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The End of Bank Secrecy? An Evaluation of the G20 Tax Haven Crackdown†

By Niels Johannesen and Gabriel Zucman*

During the financial crisis, G20 countries compelled tax havens to sign bilateral treaties providing for exchange of bank information. Policymakers have celebrated this global initiative as the end of bank secrecy. Exploiting a unique panel dataset, our study is the first attempt to assess how the treaties affected bank deposits in tax havens. Rather than repatriating funds, our results suggest that tax evaders shifted deposits to havens not covered by a treaty with their home country. The crackdown thus caused a relocation of deposits at the benefit of the least compliant havens. We discuss the policy implications of these findings. (*JEL* G21, G28, H26, H87, K34)

In August 2009, France and Switzerland amended their tax treaty. The two countries agreed to exchange upon request all information necessary for tax enforcement, including bank information otherwise protected by Swiss bank secrecy laws. Over the following months, one of France's richest persons and her wealth manager were taped discussing what to do with two undeclared Swiss bank accounts, worth $160 million. After a visit to Switzerland, the wealth manager concluded that keeping the funds in Swiss banks or bringing them back to France would be too risky. He suggested that the funds be transferred to Hong Kong, Singapore, or Uruguay, three tax havens which had not committed to exchanging information with France. After the tapes were made public, they received extensive newspaper coverage and eventually the funds were repatriated to France.[1]

The amendment to the French-Swiss tax treaty was part of a major initiative to combat tax evasion at the global level. Since the end of the 1990s, the OECD has encouraged tax havens to exchange information with other countries on the

* Johannesen: Department of Economics, University of Copenhagen, Øster Farimagsgade 5, 1353 Copenhagen, Denmark (e-mail: niels.johannesen@econ.ku.dk); Zucman: Univeristy of California, Berkeley, 530 Evans Hall #3880, Berkeley, CA 94720, and London School of Economics, 32 Lincoln's Inn Fields, London WC2A 2AE (e-mail: zucman@berkeley.edu). We are grateful to the Bank for International Settlements for giving us access to the otherwise restricted data on foreign deposits for the purposes of this research and to the Danish Central Bank for facilitating the contact. We thank two anonymous referees, Nicolas Frémeaux, Lucie Gadenne, Harry Huizinga, Thomas Piketty, Johannes Voget, audiences at the Danish Central Bank, University of Copenhagen, Paris School of Economics, Max Planck Institute, Norwegian Business School, Oxford, Tilburg, Vienna Institute for Advanced Studies, IIPF Congress, Days Louis-Andre Gerard-Varet, and Helsinki for valuable comments and suggestions. Niels Johannesen acknowledges financial support from the Danish Council for Independent Research and Gabriel Zucman from the French Ministry of Higher Education.

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[1] For a summary of this evasion case, see "Affaire Bettencourt: ce que disent les enregistrements," *Le Monde*, 30 June 2010.

basis of bilateral tax treaties, but until 2008 most tax havens declined to sign such treaties. During the financial crisis, the fight against tax evasion became a political priority in rich countries and the pressure on tax havens mounted. At the summit held in April 2009, G20 countries urged each tax haven to sign at least 12 information exchange treaties under the threat of economic sanctions. Between the summit and the end of 2009, the world's tax havens signed a total of more than 300 treaties.

The effectiveness of this crackdown on offshore tax evasion is highly contested. A positive view asserts that treaties significantly raise the probability of detecting tax evasion and greatly improve tax collection (Organisation for Economic Co-operation and Development 2011). According to policy makers, "the era of bank secrecy is over" (G20 2009). A negative view, on the contrary, asserts that the G20 initiative leaves considerable scope for bank secrecy and brings negligible benefits (Shaxson and Christensen 2011). Whether the positive or the negative view is closer to reality is the question we attempt to address in this paper.

This is an important question for two reasons. First, the fight against offshore tax evasion is a key policy issue. Globalization and the information technology revolution have made it easier for tax evaders to move funds offshore. Absent information exchange between countries, personal capital income taxes cannot be properly enforced, giving rise to substantial revenue losses and constraining the design of tax systems. Against the backdrop of the large public deficits faced by most countries since the financial crisis, curbing tax evasion is high on the policy agenda.

Second, although treaties have prevailed as the main policy instrument in the fight against international tax evasion, surprisingly little is known about their effectiveness. The G20 crackdown has generated a lot of discussion in policy circles but there is little fact-based evidence of its efficacy and no academic evaluation. The OECD has launched a peer-review evaluation to assess whether treaties are properly drafted and enforced, but while this legal work is necessary, it is not sufficient: if the information exchange mechanism advocated by the OECD has fundamental shortcomings, then even properly drafted and enforced treaties may be ineffective. Our study is the first attempt to assess from a quantitative perspective the impact of the many treaties signed by tax havens since G20 countries have made tax evasion a priority.

Providing compelling evidence on tax evasion is notoriously difficult, and even harder in the complex area of international tax evasion. We break new ground in this field by drawing on a particularly rich dataset on cross-border bank deposits. For the purpose of our study, the Bank for International Settlements (BIS) has given us access to bilateral bank deposit data for 13 major tax havens, including Switzerland, Luxembourg, and the Cayman Islands. We thus observe the value of the deposits held by French residents in Switzerland, by German residents in Luxembourg, by US residents in the Cayman Islands and so forth, on a quarterly basis from the end of 2003 to the middle of 2011. Using specific country names for the sake of concreteness, we ask: Did French holders of Swiss deposits respond to the 2009 French-Swiss treaty by repatriating funds to France? Did they relocate their funds to other tax havens? Or did they simply leave them in Switzerland? To address these

questions, after providing more details on offshore tax evasion and the data we use in Section I, we employ graphical analysis in Section II and panel regression analysis in Section III.

We obtain two main results. First, treaties have had a statistically significant but quite modest impact on bank deposits in tax havens: a treaty between say France and Switzerland causes an approximately 11 percent decline in the Swiss deposits held by French residents. Second, and more importantly, the treaties signed by tax havens have not triggered significant repatriations of funds, but rather a relocation of deposits between tax havens. We observe this pattern in the aggregate data: the global value of deposits in havens remains the same two years after the start of the crackdown, but the havens that have signed many treaties have lost deposits at the expense of those that have signed few. We also observe this pattern in the bilateral panel regressions: after say France and Switzerland sign a treaty, French deposits increase in havens that have no treaty with France.

The finding that tax evaders shift deposits in response to treaties, our key result, illustrates an important pitfall of the current approach to the fight against tax evasion. Tax havens are whitelisted after signing 12 treaties, leaving considerable scope for tax evaders to ensure that their assets are not covered by a treaty. Our analysis shows that tax evaders exploit this possibility, which ultimately provides incentives for tax havens to keep their treaty networks at the minimum. From a normative viewpoint, our paper thus lends support to the idea developed theoretically by Elsayyad and Konrad (2011) that a "big bang" multilateral agreement should be preferred to the current sequential approach.

The finding that treaties have had a modestly sized impact on bank deposits has several possible interpretations between which we cannot discriminate conclusively with the data at our disposal. First, most tax evaders may have chosen not to move deposits because they considered that treaties did not substantially increase the probability they be detected. This interpretation is consistent with the fact that treaties only rarely lead to actual exchange of information in practice. Yet another possible interpretation is that the modest size of our estimates is due to limitations of our deposit dataset. For instance, some tax evaders use sham corporations with addresses in Panama and the British Virgin Islands as nominal holders of their bank accounts in Switzerland and other havens, which obscures who ultimately owns part of the funds offshore. We tackle this issue in Section IV, for the first time in this literature, and we show that the funds held through sham corporations might have responded strongly to the treaties. Lastly, tax evaders might have declared some of their assets to tax authorities while keeping them offshore. In Section V we analyze a novel dataset with direct information on income that European owners of Swiss accounts voluntarily declare. We find no signs that treaties induced Swiss account holders to comply more with tax laws, but we cannot rule out an increase in compliance in other tax havens.

Our paper adds to the literature on tax treaties, where a recurring finding is that treaties have little real economic effects (e.g., Blonigen and Davies 2005; di Giovanni 2005; Louie and Rousslang 2008). Relative to this literature, our contribution is to focus on the information sharing provisions included in tax treaties rather than on those aimed at promoting cross-border investments and limiting double taxation.

The effectiveness of information sharing mechanisms is rarely assessed and our paper contributes to filling this gap.[2]

We also contribute to the literature on how tax policies affect international investments (e.g., Chan, Covrig, and Ng 2005; Desai and Dharmapala 2011). A branch of this literature initiated by Alworth and Andresen (1992) focuses on the determinants of cross-border deposits such as taxes, interest rate differentials and distance. Huizinga and Nicodème (2004) find that information exchange agreements have no significant effect on cross-border deposits in OECD countries. We focus, by contrast, on how tax treaties affect deposits in tax havens. This evaluation was not possible before 2009, the year when most tax havens started signing information exchange treaties.[3]

Lastly, our paper sheds new light on the activities taking place in tax havens, a topic which is attracting increasing interest (Desai, Foley, and Hines 2006; Dharmapala 2008; Dharmapala and Hines 2009; Palan, Murphy, and Chavagneux 2010). Tax havens provide corporations and individuals with opportunities to avoid or evade taxes. The bulk of the literature focuses on the use of tax havens by corporations, following Hines and Rice (1994). By contrast, we focus on their use by households, which is still little studied.

I. Offshore Tax Evasion By Households: Context and Data

A. *Policies to Prevent Offshore Tax Evasion*

Tax havens such as Switzerland, Singapore, and the Cayman Islands host an important wealth management industry which provides foreigners with an opportunity to evade taxes. If a French household entrusts assets to a French bank, there is automatic reporting of capital income to the French tax authorities: evasion of the personal income tax is impossible. But if it entrusts assets to a Swiss bank, there is no automatic reporting: French authorities have to rely on self-reporting and tax evasion is possible.[4] Using official Swiss statistics and anomalies in the international investment data of countries, Zucman (2013) estimates that around 8 percent of households' global financial wealth is held in tax havens. This figure implies substantial tax revenue losses due to outright fraud.

Missing information on income earned through bank accounts in tax havens is the key problem for enforcing personal capital income taxes. Exchange of information between countries is the obvious solution. There are two main ways countries can exchange information: automatically or upon request (Keen and Ligthart 2006). Automatic exchange of information is widely acknowledged to be the most effective solution because it allows tax authorities to obtain comprehensive data about

[2] A complementary contribution is Blonigen, Oldenski, and Sly (2011) who study whether information exchange agreements affect foreign direct investments (while we look at bank deposits and tax evasion).

[3] Two related papers are Hemmelgarn and Nicodème (2009) and Johannesen (2010), who study the effects of the Savings Directive, a European policy initiative that imposes a tax on interest income earned by European Union residents in a number of tax havens. We discuss in the conclusion the relative merits of withholding taxes and treaties in light of our results.

[4] Kleven et al. (2011) document the importance of third-party reporting to prevent tax evasion.

income earned by domestic residents in foreign banks. But information exchange upon request is more common. It is the standard promoted by the OECD and embedded in the treaties signed by tax havens. Under the amended French-Swiss treaty, French authorities can request information from Switzerland to enforce tax laws. Requests must concern specific taxpayers. France cannot ask for a list of all its residents with funds in Switzerland. Moreover, the requested information must be "foreseeably relevant" (Organisation for Economic Co-operation and Development 2008, 38): information can be obtained by French authorities only if they have a well documented suspicion that a resident is evading taxes. All the treaties signed by tax havens have identical wording: they follow the OECD model tax convention.

The usefulness of the OECD standard of information exchange is the object of much controversy. Critics argue that since placing a request for information requires prior knowledge, which is extremely hard to come about, little can be obtained through treaties (Sheppard 2009). And indeed, the US Government Accountability Office (2011) revealed that during the 2006–2010 period, the United States placed only 894 requests under its more than 80 tax treaties. Since a single Swiss bank admitted in 2008 to have more than 19,000 US clients with undeclared bank accounts (US Senate 2008), information exchange upon request is clearly associated with a small probability of detecting tax evasion. Advocates of the OECD standard, on the other hand, stress that even a small probability of detection may be sufficient to deter tax evasion and that information exchange upon request is a major step forward from no exchange at all.

Since the end of the 1990s, the OECD has tried to convince tax havens to sign information exchange treaties. But, as shown by Figure 1, most havens declined to sign treaties until the financial crisis.[5] The turning point occurred in April 2009. The OECD specified that each tax haven should conclude at least 12 treaties to be in compliance and drew up a list of 42 noncompliant havens. The G20 threatened to impose economic sanctions on noncompliant havens. In just five days, all havens committed to signing 12 treaties and the G20 declared the era of bank secrecy over (G20 2009).

As a result of G20 pressure, treaty signature effectively boomed in 2009 and 2010. But the pace slowed down considerably after 2010. Moreover, tax havens signed many treaties with each other: in 2009, almost one-third of the treaties signed by tax havens were with other havens. Such haven-haven treaties do not help non-haven countries curb tax evasion in any way. In all likelihood they only reflect the desire of some tax havens to reach the 12 treaties threshold without giving substantial concessions.

B. *Data on Tax Treaties*

To study the effects of the G20 tax haven crackdown, we have compiled a complete dataset on the treaties concluded by tax havens. The dataset covers 52 tax

[5] All the data on tax treaties and aggregate bank deposits used for this research are available online on the authors' websites.

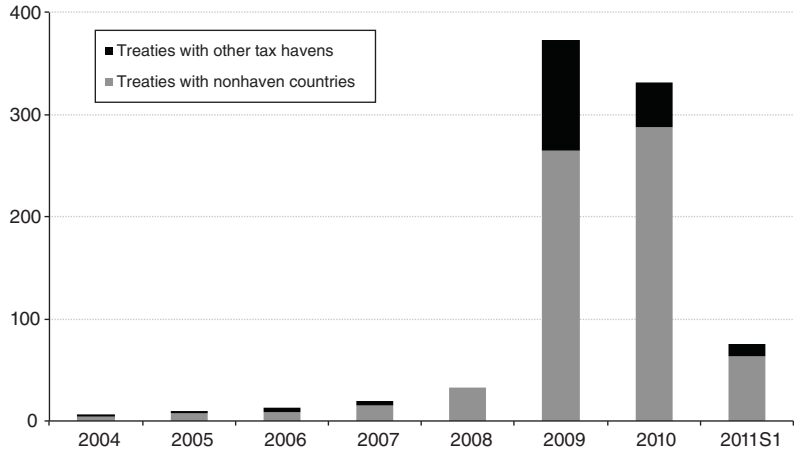

Figure 1. Number of Bank Information Exchange Treaties Signed by Tax Havens, by Year

Note: The figure charts the number of new treaties or amendments to existing treaties allowing for information exchange signed each year by the world's 52 tax havens (see list in the online Appendix).

Source: Global Forum on Transparency and Exchange of Information for Tax Purposes (1998–2011) and authors' research (see online Appendix)

havens (see the online Appendix), more than 220 potential partner countries, and includes information until the end of 2011:II.

Tax havens can start exchanging information with partner countries on the basis of two types of legal events: new treaties or amendments to existing treaties on the one hand (for instance, the amendment to the French-Swiss tax treaty in August 2009), and changes in domestic laws allowing for information exchange with existing treaty partners on the other (Cyprus passed such a law in July 2008). The two types of events are legally equivalent, but new treaties may be more salient than subtle changes in the banking laws of tax havens. Distinguishing between the two kinds of legal events allows us to investigate whether depositors respond differently to more salient events.[6]

The main data source is the Exchange of Tax Information Portal, which represents the best effort of the OECD to gather accurate information on tax treaties.[7] In some cases, we have added information from official government websites. The online Appendix describes step-by-step how we compiled the treaty dataset from readily available sources. The final dataset includes 1,025 events: 861 new treaties or amendments to existing treaties, and 164 instances when changes in domestic laws rendered information exchange possible under existing treaties. Note that since there are 52 tax havens and around 220 countries and territories in the world, a full network of treaties would include around 11,000 treaties. Through a peer-review evaluation, the OECD assesses whether the treaties signed by tax havens are

[6] Chetty, Looney, and Kroft (2009) provide evidence of the importance of salience for the response to taxes.

[7] See http://eoi-tax.org/. We have also benefited from discussions with Jeremy Maddison and Sanjeev Sharma from the OECD.

properly drafted and enforced. Out of the 861 new treaties signed from 2004 to mid-2011, 68 percent were deemed compliant, 13 percent were deemed not compliant, and 19 percent were still unreviewed in November 2011.

C. *Data on Deposits in Tax Havens*

Our second data source is the BIS locational banking statistics, which contain information on foreign bank deposits in 41 countries. The BIS publishes quarterly data aggregated at the country level, for instance total deposits held by French residents in foreign banks and total deposits held by foreign residents in Swiss banks. For our study and on the condition that we do not disclose bilateral information, the BIS has given us access to deposit data at the bilateral level, for instance deposits held by French residents in Swiss banks. There are 18 tax havens reporting to the BIS. We have access to bilateral deposit data for 13 of them: Austria, Belgium, the Cayman Islands, Chile, Cyprus, Guernsey, the Isle of Man, Jersey, Luxembourg, Macao, Malaysia, Panama, and Switzerland. We also have bilateral data for the aggregate of the remaining five havens: Bahamas, Bahrain, Hong Kong, the Netherlands Antilles, and Singapore.[8] The 13 havens for which we have bilateral data host about 75 percent of the deposits of all BIS-reporting havens, which allows us to make reasonable inference from this sample of countries.

The BIS locational banking statistics are widely used in international economics and are a key input to statistics on balance of payments. The most important financial centers (havens and nonhavens) report to the BIS. New financial centers are systematically included in the BIS statistics once they reach a significant size, so that the havens not covered are by construction very small. Further, within each covered center there is almost full coverage of deposits, because all the banks with cross-border positions in excess of a modest threshold (e.g., $10 million in the Bahamas) are required to report. The Bank for International Settlements (2008) indicates that coverage rates systematically exceed 90 percent. The reporting requirements of the BIS do not violate any bank secrecy provisions, because banks do not report data on individual customers but only aggregate figures.

The BIS data, however, have three limitations. First, it is not possible to know what fraction of the deposits in tax havens belong to households evading taxes. The BIS provides a sectoral decomposition between deposits owned by banks and by "nonbanks." Since interbank deposits do not play a role in personal income tax evasion, we focus on the deposits of "nonbanks." Part of these deposits, however, belong to multinational corporations that stash cash offshore and that are not affected by bank information sharing. Ideally we would like to observe the deposits that belong to households only. Since this is not possible, we cannot directly estimate the behavioral response of tax evaders: all we can do is making inference from the evolution of the deposits owned by "nonbanks."

[8] The secession of the Netherlands Antilles in October 2010 resulted in two new countries, Curaçao and Sint Maarten. Curaçao took over the reporting obligation to the BIS. Note also that we do not include Bermuda in our list of tax havens, because there are no private wealth management activities there (only four banks are registered in Bermuda).

To do so, we need an idea of what fraction of "nonbank" deposits belong to households. Data made available by a number of BIS-participating central banks enable us to shed light on this issue. In Switzerland, the second largest offshore center in terms of "nonbank" deposits, 80–90 percent of the deposits seem to belong to households.[9] The Bank of England reports that in 2007 households owned about 70–75 percent of the deposits in the Channel Islands and the Isle of Man, collectively the third largest offshore center. And a previous study (Zucman 2013), using different data, found that at least 50 percent of haven deposits likely belong to households.[10] On the basis of these elements, our baseline assumption when we interpret the results will be that tax evaders own about 50 percent of the deposits in tax havens.

The second limitation of the BIS data is that they are based on immediate rather than beneficial ownership. If a French individual owns a Swiss deposit through a sham corporation with an address in Panama, the BIS assigns the funds to Panama. Almost 25 percent of all deposits in tax havens are registered as belonging to other havens reflecting the widespread use of sham corporations by clients of offshore banks. Our analysis in Section IV will explicitly address the existence of deposits held through sham corporations.

Lastly, the BIS data relate to only one form of wealth held by households in tax havens: bank deposits. They do not provide information on the equity and bond portfolios that savers entrust to tax haven banks. There is little public information on households' offshore portfolios, except in Switzerland. The Swiss National Bank reports that about 25 percent of the funds held by foreigners in Switzerland take the form of bank deposits, while 75 percent are equities and bonds (Zucman 2013). With the data at our disposal, we cannot say anything about the response of tax evaders' portfolio wealth to treaties: we can only analyze the evolution of deposits. It is safe, however, to assume that the response of bank deposits is a good proxy for the response of the overall stock of offshore wealth, because the information exchange provisions of treaties affect all assets similarly.

II. Graphical Evidence

A. *The Effects of the G20 Initiative on Aggregate Deposits*

As a starting point for the empirical analysis, Figure 2 shows the evolution of the bank deposits held on aggregate in the 18 tax havens reporting to the BIS. Despite the wave of treaties signed in 2009–2010, deposits in tax havens remained stable

[9] There are two types of Swiss bank deposits covered by the BIS data: regular deposits (10–20 percent of the total) and "fiduciary deposits" (80–90 percent). In all likelihood, fiduciary deposits entirely belong to individuals: these are investments made by Swiss banks in foreign money markets on behalf of foreign individuals, an arrangement that enables clients of Swiss banks to avoid the 35 percent tax imposed by Switzerland on Swiss-source capital income. Multinational corporations do not use fiduciary deposits because they can directly invest in foreign money markets without having to pay the handsome fees charged by Swiss banks for these operations. For more details on fiduciary deposits, see e.g., Brown, Döbeli, and Sauré (2011).

[10] The figure was obtained as follows. On the basis of official Swiss National Bank statistics and of large anomalies in the international investment data of countries, Zucman (2013) estimates that individuals owned at least $6 trillion in financial assets through bank accounts in tax havens in end 2008, of which $1.4 trillion took the form of bank deposits. These $1.4 trillion account for 50 percent of the total deposits in tax havens as per the BIS.

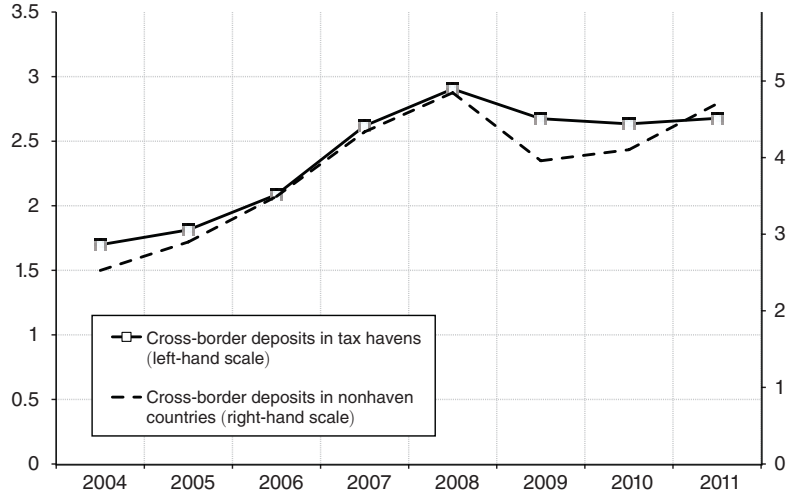

FIGURE 2. BANK DEPOSITS IN HAVEN AND NONHAVEN COUNTRIES, 2004–2011 (*trillions US$*)

Note: All figures are yearly averages (first semester average for 2011).

Source: Bank for International Settlements (2002–2011, table 3B)

over the 2007–2011 period at around $2.7 trillion. For comparison, the figure shows the evolution of the deposits held on aggregate in the nonhaven countries reporting to the BIS. This group includes financial centers that have a large treaty network and have not been affected by the G20 initiative, such as the United States or Germany. Deposits in havens and nonhavens have followed a similar trend over the 2004–2011 period. The evolution of deposits in nonhavens might be an imperfect counterfactual for the evolution of deposits in tax havens, but we can at least exclude that the G20 crackdown was followed by a significant drop in aggregate deposits in tax havens.

Next, we compare the deposits that have become covered by a treaty to the deposits that have not. We consider all country-haven combinations (e.g., France-Switzerland) among the 13 havens for which we have bilateral deposit data and the more than 200 countries holding deposits in these havens. From this universe, we construct two groups: a "treaty" group including all country-haven pairs that signed a compliant treaty between January 1, 2008 and June 30, 2011, and a "no-treaty" group including all other pairs. Figure 3 shows that deposits decreased moderately in the "treaty" group but remained roughly stable in the "no-treaty" group. Should all deposits have followed the same trend, the deposits in the "treaty" group would have been around 15 percent larger in 2011. Figure 3 suggests that at least some tax evaders responded to treaty signatures, although it does not reveal the nature of this response.

B. *The Effects of the G20 Initiative on the Deposits in Each Tax Haven*

To investigate how tax evaders responded to treaties, we examine the evolution of deposits in each tax haven between 2007 and 2011. Figure 4 reveals that the globally stable level of deposits in tax havens conceals significant differences across havens.

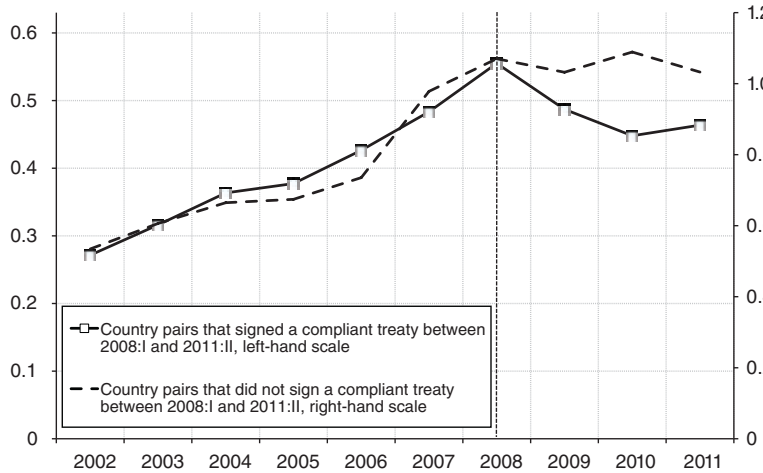

Figure 3. Bank Deposits in Treaty and No-Treaty Country-Pairs, 2002–2011 (*trillions US$*)

Notes: The figure charts the evolution of the deposits held by savers of country i in banks of tax haven j for the set of country-haven pairs (i, j) that signed a treaty deemed compliant by the OECD between January 1, 2008 and June 30, 2011, and the set of country-haven pairs that did not. Saver countries exclude tax havens. Tax havens include Austria, Belgium, Chile, the Cayman Islands, Cyprus, Guernsey, the Isle of Man, Jersey, Luxembourg, Macao, Malaysia, Panama, and Switzerland. All figures are yearly averages (first semester average for 2011) and expressed in trillions of US dollars.

Source: Bank for International Settlements (2002–2011), restricted bilateral locational banking statistics

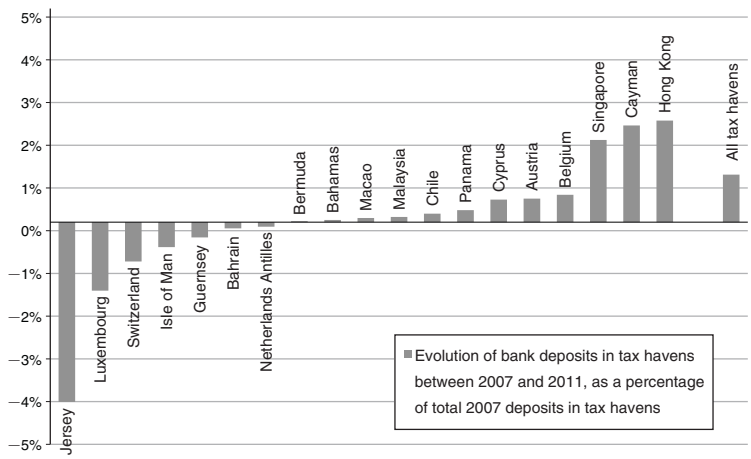

Figure 4. Evolution of Bank Deposits in Each Tax Haven, 2007–2011.

Notes: The figure charts the evolution of the foreign-owned deposits in each BIS-reporting tax haven. We compare first semester of 2011 averages with 2007 averages (except for Cyprus which started reporting in 2008:IV and Malaysia which started in 2007:IV), and express the difference as a fraction of the deposits held in all tax havens in 2007 ($2.6 trillion).

Source: Bank for International Settlements (2002–2011), restricted bilateral locational banking statistics

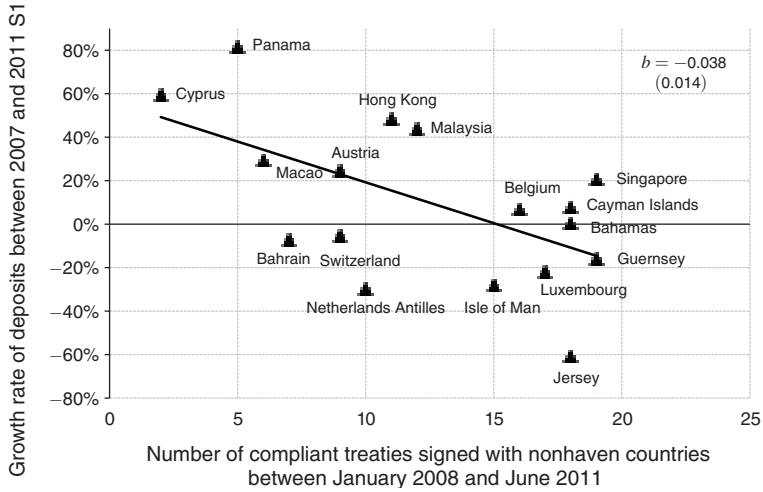

FIGURE 5. DEPOSIT GROWTH AND TREATY SIGNATURE ACTIVITY OF TAX HAVENS, 2007–2011

Notes: The figure charts the growth rate of the deposits in each BIS-reporting tax haven between 2007 (year average, except for Cyprus which started reporting in 2008:IV and Malaysia which started in 2007:IV) and 2011 (first semester average), as a function of the number of compliant treaties signed between the beginning of 2008 and the end of the first semester 2011. b is the coefficient of the slope with standard error in parentheses.

Sources: Deposits: Bank for International Settlements (2002–2011, table 3B). Compliant treaties: Global Forum on Transparency and Exchange of Information for Tax Purposes (1998–2011) and authors' research, see online Appendix.

Banks in Jersey lost the equivalent of 4 percent of the 2007 total amount of haven deposits (i.e., about 8 percent of tax evaders' deposits, if tax evaders own about 50 percent of haven deposits), while banks in Hong Kong gained around 2.5 percent (about 5 percent of tax evaders' deposits).

Crucially, the deposit gains and losses correlate strongly with the number of treaties signed by each haven. Figure 5 plots the percentage change of each haven's deposits between 2007 and 2011 against the number of compliant treaties signed over the same period. Cyprus signed only two compliant treaties and experienced a 60 percent increase in its deposits, whereas Guernsey signed 19 compliant treaties and experienced a 15 percent decrease. A simple bivariate regression suggests that an additional treaty signed by a haven is associated with a decrease of 3.8 percent of the deposits in its banks (with a standard error of 1.4 percent).[11]

Overall, the graphical evidence suggests that a number of tax evaders responded to treaties and that their response was mostly to transfer deposits to other tax havens, leaving roughly unchanged the funds globally held in tax havens. Figure 6 lends additional support to this conjecture. It shows that there is no correlation between the number of treaties signed by OECD countries with tax havens between 2007 and 2011 and the growth of the deposits held by OECD countries'

[11] This correlation remains when we consider cumulated exchange rate adjusted net flows in each haven as a percentage of end-2007 stocks rather than the simple growth rate of deposits, or when we consider all treaties signed, whether complying with the OECD standard, unreviewed, or not complying.

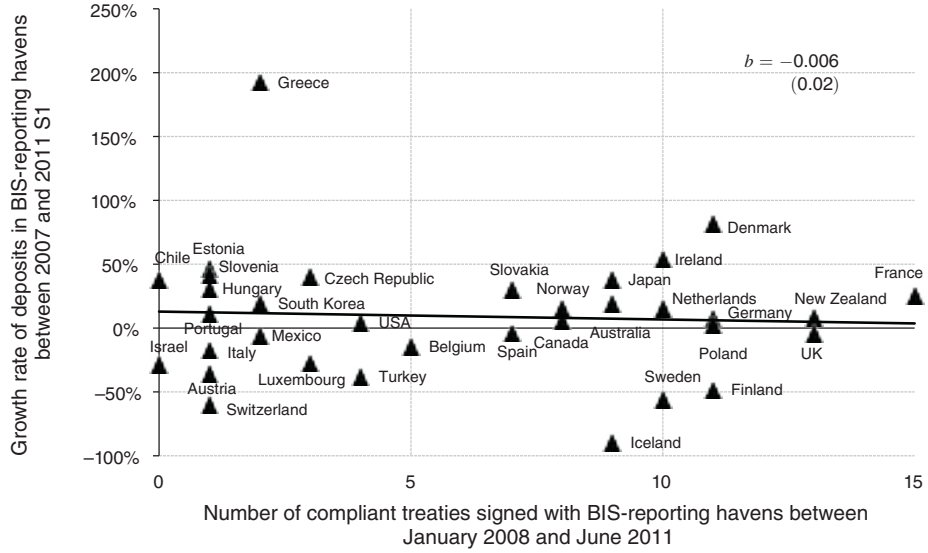

FIGURE 6. DEPOSIT GROWTH AND TREATY SIGNATURE ACTIVITY OF OECD COUNTRIES, 2007–2011

Notes: The figure charts the growth rate of the deposits held by each OECD country in BIS-reporting tax havens between 2007 (year average) and 2011 (first semester average), as a function of the number of compliant treaties signed between the beginning of 2008 and the end of the first semester 2011. b is the coefficient of the slope with standard error in parentheses.

Sources: Deposits: Bank for International Settlements (2002–2011), restricted bilateral locational banking statistics. Compliant treaties: Global Forum on Transparency and Exchange of Information for Tax Purposes (1998–2011) and authors' research, see online Appendix.

residents in tax havens. Signing more treaties does not seem to help OECD countries repatriate funds.

While the graphical evidence suggests a consistent scenario, it aggregates treaties signed at different dates and does not fully exploit the bilateral nature of our data. To deal with this, we now turn to panel regression analysis.

III. Regression-Based Evidence

A. *The Impact of Treaties on Bilateral Deposits*

The first question we want to address is whether treaties have had a statistically significant impact on deposits in tax havens at the bilateral level. We run regressions of the form

$$\log(Deposits_{ijq}) = \alpha + \beta Signed_{ijq} + \gamma_{ij} + \theta_q + \epsilon_{ijq}, \tag{1}$$

where $Deposits_{ijq}$ denotes the deposits held by residents of country i with banks of haven j at the end of quarter q, $Signed_{ijq}$ is a dummy equal to 1 if a treaty allowing for information exchange between i and j exists in quarter q, γ_{ij} denotes country-pair fixed effects, and θ_q time fixed effects. The coefficient of interest is β: should treaties have any effect at all, β should be statistically different from zero. The country-pair

fixed effects γ_{ij} control for all time invariant characteristics of country-haven pairs, such as distance or common language. The time fixed effects θ_q control for all common time trends affecting the deposits in tax havens, such as the financial crisis. Thus, β only captures the deposit changes in the "treaty" country-haven pairs that come in addition to the deposit changes in the "no-treaty" pairs. All the regressions use the sample period 2003:IV–2011:II and have robust standard errors clustered at the country-pair level.

The first column of Table 1 estimates equation (1) using the complete universe of country-haven pairs for which we have bilateral deposit data. We find that the deposits of the "treaty" pairs are smaller after treaty signature than before relative to the deposits of the "no treaty" pairs. But the coefficient is only borderline significant.

We then in column 2 restrict the sample to the universe of pairs that include one haven and one nonhaven country, in order for our coefficient β to exclude the effect of the treaties signed by havens with each other on haven-haven deposits. Treaties now have a larger effect; β is different from zero at the 5 percent level. Column 3 investigates the effect of haven-haven treaties on haven-haven deposits. We find that a treaty between say the British Virgin Islands (BVI) and Jersey does not affect the deposits "held by" the BVI in Jersey, consistent with our notion that treaties between two havens have no economic meaning. We continue the analysis with the sample that excludes haven-haven pairs. We refer the reader to Section IV for a detailed analysis of how haven-haven deposits have responded to treaties between haven and *nonhaven* countries.

In column 4, we investigate whether depositors respond differently to new treaties and to changes in the domestic laws of tax havens. Since new treaties are more salient to tax evaders, we conjecture that evaders should respond more to new treaties. We interact the dummy variable *Signed* with dummy variables indicating whether the legal event establishing information exchange is a new treaty or a change in domestic law. The results show that new treaties affect deposits but equivalent changes in domestic laws do not.

The timing of the response to treaty signature is analyzed in column 5. We include a dummy equal to one in the quarter q of the legal event establishing information exchange (*Contemp*), three dummies equal to one in $q + 1$, $q + 2$, and $q + 3$ respectively, and a dummy equal to one in all quarters after $q + 3$. We find that the bulk of the response occurs two quarters and more after treaty signature. A plausible explanation is that treaties do not enter into force immediately after they are signed. For instance, the amendment to the French-Swiss treaty signed in August 2009 entered into force in November 2010. Typically, there is a time lag of 3–5 quarters between treaty signature and entry into force.

Table 1 confirms that there is a correlation between treaties and deposits in tax havens: on average, the deposits in the "treaty" pairs decrease after treaty signature relative to the deposits in the "no treaty" pairs. The difference is statistically significant. But it is quite modest: about 11 percent according to column 2.[12] How should we interpret this result?

[12] $\exp(-0.1156) - 1 = 0.109$.

Table 1—Baseline Panel Regressions of Bilateral Bank Deposits on Treaty Signature

	Bank: Havens				
Variables	Saver: All (1)	Saver: Nonhavens (2)	Saver: Havens (3)	Saver: Nonhavens (4)	Saver: Nonhavens (5)
Signed	−0.0849*	−0.1156**	0.0457		
	(0.0893)	(0.0349)	(0.6926)		
Signed × *NewTreaty*				−0.1349**	
				(0.0243)	
Signed × *DomLaw*				0.0163	
				(0.8825)	
Signed (*Contemp*)					0.0223
					(0.6331)
Signed (+1 *quarter*)					−0.0927
					(0.1300)
Signed (+2 *quarters*)					−0.1306**
					(0.0449)
Signed (+3 *quarters*)					−0.1724***
					(0.0057)
Signed (>3 *quarters*)					−0.1818**
					(0.0137)
Constant	3.4685***	3.2187***	4.3499***	3.2171***	3.2196***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Observations	39,758	30,960	8,798	30,960	30,960
R^2	0.0870	0.0796	0.1167	0.0798	0.0803
Number of country pairs	1,631	1,285	346	1,285	1,285
Country pair FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes

Notes: p-values in parentheses, based on robust standard errors clustered at the country-pair level. The dependent variable is the stock of deposits held by savers of country i in banks of tax haven j at the end of quarter q. The unit of observation is the country-haven pair (i, j) and the sample period goes from 2003:IV to 2011:II. For a given haven j there are up to 220 saving countries i, and we consider the deposits held in 13 tax havens j. *Signed* is a dummy equal to 1 if there exists a treaty providing for information exchange between i and j in quarter q. *NewTreaty* is a dummy equal to 1 if the event establishing information exchange is a new treaty; *DomLaw* is a dummy equal to 1 if the event establishing information exchange is a change in haven's j domestic law. *Signed* (*Contemp*) is a dummy equal to 1 in the quarter q when the legal event establishing information exchange between i and j occurs; *Signed* (+1 *quarter*) is a dummy equal to 1 in $q + 1$, and so on.

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Source: Restricted bilateral locational banking statistics

Because the BIS data include deposits owned by corporations that are not concerned by information sharing agreements, our estimated β only provides a lower bound for the response of tax evaders. If tax evaders own a fraction s of deposits, one can show that their response to treaties is approximately β/s.[13] To interpret what

[13] In a simple difference-in-differences setting in which deposits in the treaty group grow at rate g^t and deposits in the no-treaty group grow at rate g^c, the estimator of the response of bank deposits to treaty signature (in a log specification) is $\log[(1 + g^t)/(1 + g^c)]$. If a fraction s of deposits initially belong to tax evaders, then the diff-in-diff estimator for the response of tax evaders is: $\log[(s + g^t)/(s + g^c)]$. At a first-order approximation this is $1/s$ times larger than $\log[(1 + g^t)/(1 + g^c)]$.

a 11 percent drop in deposits means, we need to take a stance on how large s is. If, as available evidence suggests, s is around 50 percent, then treaties are associated with a roughly 22 percent average drop in tax evaders' deposits. This is probably much more than expected by those who considered treaties worthless: upon request information exchange seems enough to substantially affect behavior. But it does not seem strong enough to affect the deposit behavior of the majority of individuals: as long as s is larger than 20–25 percent, our results imply that only a minority of tax evaders (weighted by assets) have moved funds in response to treaties.

Another issue in the interpretation of the magnitude of β is that if tax evaders respond to treaties by shifting deposits, then our comparison group of "no treaty" country pairs is also affected by treaty signature. We now augment the model to tackle this issue.

B. *Deposit Shifting*

Table 2 explicitly models shifting behavior. To fix ideas, consider the France-Cayman Islands pair. To explain the amount of French deposits held in the Cayman Islands, we introduce in columns 1–3 a treaty coverage variable that simply counts the number of treaties signed by France with the world's 51 tax havens other than the Cayman Islands. Column 1 shows that an additional treaty signed by France, say with Switzerland, increases the deposits held by French residents in the Cayman Islands by 0.6 percent. More generally, it increases French deposits by an average of 0.6 percent in each of the 12 havens other than Switzerland for which we have bilateral data. It is natural to assume that deposits are also shifted to the havens for which we have no bilateral data, which host around 25 percent of offshore deposits. If each haven attracts funds in proportion to its initial deposit stock, a treaty signed by France with Switzerland increases French deposits in each of the world's havens other than Switzerland by 0.6 percent.[14]

As column 2 shows, this shifting only occurs to the benefit of the havens that do not have a treaty with France (i.e., when $Signed = 0$). In such havens, an additional treaty signed by France is associated with 1.2 percent more French-owned deposits. By contrast, the havens that have a treaty with France (i.e., when $Signed = 1$) do not attract deposits. Note also that when we account for shifting, the signature of a treaty between say France and Switzerland still significantly decreases French deposits in Switzerland, just as we found previously.[15]

Since 2005, 18 tax havens have cooperated with EU countries in combatting tax evasion under the Savings Directive. When a bank in Jersey, for instance, pays interest to a French resident, it withholds 35 percent of the interest payment as a tax and remits 75 percent of the proceeds to France without disclosing the identity of the

[14] The fact we do not have bilateral data for all the world's tax havens does not bias our estimate of the magnitude of shifting. Having more bilateral data would simply make our estimate more precise.

[15] In column 2 of Table 2, *Signed* appears in three places, all of which need to be accounted for when computing the total effect of an additional treaty on bilateral deposit. Assuming that treaty coverage $= 6$ (which is the mean number of compliant treaties signed by OECD countries with tax havens in the 2008–2011 period), the total coefficient on Signed is $-0.0498 + 6 \times (0.0001 - 0.0120) = -0.12$. This coefficient is comparable to the coefficient found in column 2 of Table 1.

Table 2—Panel Regressions of Bilateral Bank Deposits Taking into Account Deposit Shifting

	Bank: Havens Saver: Nonhavens					
	Treaty coverage: Number			Treaty coverage: Share		
	(1)	(2)	(3)	(4)	(5)	(6)
Signed	−0.1659***	−0.0498	−0.0750	−0.1468**	−0.0816	−0.0933
	(0.0052)	(0.4286)	(0.2410)	(0.0139)	(0.2444)	(0.1852)
Saving tax directive (*STD*)	−0.2161***	−0.2198***	−0.1553***	-0.2130***	−0.2135***	−0.1815***
	(0.0004)	(0.0003)	(0.0077)	(0.0005)	(0.0005)	(0.0018)
Treaty coverage	0.0059**			0.1272*		
	(0.0402)			(0.0568)		
Treaty coverage × *Signed*		0.0001			0.0277	
		(0.9719)			(0.7373)	
Treaty coverage × (1-*Signed*)		0.0120***			0.1752**	
		(0.0033)			(0.0318)	
Treaty coverage × *STD* × *Signed*			−0.0030			−0.0679
			(0.3202)			(0.4762)
Treaty coverage × (1-*STD*) × *Signed*			0.0066			−0.0927
			(0.1937)			(0.4975)
Treaty coverage × *STD* × (1-*Signed*)			−0.0071			0.1913*
			(0.3697)			(0.0962)
Treaty coverage × (1-*STD*) × (1-*Signed*)			0.0183***			0.2868***
			(0.0000)			(0.0027)
Constant	3.2147***	3.2115***	3.2094***	3.2285***	3.2275***	3.2259***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Observations	30,960	30,960	30,960	30,610	30,610	30,610
R^2	0.0829	0.0841	0.0867	0.0835	0.0838	0.0855
Number of country pairs	1,285	1,285	1,285	1,264	1,264	1,264
Country pair fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: p-values in parentheses, based on robust standard errors clustered at the country-pair level. The dependent variable is the stock of deposits held by savers of country i in banks of tax haven j at the end of quarter q. The unit of observation is the country-haven pair (i, j) and the sample period goes from 2003:IV to 2011:II. *Signed* is a dummy equal to 1 if there exists a treaty providing for information exchange between i and j in quarter q. *STD* is a dummy equal to one if the country-haven pair (i, j) applies the EU Savings Directive. In columns 1–3, *Treaty coverage* counts the number of treaties that i has with tax havens other than j. In columns 4–6, *Treaty coverage* measures the share of the deposits held in 2004 by residents of country i in BIS-reporting havens that are covered by a treaty in quarter q.

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Source: Restricted bilateral locational banking statistics

taxpayer. A number of havens, however, do not participate in the Directive, most notably Singapore, Hong Kong, the Bahamas, and Bahrain. Strikingly, we find that deposit shifting in response to treaties only occurs to the benefit of the havens that do not participate in the EU Savings Directive. As shown in column 3, an additional treaty signed by France does not affect the deposits in havens that apply the Directive (i.e., when $STD = 1$), but it increases deposits by 1.8 percent in havens that do not apply it and do not have a treaty with France. To put it simply, deposits go to the least compliant havens. Table 2 also confirms the finding of existing studies that the Directive itself significantly affected the bank deposits of EU residents in participating havens (Johannesen 2010).

The number of treaties signed is a crude measure of treaty coverage. Treaties with Switzerland and Luxembourg are much more important for France in fighting tax evasion than treaties with Vanuatu and Saint Lucia. We therefore construct a second measure of treaty coverage that weighs treaties according to their importance.

For each country i and haven j for which we have bilateral deposit data, we compute the share of i's deposits in tax havens which were placed in j during the first year of our sample. In 2004, the location of deposits was unaffected by the European Savings Directive which was not yet implemented, and largely unaffected by treaties which were still few in numbers. The shares, therefore, measure the relative importance of haven j to tax evaders of country i and are exogenous to recent policy developments. For each country-haven pair (i, j), we use the shares to weigh each treaty concluded by i with havens other than j. The resulting measure of treaty coverage takes values between zero (no treaty) and one (full coverage). By construction, this measure only takes into account treaty coverage over the 13 havens for which we have bilateral deposit data.

As columns 4 to 6 show, with this measure of treaty coverage the results are similar to those obtained with the measure that merely counts the number of treaties signed. Consider a treaty between France and a haven which, in 2004, attracted 10 percent of the deposits owned by French residents in tax havens. According to column 4, such a treaty causes a 1.2 percent average increase in French deposits in each other BIS-reporting tax haven. As columns 5 and 6 suggest, only the havens that have no treaty with France and that are not covered by the EU Savings Directive attract deposits.

The results in Tables 1 and 2 show that there is a strong correlation between treaty signature and subsequent deposit growth in tax havens. To conclude that the changes in deposits we observe are caused by treaties, we need to assume that in a counterfactual world without treaties, the deposits in the "treaty" and "no treaty" pairs would have grown similarly. This key identifying assumption deserves a careful examination.

C. *Tests of Identification Strategy*

We have conducted two tests of our identification strategy. A first test examines the possibility that tax havens might have systematically signed treaties with countries that were placing less and less deposits in their banks relative to the global trend, which would introduce a spurious relationship between treaty signature and deposit growth. We investigate this possibility by running probit models of the form

$$(2) \qquad Treaty_{ijq} = \alpha + \beta_2 Growth_{ijq} + \delta X_{ijq} + \gamma Distance_{ij} + \zeta_i + \theta_q + \epsilon_{ijq},$$

where $Treaty_{ijq}$ is a dummy equal to 1 if i and j sign an information exchange treaty in quarter q, $Growth_{ijq}$ captures the growth rate of the deposits held by savers of country i in haven j before quarter q, X_{ijq} includes other bilateral factors, ζ_i denotes saver-country fixed effects and θ_q time fixed effects.

We want to know whether the probability to sign a treaty is affected by past deposit growth rates, i.e., whether β_2 is different from zero.[16] We consider two

[16]The determinants of treaty signature have been studied theoretically by Bacchetta and Espinosa (2000); Eggert and Kolmar (2002); and Huizinga and Nielsen (2003); and empirically by Ligthart, Vlachaki, and Voget

Table 3—Probit Models of Treaty Signature

Variables	Bank: Havens Saver: Nonhavens			
	(1)	(2)	(3)	(4)
Deposit growth rate, −4q to 0q	0.0004	0.0011	−0.0010	−0.0013
	(0.6916)	(0.4146)	(0.6283)	(0.7340)
Deposit growth rate, −8q to −4q	−0.0017*	−0.0012	−0.0019	−0.0037
	(0.0849)	(0.3985)	(0.2841)	(0.2745)
Deposits (in logs)			0.0010**	0.0034***
			(0.0398)	(0.0002)
Distance (in logs)			−0.0041***	−0.0039*
			(0.0000)	(0.0513)
GDP (in logs)			0.0041***	0.0991***
			(0.0000)	(0.0041)
Observations	56,069	37,053	11,844	4,743
Time fixed effect	No	Yes	Yes	Yes
Saver-country fixed effect	No	No	No	Yes

Notes: p-values in parentheses, based on robust standard errors. This table investigates what determines the signature of a treaty between a country i and a tax haven j. The dependent variable is a dummy equal to 1 if a country i and haven j sign an information exchange treaty in quarter q. The unit of observation is the country-haven pair (i, j) and the sample period goes from 2003:IV to 2011:II. The estimates are marginal effects. *Deposit growth rate* captures the growth rate of the deposits held by savers of country i in haven j before quarter q. We consider two measures of the growth rate of deposits: the percentage growth over the four quarters before q and the percentage growth from eight quarters to four quarters before q. *Deposits* is the log of the stocks of deposits held by country i in haven j in quarter q, *GDP* the log of country i's GDP (from the World Bank's World Development Indicator), *Distance* the geodesic distance between i and j (from the CEPII database, http://www.cepii.fr/anglaisgraph/bdd/distances.htm).

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Source: Restricted bilateral locational banking statistics

measures of deposit growth: the percentage growth over the four quarters before q, and the percentage growth from eight quarters to four quarters before q. The results are in Table 3. As column 1 shows, the probability to sign a treaty is not affected by the growth rate of deposits during the year preceding treaty signature. It is marginally affected by deposit growth from eight quarters to four quarters before treaty signature, but this barely significant correlation disappears when we control for time fixed effects (column 2): it reflects the fact that most treaties were signed during the financial crisis, when deposits were falling worldwide.

Columns 3 and 4 show that the *level* of deposits, distance, and GDP are significant determinants of the probability to sign a treaty. But when we control for those factors, the probability to sign a treaty remains unaffected by past growth rates of deposits. On average, treaties were not concluded by country-haven pairs where deposits were growing more slowly than the global trend.

(2011); Bilicka and Fuest (forthcoming); and Elsayyad (2012).

Our second test examines whether the country-haven pairs that signed a treaty and those that did not experienced an otherwise similar evolution over the period of study. The goal of this test is to make sure that the correlation we observe between treaty signature and subsequent deposit growth is not driven by an unobserved third factor such as a slowdown in the financial activity of relatively compliant havens.

The idea of the test is simple: if a confounding trend were driving our results, then treaty signature should be associated with a subsequent lower growth of the haven activities that are unrelated to treaties. So we study how those unrelated activities evolve in the "treaty" and "no treaty" groups. We focus on the inter-bank activities of tax havens. Haven-based banks receive large amounts of deposits from foreign banks, which they use in turn to grant loans. Interbank deposits received by tax havens are unrelated to personal tax evasion, so they should not be affected by information exchange agreements. But they are sensitive to the international business cycle, to domestic conditions in the havens, and more generally to any trend that could potentially confound our analysis of treaties. In columns 1–2 of Table 4, we run the same regression for interbank deposits as we did for the deposits owned by "nonbanks" in column 2 of Table 1 and column 2 of Table 2, our core specifications. The results show that treaties have zero effect on interbank deposits. In other words, interbank deposits have evolved similarly in the "treaty" and "no-treaty" pairs. The statistically significant effect of treaties on "nonbank" deposits is thus unlikely to be driven by an omitted differential time trend.

Our two tests establish that we have a reasonably valid natural experiment: the country-haven pairs in our sample have similar ex ante and ex post observable characteristics, the sole relevant difference being that some pairs signed an information exchange agreements while others did not. The correlations we document between treaty signature and subsequent deposit growth can thus be considered causal. We present below further robustness checks.

D. *Robustness Tests*

OECD countries have concluded many more treaties than developing countries. Our results, one could fear, might be driven by asymmetric shocks reducing the deposits of developed countries relative to those of developing countries, such as the 2008–2009 financial crisis. To address this concern, we restrict the sample to OECD countries only. Columns 3–4 of Table 4 show that the response to treaties is slightly larger in the OECD sample than in the full sample, though qualitatively similar.

Second, we run the regressions with exchange rate adjusted deposit stocks. So far, we have used data that convert deposits in pounds, euros or Swiss francs into US dollars using end of quarter exchange rates. If a large share of bank deposits in Switzerland are denominated in Swiss francs and if Switzerland signed most of its treaties during a period when the Swiss franc depreciated, there is a risk that we capture a spurious effect of treaties on deposits. To address this issue, we construct an exchange rate adjusted measure of deposit stocks. For each country-pair, we know what fraction of deposits are denominated in US dollars, euros, British pounds,

Table 4—Tests of Identification Strategy and of Robustness

Variables	Bank: Havens							
	Saver: Nonhavens Interbank deposits		Saver: OECD OECD countries only		Saver: Nonhavens Exchange-rate adjusted		Saver: OECD Country-year fixed effects	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Signed	−0.0248	−0.0425	−0.1905***	−0.1230	−0.0890*	−0.0431	−0.2962***	−0.1407*
	(0.7963)	(0.7083)	(0.0094)	(0.1321)	(0.0954)	(0.4898)	(0.0001)	(0.0862)
STD		−0.0224		−0.5302***		−0.2279***		−0.6431***
		(0.8235)		(0.0000)		(0.0002)		(0.0005)
Treaty coverage × *Signed*		0.0004		0.0052		0.0015		0.0022
		(0.9449)		(0.1956)		(0.5938)		(0.6543)
Treaty coverage × (1-*Signed*)		−0.0034		0.0128**		0.0125***		0.0115**
		(0.6904)		(0.0210)		(0.0023)		(0.0151)
Constant	3.7524***	3.7532***	4.8144***	4.7834***	3.2197***	3.2197***	3.2197***	3.2197***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Observations	20,489	20,489	8,049	8,049	30,693	30,693	8,049	8,049
R^2	0.0394	0.0395	0.0852	0.1129	0.0644	0.0693	0.1744	0.1903
Number of country pairs	1,004	1,004	307	307	1,270	1,270	307	307
Country pair fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Saver-year dummies	No	No	No	No	No	No	Yes	Yes
Bank-year dummies	No	No	No	No	No	No	No	No

Notes: p-values in parentheses, based on robust standard errors clustered at the country-pair level. The dependent variable is the stock of deposits held by savers of country i in banks of tax haven j at the end of quarter q. The unit of observation is the country-haven pair (i, j) and the sample period goes from 2003:IV to 2011:II. *Signed* is a dummy equal to 1 if there exists a treaty providing for information exchange between i and j in quarter q. *STD* is a dummy equal to one if the country-haven pair (i, j) applies the EU Savings Directive. *Treaty coverage* counts the number of treaties that i has with tax havens other than j. Columns 3–10 consider the deposits held by nonbank agents; columns 1–2 the deposits held by banks.

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Source: Restricted bilateral locational banking statistics

Swiss francs, and yen. We use this currency decomposition to hold exchange rates fixed at their end-of-2003 level. The results are reported in columns 5–6 of Table 4. The estimated effects of treaties are slightly smaller but qualitatively identical to the core specifications.

This result may come as a surprise given the large exchange rate movements during the financial crisis. But it can easily be explained. The online Appendix shows that the currency composition of deposits is strikingly similar in the group of "treaty" and "no treaty" country pairs: it is not correlated with treaty signature. For this reason, exchange rate changes are absorbed by our time fixed-effects and do not interfere with the identification of the impact of treaties.

In a final robustness check, we sequentially add country-year dummies and haven-year dummies to the core specifications. Country-year dummies control for all time-varying factors at the country level, such as changes in compliance efforts, capital tax rates or the incomes of top earners who are most likely to hold assets in tax havens. Haven-year dummies control for all time-varying factors at the haven level, such as bank crises or changes in political environment. The estimated effects

are robust to the inclusion of country-year dummies, as shown by columns 7–8 of Table 4. When we include both country-year dummies and haven-year dummies, we still find a modest effect of treaties on deposits but are unable to identify a deposit shifting effect (results not reported).

IV. Deposits Held through Sham Corporations

There is a great deal of anecdotal evidence suggesting that clients of offshore banks routinely use sham corporations with addresses in tax havens such as Panama as nominal owners of their bank accounts in Switzerland and other havens. The IRS, for instance, provides case studies of tax evasion by US individuals through a big Swiss bank revealing a quasi-systematic use of shell companies.[17] This section focuses on how deposits held through sham corporations have responded to the wave of tax treaties.

Remember that when a French saver holds assets in Switzerland through a sham Panamanian company, the BIS assigns the funds to Panama. This convention explains why haven-haven deposits are so important in the BIS statistics: in the first half of 2011, they accounted for around $550 billion, almost 25 percent of all the deposits in tax havens. Deposits from the British Virgin Islands and Panama were particularly important. Both jurisdictions have flexible corporate laws that make it simple to create companies in a few minutes.

Using a sham corporation as nominal account holder adds a layer of secrecy between an account and its beneficial owner: essentially, accounts held through sham corporations are equivalent to numbered accounts, which are today prohibited by anti-money laundering regulations. Sham corporations also help avoiding taxes: the EU Savings Directive does not apply to the deposits held by European residents through sham companies. But they do not protect from information exchange treaties. If France and Switzerland have a treaty and French authorities suspect a taxpayer of hiding funds in Switzerland, they can ask Switzerland to provide the relevant information, even if the funds are held through a shell company. Banks are required by anti-money laundering regulations to know at all times who are the ultimate owners of the assets they manage. They must provide this information to foreign authorities that file information requests under a treaty.

The implication is that if tax evaders respond to treaty signature, then treaties concluded between havens like Switzerland and countries like France should affect the Swiss deposits held by French residents through sham corporations, i.e., the Swiss deposits that the BIS assigns to the British Virgin Islands, Panama, and other havens.

Table 5 investigates whether this is the case by analyzing the evolution of haven-haven deposits. In column 1, we regress haven-haven deposits (e.g., Swiss deposits assigned to Panama) on the number of treaties concluded by banking havens (e.g., Switzerland) with nonhaven countries (e.g., France). A treaty between France and

[17] See http://www.irs.gov/uac/Offshore-Tax-Avoidance-and-IRS-Compliance-Efforts. See also Zaki (2010) for anecdotal evidence on the use of sham corporations by Europeans, and Hanlon, Maydew, and Thornock (forthcoming) for evidence on the use of sham offshore corporations by US tax evaders for their US investments.

Table 5—Panel Regressions of Bank Deposits Held through Sham Corporations

	Bank: Havens Saver: Havens			
	Treaty coverage: Number		Treaty coverage: Share	
	(1)	(2)	(3)	(4)
Treaty coverage, banking haven with nonhaven countries	−0.0067** (0.0188)	−0.0095*** (0.0015)	−0.5900*** (0.0000)	−0.6045*** (0.0000)
Treaty coverage, banking haven with other tax havens		0.0087 (0.3362)		0.0224 (0.9103)
Signed		0.0536 (0.6726)		0.1005 (0.4022)
Constant	4.3572*** (0.0000)	4.3604*** (0.0000)	4.4043*** (0.0000)	4.4057*** (0.0000)
Observations	8,798	8,798	8,798	8,798
R^2	0.1188	0.1199	0.1359	0.1365
Number of country pairs	346	346	346	346
Country pair fixed effect	Yes	Yes	Yes	Yes
Time fixed effect	Yes	Yes	Yes	Yes

Notes: p-values in parentheses, based on robust standard errors clustered at the country-pair level. The table investigates how the signature of a treaty between a tax haven (e.g., Switzerland) and a nonhaven country (e.g., France) affects the deposits recorded by the BIS as belonging to tax havens (e.g., the deposits in Swiss banks recorded as belonging to Panama). The dependent variable is the stock of deposits recorded as belonging to haven i (e.g., Panama) in the banks of haven j (e.g., Switzerland) at the end of quarter q. The unit of observation is the haven-haven pair (i, j) and the sample period goes from 2003:IV to 2011:II. For a given banking haven j, there are up to 41 "saving" havens i. We consider the deposits held in 13 banking havens j. In columns 1–2, *Treaty coverage, banking haven with nonhavens* counts the number of treaties that j has with nonhaven countries (and *Treaty coverage, banking haven with other tax havens* the number of treaties that j has with other havens). In columns 3–4, the *Treaty coverage*, variables measure the share of the deposits held by nonhaven (resp. haven) countries in haven j in 2004 that are covered by a treaty in quarter q. *Signed* is a dummy equal to 1 if there exists a treaty providing for information exchange between haven i and haven j in quarter q.

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Source: Restricted bilateral locational banking statistics

Switzerland reduces the Swiss deposits registered as belonging to each tax haven by 0.7 percent on average.

In column 2, we investigate whether haven-haven treaties matter for the pattern of haven-haven deposits. Neither a treaty between Switzerland and Panama $(Signed = 1)$ nor treaties between Switzerland and havens other than Panama affect the value of the Swiss deposits assigned to Panama in the BIS statistics, which is fully consistent with our interpretation of what haven-haven deposits represent. Indeed, there is no reason why information exchange between Panama and Switzerland should affect the French residents who use sham corporations in Panama as nominal owners of their Swiss accounts.

In columns 3 and 4, we run the same regressions as in columns 1 and 2 but with the measure of treaty coverage that weighs treaties by the importance of the deposits covered. The estimated effects are statistically and economically significant. Consider a treaty between France and Switzerland. Assume that French residents hold 10 percent of all Swiss deposits belonging to nonhaven countries. Column 3

suggests that such a treaty reduces the bank deposits in Switzerland registered as belonging to tax havens (e.g., Panama) by 4.5 percent.[18] Now assume that French residents are also the ultimate owners of 10 percent of the Swiss deposits registered as belonging to tax havens. Under this assumption, a treaty between France and Switzerland causes a 45 percent reduction of the deposits held in Switzerland by French savers through sham corporations. Under plausible assumptions, the tax evaders who use sham corporations may have responded strongly to the G20 crackdown.

There is one caveat, however: since we cannot identify the ultimate owners of the deposits held through sham corporations, the results in Table 5 rely on variation at the haven level rather than variation at the country-haven-pair level. It is an unfortunate feature of cross-border bank deposits statistics that they are based on immediate rather than beneficial ownership. If deposit data were established on a beneficial ownership basis, almost no deposits would be assigned to the British Virgin Islands or Panama; more deposits would be assigned to the US, Italy, or France; and it would be easier to track the progress made in the fight against tax evasion.

V. The Compliance Effect of Treaties

Our results so far indicate that the G20 initiative has caused a relocation of deposits between tax havens leaving the funds globally held offshore roughly unchanged. But depositors may have responded to the crackdown by complying more with tax laws while keeping their funds in tax havens. In this section we analyze the available evidence on the compliance effect of treaties.

There are two types of data at hand. First, we have direct information on tax compliance in Switzerland, probably the most important tax haven as far as personal wealth management is concerned.[19] Since mid-2005, in the context of the EU Savings Directive, Swiss banks must withhold a tax on interest income paid to European households who own Swiss accounts. Savers can escape the withholding tax if they voluntarily declare their income to their home country tax authority. Swiss authorities have published on a yearly basis the amount of interest earned by residents of each EU country, as well as what fraction of this income savers have chosen to voluntarily disclose. We know for instance that in 2011, French residents earned CHF 324 million in interest, and chose to declare 33 million, or about 10 percent. To our knowledge, this unique dataset has never been used before in the literature.[20]

It enables us, for one key haven and 27 counterpart countries, to conduct a direct test of the compliance effect of treaties. We analyze how the share of interest declared has evolved over 2006–2011 for the 15 EU countries that have signed a treaty with Switzerland since 2008 (e.g., France, Spain, Austria), and for the 12 countries that have not (e.g., Belgium, Portugal, Hungary). As shown by Figure 7, there has been a general increase in compliance over the 2006–2011 period. But

[18] $(\exp(-0.59) - 1) \times 10 = 4.5$ percent.

[19] Switzerland comes second to the Cayman Islands in terms of deposits, but an exceptionally high fraction of deposits in Swiss banks seem to belong to individuals (80–90 percent, whereas our informed guess for the average across all havens is about 50 percent).

[20] The data are available on the authors' websites.

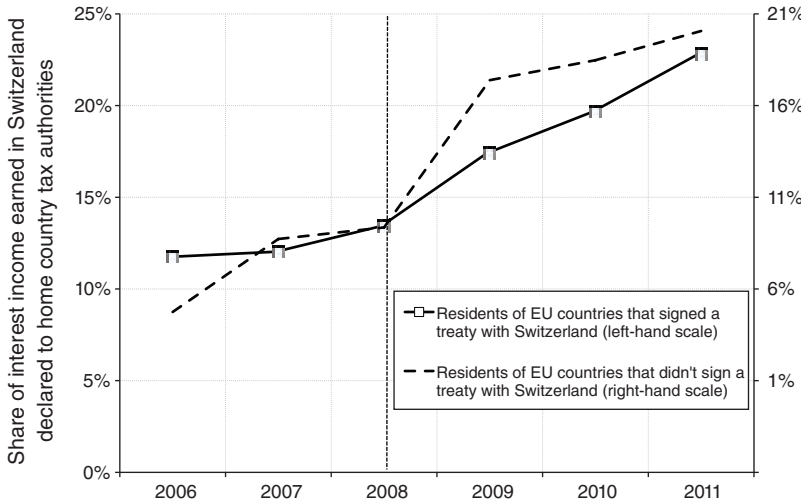

Figure 7. Fraction of Interest Income Earned by EU Residents in Swiss Banks Declared to Home Country Tax Authorities

Source: Administration fédérale des contributions

there is no indication that this trend has been any stronger for the countries that have signed a treaty with Switzerland. And indeed, when we use the same regression framework as in Section III, we find that treaty signature has no statistically significant effect on the fraction of interest that taxpayers chose to declare.[21] Despite the G20 initiative, the general level of compliance of EU Swiss bank account holders remains low, around 10–20 percent.[22]

The second type of evidence on tax enforcement comes from the OECD (2011), which has gathered data on the amount of taxes recovered due to increased compliance on the part of offshore account holders. Over the 2009–2011 period, the OECD (2011) reports an increase of almost EUR 14 billion in taxes paid in rich countries. This is certainly far from negligible. However, assuming that evaders paid in taxes and penalties an amount equivalent to 5 percent of their assets (which is what the OECD reports for Italy, Mexico, and the United Kingdom), then the OECD figures imply that about $350 billion in offshore assets may have been disclosed to tax authorities. This figure falls short of the $6 trillion or so likely held by households in tax havens.[23] Taken at face value, the OECD's findings do not lend support to the view that compliance has considerably improved.

The evidence we have just described is far from systematic. There is no cross-country database on tax compliance comparable to the BIS' bank deposit statistics. So we cannot fully exclude a large increase in compliance in havens other than

[21] See online Appendix.

[22] The compliance figures reported on Figure 7 are upper bounds, for one simple reason. They are obtained by dividing interest declared by interest earned, but the denominator excludes interest earned by EU residents through sham corporations, and a very large fraction of Swiss bank fiduciary deposits are held through sham corporations.

[23] Based on interviews with wealth managers, Damish et al. (2010) puts the amount of offshore wealth at $7.4 trillion in 2009. This figure is close to the one found by Zucman (2013), who reckons that 8 percent of households' financial wealth is held in tax havens, which is around $6 trillion in 2008.

Switzerland. Better measuring compliance and its determinants is an important challenge for future research.

VI. Concluding Remarks

Conventional wisdom among policymakers is that the G20 tax haven crackdown is a success. The evidence presented in this paper challenges this view. It suggests that, so far, treaties have led to a relocation of bank deposits between tax havens but have not triggered significant repatriations of funds. The least compliant havens have attracted new clients, while the most compliant ones have lost some, leaving roughly unchanged the total amount of wealth managed offshore.

Although this is disappointing, we emphasize that the G20 initiative is not useless. We find evidence that some tax evaders have responded to the wave of tax treaties. Many experts were skeptical that upon request information sharing could achieve anything at all. Our results belie the most pessimistic views on the efficacy of treaties: even a weak threat of enforcement is sometimes enough to affect behavior. Further, uncertainties remain on the extent to which treaties have induced tax evaders to comply more with tax laws while keeping their funds offshore.

Yet our results suggest that there is room to improve the fight against offshore tax evasion. First, the G20 could urge tax havens to sign treaties with all countries: a comprehensive multilateral agreement would prevent tax evaders from transferring their funds from haven to haven. Second, our results suggest that even in the presence of a complete network of upon request information exchange treaties, there may remain a scope for improved tax collection by making treaties more demanding.

The G20 tax haven crackdown is a major coordinated initiative against tax evasion at the global level. Another important initiative, at the regional level, is the European Union Savings Directive. The G20 initiative relies on information exchange treaties; the EU Savings Directive imposes a withholding tax on interest income earned by European residents in a number of cooperating tax havens. So far, both policies have pitfalls: treaties are not comprehensive enough; the EU withholding tax exempts equities and derivatives, and does not look through sham corporations that tax evaders routinely use (Johannesen 2010; Zucman 2013). Therefore, what is the best tool—treaty or tax—to combat offshore tax evasion remains an open question.

A comprehensive network of treaties providing for automatic exchange of information would put an end to bank secrecy and could make tax evasion impossible. Taxes withheld on all incomes earned by foreign residents in all tax havens could also make tax evasion impossible, while maintaining some form of bank secrecy. Which of the two instruments would maximize tax revenues while minimizing administrative costs, including the costs of negotiating with tax havens? There is need for more research on this question. Policymakers have diverging views: on the one hand, the European Union Commission pushes for automatic exchange of information, just like the United States with the Foreign Account Tax Compliance Act (FATCA), but on the other hand countries such as Germany and the United Kingdom are negotiating a comprehensive withholding tax with Switzerland.

Another question raised by our study is why some havens cooperate more than others. Tax havens have a strong economic interest in bank secrecy. But maybe

abandoning bank secrecy has a positive effect on a haven's reputation, which may help it attract other financial activity, such as the incorporation of investment funds. This issue would deserve to be further analyzed.

REFERENCES

Alworth, Julian S., and S. Andresen. 1992. "The Determinants of Cross-Border Non-Bank Deposits and the Competitiveness of Financial Market Centres." *Money Affairs* 5 (2): 105–33.

Bacchetta, Philippe, and Maria Paz Espinosa. 2000. "Exchange-of-Information Clauses in International Tax Treaties." *International Tax and Public Finance* 7 (3): 275–93.

Bank for International Settlements. 2002–2011. "Locational Banking Statistics: 3 External loans and deposits of banks in individual reporting countries." http://www.bis.org/statistics/bankstats.htm (accessed November 27, 2011).

Bank for International Settlements. 2008. *Guidelines to the international locational banking statistics*. Monetary and Economic Department. Basel, December, (Orig. pub. 2006).

Bilicka, Katarzyna, and Clemens Fuest. Forthcoming. "With which countries do tax havens share information?" *International Tax and Public Finance*.

Blonigen, Bruce A., and Ronald B. Davies. 2005. "Do Bilateral Tax Treaties Promote Foreign Direct Investment?" In *Economic and Legal Analysis of Laws and Institutions,* Vol. 2, *Handbook of International Trade*, edited by E. Kwan Choi and James C. Hartigan, 526–46. Blackwell Publishers.

Blonigen, Bruce A., Lindsay Oldenski, and Nicholas Sly. 2011. "Separating the Opposing Effects of Bilateral Tax Treaties." National Bureau of Economic Research (NBER) Working Paper 17480.

Brown, Martin, Barbara Döbeli, and Philip Sauré. 2011. "Swiss Bank Accounts." Unpublished.

Chan, Kalok, Vicentiu M. Covrig, and Lilian K. Ng. 2005. "What Determines the Domestic Bias and Foreign Bias? Evidence from Mutual Fund Equity Allocations Worldwide." *Journal of Finance* 60 (3): 1495–1534.

Chetty, Raj, Adam Looney, and Kory Kroft. 2009. "Salience and Taxation: Theory and Evidence." *American Economic Review* 99 (4): 1145–77.

Damish, Peter, Bruce Holey, Monish Kumar, Matthias Naumann, Tjun Tang, and Anna Zakrzewski. 2010. *Global Wealth Report, Regaining Lost Ground*. Boston Consulting Group. Boston, June.

Desai, Mihir A., and Dhammika Dharmapala. 2011. "Dividend Taxes and International Portfolio Choice." *Review of Economics and Statistics* 93 (1): 266–84.

Desai, Mihir A., C. Fritz Foley, and James R. Hines. 2006. "The Demand for Tax Haven Operations." *Journal of Public Economics* 90 (3): 515–31.

Dharmapala, Dhammika. 2008. "What problems and opportunities are created by tax havens?" *Oxford Review of Economic Policy* 24 (4): 661–79.

Dharmapala, Dhammika, and James R. Hines. 2009. "Which Countries Become Tax Havens?" *Journal of Public Economics* 93 (9–10): 1058–68.

di Giovanni, Julian. 2005. "What Drives Capital Flows? The Case of Cross-Border M&A Activity and Financial Deepening." *Journal of International Economics* 65 (1): 127–49.

Eggert, Wolfgang, and Martin Kolmar. 2002. "Residence-Based Capital Taxation in a Small Open Economy: Why Information is Voluntarily Exchanged and Why it is Not." *International Tax and Public Finance* 9 (4): 465–82.

Elsayyad, May. 2012. "Bargaining Over Tax Information Exchange." Max Planck Institute for Tax Law and Public Finance Working Paper 2012-02.

Elsayyad, May, and Kai A. Konrad. 2011. "Fighting multiple tax havens." *Journal of International Economics* 86 (2): 295–305.

G20. 2009. "The Global Plan for Recovery and Reform, Final Communique of the G20 Summit Held in London on 2 April 2009." http://www.g20ys.org/upload/files/London_1.pdf (accessed November 12, 2011).

Global Forum on Transparency and Exchange of Information for Tax Purposes. 1998–2011. "Exchange of Information Portal." http://www.eoi-tax.org (accessed November 12, 2011).

Hanlon, Michelle, Edward L. Maydew, and Jacob R. Thornock. Forthcoming. "Taking the Long Way Home: Offshore Investments in U.S. Equity and Debt Markets and U.S. Tax Evasion." *Journal of Finance.*

Hemmelgarn, Thomas, and Gaëtan Nicodème. 2009. "Tax Co-ordination in Europe: Assessing the First Years of the EU-Savings Taxation Directive." European Commission Working Paper 18.

Hines, James R., Jr., and Eric M. Rice. 1994. "Fiscal Paradise: Foreign Tax Havens and American Business." *Quarterly Journal of Economics* 109 (1): 149–82.

Huizinga, Harry, and Gaëtan Nicodème. 2004. "Are international deposits tax-driven?" *Journal of Public Economics* 88 (6): 1093–1118.

Huizinga, Harry, and Søeren Bo Nielsen. 2003. "Withholding taxes or information exchange: the taxation of international interest flows." *Journal of Public Economics* 87 (1): 39–72.

Johannesen, Niels. 2010. "Tax Evasion and Swiss Bank Deposits." Economic Policy Research Unit (EPRU) Working Paper 2010-05.

Johannesen, Niels, and Gabriel Zucman. 2014. "The End of Bank Secrecy? An Evaluation of the G20 Tax Haven Crackdown: Dataset." *American Economic Journal: Economic Policy*. http://dx.doi.org/10.1257/pol.6.1.65.

Keen, Michael, and Jenny E. Ligthart. 2006. "Information Sharing and International Taxation: a Primer." *International Tax and Public Finance* 13 (1): 81–110.

Kleven, Henrik Jacobsen, Martin B. Knudsen, Claus Thustrup Kreiner, Søren Pedersen, and Emmanuel Saez. 2011. "Unwilling or Unable to Cheat? Evidence from a Tax Audit Experiment in Denmark." *Econometrica* 79 (3): 651–92.

Ligthart, Jenny E., Mina Vlachaki, and Johannes Voget. 2011. "The Determinants of Double Tax Treaty Formation." Unpublished.

Louie, Henry J., and Donald J. Rousslang. 2008. "Host-country governance, tax treaties and US direct investment abroad." *International Tax and Public Finance* 15 (3): 256–73.

Organisation for Economic Co-operation and Development (OECD). 2008. *Model Tax Convention on Income and on Capital*. Committee on Fiscal Affairs. Paris: OECD Publishing.

Organisation for Economic Co-operation and Development (OECD). 2011. *The Era of Bank Secrecy is Over: The G20/OECD Process Is Delivering Results.* Paris, October.

Palan, Ronen, Richard Murphy, and Christian Chavagneux. 2010. *Tax Havens: How Globalization Really Works. Cornell Studies in Money*. Ithaca, NY: Cornell University Press.

Shaxson, Nicholas, and John Christensen. 2011. "Time to Black-List the Tax Haven Whitewash." *Financial Times*, April 4.

Sheppard, Lee. 2009. "Don't Ask, Don't Tell, Part 4: Ineffectual Information Sharing." *Tax Notes*, March 23.

U.S. Government Accountability Office (GAO). 2011. *IRS's Information Exchanges with Other Countries Could Be Improved through Better Performance Information. Report to the Permanent Subcommittee on Investigations, Committee on Homeland Security, and Governmental Affairs, U.S. Senate*. Washington, DC, September.

U.S. Senate. 2008. *Tax Haven Banks and U.S. Tax Compliance. Staff Report of the Permanent Subcommitee on Investigations*. Washington, DC, July.

Zaki, Myret. 2010. *Le secret bancaire est mort, vive l'évasion fiscal.* Lausanne: Favre.

Zucman, Gabriel. 2013. "The Missing Wealth of Nations: Are Europe and the U.S. net Debtors or net Creditors?" *Quarterly Journal of Economics* 128 (3): 1321–64.