Tax Evasion and the "Swiss Cheese" Regulation

Clara Martínez-Toledano* Nina Roussille†

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Abstract

This paper studies how investors respond to tax evasion regulations in offshore financial centers. We do so by analyzing the 2005 EU Savings Tax Directive, which introduced a withholding tax on interest income earned by EU households in Switzerland and other offshore centers. Exploiting a unique combination of public administrative Swiss datasets, we find that the reform barely curbed tax evasion: 73% of the European offshore wealth in Switzerland remained both undeclared and untaxed by the time the Directive was repealed. We show that the limited scope of the Directive is mainly explained by tax evaders' active re-investment strategies in tax-exempt assets, as well as ownership transfer to sham corporations registered in tax havens. We rationalize the drivers of declarations by means of a model and document empirically that monetary incentives, such as the increase in the upfront tax in Switzerland or tax amnesties in the evader's home country, appear to be the driving force behind the rise of declarations. Conversely, bilateral information exchange treaties that were praised as a way to "end bank secrecy" have the least effect on declarations.

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*Imperial College London, Department of Finance and Economics, South Kensington Campus, London SW7 2AZ, UK; email: c.martinez-toledano@imperial.ac.uk. Martínez-Toledano is also affiliated at CEPR, CESifo, the EU Tax Observatory, and the World Inequality Lab.

†MIT, Department of Economics, 77 Massachusetts Avenue Cambridge, MA 02139; e-mail: nroussil@mit.edu.

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1 Introduction

Offshore financial wealth amounts to about 8 percent of total household financial wealth (Zucman, 2013) and is highly concentrated at the top of the wealth distribution (Alstadsæter et al., 2019), leading to substantial government revenue losses and a rise in wealth inequality. The past two decades have thus been marked by a number of policy initiatives (e.g., witholding taxes, information exchange agreements, voluntary disclosure programmes, criminal prosecutions, etc.) to fight offshore tax evasion with the ultimate aim of raising government revenues and reducing financial inequality. While many aspects of these policies have been studied in isolation, less is known about how these policies interact with each other, and their relative effectiveness.

This paper offers a comprehensive picture of how investors respond to simultaneous tax evasion regulations in offshore financial centers. We do so by first unpacking the effects of one of the most far-ranging initiatives in the attempt to curb tax evasion in Europe, the 2005 "Savings Tax Directive", and, second, by comparing its efficacy to other forms of policies, such as voluntary disclosure programmes and information exchange treaties.

Before the implementation of the 2005 "Savings Tax Directive", European country tax administrations had no legal lever to tax wealth hidden in offshore centers. Under the Directive, Switzerland, as well as other compliant offshore centers, agreed to tax the interest income of European households who do not declared this revenue to their home country. This left tax evaders with two choices: either report their Swiss accounts to the fiscal authorities of their resident countries or pay the upfront tax and keep their anonymity. Under this rule, investors that were already declaring their Swiss revenues to their home country remained unaffected.

With the implementation of this Directive, European governments pursued two complementary goals. In the short run, this Directive was aimed at collecting tax revenue on otherwise untaxed accounts. In the longer run, the tax was also meant to incentivise tax evaders to declare their offshore accounts. Indeed, the upfront tax reduced the benefit of holding a hidden bank account in Switzerland, while the risk of being caught and the associated consequences (i.e., large penalties, legal pursuits etc.) remained. The incentives to declare hidden bank accounts to tax authorities also increased over time as the upfront tax withholding went from 15% for the interest payments earned before June 30th 2008, to 20% for those earned between July 1st 2008 and July 1st 2011 and finally to 35% for the interest payments earned from July 1st 2011 onwards. On October 14 2014 the European Commission announced its intention to repeal the Directive and replace it by the Global Standard on automatic exchange of financial account information, which was effectively adopted in November 2015. This announcement was made short after the G20 Finance Ministers agreed on February 23 2014 to implement the Global Standard on

automatic exchange of financial account information. To avoid confounding our analysis of the Directive with the response to this new regulation, we end our analysis of the Directive in the end of 2013.

We combine a unique set of public administrative Swiss datasets to study the effectiveness, or lack thereof, of the Directive. The first dataset is the Swiss Federal Tax Administration ("Administration fédérale des contributions", AFC) annual publication about the Directive, which includes the amount of interest collectively earned by investors, separately for each EU country. The second dataset is derived from the publications of the Swiss National Bank. Since 1998, the Swiss National Bank (SNB) has published the value of the offshore portfolios in Swiss banks. Crucially, the Swiss National Bank provides a breakdown of securities held by foreigners (and Swiss residents) by asset category (i.e., bonds, equities, mutual fund shares) and type of holder (i.e., private customer, commercial customers or institutional investors). The granularity of the data makes it possible to track whether evaders responded to the tax by re-investing their money in tax-free vehicles, such as stocks or assets held through a sham corporation rather than directly.

Did the Directive successfully achieve its short term goal, namely collecting taxes for the home countries of hidden account holders ? Our computations reveal that approximately three quarters of the income derived from EU offshore wealth in Switzerland remained untaxed in 2013. In other words, only 27% of the EU offshore wealth in Switzerland was either held legally and declared to the account holder home country or remained undeclared, but the income was taxed at the Swiss withholding rate. To give a sense of magnitudes, EU countries only managed to jointly collect on average $104 million per year thanks to the Directive, which represents 0.002% of the average annual EU tax revenues.

To understand the reasons behind the lack of effectiveness of the Directive, we track the behavior of tax evaders. We find that three distinct elements can explain the limited reach of the policy. First, European tax evaders took advantage of the fact that the tax only applied to a subset of capital income, namely interest-yielding accounts, by shifting their assets to tax-free vehicles, namely dividend-yielding securities. We establish this result by comparing the investment strategies of Swiss residents, who were unaffected by the tax, to the investment strategies of foreign account holders, who were affected by the tax. We find that, in the five years before the withholding tax is implemented, Swiss and foreign account holders have very similar investment strategies, both in level and in trend: over the period from 1999 to 2004, about 50% of the assets in both Swiss and foreign portfolios were interest-yielding. However, in the months in between the Directive was signed and applied (October 2004 - July 2005), the share of interest-yielding securities sharply went down by 8 percentage points (a 17% decline), while it remained the same in Swiss portfolios. Two years after the Directive was put in place, the share of interest-yielding securities in Swiss portfolios was still 42%, while that in foreign portfolios had gone down to 30%.

The Swiss National Bank unfortunately does not provide a breakdown of the investment choices of foreigners separately for EU and non-EU residents. However, if we consider that among foreign investors only the EU residents deviated from the investment strategy of Swiss households after the Directive—which seems plausible as non-EU residents were not affected by the Directive—, we can then estimate that the share of interest-yielding securities in EU residents portfolios went all the way down to 17% by 2007.

Second, the tax only applied to interest income from securities directly held by EU customers. This opened the way for another avoidance strategy which consisted in shifting from direct ownership of the accounts to ownership through a sham corporation registered outside of the EU, in a tax haven. The most compelling evidence of this in the Swiss Bank data can be found for fiduciary deposits. These deposits, while they represent a small share of the offshore portfolio of European investors, have a major advantage when it comes to studying investment patterns: the Swiss National Bank (SNB) has published a full country breakdown of the owners of fiduciary deposits since 1976 until the present.[1] This allows us to track, over time, the share of fiduciary deposits held directly by EU customers, compared to a control group of non-EU non-tax havens countries over time. This exercise reveals that in the years preceding the Directive both EU and non-EU non-tax havens countries held a very similar share of all fiduciary deposits (about 25% each, the remaining 50% being held by tax havens). In 2005, the share of all fiduciary deposits held directly by EU investors sharply dropped to 15%, which represents a 40% decrease. In contrast, the share of all fiduciary deposits held directly by non-EU non-haven investors remained the same. This stark difference, which persists after 2005, provides striking evidence that EU customers opened sham corporations in tax havens and transferred ownership of their Swiss accounts to these corporations to shield themselves from the tax. A similar shift from private to commercial ownership can be observed in the custody portfolios of foreign customers, but the identification is not as clean, since foreign customers groups together both EU and non-EU customers.

Third, we show by combining the AFC and SNB data with the Credit Suisse 2014 Global Wealth Databook that the small share of European offshore wealth taxed or declared under the Directive belongs to relatively low wealth evaders: the average wealth declared is below the average financial wealth of the top 1% in the evader's home country, leaving the bulk of very high-net-worth households unaffected. Taken together, these three patterns

[1] As noted in Zucman (2013), "country breakdowns are puzzling at first glance. The SNB records a large and growing fraction of Swiss fiduciary deposits as belonging to tax havens, most notably Panama, Liechtenstein, and the British Virgin Islands. The reason is that the SNB does not see through sham corporations used by investors. If a French saver opens an account in the name of a shell company incorporated in Panama, the SNB assigns the funds to Panama. Once it is understood the purposes that sham corporations serve, it becomes clear that most fiduciary deposits assigned to tax havens by the SNB belong to residents of rich countries, in particular to Europeans."

highlight the several loopholes in the Directive, which we hence label the "Swiss cheese" regulation.

Was the Directive successful in its longer term objective of increasing the declaration of hidden accounts to the holders' home country? When analyzing the evolution of declarations of offshore wealth, we do observe an increasing trend from 2006 to 2015: while the share of offshore wealth that is either taxed or declared under the Directive was about 8% in 2006, it went up to 27% by 2013. This increase is mostly due to a rise in declarations rather than a rise in undeclared but taxed accounts. The rise in declarations cannot however be solely attributed to the Directive as an evader's decision to declare was influenced by several public policies at the same time; not only the implementation and then increase in the Savings Directive tax rate from 15% in July 2005 to 35% in July 2011 onwards, but also the multiplication of tax amnesties in evaders' home countries and the signature of bilateral treaties between Switzerland and some EU countries.

We develop a theoretical framework to understand the trade-offs faced by an evader in his/her decision to declare and specifically how each tax evasion policy—withholding tax from the Directive, tax amnesties and bilateral treaties—enters this decision. In this respect, there are broadly two alternatives. Either evaders declare mostly because the recent advances in the fight against tax dodging, notably the signature of bilateral tax treaties, are credible and they fear to be discovered. Or, taxpayers are mostly motivated by monetary incentives: they decide to declare when the Swiss tax rate exceeds the tax they would pay in their home country, or when a window of opportunity is offered to limit the cost of declaration, for instance, during tax amnesties.

To empirically evaluate which type of policy had the most impact on tax evaders, we collect yearly information on the capital tax rates in each country from the International Bureau of Fiscal Documentation annual "European Tax Handbook" publications, as well information on the existence and modalities of tax treaties from the OECD Exchange of Tax Information Portal. Finally, data on Voluntary Disclosure Programs was compiled using OECD (2010) & OECD (2015) publications on Offshore Voluntary Disclosure as well as the annual publication of the "Tax Regularization Handbook" by Baker and Mc. Kenzie (2009-2013). Leveraging time variation in these policies in a OLS regression model with country-fixed effects, we find that monetary incentives appear to be the first drivers of declarations. Conversely, bilateral information exchange treaties that were praised as a way to "end bank secrecy" have by far the least effect on declarations.

This paper first contributes to the literature on tax evasion and tax enforcement (e.g., Slemrod and Yitzhaki, 2002; Hanlon and Heitzman, 2010; Slemrod, 2019). A strand of this literature has emphasized the importance of tax havens as a vehicle to escape the taxation of individual financial assets and capital income (e.g., Alstadsæter et al., 2019;

Alstadsæter et al., 2022; Casi et al., 2020; De Simone et al., 2020; Guyton et al., 2021; Hanlon et al., 2015; Johannesen et al., 2020; Londoño-Vélez and Ávila-Mahecha, 2021; Zucman, 2021), as well as corporate profits (e.g., Bennedsen and Zeume, 2018; Bilicka, 2019; Coppola et al., 2021; Dyreng et al., 2013; O'Donovan et al., 2019; Tørsløv et al., 2022). We provide evidence on a new tax evading behavior in the international context: the shifting of individual portfolios from taxed to tax-free investment vehicles. In particular, we document a large reshuffling from interest-yielding to tax-free dividend-yielding assets.

Another strand of this literature has studied why enforcement efforts do not have a larger effect on tax compliance. Johannesen et al. (2020) and Menkhoff and Miethe (2019) demonstrate that information exchange treaties signed with offshore centers did not lead to an increase in declaration of offshore wealth, but rather induced a relocation of deposits in offshore countries outside the scope of these treaties. Omartian (2017) finds that banks undermine tax evasion regulation by establishing opaque legal structures in tax havens. Langenmayr (2017) finds evidence that the 2009 U.S. offshore voluntary disclosure program actually increased tax evasion due to the expectation of lenient treatment after a possible voluntary disclosure in the future. Johannesen et al. (2020) document that the bundle of US enforcement initiatives starting in 2008 had a significant effect on aggregate tax compliance, but they were limited by a lack of scope. Londoño-Vélez and Tortarolo (2022) study the effectiveness of voluntary disclosure programs in the context of Argentina, which implemented the world's most successful program. They conclude that the design of the tax incentives, the threat of detection, the salience, the compliance costs, and the political economy surrounding are important factors behind the effectiveness of these schemes. When addressing the effectiveness of policies to curb tax evasion, these studies use metrics such as the variation in amounts hidden in offshore centers or in tax revenues. However, there is still very little evidence on the underlying motives of evaders to either conceal or declare their offshore revenues. The simultaneity of policies (i.e., savings tax directives, tax amnesties, bilateral treaties) to incentivize evaders to declare their income and wealth makes it hard to attribute the rise in declarations to one particular policy. Our theoretical model in combination with our empirical analyses using both country-level data on declarations and home-country tax policy shed new light on the drivers of tax evaders' choice to regularize their fiscal situation, in particular, on the importance of monetary incentives.

A few earlier papers study the 2005 European Savings Tax Directive. Hemmelgarn and Nicodème (2009) use sectoral account data, Bank for International Settlements (BIS) deposit data, and European Commission withholding tax revenue data to conclude that the Savings Directive had no measurable effects on international savings. Klautke and Weichenreider (2010) show that bonds, which are exempt from the withholding tax due to a grandfather clause, are not associated with lower pre-tax returns than comparable taxable

bonds, suggesting that avoiding the tax has negligible costs. Caruana-Galizia and Caruana-Galizia (2016) use individual offshore entities leaked from two firms to provide micro-level evidence on avoidance behavior by moving entities to a non-cooperative jurisdiction: the growth of EU-owned entities declined immediately after the Directive's implementation, whereas that of non-EU-owned entities remained stable. Using BIS data, Johannesen (2014) documents a decrease in EU-owned bank deposits in Switzerland of about 30-40% in the months following the enforcement of the Directive. He then presents evidence that this decrease was not driven by repatriation but rather relocation in other tax havens. Our paper adds to this literature along two dimensions. First, we present evidence that the drop in Swiss bank fiduciary deposits was also driven by another type of behavioral response, namely, the shifting of individual portfolios from taxed to tax-free investment vehicles. Second, we combine novel datasets to construct a unifying statistics—accounting for not only deposits but also custody accounts which can contain any interest-yielding security and make up for the bulk of tax evaders' portfolios—to understand the extent of the failure of the Directive: 73% of European wealth remained untaxed or undeclared by the repeal of the Directive.

Taken together, our analyses have important policy implications for the future design of regulations aimed at fighting tax evasion and avoidance in the international context. They highlight the importance of broadening tax bases to avoid the shifting of individual portfolios from taxed to tax-free investment vehicles. They also reveal that monetary incentives (e.g., taxes)—if well-designed—could be a powerful tool to incentivize evaders to declare their otherwise untaxed offshore accounts.

2 Institutional setting and Data

This section describes the Swiss tax environment, in particular how non-Swiss residents could, until 2005, escape all forms of capital income taxation by holding securities or deposits in Switzerland and how the Directive changed this status quo.

2.1 Bank secrecy

Following the methodology in Zucman (2013), we estimate the amount of offshore wealth held in Switzerland. We find that there are $2,400 bn of offshore wealth in Switzerland at the end of 2013, out of which $1,350 bn are from EU citizens. This represents 5.6% of the net financial wealth of EU households.[2] What sets Switzerland apart for the handling of tax evaders' assets? The answer resides in the 1934 Swiss Federal Act on Banks and Savings Banks. Under this law, privacy is statutorily enforced. In practice, it means that

[2]This number is derived using the 2014 Credit Suisse Global Wealth Databook.

banks will not share their clients' bank account details with any third party, be it foreign governments or even Swiss authorities. In the aftermath of the G20 2009 crackdown on tax evasion, Switzerland signed 12 new exchange of information treaties and all countries with which Switzerland has signed a tax treaty can theoretically obtain accounts information on their residents. However, the exchange of information was not automatic: countries could only request information on investors that are suspected of tax evasion. One can easily see how such terms of enforcement will not stand the test of practicality: because of the opacity of international financial markets, evidence on fiscal evasion is very difficult to gather and countries will rarely be able to send a proper request to Switzerland.[3] With the OECD treaty network based on the Automatic Exchange of Information (AEOI) and Common Reporting Standard (CRS) signed in 2017, over 100 countries (including Switzerland) started to take part in AEOI for tax matters.

2.2 The Savings Tax Directive

The Savings Tax Directive introduced a system of taxation of foreign interest income for European Union resident investors. The Directive was enacted on June 3rd 2003 for EU countries, and fifteen tax havens (including Switzerland) signed equivalent agreements in the following year. The Directive came into force simultaneously on July 1st 2005.

The agreement with Switzerland was signed on October 26th 2004 and introduced the following rule: banks must levy a withholding tax on the savings income of EU households and 75% of the tax collected is redistributed to the home country of the beneficial owner. Importantly, the Directive does not conflict with Swiss bank secrecy rule: banks redistribute the withholding tax to Swiss authorities without disclosing the identity of the beneficial owner. Regarding the withholding tax rate, the applicable rule is the following: 15% for the interest payments earned before June 30th 2008, 20% for the interest payments earned between July 1st 2008 and July 1st 2011 and 35% for the interest payments earned from July 1st 2011 onwards. The Directive remained in place until November 2015, when it was replaced by the Global Standard on automatic exchange of financial account information within the EU.[4]

[3]For instance, between January 2011 and December 2012, France only sent 605 information requests to Switzerland (Source: "Annexe au projet de loi de finances pour 2014 - rapport annuel du gouvernement portant sur le réseau conventionnel de la France en matière d'échange de renseignements").

[4]The Savings Tax Directive was theoretically not the first occurrence of a withholding tax applied to foreign residents' interest income in Switzerland. Since the Federal Act of October 13th 1965 on withholding tax, interest income earned by Swiss and foreign residents on Swiss bank accounts and deposits is subject to a 35% anticipatory tax. However, it is easy to avoid the withholding tax by entrusting funds in other jurisdictions trough a Swiss bank in its capacity as fiduciary agent. Since the interest income paid by the other jurisdiction is not considered as Swiss-source, fiduciary deposits are exempt from the 35% Swiss anticipatory tax. Hence, the EU Savings Tax Directive affected foreign residents' interest income in Switzerland that was not subject to the 35% Swiss advance tax.

Under the Directive, the transmission of information about a given EU account holder was necessary only if the individual did not already self-report his revenue to his home tax administration. Therefore, the Directive aimed at taxing individuals who did not declare their offshore interest-yielding accounts, the others remained unaffected. Concretely, those who used to declare their Swiss interest income to their home country before July 1st 2005 were recorded as "declarations under the Directive", but their tax rate remained the one of their home country. For the rest, two options were available. They could opt for the withholding tax, preserve their anonymity, and see their tax rate on interest income increase from 0% to 15% in 2005, 20% in mid-2008 and 35% in mid-2011. Alternatively, they could decide to come forward to their home tax administration, pay potential immediate penalties and, from then on, be taxed at their home country rate.

2.3 Data

To examine the scope of the Directive, we rely on two main publicly available data sources. First, we use the Swiss Federal Fiscal Administration ("Administration fédérale des contributions") annual publications (2005-2013) about the Directive.[5] The publication separates the amount of interest income that is taxed at the witholding rate from the amount that is declared by EU citizens to their home administration. For instance, in 2013, French residents earned $365 million in interest and declared $47 million, so that the share of interest declared out of total interest earned was 13%.

The second dataset that we use to analyze the scope of the Directive are the publications of the Swiss National Bank (SNB) about the value of offshore portfolios in Swiss banks since 1998. Zucman (2013) is the first to use this dataset to investigate the wealth held offshore. Following his methodology, we compute EU offshore portfolio wealth held in Switzerland between 2002 and 2013. The Swiss National Bank also provides a breakdown of securities held by foreigners (and Swiss residents) by asset category (i.e., bonds, equities, mutual fund shares) and by type of holder (i.e., private customers, commercial customers or institutional investors). We use these breakdowns to analyse strategic patterns of re-investments following the Directive.

To empirically investigate the drivers of declarations, we gather three additional datasets. First, we collect interest and dividend income tax rates for the 27 EU countries over the period 2006-2013 from the International Bureau of Fiscal Documentation (IBFD) and the OECD tax database. Importantly, in countries where tax rates differ between capital income derived domestically and capital income derived abroad, we select the latter. The

[5]Although the Directive remained in place until November 2015, we carry our analyses until 2013. The reason is that already in 2014 the European Commission announced its intention to repeal the Directive and introduce the automatic exchange of information system and the behavior of investors could have already changed as a consequence.

second dataset we use is the inventory of tax treaties signed between Switzerland and other European countries between 2006 and 2013 that is available on the OECD Exchange of Tax Information Portal. We use this information to test the effect of tax treaties on declarations.

Finally, we also build a unique dataset that lists all the Voluntary Disclosure Programs that were in place between 2006 and 2013 in each European country participating in the Directive. This dataset is constructed by combining OECD (2010) & OECD (2015) publications on Offshore Voluntary Disclosure, as well as the annual publication of the "Tax Regularization Handbook" by Baker and Mc. Kenzie (2009-2013). The dataset provides information on the time period of the programs, the type of program (permanent or temporary) and the generosity of the program, that is, how attractive are the reliefs for evaders. For instance, a "high" generosity program means that the evader who voluntarily comes forward to his home administration is relieved from nearly all monetary penalties (as well as penal prosecutions). Bulgaria, Romania and Cyprus are removed from the sample because no reliable information could be found about the voluntary disclosure programs in these countries.

3 The scope of the Directive

This section first demonstrates that at most about a quarter of the total EU offshore wealth in Switzerland was ever taxed or declared under the Directive. We then document three loopholes in the design of the Directive that can explain its limited scope: the taxation of interest-yielding accounts only, the taxation of directy-held European accounts only, and the non-ultra-wealthy profile of those individuals subject to the Directive.

3.1 The effective tax base of the Directive

To assess the effectiveness of the Directive at collecting tax revenue, we first need to estimate the tax base that should be subject to it. That is, we need to estimate the yearly EU offshore wealth in Switzerland. To do this, we follow Zucman (2013) and use Swiss National Bank data about the value of offshore portfolios in Swiss banks. Figure 1 shows the yearly evolution of both total and EU offshore wealth in Switzerland. Despite the policies aimed at curbing tax evasion, total offshore wealth in Switzerland, depicted by the solid green line, has significantly increased between 2002 and 2013, from about $1,300bn to $2,400bn.[6] The evolution of EU offshore wealth in Switzerland, depicted by the dashed blue line, follows a similar increasing pattern, from about $700bn in 2002 to $1,300bn in 2013.

[6]The only major drop is the financial crisis year of 2009.

In a second step, we want to estimate the *scope* of the Directive, that is the share of the total EU offshore wealth that ended up being either taxed by the Swiss authorities or declared to the fiscal authorities of their resident countries. To do this, we rely on the Swiss Federal Fiscal Administration annual publications about the Directive. While these publications provide information on the amount of interest earned by EU investors that is taxed or declared under the Directive, they do not include the value of the underlying accounts. Therefore, we need to compute the average interest rate on foreign-held accounts in Switzerland. According to Swiss National Bank statistics, the composition of bonds held by foreign investors is roughly one-sixth in the public sector and five-sixth in the private sector, which is indicative of a risk-loving profile. This is also coherent with the general idea that foreigners who invest their money in Swiss banks are seeking high returns. To approximate the interest rate on public and private sector investment, we rely on the previous portfolio weights on private vs public bonds and, respectively, the returns on Vanguard Intermediate-Term Treasury Fund Investor Shares (to capitalise private bonds) and Vanguard Total Bond Market Index Fund Investor Shares (to capitalise public bonds). For 2013, the estimated weighted return is 2.1%.[7] We can then back out the value of the interest-yielding accounts owned by EU households in Switzerland by dividing the total amount of interest earned by EU households in Switzerland by the estimated weighted returns. Finally, investors that declare their accounts will likely report not only their interest-yielding accounts, but all other accounts. Assuming that investors who declare their earned interest have the same proportion of interest-yielding assets as other EU households, we can back out the value of the other assets declared and add it to the scope of the Directive. The red line on Figure 1 describes the yearly evolution of the scope of the Directive, which reached its maximum in 2013 at 27%.

Figure 2 takes the ratio of the red line to the dashed blue line from Figure 1 to compute the share of total EU offshore wealth in the scope of the Directive. While the Savings Tax Directive was praised in policy circles as a major breakthrough in the fight against tax evasion,[8] our computations show that the share of EU offshore wealth declared or taxed under the Directive was below 10% until 2010 and only reached 27% in 2013, leaving about three quarters of EU offshore wealth undeclared and untaxed.

[7]Considering that European evaders are high-net-worth individuals who are advised by qualified bank managers, these estimates are very conservative. Consequently, we think of this return as a lower-bound for the true interest rate and an upper-bound for the total interest yielding accounts taxed or declared under the Directive.

[8]The then French president François Hollande during a visit to Switzerland in May 2015 declared: "the fiscal discord with Switzerland is behind us".

3.2 Strategic reallocation in tax-free dividend-yielding assets

The Directive had several blind spots that significantly restrained its efficacy. The first and most obvious one is that the European Commission decided to tax only interest income, not dividends. From a purely static perspective, SNB data shows that only 45% of the total offshore wealth is invested in interest-yielding securities (i.e., bonds, bank deposits or money market instruments) in January 2005. In other words, from the very beginning, the Directive left out of its reach more than half of European fortunes hidden in Swiss accounts. Additionally, from a dynamic perspective, active investors could just shift their portfolios from taxed interest to untaxed dividend yielding securities.

To investigate whether tax-savvy investors took advantage of this loophole, we rely on monthly SNB data to compute the share of interest-yielding securities in the portfolios of non-residents between 1999 and 2013. We then use the portfolio composition of Swiss residents as the comparison group. Contrary to European investors, Swiss investors were not incentivized by the Directive to alter their investment behavior. Therefore, if the common trend before 2005 is verified, the portfolio of Swiss residents can be used as a counterfactual for the one of non-residents. Finally, it is important to note that we only focus on investments in foreign assets, that is, assets emitted by non-Swiss entities, which represent about 70% of the portfolio of non-residents. The reason is that Swiss securities are already subject to another withholding tax, the 35% Swiss advance tax, so that they were unaffected by the Directive.

Figure 3 provides evidence that a tax-savvy behavior was adopted by offshore account holders. To understand this, let us first focus on the two solid series: "foreign securities held by Swiss residents" and "foreign securities held by foreigners". We observe that between 1999 and January 2005, the common trend assumption is verified: the evolution, both in level and trend, of the share of interest-yielding securities is very similar for both types of investors. In October 2004, at the signature of the treaty, the share of interest-yielding securities out of the portfolio of foreigners starts to decrease sharply: by July 2005, it had already gone down from 47% to 38% (a 19% decrease), while, over the same time period, this share remained roughly stable for Swiss residents. In other words, the signature of the treaty had an anticipatory effect: some EU tax evaders decided to reinvest their money in securities that are tax-free, such as dividends, before the entry in force of the Directive. The decreasing trend persists in the following two years: by December 2007, the share of interest-yielding foreign securities in the portfolio of non-Swiss residents had reached 26%, an almost 50% decrease compared to its pre-signature value. Over the same time period, this share had remained above 40% for Swiss residents, reaching 42% in December 2007, a more modest 14% decline compared to its pre-signature value. The differential trend between Swiss residents and foreign residents as of January 2005 and until December 2007 reveals that Europeans strategically invested their money to avoid paying taxes on their

Swiss accounts.

The decrease in the share of interest-yielding accounts is even sharper if we try to isolate Europeans from the rest of foreign investors. Indeed, we can consider that the decrease in the share of interest-yielding securities out of the portfolio of foreigners is only driven by the European re-allocation of assets: non-EU households have no incentive to re-invest their money as they are not subject to the EU withholding tax. According to Zucman (2013), EU countries represent about 56% of the total offshore portfolio of foreigners each year in Switzerland. Therefore, assuming that from January 2005 onwards, the portfolio allocation of non-EU foreigners evolved in the same way as that of Swiss residents, we can simulate the evolution of the portfolio of EU residents. According to this simulation, the share of interest-yielding accounts out of total securities for EU residents plummets. As illustrated in Figure 3 by the dashed blue line, by December 2007, only 16% of the securities owned by EU residents in Switzerland remain invested in bond issues or money market instruments.

A confounding scenario could arise if from 2005 onwards, for an exogenous reason, foreigners and Swiss start investing differently. If this was true, then we would expect differential trends not only in the couple of years after the Directive but also afterwards. Conversely, if the Directive is the main force behind the change in pattern, then once the active investors have switched their portfolio to dividend yielding securities, the general time trend should be back on the same tracks as Swiss residents. Empirically, we observe that from 2008 onwards, foreigners and Swiss residents' series have parallel evolutions. This pattern is reassuring: the Directive seems to be the main factor behind the dramatic drop in interest-yielding custody accounts held by the countries subject to the Savings Tax Directive.

3.3 Avoiding the tax by opening a sham corporation in tax havens

The second blind spot of the Directive is that it only applied to securities held directly by EU citizens. This left yet another opportunity for evaders to circumvent the taxation of their offshore income, as they could transfer the ownership of their assets to a sham corporation outside of the EU to hold their Swiss assets. Consider a French evader who wants to avoid paying the tax by opening a sham corporation in Panama. The dummy company will fictitiously own his Swiss accounts. From then on, even if the final beneficiary of the account is French, the direct ownership rule applies and the account is considered as Panama-owned. Therefore, Swiss authorities, which do not look through the scheme, register the account as being possessed by Panama. Finally, as Panama is not inside the EU, the account will be exempt from the tax.

Using data from the Bank for International Settlements (BIS), Johannesen (2014) shows

a decrease in EU-owned bank deposits in Switzerland of about 30-40% in the months following the enforcement of the Directive. He also presents evidence suggesting that the drop in Swiss bank deposits was driven by behavioral responses aiming to escape the tax—such as the transfer of deposits to bank accounts in other offshore centers and the transfer of formal ownership of Swiss deposits to offshore holding companies—rather than repatriation of deposits. To obtain these results, the author uses cross-border bank deposits from the Bank for International Settlements.

We complement his analysis by using a different dataset: the SNB publications. First, we document the symmetrical pattern, namely that Switzerland recorded a decrease in the fiduciary deposits held by EU citizens. Second, we verify that this trend holds not only for fiduciary deposits but also for custody accounts, which can contain any interest-yielding security and make up for about 90% of tax evaders' portfolios and are not included in the BIS data.

While fiduciary deposits represent a small share of European households' assets in Switzerland—approximately 10% before the introduction of the Directive—, they are interesting to study because there exists a country level breakdown of assets making it possible to clearly define EU and non-EU held accounts. The latter group can further be broken down between tax havens—that are used as tax evasion vehicles—and non-tax havens.

Figure 4 illustrates the evolution of the share of total fiduciary deposits held directly by EU citizens, versus non-EU non-haven citizens. In the years preceding the reform, the share held by both groups is very close, both in trend and in level, reaching around 25% in 2004. In 2005, the share held by EU citizens drops to 15%, a decrease of 40% from the previous year. In contrast, the share held by non-EU citizens slightly increases from 25.5% to 27%. The gap between the two groups persists until 2013. Therefore, the entirety of the drop in the share held by EU citizens is explained by a symmetrical increase in the share held by tax havens. This provides evidence that EU citizens opened sham corporations in tax havens, transferred the ownership of their assets and therefore, avoided the withholding tax.

To get a comprehensive picture of the evolution of total EU offshore wealth in Switzerland, we now turn to analyze custody accounts, which make up for the remaining 90% of tax evaders' portfolios. In the case of custody accounts, when an individual transfers the ownership of his account to a sham corporation, the Swiss National Bank shifts the holding of the account from "private customer" to "institutional investor". Therefore, custody accounts held by foreign private customers are the ones owned directly by individuals, while some of the custody accounts held by institutional investors are in fact accounts held through sham structures in offshore centers.

Figure 5 documents the share of foreign and domestic securities held in custody accounts by private customers in Switzerland between 2004 and 2008.[9] While the average annual decline in the share of privately owned accounts by foreigners in Switzerland between 2004 and 2014 (excluding 2005) is 2 percentage points, there is a sharp decline of 4 percentage points between March and September 2005 (6 months window), right at the time of the Directive. In other words, the decline between March and September 2005 is approximately 4 times the average decline between 2004 and 2014. This drop is only the lower bound for the true decline in EU countries' directly held custody accounts. For instance, if we consider that the decline of the non-EU share in this period is equal to the average decline over 2004-2014, then the estimated decline in the share of directly held accounts for EU countries is of 7 percentage points in only 6 months, that is, more than 6 times the average decline between 2004 and 2014.

The opening of a sham corporation is used not only to avoid the withholding tax but also, more generally, to decrease the probability of being caught by adding a layer of secrecy. That is why we observe that the share of privately owned accounts has persistently decreased among foreigners since 2004. Therefore, it is harder to consider in this case the share of private customers in Swiss residents' data as a comparison group. Nonetheless, these limitations do not prevent us from drawing conclusions on the role of the Directive in shaping the share of private customers in EU-owned custody accounts.

3.4 The profile of declarants

The data provided by the Swiss Fiscal Administration can also be used to test the wealth profile of the subset of individuals that are compliant with the Directive. Indeed, the Swiss Fiscal Administration annual data on declarations provides, along with the total interest declared, the number of accounts declared. Table 1 shows how the average wealth declared under the Directive ranks within each country's financial wealth distribution. In most countries, the average wealth declared under the European Directive is below the average financial wealth of the top 1% in the evader's home country, according to 2014 Credit Suisse Global Wealth Databook.

These results are consistent with Alstadsæter et al. (2019), who show that increases in enforcement are more effective in inducing evaders with the smallest accounts to become compliant. This evidence is also consistent with the idea that in a context of increasing concentration of wealth (Chancel et al., 2022), tax havens are ready to let go of the small accounts to demonstrate compliance, but are still holding on to the very high-net-worth

[9] We zoom in on those years, since one can better appreciate the different evolution between the share of foreign and domestic securities held in custody accounts during the six-month window around the date the Directive took effect.

profiles. Hence, it is also important to keep this feature in mind when considering the investment profile of agents that end up declaring. Indeed, as risk aversion is decreasing with wealth (Riley and Chow, 1992), declarants likely have portfolios skewed towards more interest-yielding shares than the rest of evaders. While this analysis is purely descriptive, the model and econometric approach in Sections 4.2 and 4.3 make it possible to explain why only small offshore account owners make the decision to self-report their hidden wealth.

4 Drivers of Declarations: Theory and Evidence

This section analyzes the drivers of the rise in declarations after the introduction of the Directive. The rise in declarations was likely influenced by several public policies at the same time: the increase in the Savings Directive tax rate from 15% in 2005 to 35% in July 2011 onwards, the multiplication of tax amnesties in evaders' home countries, and the signature of bilateral treaties between Switzerland and some EU countries. We propose a model to rationalize the mechanisms through which each of these policies can impact declarations of offshore wealth. We then carry an empirical analysis to quantify which type of policy had the most impact on evaders.

4.1 Policies driving declarations

Let us first provide more background on the three main public policies that can have an effect on tax evasion. First, there are tax rates. Specifically, in the case of tax evasion in Switzerland, two tax rates are directly impacting the decision to declare offshore wealth: the capital tax rate in the home country of the tax evader and the withholding tax rate in Switzerland. Intuitively, the higher the tax rate at home, the more costly it is to declare at home and, conversely, the higher the tax rate in Switzerland the more incentives there are to declare at home.

Second, information exchange treaties between Switzerland and European countries can also influence the number of declarations. These bilateral treaties force Switzerland to provide, on request, access to the evader's identity. Because these treaties increase the chance of an evader to get caught, it enters his/her decision to declare offshore accounts. One major limitation, however, is that banking secrecy is waived only if the home country has sufficient evidence ex-ante of the misbehavior of its citizen.

Finally, the other type of public policies that can incentivize tax evaders to "settle the bill" with their home tax administration are voluntary disclosure programs. Baer and Le Borgne (2008) provide a precise definition of this specific subset of tax amnesties: they are an offer by the government to pay a defined amount, in exchange for forgiveness of a

tax liability (including interest and penalties) as well as—most of the time—freedom from legal prosecution. Policymakers often view such programs as a tool that simultaneously produces short and medium-run benefits. Amnesties immediately yield additional revenue, but they are also expected to increase future revenue collection, as tax evaders re-enter the country's tax base. The Italian Scudo Fiscale (2001)—which targeted undeclared offshore capital—is one of those recent policies that got strong media coverage, as it enabled the repatriation of approximately 60 billion euros (Baer and Le Borgne, 2008). In the aftermath of this successful disclosure program, variants of this amnesty program emerged in several European countries from 2010 onwards, as well as in the US (Johannesen et al., 2020). For instance, Spain offered a similar program under the name "Declaración tributaria especial" in 2012, limiting the tax to 10% of the asset declared and waiving all other interests or penalties. France also implemented in 2013 a similar program, which is described in detail in the Appendix. While the French or Spanish programs are temporary, some countries have Voluntary Disclosure Programs that are permanent. It is for instance the case of Germany where evaders that self-report their offshore wealth pay penalties on each of the understated taxes to the public treasury, the evaded taxes and interest rates.

4.2 Modeling the behavior of tax evaders

To better understand the channels through which the public policies described above can affect the choice of evaders to declare their offshore wealth, we develop a simplified model of agents' returns to evasion. Let us consider a one period model with a representative tax evader i who faces the decision to either declare his offshore account or to keep it secret. Importantly, we do not consider here an agent who is compliant and decides whether or not to evade, we are focusing on an investor whose money is already hidden in Switzerland and who faces the choice to either self-report his wealth to his home tax administration or to keep evading.[10]

We first assess the fiscal cost of declaration. Let us consider τ^c, the top tax rate on capital income in the home country c of evader i and F_s^c, the rate of the penalty in the event that the evader self-reports his offshore wealth to his home country c. $\tau^c + F_s^c$ can then be interpreted as the tax rate that the evader avoids paying by keeping his money hidden in Switzerland. Indeed, the first rate τ^c is simply what the evader escaped in the first place by hiding his money from his home country tax authorities. However, if we want to fully account for the cost of declaration, we should also consider the penalties that the evader will face when admitting his non-compliance. We epitomize this cost in the rate F_s^c. It is worth noting that F_s^c can be interpreted more broadly than just a monetary incurred cost: it can also encompass penal prosecutions or moral shaming. We then turn to assess the

[10]We will use his throughout as a convention.

fiscal cost of evasion. Let us first denote p_i^c the probability that the evader gets caught by his home country tax authorities, F_d^c the rate of the penalty in the event that the evader is discovered by his home country tax authorities, τ^s the tax rate applied in Switzerland on foreigner's capital income (European Savings Tax) and s_i the share of offshore wealth subject to the European Savings Tax, that is, the interest income derived from accounts directly held by evader i. What is, in expectation, the fiscal cost of tax evasion? With probability p_i^c, the evader will be caught by his home administration. He will then will have to pay τ^c, as well as an additional penalty tax F_d^c. Typically, $F_d^c \geq F_s^c$: being caught always leads to at least as much penalties as self-reporting. With probability $1 - p_i^c$, the evader remains out of reach and only pays the European Savings Tax τ^s on the fraction of his offshore income s_i that he earns in interest income from accounts he directly owns. We can therefore write $E(T)$, the expected tax rate that the evader faces by hiding his money in Switzerland, as:

$$E(T) = p_i^c \times \left(\tau^c + F_d^c\right) + \left(1 - p_i^c\right) \times \left(\tau^s \times s_i\right) \tag{1}$$

Finally, the difference between $\tau^c + F_s^c$ and $E(T)$, multiplied by the total wealth held offshore, W_i^c, represents the payoff of evasion which can be expressed as follows:

$$\Pi_i = W_i^c \times \left[\left[\tau^c + F_s^c\right] - \left[p_i^c \times \left[\tau^c + F_d^c\right] + \left[1 - p_i^c\right] \times \left[\tau^s \times s_i\right]\right]\right] \tag{2}$$

Under this payoff function, the evader has two choices. He can either keep his offshore funds hidden. This decision is made if the gains of evasion offset the costs incurred, that is, if $\Pi_i > 0$. Or he can declare his offshore accounts to his home tax administration. This decision is made if evasion is no longer profitable, that is if $\Pi_i < 0$.

The next step is to understand how each element of Equation 2 is affected by the policies we described in Section 4.1. In particular, we want to take a closer look at how the policies we are interested in, that is, tax rate settings, voluntary disclosure programs or the signature of a treaty, affect the variables in the payoff function and in turn the decision of the evader. Let us denote VD^c a continuous variable indicating the generosity of a voluntary disclosure program in country c ($VD^c = 0$ is equivalent to an absence of VD program) and T^c a continuous variable measuring the enforcement efficiency of an information exchange treaty between country c and Switzerland ($T^c = 0$ is equivalent to an absence of treaty). We can then write the different variables in Equation 2 as a function of the policies they are affected by.

First, the rate of the penalty in the event that the evader self-reports his offshore wealth to his home country c, F_s^c, is a function of the existence of voluntary disclosure programs,

which imply lower penalties in the event that the evader comes forward to his home tax administration. Therefore:

$$\frac{\partial F_s^c(VD^c, W_i^c)}{\partial VD^c} \leq 0 \longrightarrow \frac{\partial \Pi_i}{\partial VD^c} \leq 0 \tag{3}$$

F_s^c is also an increasing function of W_i^c, as the wealthier an evader the more likely he is to face penal prosecutions and thus a higher penalty rate. Second, F_d^c, the rate of the penalty in the event that the evader is discovered by his home country tax authorities, is also an increasing function of W_i^c for the exact same reasons. Third, p_i^c, the probability that the evader gets caught by his home country tax authorities, is a function of the existence of an information exchange treaty between Switzerland and the home country of the evader, T^c. Indeed, the treaty allows for more transparency between the two countries and therefore increases the probability of an evader to be caught. Therefore:

$$\frac{\partial p_i^c(T^c, W_i^c)}{\partial T^c} \geq 0 \longrightarrow \frac{\partial \Pi_i}{\partial T^c} \leq 0 \tag{4}$$

p_i^c is also a function of total wealth W_i^c but the sign of the partial derivative is uncertain. Indeed, the wealthier an evader is, the more he can afford to add layers of secrecy, such as opening a sham corporation to purportedly own his funds. In that sense, p_i^c should be a decreasing function of W_i^c. However, we should also consider that the wealthier an individual is the more likely it is that his monetary flows will be under the scrutiny of his home tax administration. In that case, p_i^c should be an increasing function of W_i^c. Finally, the share of offshore wealth subject to the European Savings Tax, s_i, is a decreasing function of W_i^c. The wealthier an evader is, the more means he has to escape the tax, either by actively managing his portfolio and switching to dividends or by opening a sham corporation. One should see switching to dividend-yielding accounts or the opening of a sham corporation as significant fixed costs that the small evaders cannot afford to pay. Therefore, we can write:

$$\frac{\partial s_i(W_i^c)}{\partial W_i^c} \leq 0 \tag{5}$$

However, the sign of $\frac{\partial \Pi_i(W_i^c)}{\partial W_i^c}$ is ambiguous because of the uncertain impact of W_i^c on p_i^c. According to the French 2013 Voluntary Disclosure Program experience, it seems that the monetary penalty rate is increasing with wealth. However, we cannot deduct the sign of $\frac{\partial \Pi_i(W_i^c)}{\partial W_i^c}$ because of the uncertain impact of W_i^c on p_i^c.

Another dimension to explore is temporality. While adding time in the model would make it more complex without changing the sign of the coefficients, it can help refining the distinction between the different channels. In a dynamic game, the decision to declare in a given period would rely on the sum of the current period tax difference and all expected future period differences, discounted at the individual discount rate. Hence, in our setting

we can interpret τ^s - τ^c as a proxy for the long-term benefit of evasion if τ^s - τ^c is positive (or as the long-term cost of declaration if τ^s - τ^c is negative). On the contrary, voluntary disclosure programs reduce the "one-off" payment that evaders face when they decide to self-report their offshore income. In a dynamic game, this cost would still be incurred only in the period where the evader decides to declare. In this sense, it can be interpreted as the short-term cost of declarations.

We can summarize the different channels and their impact on Π_i in the following table:

Parameter X	sign of $\frac{\partial \Pi_i(X)}{\partial X}$	Impact on Declarations	Impact Channel
τ^s - τ^c	-	+	long-term
VD^c	-	+	short-term
T^c	-	+	both
W_i^c	uncertain	uncertain	both

Finally, it is important to note that the payoff function of evasion is a continuous one but the decision to declare is binary. Therefore, we should expect some threshold effects. To illustrate this point, let us take a very simplified model where the payoff of evasion only depends on τ^s - τ^c, namely $\Pi_i = \tau^c$ - τ^s. The profit is continuously decreasing in τ^s - τ^c. Conversely, the evader will never decide to declare as long as τ^s - $\tau^c < 0$ (that is, $\Pi_i > 0$) and will always decide to declare if τ^s - $\tau^c > 0$ (that is, $\Pi_i < 0$).

While the model gives the sign of the relation between the payoff of the evader and the different policies, the empirical analysis will allow us to assess the magnitude of these coefficients. Specifically, there are broadly two possible mechanisms behind the increase in the declarations at the time the Directive was in effect. One potential channel is that the signature of bilateral tax treaties since the 2009 G20 summit has strongly encouraged tax evaders to come forward to their home tax administrations and is the first driver of offshore accounts declarations. A limit case would be that for a country c, the treaty is so efficient that $p_i^c = 1$ for a given evader. In that case, the profit from evasion becomes negative and declarations independent of all other variables. Another potential channel is that declarations are mostly driven by monetary incentives. In this case, voluntary disclosure programs (short-term incentives) and/or increasing τ^s - τ^c (long-term incentive) would be the main drivers of declarations.

4.3 Empirical analysis

To test the predictions of the model and evaluate which type of policy (i.e, tax rates, tax amnesties or bilateral treaties) had the most impact on tax evaders, we complement the theoretical framework with an empirical analysis.

4.3.1 From the theoretical model to the econometric specification

In the main specification, we use as dependent variable the fraction of interest income declared at the country level, that is the ratio of interest income declared over the sum of interest income declared and taxed under the Directive. This variable captures the choice that individuals who are subject to the Directive face: do I keep my offshore account illegally and pay the upfront tax or do I declare it to my home country? We also present results for the share of wealth declared under the Directive.[11] Figure 6 presents the fraction declared for different countries and documents the existence of significant spatial disparities: while the fraction declared for Germany in 2006 was 41.7%, it was only 2.5% for France. By 2013, the fraction declared in France remained below 15%, while that in Germany was beyond 55%. The empirical strategy below aims at understanding what explains these within and cross country variations in the share of interest income declared.

With regards to independent variables, we need to adapt the model to the available data. First, while the model considers voluntary disclosure programs and treaties as continuous variables (we can think of this intensive margin as measuring the generosity of the programs), real world data are categorical. Therefore, we can only test the impact of the presence versus the absence of a treaty. In the case of voluntary disclosure programs, since we have more details on each country-specific program, we can assess the difference between a program that offers a high relief to evaders versus a program that offers a low relief.[12]

Another important feature of the empirical analysis is that τ^s and τ^c are not capital income but interest income tax rates. This choice comes from the observation in Section 3.4 that declarants are at the lower end of the wealth distribution of tax evaders. Relatedly, our intuition is that their portfolio investment is not similar to the one of the average evader: declarants are likely the ones mostly invested in lower-risk assets, that is, interest-yielding ones. Therefore, we decided to rely on interest income tax rates in the main specification and leave the analysis on the estimated capital income tax rates for the robustness checks section.

[11] The reason we mainly use fraction declared is because it is a transparent metric derived from only one source: the Swiss Fiscal Administration. Conversely, to compute the offshore wealth declared under the Directive, we rely on several assumptions and extrapolations as described in Section 3.1.

[12] The determination of the generosity of VD programs is done based on the following criteria. High-relief programs are those in which all penalties are waived and sometimes unpaid taxes as well. Medium-relief programs are those in which penalties remain >= 10% of unpaid taxes. Low-relief programs are those in which penalties remain >= 30 % of unpaid taxes or in which the interest rate per year is higher than 15%. We choose not to take prison charges into consideration when computing the categories because in most cases self-reporters cannot be prosecuted and when the risk still exists, incarceration still only effectively concern evaders that actively hid money from criminal activities or who hid tremendously large amounts, which is not the case of the declarants under the Savings tax Directive.

4.3.2 Econometric specification

The main specification we use is the following:

$$FDEC_{it} = \beta_0 + \beta_1(\tau^s - \tau^c)_{it} + \beta_2 SVD_{it} + \beta_3 PVD_i + \beta_4 TREATY_{it} + u_i + \epsilon_{it}, \quad (6)$$

where $FDEC_{it}$ = declared interest income / (declared + taxed interest income) is the fraction declared by country i at time t, $(\tau^s - \tau^c)_{it}$ is the difference between the Swiss withholding interest tax rate and the home interest tax rate for country i at time t, SVD_{it} is a dummy equal to 1 if there is a special voluntary disclosure program in country i at time t, PVD_i is a dummy equal to 1 if there is a permanent voluntary disclosure program in country i, $TREATY_{it}$ is a dummy equal to 1 if a bilateral treaty was signed between Switzerland and country i at time t, u_i is a country fixed effect and ϵ_{it} is the error term.

Because we are interested in the coefficient of a one time-invariant independent variable—the permanent VD programs—, we also rely on a correlated random-effects model (Wooldridge, 2010), first proposed by Mundlak (1978).[13] This specification adds the cluster means of all time-varying covariates as regressors in the estimated model instead of fixed effects. The cluster means are invariant within cluster, vary between clusters and allow for consistent estimation of time-invariant parameters just as if fixed-effects had been included. The interpretation of the coefficient of the cluster mean is then the difference in the between and within effects.

The transformed baseline equation using the correlated random-effects model is the following:

$$\begin{aligned} FDEC_{it} =& \beta_0 + \beta_1(\tau^s - \tau^c)_{it} + \beta_2 SVD_{it} + \beta_3 PVD_i + \beta_4 TREATY_{it} + \\ & \beta_5 \overline{(\tau^s - \tau^c)}_i + \beta_6 \overline{SVD}_i + \beta_7 \overline{TREATY}_i + u_i + \epsilon_i t, \end{aligned} \quad (7)$$

where $\overline{(\tau^s - \tau^c)}_i$, $\overline{SVD}_i$ and $\overline{TREATY}_i$ are respectively the country-clustered means of $(\tau^s - \tau^c)_{it}$, SVD_{it} and $TREATY_{it}$.

Given that the dependent variable is a fraction, we rely on the logit transformation to keep the predictions of the linear regression model strictly within the unit interval. Therefore, we specify a model where :

$$Y_{it} = \log\left(\frac{FDEC_{it}}{1 - FDEC_{it}}\right) \quad (8)$$

[13] We could alternatively use a hybrid random effects model (Allison, 2009). We prefer to use the correlated random-effects model, since it relaxes the assumption of zero correlation between the time-invariant variable (PVD_i in this case) and u_i (the country fixed effect in this case).

and

$$Y_{it} = \beta_0 + \beta_1(\tau^s - \tau^c)_{it} + \beta_2 SVD_{it} + \beta_3 PVD_i + \beta_4 TREATY_{it} + \beta_5\overline{(\tau^s - \tau^c)}_i + \beta_6\overline{SVD}_i + \beta_7\overline{TREATY}_i + u_i + \epsilon_i t. \quad (9)$$

4.3.3 Main results

Table 2 provides results for the FE model, the Mundlak specification, and the logit transformation. We can first note that all the coefficients signs are in accordance with the model proposed in Section 4.2. The fraction declared is an increasing function of (τ^s - τ^c), the signature of a treaty and the existence of a voluntary disclosure program, whether it is permanent or temporary.

The second important result is the magnitude of each variable. Differences in tax rates appear to be the first driver of declarations. According to our estimates on columns (1) and (2), the increase in the effective withholding tax rate from 15% in 2005 to 35% in 2013 led to a 0.87*20 = 17.4 percentage point change in declarations, assuming away changes in the home country tax rates. In comparison, the signature of a bilateral treaty increases the share declared by only 10 percentage points. Temporary voluntary disclosure programs are only significant at the 10% level and increase the share declared by 8 percentage points.

The logit transformation in column (3) makes it easier to compare the magnitude of the coefficients. From this specification, it appears that both temporary and permanent voluntary disclosure programs have higher coefficient estimates than the signature of a treaty. In particular, permanent programs have an association about 1.5 times stronger than that of a treaty signature on the fraction of interest income declared in Switzerland. Permanent programs also have a higher coefficient than temporary programs.[14] These results appear to hold across all specifications.

4.3.4 Heterogeneity

Appendix Figure 1 illustrates that the relationship between the fraction declared and $(\tau^s - \tau^c)$ is, as expected increasing, but the slope is much steeper when $(\tau^s - \tau^c) > 0$ than when $(\tau^s - \tau^c) < 0$. This is in line with the tax evader's incentives: if tax evaders take mostly into account the long-term impact of declarations, they should start declaring when (τ^s - τ^c) > 0, that is, when the withholding tax becomes higher than the home interest income tax rate. Therefore, we also run regressions splitting (τ^s - τ^c) into two

[14]This result is in line with the previous literature. For instance, Langenmayr (2017) demonstrates that a permanent voluntary disclosure program seems to have a positive impact on tax collections, in contrast to temporary tax amnesties, which were found in early time-series studies to leave tax revenues unaffected (Alm and Beck, 1993).

subsets: $(\tau^s - \tau^c) > 0$ and $(\tau^s - \tau^c) < 0$. We also allow for a potential discontinuity in the intercept by adding a dummy variable equal to 1 if $(\tau^s - \tau^c) > 0$, $\mathbb{1}_{(\tau^s - \tau^c) > 0}$.

The first two columns of Table 3 provide the results for this piecewise regression, respectively for the standard and logit transformation models. The two specifications point to the same conclusions: the coefficient $(\tau^s - \tau^c)$ is higher when $(\tau^s - \tau^c) > 0$ than when $(\tau^s - \tau^c) < 0$. This means that an increase of 1 percentage point in τ^s has a stronger association with declarations in countries where τ^s is greater than τ^c. This result illustrates the "threshold effect" mechanism described in Section 4.3.2. While the profit from evading is continuously decreasing in $(\tau^s - \tau^c)$, evaders start declaring only when their profit becomes negative. The latter outcome is more likely when $(\tau^s - \tau^c) > 0$ than when $(\tau^s - \tau^c) < 0$. However, the fact that the coefficient is still positive when $(\tau^s - \tau^c) < 0$—even after controlling for other incentives to declare such as the signature of a treaty or a voluntary disclosure program—indicates that other considerations than just monetary ones enter the decision function. These considerations are incorporated into the model in F_d^c, the penalty incurred when an evader is discovered and which encompasses monetary penalties but also shame or the fear of penal prosecutions.[15]

We also separate voluntary disclosure programmes according to the incentives they provide to declare. The level denominated PVD_{high} corresponds to amnesties under which tax evaders are strongly incentivized to declare their accounts. For permanent programs, since we include dummies for the high and low levels, the coefficients on these variables should be respectively interpreted as the differential impact of a "high" VD program compared to no VD program and of "low" VD program compared to no VD program. The same reasoning applies for temporary programs. The last two columns of Table 3 provide results when we break down voluntary disclosure programs into different levels in accordance with the generosity of the relief offered by the government, respectively, for the standard and logit specification. We find that the only temporary programs that have a significantly positive association with declarations are the ones that offer high reliefs to evaders. In both columns, the coefficient on high relief permanent voluntary disclosure program is almost twice as high as the one on the signature of a treaty. We also find a discrepancy between the low and high relief permanent voluntary disclosure programs, as the coefficient on the second is 50% higher than on the first one in both columns.

These results reveal that, far from declaring mostly because of international agreements' pressure, the bulk of tax evaders appears to declare their accounts in reaction to monetary incentives. Consequently, it is not surprising that declarants are mostly "small" account

[15]It is important to keep in mind that these remarks only apply to the subset of evaders that end up declaring, who are mostly on the lower end of the wealth distribution of evaders. However, if small owners are indeed fearing penal prosecutions, it is very likely that more wealthy ones also take these parameters into account in their evasion payoff function.

holders.[16] The potentially negative effect of W_i^c on Π_i through its positive effect on p_i^c is more than compensated by the negative effect of wealth on s_i, F_s^c and F_d^c. In other words, wealthy evaders can afford to evade the withholding tax so that their effective tax rate remains at 0% and, by holding their accounts through offshore corporations, they still limit p_i^c. As a consequence, there is no monetary incentive or information treaty threat that is high enough to deter them.

4.3.5 Extensions and robustness checks

We first test alternative specifications of the model. The first specification we test adds interaction terms between (τ^s - τ^c) and the TREATY, SVD and PVD variables, respectively The results are reported in column (1) of Table 4. While all interaction terms have a positive coefficient, none of them are significantly different from zero at the 1% nor 5% level. This implies that we cannot find a significant differential association of (τ^s - τ^c) in the presence of a treaty or a VD program than in the absence of such public policies.

The second strain of alternative specifications introduces time fixed effect or time trends in the model. The results are reported in columns (2-4) of Table 4. The introduction of year fixed effects in column (2) cancels all of the effect of (τ^s - τ^c). This is due to the fact that τ^s is common to all countries in a given year, and changes on average every two years, which makes it highly correlated with year fixed effects. As τ^c is not highly variable over an eight-year period, the effect of (τ^s - τ^c) is absorbed by the introduction of year fixed effects. The introduction of a year trend in column (3) also diminishes the coefficient on (τ^s - τ^c), but the linear constraint imposed on the time trend enables to obtain a positive and significant association at the 10% level of (τ^s - τ^c) with the fraction declared. Finally, in column (4) we introduce two different trends, before and after 2009. The motivation behind this specification is that 2009 is simultaneously the year of the financial crisis—which can have impacted differently the numerator and denominator of the fraction declared[17]—and the year of the "G20 crackdown on tax evasion"—which could have entailed a surge in declarations if evaders strongly believed that tax havens were about to disappear. The results show no differential trend before and after 2009. Therefore, the crisis and the 2009 G20 crackdown have had no structural break on the outcome variable.

While this study focuses mainly on the declaration of accounts that stay in Switzerland, we should also keep in mind that tax evaders have the possibility to come forward to their home tax authorities, settle their bill and bring their money back into their home country.

[16] The average account declared lies below 1 million € in 2015, see Section .

[17] For instance, we can think that it decreased the total wealth taxed or declared under the Directive because of an overall decrease in assets, but that it increased declarations because smaller accounts owners are more prone to declarations.

In other words, while we focus on declarants that keep their money in Switzerland even after they self-report it to their home country, we disregard the option of repatriating wealth. Because the second type of evaders leaves Switzerland, they are not in the statistics of the Swiss Fiscal Administration, and therefore not in our sample. As a consequence, a possible confounding scenario would be that the signature of treaties affects moderately the declaration of offshore accounts in Switzerland, but they are at the origin of important repatriations that we do not account for. If that was the case, then the statement that monetary incentives are the first drivers of the decision to self-report would be erroneous. In order to test this scenario, we use as outcome variable deposits directly held by EU citizens in Switzerland instead of the fraction of interest declared. We estimate the following equation:

$$\begin{aligned}\log(deposit_{it}) =&\beta_0 + \beta_1(\tau^s - \tau^c)_{it} + \beta_2 SVD_{it} + \beta_3 PVD_i + \beta_4 TREATY_{it} + \\ &\beta_5\overline{(\tau^s - \tau^c)}_i + \beta_6\overline{SVD}_i + \beta_7\overline{TREATY}_i + u_i + \epsilon_i t\end{aligned} \tag{10}$$

The results are reported in column (5) of Table 4. The negative coefficient on (τ^s - τ^c) does not necessarily mean that people repatriate more when the difference in tax differential increases. It could also be that a higher tax differential incentivizes evaders to move their funds into another offshore center or add a further layer of secrecy by opening a dummy company. The Savings Directive has indeed triggered such reactions, which have been thoroughly documented in Johannesen (2014). Conversely, the fact that the coefficient on TREATY is not statistically different from zero implies that signing a treaty does not entail a higher decrease in deposits held by evaders. Hence, the only configuration in which signing a treaty could still have a differential impact on repatriation from Switzerland would be that while evaders from countries that signed a treaty repatriate, the others escape the Swiss tax by moving their tax residence (or funds) to other offshore centers. This scenario is highly unlikely. If anything, evaders from countries which signed a treaty should have more incentives to add a layer of secrecy and open a sham corporation. Hence, this evidence does not support that the signature of treaties is at the origin of important repatriations that we do not account for.

Another source of concern is reverse causality bias. This could potentially arise if the fraction of interest income declared in Switzerland could affect fiscal policy in home countries, the tax rate schedule of the Savings Tax Directive or the signature of a treaty. However, we think that, in our context, this should not be an issue: top interest income tax rates in home countries, τ^c, cannot realistically be influenced by the fraction of interest income declared in Switzerland. Furthermore, the tax rate schedule for the Savings Tax Directive, τ^s, was decided in 2003 and was not re-adjusted after the policy started, so that the fraction declared cannot have influenced it. Johannesen and Zucman (2014) show

that, prior to the signature of treaties starting in 2009, there was no significant difference in the fraction declared between countries that end up signing a treaty with Switzerland and countries that do not. Therefore, we can also rule out reverse causality bias for the TREATY variable.

In an additional robustness test, we alter the sample on which the regressions are ran to remove potential confounding countries. The first restriction is to remove countries that are suspected of offshore activities (Appendix Table 1). Indeed, these countries could be the tax residencies of evaders that are not their citizens. Therefore, a significant share of offshore wealth taxed under the Directive could be wrongly attributed to these countries, which would bias the results. As a consequence, we remove Luxembourg, Malta and Ireland, which are well-known for their offshore activities (IMF, 2000). Removing these countries leaves the sign and magnitude of the results unchanged but for one characteristic: the difference in the coefficient between $(\tau^s - \tau^c) < 0$ and $(\tau^s - \tau^c) > 0$ goes up. Indeed, the coefficient on $(\tau^s - \tau^c) > 0$ becomes roughly twice as high (both in the basic and logit transformed regressions) as the one on $(\tau^s - \tau^c) < 0$. This feature confirms that declarations appear to be mostly driven by long-term cost/benefit computations: evaders declare substantially more when it becomes costly in the long-run to be in a tax haven.

An alternative sample variation consists in removing all the countries that were not in the EU before 2004. New member states adopted important agreements between the EU and Switzerland almost simultaneously with the implementation of the Savings Directive, notably agreements on free trade, free movement of persons and free movement of capital. Since these changes in legislation could have directly affected countries' offshore wealth in Switzerland, as well as declarations, we should make sure that the results still hold if we exclude these countries from the sample. The results show that removing these countries leaves coefficients qualitatively unchanged (Appendix Table 2).

We also display results using the share of offshore wealth declared under the Directive as a dependent variable in Appendix Table 3. The sign of coefficients is the same as for the fraction of interest declared variable. However, the effect of $(\tau^s - \tau^c)$ seems to predominate even more on the share of offshore wealth declared than on the fraction of interest income declared. A possible explanation for this outcome is that the denominator of this variable is the "offshore wealth declared under the Directive", which includes both interest and dividend income declared. Indeed, when an evader decides to declare under the Directive, he cannot declare partially his accounts: he needs to declare both the ones that would have been taxed (interest-yielding) and the ones that were out of the reach of the withholding tax. This implies that every interest-yielding account declared is multiplied by a factor to obtain the total wealth declared. Declarations therefore have a stronger impact on the numerator here than with the fraction declared.

A final robustness check replaces (τ^s - τ^c) by (τ^s_w - τ^c_w), that is, the difference in the capital income tax rate, which is a weighted tax rate of both interest and dividend income.[18] The intuition behind this specification is that maybe declarants are also sensitive to top dividend tax rates since they cannot declare their offshore portfolio partially and consequently they have to declare their dividend income simultaneously. Results are reported in Appendix Table 4. Column (1) shows similar results to the specification with interest income tax rates. More interestingly, we see on Column (2) and (3) that the coefficient on (τ^s_w - τ^c_w) > 0 is lower than the one on (τ^s_w - τ^c_w) <0. However, if we change the split point to -0.05 (Column (4) and (5)) we obtain similar results as with (τ^s - τ^c) > 0 and (τ^s - τ^c) < 0. Two interpretations are possible: either (τ^s_w - τ^c_w) > -0.05 is just a noisy proxy for (τ^s - τ^c) > 0, because declarants in fact mostly invest in interest-yielding accounts.[19] Or declarants have investment choices similar to other EU evaders, in which case we should interpret the fact that the split point is at -0.05 as further evidence of the existence of extra-monetary incentives (encompassed in the model in the variables F^c_d and F^c_s).

5 Conclusion

This paper examines how investors react to tax evasion regulations in offshore financial centers. We start by assessing the effectiveness of one of the most important policy initiatives aimed at curving tax evasion: the introduction of withholding taxes on interest income in offshore financial centers. In particular, we focus on the 2005 Savings Tax Directive, which introduced a withholding tax on interest income earned by EU investors in Switzerland and several other offshore centers. Leveraging a unique combination of public administrative Swiss datasets, we provide a unifying statistics to describe the limited scope of the Directive: 73% of European wealth remained untaxed or undeclared by the repeal of the Directive. We document that tax evaders took advantage of two loopholes of the Savings Tax Directive to dodge taxation: the taxation of interest-yielding accounts only and the tracking of accounts only when they are owned directly by Europeans.

Although the effectiveness of the Directive was limited, we find that the share of EU offshore wealth declared or taxed under the Directive tripled between 2006 and 2013, due mostly to declarations. We show by means of a theoretical model the mechanisms through which different public policies (i.e., tax rates, tax amnesties, bilateral treaties) can impact the rise of declarations. We then carry an empirical analysis to quantify the importance

[18] Once again, we assume the share of interest yielding accounts in declarants' offshore portfolio is the one of the average non-EU evader.

[19] The overall R^2 of the specification with capital income tax rate is always lower than the one with interest income tax rates.

of each public policy in explaining the bulk of declarations. We find that declarations are mostly driven by monetary incentives while bilateral treaties, that were praised as a way to end bank secrecy, happen to have the least impact of all studied policies on declarations.

After ten years of status quo on the Directive, on May 27th 2015, the European Union and Switzerland signed a Protocol amending their existing Savings agreement and transforming it into an agreement on automatic exchange of financial account information based on the Common Reporting Standard (CRS) set by the OECD. The new agreement became effective on January 1st 2017. Casi et al. (2020) have already studied the short-term effect of CRS—under which 4,000 bilateral information exchange relations were created—on cross-border tax evasion. They find that the CRS induced a reduction of 11.5% in cross-border deposits parked in tax havens, but that deposit relocation is still an option for evaders. Taken together, our evaluation of the EU Savings Tax Directive coupled with the recent evidence about CRS suggest that recent enforcement policies have had some moderate effects on aggregate tax compliance, but remain far from the stated goal of ended tax evasion. Hence, more comprehensive policy instruments may be needed to ensure effective taxation of foreign accounts.

References

Allison, Paul D (2009). *Fixed effects regression models*. SAGE publications.

Alm, James and William Beck (1993). "Tax amnesties and compliance in the long run: a time series analysis". *National Tax Journal* 46.1, pp. 53–60.

Alstadsæter, Annette, Niels Johannesen, Ségal Le Guern Herry, and Gabriel Zucman (2022). "Tax evasion and tax avoidance". *Journal of Public Economics* 206, p. 104587.

Alstadsæter, Annette, Niels Johannesen, and Gabriel Zucman (June 2019). "Tax Evasion and Inequality". *American Economic Review* 109.6, pp. 2073–2103.

Baer, Katherine and Eric Le Borgne (2008). "Tax Amnesties.Theory, Trends, and Some Alternatives". *Washington, D.C. : International Monetary Fund.*

Baker and Mc. Kenzie (2009-2013). "Tax Regularization: Voluntary Disclosure Handbook".

Bennedsen, Morten and Stefan Zeume (2018). "Corporate Tax Havens and Transparency". *The Review of Financial Studies* 31.4, pp. 1221–1264.

Bilicka, Katarzyna A. (2019). "Comparing UK Tax Returns of Foreign Multinationals to Matched Domestic Firms". *American Economic Review* 109.8, pp. 2921–53.

Caruana-Galizia, Paul and Matthew Caruana-Galizia (2016). "Offshore financial activity and tax policy: evidence from a leaked data set". *Journal of Public Policy* 36.3, pp. 457–488.

Casi, Elisa, Christoph Spengel, and Barbara MB Stage (2020). "Cross-border tax evasion after the common reporting standard: Game over?" *Journal of Public Economics* 190, p. 104240.

Chancel, Lucas, Thomas Piketty, and Emmanuel Saez (2022). *World inequality report 2022*. Harvard University Press.

Coppola, Antonio, Matteo Maggiori, Brent Neiman, and Jesse Schreger (2021). "Redrawing the map of global capital flows: The role of cross-border financing and tax havens". *The Quarterly Journal of Economics* 136.3, pp. 1499–1556.

De Simone, Lisa, Rebecca Lester, and Kevin Markle (2020). "Transparency and Tax Evasion: Evidence from the Foreign Account Tax Compliance Act (FATCA)". *Journal of Accounting Research* 58.1, pp. 105–153.

Dyreng, Scott D., Bradley P. Lindsey, and Jacob R. Thornock (2013). "Exploring the Role Delaware plays as a Domestic Tax Haven". *Journal of Financial Economics* 108.3, pp. 751–772.

Guyton, John, Patrick Langetieg, Daniel Reck, Max Risch, and Gabriel Zucman (2021). *Tax evasion at the top of the income distribution: Theory and evidence*. Tech. rep. National Bureau of Economic Research.

Hanlon, Michelle and Shane Heitzman (2010). "A Review of Tax Research". *Journal of Accounting and Economics* 50.2-3, pp. 127–178.

Hanlon, Michelle, Edward L. Maydew, and Jacob R. Thornock (2015). "Taking the Long Way Home: US Tax Evasion and Offshore Investments in US Equity and Debt Markets". *The Journal of Finance* 70.1, pp. 257–287.

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

IMF (2000). "Offshore Financial Centers, IMF Background Paper Prepared by the Monetary and Exchange Affairs Department".

Johannesen, Niels (2014). "Tax Evasion and Swiss Bank Deposits". *Journal of Public Economics* 111, pp. 46–62.

Johannesen, Niels, Patrick Langetieg, Daniel Reck, Max Risch, and Joel Slemrod (Aug. 2020). "Taxing Hidden Wealth: The Consequences of US Enforcement Initiatives on Evasive Foreign Accounts". *American Economic Journal: Economic Policy* 12.3, pp. 312–46.

Johannesen, Niels and Gabriel Zucman (2014). "The End of Bank Secrecy? An Evaluation of the G20 Tax Haven Crackdown". *American Economic Journal: Economic Policy* 6(1): 65-91.

Klautke, Tina and Alfons J. Weichenreider (2010). "Interest Income Tax Evasion, the EU Savings Directive, and Capital Market Effects". *Fiscal Studies* 31(1), pp. 151–170.

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

Londoño-Vélez, Juliana and Javier Ávila-Mahecha (2021). "Enforcing Wealth Taxes in the Developing World: Quasi-experimental Evidence from Colombia". *American Economic Review: Insights* 3.2, pp. 131–48.

Londoño-Vélez, Juliana and Dario Tortarolo (2022). *Revealing 21% of GDP in Hidden Assets: Evidence from Argentina's Tax Amnesties*. Tech. rep. UNU WIDER Working Paper 103.

Menkhoff, Lukas and Jakob Miethe (2019). "Tax evasion in new disguise? Examining tax havens' international bank deposits". *Journal of Public Economics* 176, pp. 53–78.

Mundlak, Yaik (1978). "On the pooling of time series and Cross Section Data". *Econometrica* 46.1, pp. 69–85.

O'Donovan, James, Hannes F. Wagner, and Stefan Zeume (2019). "The Value of Offshore Secrets: Evidence from the Panama Papers". *The Review of Financial Studies* 32.11, pp. 4117–4155.

OECD (2010). "Offshore Voluntary Disclosure: Comparative Analysis, Guidance and policy advice".

– (2015). "Update on Voluntary Disclosure Programmes: A pathway to tax compliance".

Omartian, James D. (2017). "Do Banks Aid and Abet Asset Concealment: Evidence from the Panama Papers". *Working Paper*.

Riley, William and Victor Chow (Nov. 1992). "Asset Allocation and Individual Risk Aversion". *Financial Analysts Journal* Vol. 48, No. 6 pp. 32-37.

Slemrod, Joel (2019). "Tax Compliance and Enforcement". *Journal of Economic Literature* 57.4, pp. 904–54.

Slemrod, Joel and Shlomo Yitzhaki (2002). "Tax Avoidance, Evasion, and Administration". *Handbook of Public Economics*. Vol. 3. Elsevier, pp. 1423–1470.

Tørsløv, Thomas, Ludvig Wier, and Gabriel Zucman (2022). "The Missing Profits of Nations". *Review of Economic Studies, forthcoming*.

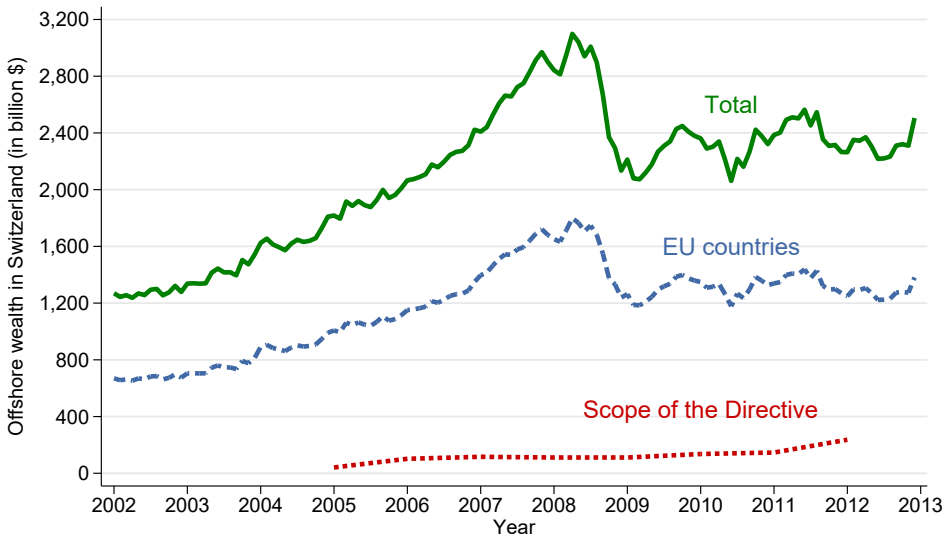
Wooldridge, Jeffrey M (2010). *Econometric analysis of cross section and panel data*. MIT press.

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): 1321-1364.

– (2021). *The Hidden Wealth of Nations*. University of Chicago Press.

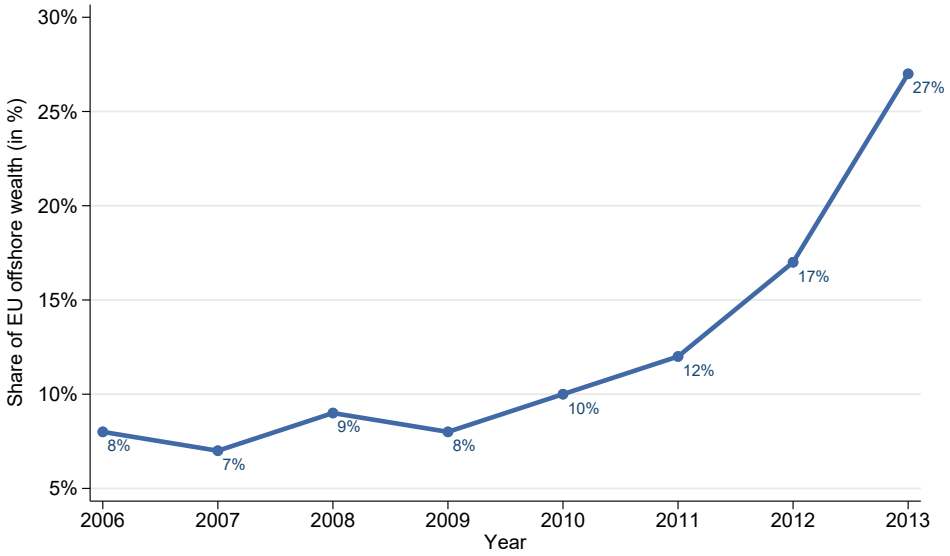
Figures and Tables

Figure 1: Offshore Wealth in Switzerland, 2002-2013



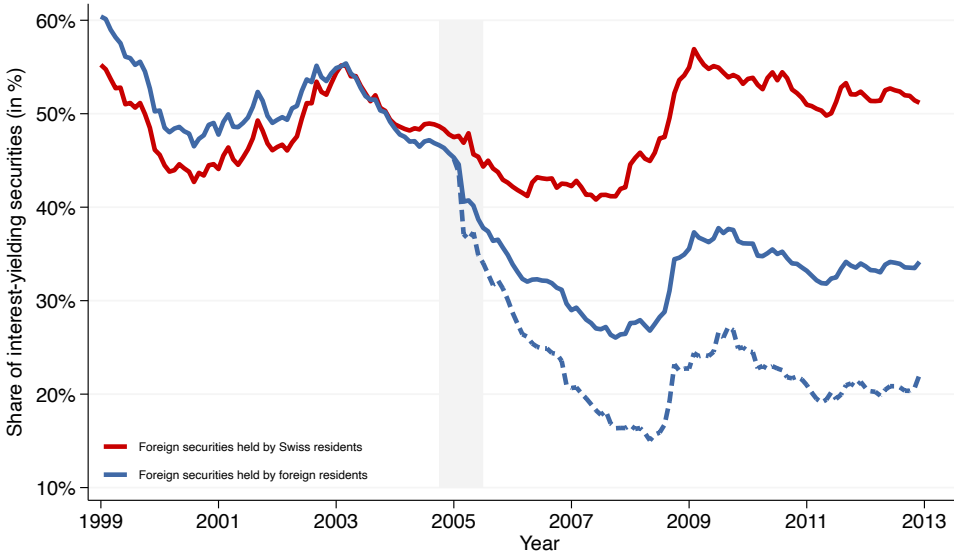
Notes: This figure depicts the evolution of total (green solid line) and EU offshore wealth (blue dash line) in Switzerland, as well as EU offshore wealth in the scope of the Directive (red solid line with markers) over the period 2002-2013. The series have been built using Swiss National Bank and Swiss Federal Fiscal Administration (SFFA) data.

Figure 2: Share of EU Offshore Wealth under the Scope of the Directive, 2006-2013



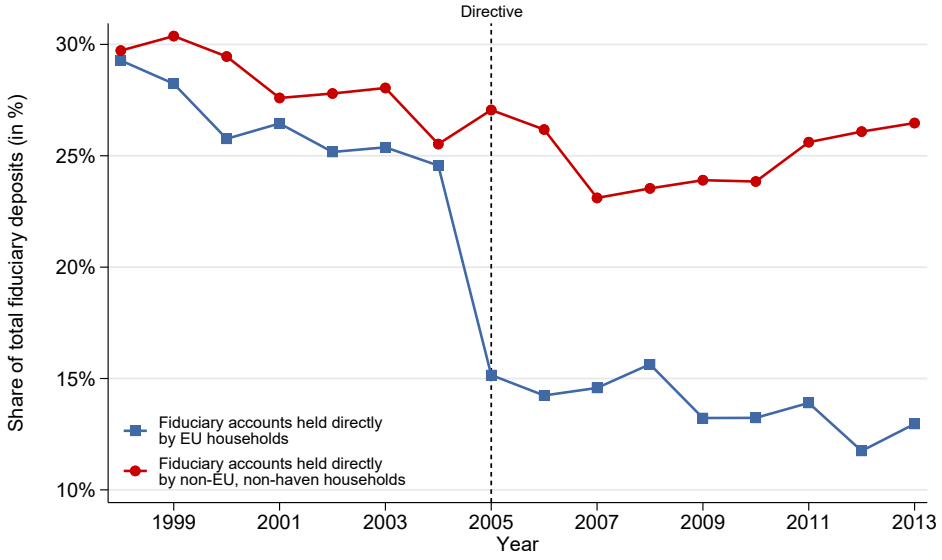
Notes: This figure depicts the share of EU offshore wealth reported or taxed under the Directive over the period 2006-2013. The series have been built using Swiss National Bank and Swiss Federal Fiscal Administration (SFFA) data.

Figure 3: Share of Interest-yielding Securities in Foreign Asset Portfolios, 1999-2013



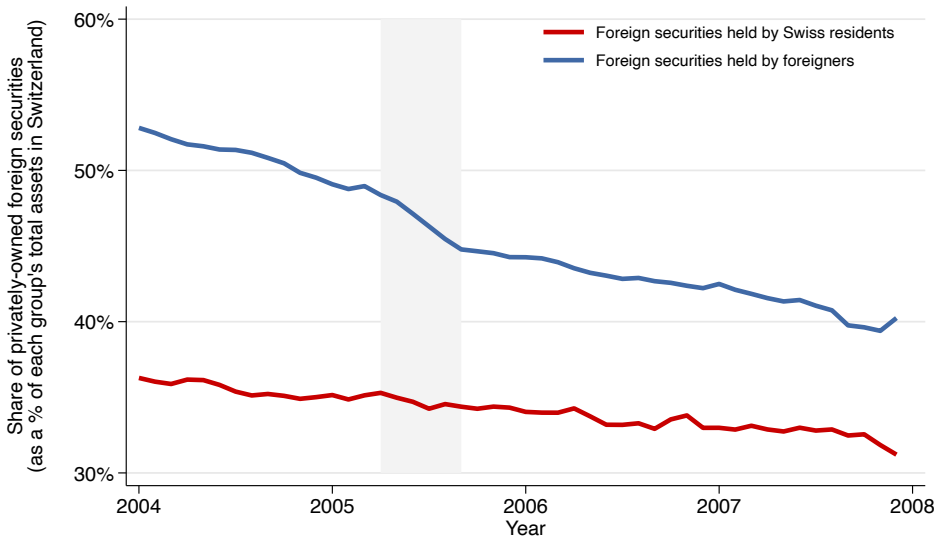
Notes: This figure depicts the evolution of the share of foreign interest-yielding securities held by Swiss residents (red solid line), foreigners (blue solid line) and by EU residents (blue dash line) over the period 1999-2013. The shaded gray area indicates the time window between the signature and the application of the Directive. The monthly series have been built using Swiss National Bank and Swiss Federal Fiscal Administration (SFFA) data.

Figure 4: Ownership of fiduciary deposits in Switzerland, 1998-2013



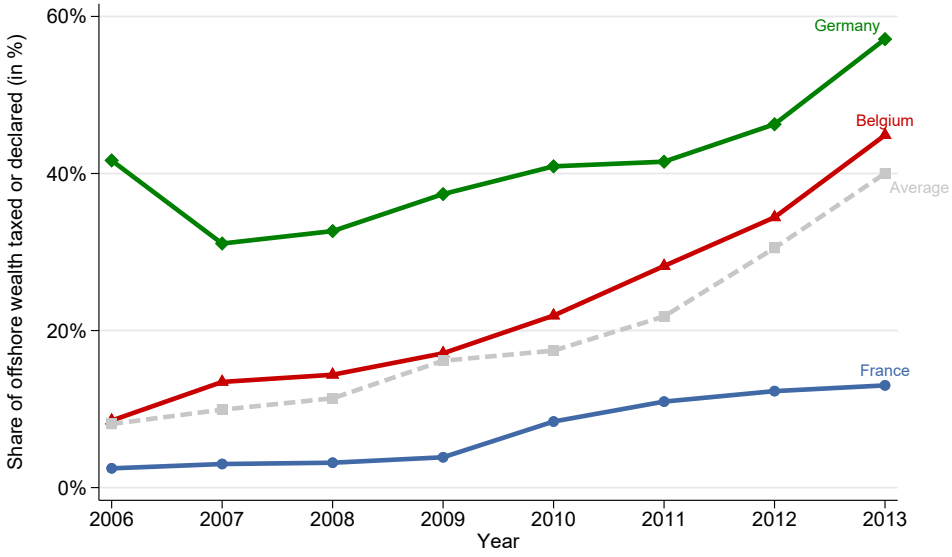
Notes: This figure compares the evolution of the share of fiduciary deposits out of total fiduciary deposits in Switzerland directly held by non-EU, non-haven individuals (red line) in Switzerland to the share of fiduciary deposits directly held by EU individuals (blue line). The monthly series have been built using Swiss National Bank data and the date displayed on the x-axis is January of each year from 1998-2013. The dotted vertical black line indicates the year in which the Savings Directive was introduced.

Figure 5: Custody accounts ownership in Switzerland, 2004-2008



Notes: This figure depicts the share of foreign securities in custody accounts by Swiss private customers (red line) and by foreign private customers (blue line) in Switzerland between 2004 and 2008. The shares have been calculated relative to the total annual assets that each group (i.e., Swiss versus foreigners) owns in Switzerland. The shaded gray area indicates the 6-month window around the date the Directive took effect. The monthly series have been built using Swiss National Bank data and the date displayed on the x-axis is January of each year.

Figure 6: Offshore wealth reported by country of origin, 2006-2013



Notes: This figure depicts the share of offshore wealth effectively taxed or declared in Switzerland by country of origin between 2006 and 2013. The "average" series is an unweighted average of all countries for which the AFC reports a positive number of declarations. The shares have been built using AFC data.

Table 1: Wealth Profile of Declarants under the Directive

Country	Average Wealth Declared under the Directive	Average Financial Wealth per Adult	Top 10% Average Financial Wealth	Top 10% Wealth Share	Top 1% Average Financial Wealth	Top 1% Wealth Share	Declarant Position in the Distribution of Average Wealth
Austria	259.09	102.1	649.37	.64	2960.96	.29	less than top 10%
Belgium	420.57	159.34	753.67	.47	2756.55	.17	less than top 10%
Czech Republic	610.31	24.43	159.5	.65	886.63	.36	greater than top 10%
Denmark	212.53	217.7	1432.45	.66	6008.46	.28	less than top 10%
Finland	122.75	73.95	403.05	.55	1626.99	.22	less than top 10%
France	48.75	117.26	612.08	.52	2403.75	.21	less than top 10%
Germany	209.52	97.48	601.45	.62	2729.44	.28	less than top 10%
Greece	224.77	37.6	203.4	.54	924.89	.25	greater than top 10%
Ireland	186.21	122.77	716.96	.58	3339.26	.27	less than top 10%
Italy	165.86	99.69	504.41	.51	2053.53	.21	less than top 10%
Netherlands	270.45	202.83	1105.41	.55	4543.35	.22	less than top 10%
Poland	566.09	14.56	90.54	.62	471.65	.32	greater than top 1%
Portugal	467.64	59.14	341.81	.58	1561.22	.26	greater than top 10%
Spain	412.19	61.07	334.68	.55	1587.9	.26	greater than top 10%
Sweden	254.85	179.1	1232.19	.69	5534.13	.31	less than top 10%
United Kingdom	371.53	146.91	787.43	.54	3349.53	.23	less than top 10%

Notes: This table describes the wealth profile of declarants under the Directive by country of origin. It includes the average wealth declared under the Directive, the average financial wealth per adult, the average financial wealth and total wealth share among top 10% and 1% wealth holders, as well as the declarant position in the distribution of average wealth. These figures are obtained by combining AFC and SNB data with the 2014 Credit Suisse Global Wealth Databook. All figures except for the shares are presented in thousands of €. The distributions are based on a country's total wealth, as reported in the 2014 Credit Suisse Global Wealth Databook.

Table 2: Main regression results

	(1) FE Model	(2) RE Mundlak	(3) Logit
$(\tau^s - \tau^c)$	0.865***	0.870***	8.747***
	(0.000)	(0.000)	(0.000)
TREATY	0.103***	0.102***	0.544**
	(0.002)	(0.001)	(0.028)
SVD	0.083*	0.084*	0.669**
	(0.094)	(0.080)	(0.013)
PVD		0.109***	0.960***
		(0.001)	(0.001)
Constant	0.181***	-0.003	-3.744***
	(0.000)	(0.897)	(0.000)
Nb. Obs	190	190	190
Clusters	25	25	25
R^2	0.27	0.57	0.57

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the fraction declared in country i at time t. The FE model (column (1)) has country-level fixed effects. The coefficients of the FE and the RE Mundlak model (columns (1) and (2), respectively) are not the same, as the panel is unbalanced. The R^2 for the fixed effect regression is the R^2 within while the R^2 for the RE regression is the R^2 overall. Regressions are run over the period 2006-2013, as the European Union already proposed in 2014 to repeal the Savings Directive and this might have influenced declarations. Austria and the United Kingdom signed a different information exchange treaty with Switzerland that came into force in January 2013. Under this agreement, a final withholding tax is deducted by Swiss banks from interest income, dividends and other investment income. The money is then forwarded anonymously to the Swiss Federal Tax Administration (FTA), which in turn transfers the collected tax to the UK and Austrian administrations. As this agreement can have simultaneously influenced the declarations under the Savings Tax Directive, year 2013 is removed from the sample for UK and Austria. We also remove Romania, Bulgaria and Cyprus because no reliable information on VD programs were found.

Table 3: Regression results - Heterogeneity

	(1) Piecewise	(2) Logit	Piecewise	(3) VD Levels	(4) Logit VD
$(\tau^s - \tau^c) < 0$	0.477*	7.571***		0.502*	7.785***
	(0.086)	(0.009)		(0.056)	(0.005)
$(\tau^s - \tau^c) > 0$	1.068***	9.626***		1.074***	9.672***
	(0.000)	(0.000)		(0.000)	(0.000)
$\mathbb{1}_{(\tau^s - \tau^c) > 0}$	0.015	-0.008		0.015	-0.011
	(0.617)	(0.975)		(0.620)	(0.964)
$TREATY$	0.110***	0.575**		0.107***	0.553**
	(0.000)	(0.025)		(0.000)	(0.023)
SVD	0.085*	0.669**			
	(0.081)	(0.012)			
PVD	0.094*	0.837**			
	(0.072)	(0.040)			
SVD_{low}				0.006	0.004
				(0.831)	(0.974)
SVD_{high}				0.125*	1.014***
				(0.056)	(0.001)
PVD_{low}				0.076	0.768*
				(0.116)	(0.071)
PVD_{high}				0.154**	1.189**
				(0.012)	(0.016)
Constant	-0.009	-3.902***		-0.037	-3.930***
	(0.913)	(0.000)		(0.622)	(0.000)
Nb. Obs	190	190		190	190
Clusters	25	25		25	25
R^2	0.58	0.57		0.62	0.59

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the fraction declared in country i at time t. The FE model (column (1)) has country-level fixed effects. The coefficients of the FE and the RE Mundlak model (columns (1) and (2), respectively) are not the same, as the panel is unbalanced. The R^2 for the fixed effect regression is the R^2 within while the R^2 for the RE regression is the R^2 overall. Regressions are run over the period 2006-2013, as the European Union already proposed in 2014 to repeal the Savings Directive and this might have influenced declarations. Austria and the United Kingdom signed a different information exchange treaty with Switzerland that came into force in January 2013. Under this agreement, a final withholding tax is deducted by Swiss banks from interest income, dividends and other investment income. The money is then forwarded anonymously to the Swiss Federal Tax Administration (FTA), which in turn transfers the collected tax to the UK and Austrian administrations. As this agreement can have simultaneously influenced the declarations under the Savings Tax Directive, year 2013 is removed from the sample for UK and Austria. We also remove Romania, Bulgaria and Cyprus because no reliable information on VD programs were found.

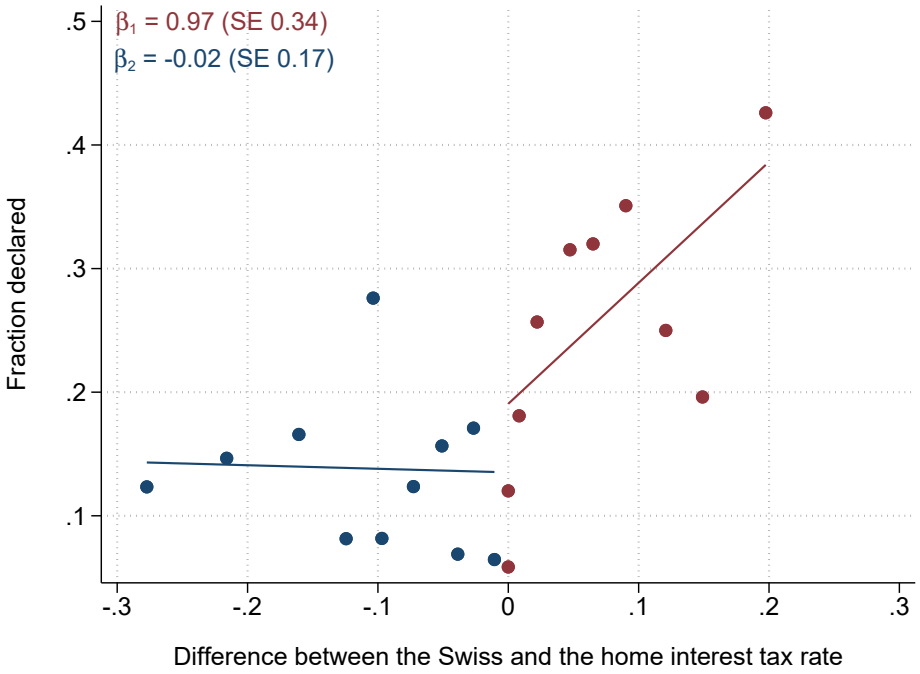
Table 4: Robustness checks: interaction term, time trends and deposits

	(1) Interaction Term	(2) Year FE	(3) Year Trend	(4) Different Trend b/a	(5) log(Deposit)
$(\tau^s - \tau^c)$	7.064***	0.442	1.948**	1.510*	-28.956***
	(0.000)	(0.791)	(0.021)	(0.092)	(0.000)
TREATY	0.493**	-0.068	-0.055	-0.093	-2.165**
	(0.039)	(0.771)	(0.811)	(0.678)	(0.011)
SVD	0.938**	0.484**	0.371	0.406*	-1.746**
	(0.019)	(0.044)	(0.101)	(0.063)	(0.031)
PVD	0.937***	0.990***	0.981***	0.988***	-0.047
	(0.003)	(0.000)	(0.000)	(0.000)	(0.954)
year			0.339***		
			(0.000)		
$(\tau^s$ - $\tau^c) \times$ *SVD*	4.012				
	(0.125)				
$(\tau^s$ - $\tau^c) \times$ *PVD*	2.740				
	(0.224)				
$(\tau^s$ - $\tau^c) \times$ *TREATY*	-1.286				
	(0.435)				
Year Trend < 2009				0.415***	
				(0.000)	
Year Trend > 2009				0.415***	
				(0.000)	
Year=2007		0.558**			
		(0.011)			
Year=2008		0.781***			
		(0.002)			
Year=2009		1.127***			
		(0.000)			
Year=2010		1.200***			
		(0.000)			
Year=2011		1.751***			
		(0.000)			
Year=2012		2.438***			
		(0.000)			
Year=2013		2.804***			
		(0.000)			
Constant	-3.708***	-5.178***	-685.809***	-837.809***	0.365
	(0.000)	(0.000)	(0.000)	(0.000)	(0.635)
Nb. Obs	190	190	190	190	174
Clusters	25	25	25	25	23
R^2	0.58	0.64	0.63	0.63	0.49

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent variable is the fraction declared in country i at time t. Column (1) adds an interaction term between the different policies to Column (2) in Table 2. Column (3) adds time (year) fixed effects to Column (2) in Table 2. Column (4) adds a time (year) trend to Column (2) in Table 2 and Column (5) splits it before and after 2009. The last column uses the log of deposits in Switzerland in a given country i at time t as the dependent variable. Regressions provide results for the logit transformation. The R^2 for the fixed effect regression is the R^2 within while the R^2 for the RE regression is the R^2 overall. Regressions are run for the same set of countries and years as in Tables 2 and 3.

Appendix Figures and Tables

Appendix Figure 1: The fraction of interest income declared as a function of (τ^s - τ^c)



Notes: This figure depicts the fraction of interest income declared out of total interest income (declared and taxed) as a function of the difference between the Swiss withholding interest tax rate and the home interest tax rate for country and year between 2006 and 2013. The shares of interest income declared have been built using AFC data. The interest and dividend income tax rates for the 27 EU countries are obtained from the International Bureau of Fiscal Documentation (IBFD) and the OECD tax database.

Appendix Table 1: Robustness check removing offshore centers from the sample

	(1) RE Mundlak	(2) Piecewise	(3) VD Levels	(4) Logit	(5) Piecewise Logit	(6) VD Logit
$(\tau^s - \tau^c)$	0.859***			8.655***		
	(0.000)			(0.000)		
$(\tau^s - \tau^c) < 0$		0.518	0.553*		6.244**	6.557**
		(0.102)	(0.066)		(0.043)	(0.029)
$(\tau^s - \tau^c) > 0$		1.157***	1.161***		10.863***	10.897***
		(0.000)	(0.000)		(0.000)	(0.000)
$\mathbb{1}_{(\tau^s - \tau^c)>0}$		-0.010	-0.011		-0.086	-0.092
		(0.739)	(0.707)		(0.745)	(0.722)
$TREATY$	0.107***	0.119***	0.115***	0.586**	0.674**	0.631**
	(0.001)	(0.000)	(0.000)	(0.036)	(0.014)	(0.017)
SVD	0.067	0.066		0.603*	0.592*	
	(0.231)	(0.246)		(0.056)	(0.051)	
PVD	0.113***	0.117**		0.892***	0.727*	
	(0.000)	(0.015)		(0.001)	(0.087)	
SVD_{low}			0.005			0.021
			(0.850)			(0.810)
SVD_{high}			0.111			1.027**
			(0.226)			(0.017)
PVD_{low}			0.122***			0.825*
			(0.009)			(0.083)
PVD_{high}			0.137*			0.800
			(0.068)			(0.193)
Constant	0.001	0.032	0.045	-3.667***	-3.917***	-3.713***
	(0.975)	(0.646)	(0.551)	(0.000)	(0.000)	(0.000)
Nb. Obs	166	166	166	166	166	166
Clusters	22	22	22	22	22	22
R^2	0.55	0.56	0.57	0.52	0.53	0.54

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The columns are the same as those in Tables 2 and 3 but the sample is restricted to countries not suspected of being offshore centers. The R^2 for the RE regression is the R^2 overall. Regressions are run for the same set of years as in Tables 2 and 3.

Appendix Table 2: Robustness check keeping only in the sample countries that entered the EU before 2004

	(1) RE Mundlak	(2) Piecewise	(3) VD Levels	(4) Logit	(5) Piecewise Logit	(6) VD Logit
$(\tau^s - \tau^c)$	0.838***			7.460***		
	(0.000)			(0.000)		
$(\tau^s - \tau^c) < 0$		0.372	0.414		6.071**	6.440**
		(0.244)	(0.186)		(0.046)	(0.028)
$(\tau^s - \tau^c) > 0$		1.328*	1.317*		11.271***	11.114***
		(0.052)	(0.053)		(0.000)	(0.000)
$\mathbb{1}_{(\tau^s - \tau^c) > 0}$		0.046	0.048		-0.087	-0.072
		(0.268)	(0.255)		(0.742)	(0.782)
$TREATY$	0.108***	0.111***	0.105***	0.691**	0.736**	0.689**
	(0.004)	(0.003)	(0.008)	(0.019)	(0.011)	(0.012)
SVD	0.082	0.083		0.655**	0.639**	
	(0.124)	(0.113)		(0.027)	(0.023)	
PVD	0.165***	0.192***		1.420***	1.435***	
	(0.000)	(0.002)		(0.000)	(0.003)	
SVD_{low}			0.008			0.020
			(0.827)			(0.791)
SVD_{high}			0.130*			1.029***
			(0.082)			(0.004)
PVD_{low}			0.160***			1.429***
			(0.000)			(0.000)
PVD_{high}			0.257***			2.014***
			(0.000)			(0.000)
Constant	0.026	0.176	0.199	-3.501***	-3.142***	-2.087*
	(0.400)	(0.129)	(0.199)	(0.000)	(0.002)	(0.090)
Nb. Obs	118	118	118	118	118	118
Clusters	15	15	15	15	15	15
R^2	0.56	0.61	0.67	0.61	0.62	0.71

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The columns are the same as those in Tables 2 and 3 but the sample is restricted to countries that entered the EU before 2004. The R^2 for the RE regression is the R^2 overall. Regressions are run for the same set of years as in Tables 2 and 3.

Appendix Table 3: Robustness check using the share of wealth declared out of total offshore wealth in Switzerland

	(1) RE Mundlak	(2) Piecewise	(3) VD Levels	(4) Logit	(5) Piecewise Logit	(6) VD Logit
$(\tau^s - \tau^c)$	0.827***			6.904***		
	(0.000)			(0.000)		
$(\tau^s - \tau^c) < 0$		0.405	0.456		4.692	5.198
		(0.279)	(0.216)		(0.145)	(0.101)
$(\tau^s - \tau^c) > 0$		1.523**	1.510**		12.218***	12.068***
		(0.023)	(0.023)		(0.000)	(0.000)
$\mathbb{1}_{(\tau^s - \tau^c) > 0}$		0.010	0.010		-0.104	-0.112
		(0.779)	(0.782)		(0.702)	(0.666)
TREATY	0.115***	0.123***	0.117***	0.717**	0.784**	0.727**
	(0.004)	(0.002)	(0.006)	(0.033)	(0.011)	(0.015)
SVD	0.066	0.064		0.591*	0.578*	
	(0.244)	(0.241)		(0.063)	(0.054)	
PVD	0.157***	0.169***		1.251***	1.051**	
	(0.000)	(0.003)		(0.000)	(0.011)	
SVD_{low}			0.007			0.039
			(0.846)			(0.692)
SVD_{high}			0.107			0.984**
			(0.229)			(0.020)
PVD_{low}			0.168***			1.358***
			(0.000)			(0.000)
PVD_{high}			0.290**			1.650**
			(0.011)			(0.048)
Constant	0.018	0.030	0.236	-3.438***	-4.628***	-2.646
	(0.612)	(0.860)	(0.352)	(0.000)	(0.002)	(0.208)
Nb. Obs	102	102	102	102	102	102
Clusters	13	13	13	13	13	13
R^2	0.55	0.58	0.64	0.57	0.60	0.66

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The columns are the same as those in Tables 2 and 3 but the dependent variable is the share of wealth declared out of total offshore wealth in Switzerland. The R^2 for the RE regression is the R^2 overall. Regressions are run for the same set of countries and years as in Tables 2 and 3.

Appendix Table 4: Robustness check using tax on capital income instead of tax on interest

	(1) Logit	(2) Piecewise Logit	(3) VD Logit	(4) Piecewise Splitpoint	(5) VD Splitpoint
$(\tau_w^s$ - $\tau_w^c)$	9.86***				
	(2.29)				
$(\tau_w^s$ - $\tau_w^c) < 0$		8.12***	8.19***		
		(2.41)	(2.34)		
$(\tau_w^s$ - $\tau_w^c) > 0$		7.63	7.74		
		(5.71)	(5.80)		
$\mathbb{1}_{(\tau_w^s-\tau_w^c)>0}$		0.54**	0.54**		
		(0.23)	(0.23)		
$(\tau_w^s$ - $\tau_w^c) <$ -0.05				6.43***	6.50***
				(2.40)	(2.26)
$(\tau_w^s$ - $\tau_w^c) >$ -0.05				15.63**	15.85**
				(7.25)	(7.31)
$\mathbb{1}_{(\tau_w^s-\tau_w^c)>-0.05}$				0.43	0.43
				(0.40)	(0.41)
$TREATY$	1.11***	0.95***	0.94***	1.10***	1.09***
	(0.23)	(0.23)	(0.22)	(0.23)	(0.22)
SVD	0.57*	0.61**		0.61**	
	(0.30)	(0.29)		(0.30)	
PVD	1.32***	0.61		1.28***	
	(0.28)	(0.38)		(0.28)	
SVD_{low}			0.05		0.06
			(0.12)		(0.14)
SVD_{high}			0.90**		0.89**
			(0.38)		(0.40)
PVD_{low}			0.57		1.11***
			(0.36)		(0.31)
PVD_{high}			0.98*		1.66***
			(0.51)		(0.44)
Constant	-3.71***	-4.81***	-4.79***	-3.41***	-3.49***
	(0.25)	(0.56)	(0.53)	(0.57)	(0.74)
Nb. Obs	189	189	189	189	189
Clusters	24	24	24	24	24
R^2	0.453	0.524	0.537	0.478	0.505

Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. In this specification, the differences in capital income taxes are used instead of the differences in interest taxes. The R^2 for the RE regression is the R^2 overall. Regressions are run for the same set of countries and years as in Tables 2 and 3.