers to Norway provides causal evidence of a substantial asset repatriation from tax havens to Norway post-CRS and confirms previous evidence of significant changes in cross-border deposits post-CRS. We can isolate bank transfers conducted through several layers of secrecy, which allows us to come closer to an accurate identification of illicit financial flows when compared to previous literature. Using this novel data on the ownership chains of bank accounts, we show a statistically significant increase in bank transfers from tax havens to Norway around the local CRS activation relative to tax havens that did not introduce the CRS or that introduced the CRS later. This suggests that at least a part of the reaction to the CRS observed in earlier studies in macro-level data can be attributed to the repatriation of financial assets to the respective country of residence.

Yet, the aggregated country effect masks substantial differences in the response of individuals

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related to the quality of CRS implementation in the sending country and the ability of the receiving country to make use of that information. We show that around the CRS activation dates, the detected asset repatriation is mainly driven by transfers from bank accounts located in tax havens with a high level of local CRS enforcement. This is especially true for tax havens that conducted extensive CRS-implementation-related direct communication and training sessions with local financial institutions.

Our analysis does not stop here; in addition to studying CRS responses in a resource-rich country like Norway, we also contribute to increasing our understanding of the role of heterogeneity in receiving countries for the effectiveness of the CRS. Analyzing the difference in the effectiveness of the CRS for receiving countries, we find that also receiving country information processing capabilities matter for the success of the CRS: cross-border deposits located in havens and owned by residents of countries with high personal income tax e-filing rates react significantly stronger to the CRS compared to those held by residents of countries with low e-filing. The CRS effect for high e-filing countries is, on average, about double as large as for low e-filing countries.

Our study's findings are crucial for policymakers as we highlight that merely having an AEOI system is insufficient; local implementation is essential. We present evidence that CRS implementation effects vary significantly with country characteristics related to tax authority capacity and CRS implementation quality. While we cannot definitively rule out the possibility that other correlated country characteristics influence the observed heterogeneous effects, the contribution of our study is to show that country characteristics are strongly associated with CRS effects, and therefore, the CRS, although a global measure, relies substantially on local conditions.

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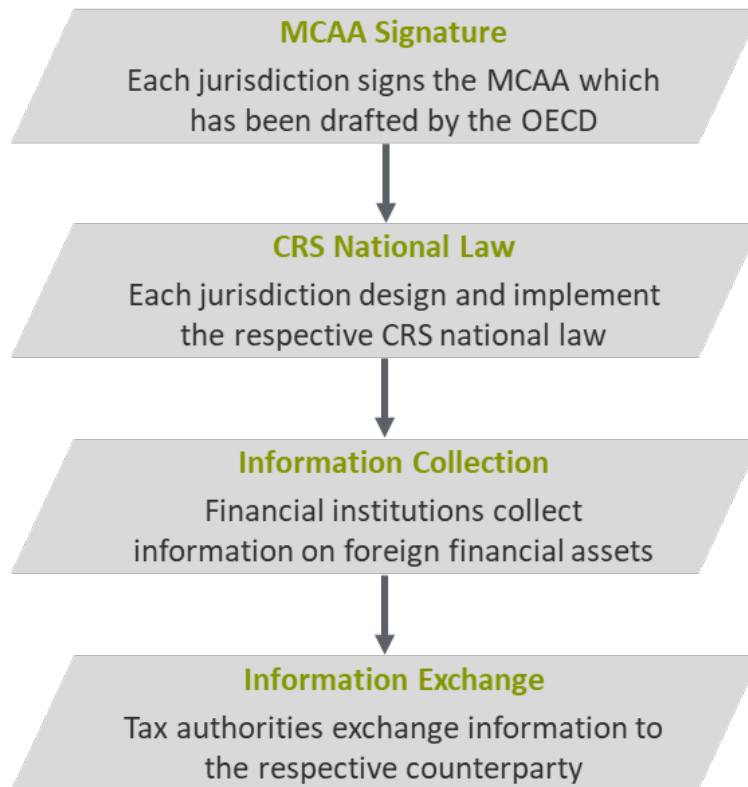
## A Online Appendix: Figures and Tables

### A.1 The OECD Global Forum and the Common Reporting Standard

In this section, we provide a comprehensive description of the legal process to become a CRS-participating jurisdiction and the OECD Peer review evaluation.

The OECD Model for AEOI is the bilateral or multilateral duty of participating jurisdictions to transpose the CRS into domestic law, to ensure the establishment of a suitable IT system to collect and exchange the information on foreign account holders with the respective jurisdictions and to guarantee adequate protection of the exchanged data.

Figure A.1: The CRS Journey



Notes: The figure present the steps required to become a CRS participating jurisdiction.

The first step to become a CRS participating jurisdiction is to sign the Multilateral Competent Authority Agreement (MCAA), which represents a country commitment to introduce the CRS locally by setting its legal basis at national level. As of 2023, more than 120 countries signed the MCAA.<sup>30</sup> Most of the signatory jurisdictions already have the CRS introduced nationally. The CRS national laws are designed following the OECD model for AEOI which dictates the diligence and reporting regulations which financial institutions must follow in order to collect and transfer the required financial information to their respective tax authorities. The OECD also provides reporting schema in extensible mark-up language (XML), i.e. the CRS XML Schema, so that all jurisdictions exchange the information in a standardised manner. Overall, each jurisdiction have

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<sup>30</sup>For the full list of signatory jurisdictions, see <https://www.oecd.org/tax/automatic-exchange/international-framework-for-the-crs/crs-mcaa-signatories.pdf>

certain degree of freedom when designing the CRS law nationally, for example in the local monetary penalties for non compliance, in the specific list of non-reportable financial institutions or assets, or in the scope of reportable assets (including reporting all foreign assets or only those from CRS participating jurisdictions).<sup>31</sup>

Over the years, the OECD launched several initiatives that aim to monitor and assess the effectiveness of local administrative compliance to ensure an effective implementation of the CRS. Initiatives included the establishment an online disclosure facility signaling the risk of shifting income to "non-reportable financial institutions". For example, Hong Kong initially classified Occupational Retirement Schemes (“ORSs”) as non-reportable financial institutions. However, the OECD received several reports on its online disclosure facility indicating the risk of exploiting “ORSs” to avoid CRS requirements. This led to international pressure resulting in Hong Kong issuing strict guidance limiting the category of non-reportable ORSs for CRS purposes. Moreover, on 9 March 2018, the OECD released Model Mandatory Disclosure Rules for CRS Avoidance Arrangements and Opaque Offshore Structures. It sets the standard for mandatory disclosure regime requiring intermediaries, such as consultants, lawyers, or financial institutions, to report a comprehensive set of information on all currently used transactions that (purport to) circumvent the CRS and on structures that disguise the beneficial owners of assets held offshore.

Finally, the OECD launched a comprehensive peer review program which aims to assess the effectiveness of each jurisdiction’s CRS law and its local implementation. The results of the peer review have been published in two separate reports issued in 2021 and 2022 respectively. The peer review has been conducted over multiple years with multiple sessions depending on the topic of the review. The peer review is conducted by a team of CRS experts from local tax administrations and by representative of the Global Forum on Transparency and Exchange of Information for Tax Purposes. Team members change each time a new review is conducted and each member from the local tax administration team is assigned to multiple countries at the same time.

Figure A.2: Peer Review Evaluation Criteria - Legal Framework

Table 2.1. The determinations

Determination	Description
In Place	<p>A jurisdiction’s legal framework is determined as being “<b>In Place</b>” where the review of its legal framework does not identify any gaps that need to be addressed in order for the legal framework to be in accordance with the AEOI Terms of Reference.</p> <p>This is the case where the peer review processes have not resulted in any recommendations. It is possible, although unusual, for a legal framework to be determined to be In Place even where there is a recommendation. This is only the case where the gap is viewed as so minor that it would have a highly limited impact on the operation of the AEOI Standard.</p>
In Place But Needs Improvement	<p>A jurisdiction’s legal framework is determined as being “<b>In Place But Needs Improvement</b>” where the review of its legal framework concludes that the legal framework is in place but certain aspects need improvement in order for it to be fully in accordance with the AEOI Terms of Reference.</p> <p>This is the case where the peer review processes have identified one or more deficiencies material to the proper functioning of elements of the AEOI Standard.</p> <p>The determination of In Place But Needs Improvement is therefore a broad category. It includes jurisdictions with one recommendation, as well as jurisdictions with multiple recommendations. In all cases, the deficiencies are viewed collectively as material to the proper functioning of certain elements of the AEOI Standard, but not to its overall operation.</p>
Not In Place	<p>A jurisdiction’s legal framework is determined as being “<b>Not In Place</b>” where the review of its legal framework shows that the legal framework needs to be significantly improved in order to be in accordance with the AEOI Terms of Reference.</p> <p>At the extreme, this is the case where a jurisdiction has not implemented the relevant legal framework. More commonly, this is where the peer review processes have resulted in recommendations viewed collectively as having a material impact on the overall operation of the AEOI Standard.</p> <p>It is important to note, aside from the jurisdictions that have not implemented a legal framework, a determination of Not In Place does not mean that a jurisdiction’s legal framework is not in effect. In fact, several aspects of that legal framework are likely to be in place as required. The determination instead means that the impact of the deficiencies found are viewed as creating a material risk to the overall proper functioning of the AEOI Standard (e.g. a jurisdiction’s legal framework to enforce the due diligence requirements is substantively incomplete).</p>

Notes: The table is taken from the OECD Peer Review of the Automatic Exchange of Financial Account Information 2020 and it summarizes the information from the Peer Review Process on Andorra.

<sup>31</sup>See Casi et al. (2019) for an overview of differences across CRS national laws.

Figure A.2 shows the evaluation of criteria in the first Peer Review Report on compliance with the AEOI Standard along two dimensions, specifically to which extends the domestic and international legal frameworks are in line with the prescribed requirements under the CRS model. Both the domestic and international frameworks are evaluated either as "In Place", "In Place but Need Improvements" and "Not in Place" as described in figure A.2. We classify a country as high legal framework if the OECD Peer Review reports the country's domestic/international legal framework as "In Place".

We consider the second OECD Peer Review Report to evaluate a country's effectiveness of the CRS implementation in practice. For this purpose, we collect data on four dimensions which includes the country's communication effort, reporting verification, quality verification and enforcement.

Figure A.3: Peer Review Evaluation Criteria - Operational Framework

Table 3. Activities undertaken

Activity type	Activities undertaken
Communication and outreach	Andorra has carried out substantial communication and outreach activities, such as the training of Financial Institutions, publishing a webpage with relevant and up-to-date information on compliance and constant communication with Financial Institutions' associations.
Verifying that Financial Institutions are reporting as required	Andorra has carried out substantial verification activities to ensure that Financial Institutions are reporting as required, such as ensuring all Financial Institutions registered with the AFA submit the required reports and identified one Financial Institutions incorrectly not reporting. It is following up on this issue with a view to ensuring future compliance.
Verifying whether the information reported is complete and accurate	Andorra has conducted a significant number of desk-based checks to verify whether the due diligence rules are being properly implemented and the information being reported is complete and accurate. Furthermore, Andorra has ordered and reviewed the reports of a significant number of in-depth external audits and identified no issues.
Enforcement	Following the activities mentioned above, Andorra has not yet imposed penalties and sanctions, but has one case open in court for failure to report.

Notes: The table is taken from the OECD Peer Review of the Automatic Exchange of Financial Account Information 2022.

Figure A.4 shows the results for the first country on the list, namely Andorra and provide an overview of the information we use to create our CRS enforcement dataset. Below a detailed overview of how we classify the country in our sample. We classify a country with high communication, reporting verification, quality verification if the word "substantial" or similar is used and we classify a country with high penalties if at least a monetary penalty was charged.

Figure A.4: Classification Example - CRS Enforcement Dataset

Category	Classification
<b>Communication Effort:</b> "Country A has carried out XX communication and outreach activities. (..)"	<b>0: NO</b> <b>1: SOME</b> <b>2: SUBSTANTIAL</b>
<b>Reporting Verification:</b> "Country A has carried out XX verification activities to ensure that Financial Institutions are reporting as required. (..)"	
<b>Quality verification:</b> "Country A has conducted XX desk-based checks in one financial sector to verify whether reported information is complete and accurate. (..)"	

Finally, we list the countries in each category of enforcement level used for our analysis, i.e. communication level and domestic legal framework. The data originates from the OECD Peer

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Review Data on quality of CRS national implementation.

For the variable "Communication", the countries are divided into high versus low as follows:

- **Communication high:** Andorra, Belgium, Bermuda, Cayman Islands, Cook Islands, Cyprus, Guernsey, Hong Kong (China), Ireland, Isle of Man, Jersey, Liechtenstein, Luxembourg, Malaysia, Malta, Mauritius, Saint Kitts and Nevis, San Marino, Singapore, Switzerland
- **Communication low:** Anguilla, Antigua and Barbuda, Aruba, Austria, Bahamas, Bahrain, Barbados, Belize, Chile, Costa Rica, Curaçao, Dominica, Gibraltar, Grenada, Lebanon, Marshall Islands, Monaco, Montserrat, Panama, Saint Lucia, Saint Vincent and the Grenadines, Samoa, Seychelles, Turks and Caicos Islands, Uruguay, Vanuatu

For the variable "Domestic Legal Framework", the countries are divided into high versus low as follows:

- **Domestic Legal Framework high:** Anguilla, Austria, Bahrain, Bermuda, Cayman Islands, Cook Islands, Cyprus, Gibraltar, Guernsey, Hong Kong (China), Ireland, Isle of Man, Jersey, Lebanon, Luxembourg, Malaysia, Malta, Marshall Islands, Mauritius, Saint Kitts and Nevis, Samoa, San Marino, Singapore, Vanuatu
- **Domestic Legal Framework low:** Andorra, Antigua and Barbuda, Aruba, Bahamas, Barbados, Belgium, Belize, Chile, Costa Rica, Curaçao, Dominica, Grenada, Liechtenstein, Monaco, Panama, Seychelles, Sint Maarten, Switzerland, Trinidad and Tobago, Turks and Caicos Islands, Uruguay

## A.2 Norwegian Tax Authorities

In our analysis on the heterogeneous responses to the local CRS enforcement, we rely on Norwegian daily bank transfers. The advantage of using these data is two-folds: on the one side, we have a large enforcement variation in the sample of sending countries as we observe transfers from 41 tax havens and on the other side, we can hold the enforcement level at the receiving country fix since we consider only transfers to Norway. Additionally, we can expect that the enforcement level in Norway is among the highest within our sample of receiving countries. In this section, we offer an overview of key statistics on Norway and the Norwegian tax authorities in particular so as to motivate why our data represents the ideal setting for testing the heterogeneous responses to the CRS where only the sending country enforcement level can explain the different reactions of taxpayers.

First, according to Worldwide Governance Indicators from the World Bank, Norway display one of the highest rule of law level being second only to Finland. Recent OECD survey offers further insights in the level of trust of the society towards public institutions: for example, 73% of businesses and 81% of individual taxpayers have trust in the Norwegian tax authority, see (OECD, 2022).

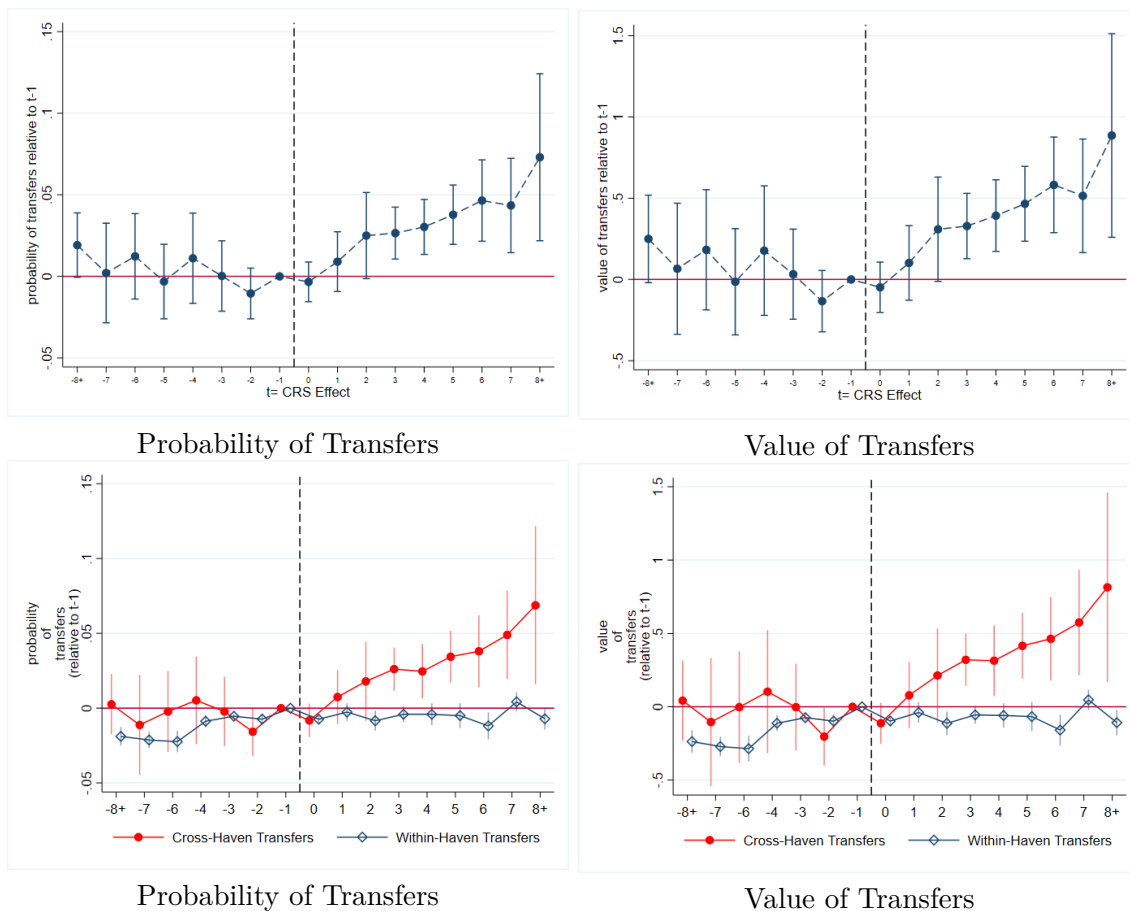
Taxes represent an important source of funding for the Norwegian government as tax revenue is more than 50% of the total revenue, where personal income taxes and value added taxes are the major source of revenue. When considering employees allocation within the Norwegian tax authority: excluding the residual category of other function, the largest percentage staff is allocated to registration taxpayer services, returns and payment processing, followed by enforced debt collections and related functions and lastly tax audits and investigations. Most of the resources are allocated to employee wages (around 80%) and a minor part to ICT spending (around 10%). The Norwegian tax authority is highly digitized with an e-filing rate close to 99% in 2022.

Finally, Norway achieved a extremely high matching rate with respect to the CRS data and national tax return data. Out of all accounts received, 90% could be linked to existing taxpayer information. This ratio is well above the matching rates of, for example, other EU countries which ranges between 37% to 80% (EU Commission, 2018).

### A.3 Sending Country Analysis - Alternative Control Group

In our baseline model, the sample of sending countries includes exclusively tax havens and we compare cross-haven transfers to within-haven transfers. For example, the control group would include a transfer to Norway from a bank account located in Switzerland and owned by a Swiss. Within-transfers represent an ideal control group because we expect them not to react once the CRS becomes effective since such transfers are not mainly not for secrecy and/or tax evasion reasons and they enable us to control for all deposit-level shocks which might occur at the same time as the local introduction of the CRS. Nevertheless we offer the results relying on an alternative control group.

Figure A.5: Sending Country Analysis: Changes in Cross-Border Bank Transfer with Alternative Control Group



Notes: The figure is a replication of figure 8. The blue line includes only non-tax haven transfers, where the non-tax havens where the bank account  $j$  is located, is the same as  $z$ , i.e. the non-tax havens where the owner of the foreign bank account is located.

In Figure A.5, we present the baseline results comparing cross-havens transfers (treated group)

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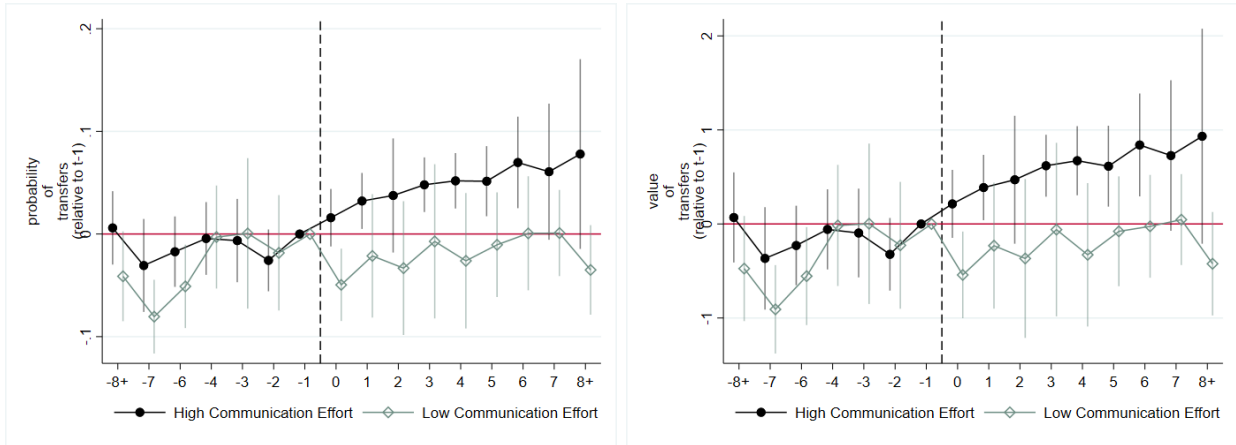
and non-tax havens transfers where the foreign deposit and the owner of the foreign deposits are located in the same country. For example, the control group would include a transfer to Norway from a bank account located in Germany and owned by a German. Non-tax havens transfers represent a sound control group because one can expect such transfers to be mainly for trade reasons (similarly to within-tax haven transfers) yet we cannot rule out that the change in cross-tax haven transfers is exclusively caused by the introduction of the CRS since we are comparing transfers to Norway which originate from two different countries. Results are in line with our baseline test as we observe no changes in transfers around the introduction of the CRS for the non-tax haven transfers to Norway.

#### **A.4 Sending Country Analysis - Excluding Conduit Countries or high GDP countries**

In our baseline model, the sample of sending countries includes all tax havens as listed in Johannesen and Zucman (2014) and Gravelle (2015) conditional on the country having the CRS in place and being observable in our bank transfer data. We notice that the haven countries that are considered conduit locations are overwhelmingly high-communication countries. Therefore, the difference in effects between high and low communication could be driven by conduit haven countries that may differ from other small haven countries by further characteristics.

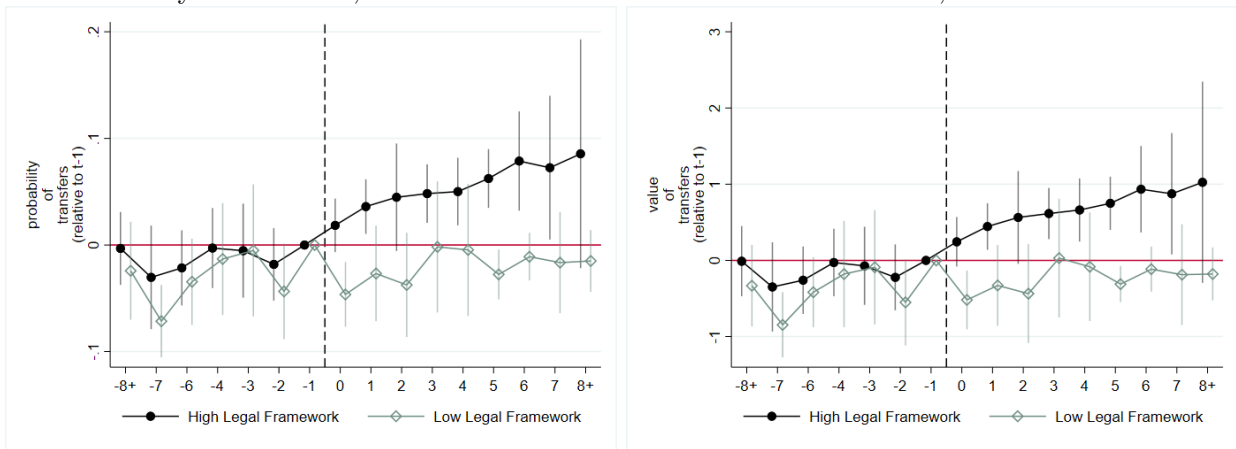
We show the robustness of our results by excluding conduit countries. We consider the broadest list of conduit countries, which combines the one in Lejour (2020) and Bolwijn et al. (2018). For our sample, this implies excluding Austria (low CRS communication, high Legal Framework); Hong Kong, Ireland, Luxembourg, Singapore (all high communication and legal framework) and Belgium, Switzerland (high CRS communication, low legal framework).

Figure A.6: Sending Country Analysis: Changes in Cross-Border Bank Transfer - Enforcement Test excluding Conduit Countries



Probability of Transfers, Communication

Value of Transfers, Communication



Probability of Transfers, Law Enforcement

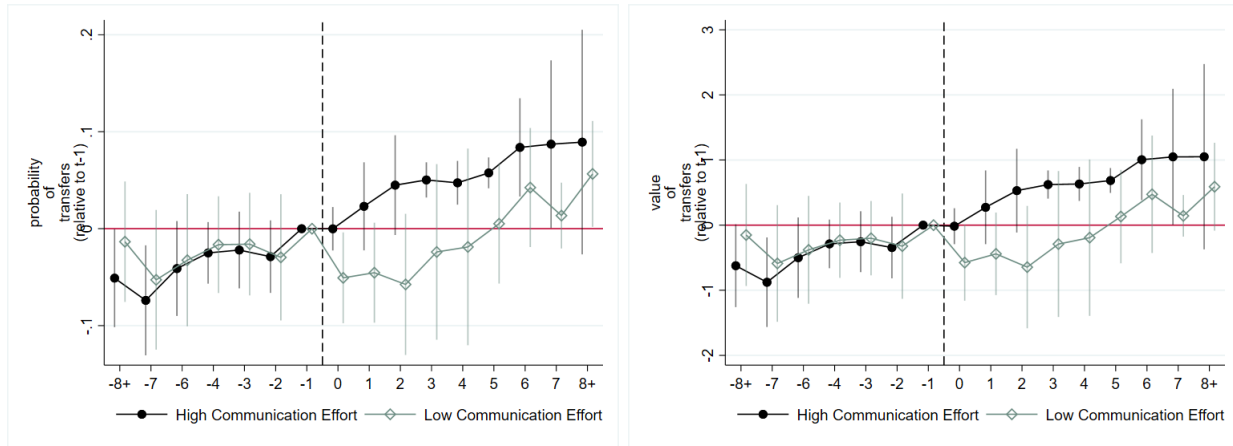
Value of Transfers, Law Enforcement

Notes: The figure is a replication of figure 9 excluding Austria, Belgium, Hong Kong, Ireland, Luxembourg, Singapore and Switzerland.

In Figure A.6, we present the baseline results comparing cross-havens transfers (treated group) and within-tax havens transfers excluding conduit countries. Results are in line with our baseline test on local enforcement level as we observe that bank transfers to Norway are mainly from tax havens with stronger CRS-related communication efforts. Relative while the taxpayers response is more similar when considering the CRS legal framework shapes the probability of bank transfers to Norway.

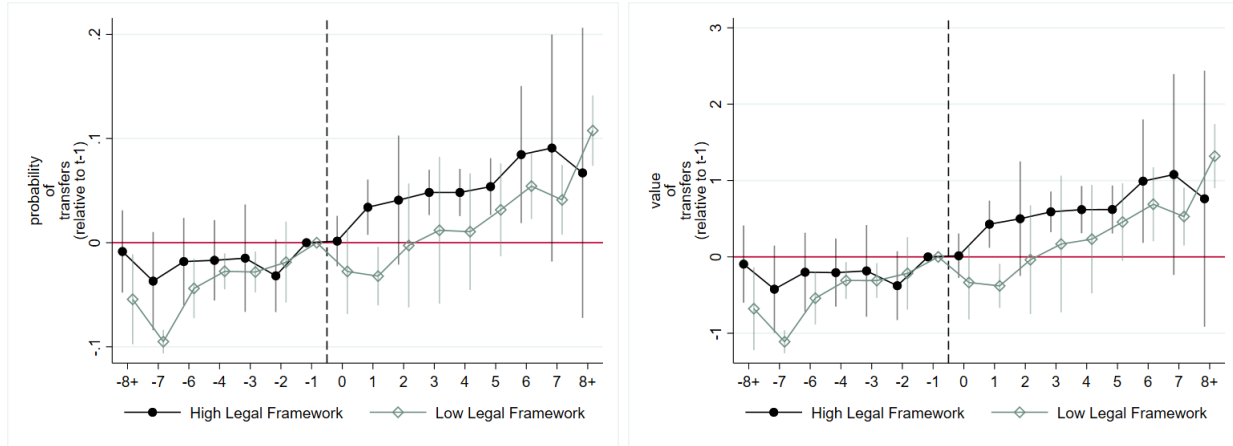
Furthermore, we observe in Figures 5 and 6 in our paper that CRS haven enforcement is correlated with being a high GDP per capita tax haven, therefore we test whether our results still hold if we test for the role of CRS haven enforcement within low GDP per capita havens. As visible in Figure A.7 in the sub-group of low GDP per capita havens our results hold, the transfers to Norway are dominantly in the high enforcement countries.

Figure A.7: Sending Country Analysis: Changes in Cross-Border Bank Transfer - Enforcement Test Excluding High GDP Countries



Probability of Transfers, Communication

Value of Transfers, Communication



Probability of Transfers, Law Enforcement

Value of Transfers, Law Enforcement

Notes: The figure is a replication of figure 9 excluding tax havens with below median GDP level. The GDP level is computed as in the descriptive statistics where GDP level is from 2018 and median is computed within the tax haven sample.





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