TAX EVASION AND THE "SWISS CHEESE" REGULATION

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November, 2020

Abstract

Before automatic exchange of information, the 2005 Savings Tax Directive was the most far-ranging initiative in the attempt to curb tax evasion of European households in Switzerland. Under this program, European tax evaders holding interest-yielding accounts in Switzerland had two choices: either declare their accounts to the fiscal authorities of their resident countries or pay a tax upfront and keep their anonymity. Exploiting a unique combination of public administrative datasets, this paper sheds light on the loopholes of this reform and the large behavioral responses of tax evaders aimed at exploiting them. I find that the reform barely curbed tax evasion : 75% of the European offshore wealth in Switzerland remained both undeclared and untaxed by the time the Directive was repealed. Using the Swiss households' investments as a control group, I 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. While they remain fairly low, declarations of offshore wealth under the Directive have more than quadrupled over the period 2006-2013. This paper argues that monetary incentives, such as tax amnesties in the evader's home country or the increase in the upfront tax in Switzerland, are the first drivers of declarations. Conversely, bilateral information exchange treaties that were praised as a way to "end bank secrecy" have the least effect on declarations.

JEL codes: D31; H24; H26; K34

Keywords: Tax evasion, capital taxation, 2005 Savings tax directive

*Email: nina_roussille@berkeley.edu. I am indebted to Thomas Piketty, Stefanie Stantcheva and Gabriel Zucman for their guidance and encouragement on this project. This paper also benefited from insightful comments from Augustin Bergeron, Sebastian Koenigs and Jeremy Majerovitz and the attendants of the Paris School of Economics Applied Economics Lunch Seminar. I want to thank Philip Kerfs and Oliver Petzold at the Centre for Tax Policy and Administration of the OECD as well as Michaels Marnin and Jessica Radermacher at Backer & McKenzie for providing me with important information on Voluntary Disclosure Programs. The usual disclaimers apply.

1 Introduction

At a time when budget deficits and sovereign debt are sharply rising, governments are looking for ways to raise revenues without putting additional fiscal pressure on their most vulnerable citizens. In this context, curbing tax evasion is an appealing option. Indeed, tax evasion amounts to about 8 percent of total household financial wealth (Zucman (2013)) and is highly concentrated at the top of the wealth distribution (Alstadsæter, Johannesen, and Zucman (2019)). Therefore, tax enforcement policies on offshore wealth could both lead to substantial government revenue and large social welfare gains. However, the extreme mobility of financial assets combined with institutionalized financial secrecy poses a challenge to policies aimed at tackling tax evasion. In this context, a better understanding of the shortcomings of past initiatives is key to the design of future policies.

The 2005 "Savings Tax Directive" was one of the most far-ranging initiative in the attempt to curb tax evasion in Europe. Before its implementation, 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, have 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, households 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 account. 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 (large penalties, legal pursuits etc.) remained. Further, the incentives to declare hidden bank accounts to tax authorities increased over time as the upfront tax withholding went from 15% for the interest payments before June 30th 2008, to 20% for those between July 1st 2008 and July 1st 2011 and finally to 35% for the interest payments from July 1st 2011 on.

This paper uses a unique combination of public administrative datasets to study the effectiveness, or lack thereof, of the Directive along these two dimensions. The first dataset is the Swiss Federal Tax Administration ("Administration fédérale des contributions") yearly publication on the amount of interests collectively earned by households, 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 categories (bonds, equities, mutual fund shares) and by type of holders (private customer, commercial customers or institutional investors). This granular data on asset categories and type of holders allows me 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.

My computations first show that 75% of the income derived from EU offshore wealth in Switzerland remained untaxed in 2013. In other words, only 25% 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 understand the reasons behind the limited reach of the Directive, I track the behavior of two types of agents, tax evaders and Swiss banks, to find patterns in investment strategies that reflect avoidance of the Directive. I find that three distinct characteristics earned the regulation its "Swiss cheese" denomination. First, European tax evaders took advantage of the fact that the tax only applied to interest-yielding accounts held directly by EU customers to operate a significant switch of their assets to tax-free vehicles, namely dividend-yielding securities. I establish this result comparing the investment strategies of Swiss residents, who were unaffected by the tax, to the investment strategies of foreign account holders, in particular EU ones. I find that, in the 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. At the time the Directive was announced, the share of interest-yielding securities sharply went down by 8 percentage points, 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[1], then we can estimate that the share of interest-yielding securities in EU residents portfolios went all the way down to 17% in 2007. Second, the tax only applied to interest income from securities directly held by EU customers. This opened the way for another

[1] This seems plausible as non-EU residents were not affected by the Directive.

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 between 1976 and 2014.[2] This allows me 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 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 households sharply dropped to 15%, which represents a 40% decrease. In contrast, the share of all fiduciary deposits held directly by non-EU non-haven households remained the same.[3] This stark difference, which persists after 2005, is evidence that EU households 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 portfolio of foreign customers but the identification is not as clean since foreign customers groups together both EU and non-EU customers. I also find suggestive evidence that banks have only been partly compliant in taxing the interest-yielding accounts of their EU clients and transferring them to the Swiss authorities, at least in the first years of application of the Directive. Finally, I show that the small share of European offshore wealth taxed or declared under the Directive belongs to relatively low wealth evaders, leaving the bulk of very high-net-worth households unaffected.

Analyzing the evolution of declarations of offshore wealth, we observe an increasing trend from 2006 to 2013. While the share of offshore wealth in the scope of the Directive[4] was about 8% in 2006, it has gone up to 26% by 2013. This increase is mostly due to a rise in declarations. The latter were 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 on, the multiplication of tax amnesties in evaders'

[2] As noted in Zucman (2013), "country breakdowns are puzzling at first glance. In 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. What happens? The SNB records such holdings because it does not see through sham corporations used by households. 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 you understand 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."

[3] And therefore, symmetrically, the share held by tax havens went up by 10 percentage points

[4] In other words, the share of offshore that is either taxed or declared under the Directive

home countries and the signature of bilateral treaties between Switzerland and some EU countries. The paper proposes a model that aggregates these public policies in a single payoff function of evasion and explains the mechanisms through which each of these policies can impact declarations of offshore wealth. While the model predicts the sign of the relation between the payoff of evasion and the different policies, the empirical analysis helps assess the magnitude of these coefficients. 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, declarants 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 assess which type of policy had the most impact on tax evaders, I collected 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 variations in these policies in a OLS regression model with country-fixed effects, the paper claims that monetary incentives are 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.

A few earlier papers study the 2005 European Savings Tax Directive but employ empirical strategies quite different from mine. Hemmelgarn and Nicodème (2009) uses 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. Johannesen (2014), using BIS data as well, shows 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. 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. Finally, 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. My paper adds to this literature by providing a unifying statistics to understand the extent of the failure of the Directives: 75% of European wealth remained untaxed or undeclared by the repeal of the Directive. In addition, my paper provides evidence on a new tax evading behavior, the shifting of portfolios from interest-yielding to tax-free dividend-yielding assets. Finally, the combination of country-level data on declarations and home-country tax policy over time generates new results on the drivers of tax evaders' choice to regularize their fiscal situation.

This paper also fits more broadly in the literature explaining why enforcement efforts do not have a larger effect on tax compliance. Johannesen and Zucman (2014) and Menkhoff and Miethe (2019) demonstrate that information exchange treaties signed between some offshore centers and other countries did not imply an increase in declaration of offshore wealth, but rather induced shifting of deposits in offshore centers outside the scope of these treaties. Omartian (2017) finds that banks undermine regulation clamping down on foreign tax evasion by establishing opaque legal structures in tax havens. Langenmayr (2017) finds evidence in the 2009 U.S. offshore voluntary disclosure program that these programs can actually increase tax evasion. 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, little empirical work has been done to understand the underlying motives of evaders to either conceal or declare their offshore revenues. Indeed, if the motivation to evade in the first place is obviously to avoid paying taxes, the reasons to declare once an individual owns an offshore account are less transparent. In particular, the simultaneity of policies to incentivize evaders makes it hard to attribute the rise in declarations to one or the other. This paper sheds light on this topic of importance to future public policy designs.

Section 2 presents the tax environment in Switzerland from an historical perspective and explains the emergence of the Savings Directive in this context. Section 3 describe the administrative datasets used in the paper. Section 4 provides the first estimate of the scope of the Directive and describes how evaders took advantage of its loopholes. Section 5 models the payoff function from evasion and explains the mechanisms through which public policies can impact this payoff. Section 6 explains the empirical strategy that is used to disentangle the effect of public policies on declarations and and presents the results from this analysis as well as their policy implications. Section 7 concludes.

2 Institutional setting

This section describes the Swiss tax environment, in particular how non-Swiss residents can escape all forms of capital income taxation by holding securities or deposits in Switzerland, as well as how the Directive reshaped it.

2.1 Bank secrecy

Following the methodology in Zucman (2013), I 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[5]. 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 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 is not automatic: countries can only request information on households 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 are very difficult to gather and countries will rarely be able to send a proper request to Switzerland.[6]

2.2 The Savings Tax Directive

The Savings Tax Directive introduced a system of taxation of foreign interest income for EU resident households. The Directive was signed in 2003 by 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

[5] This statistics is derived using the 2014 "Global Financial Wealth" publication of the Crédit Suisse

[6] 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")

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 before June 30th 2008, 20% for the interest payments between July 1st 2008 and July 1st 2011 and 35% for the interest payments from July 1st 2011 on.

Transmission of information is necessary only if the household does not already self-report his revenue to his home tax administration. Therefore, the Directive aims at taxing individuals who did not declare their offshore interest-yielding accounts, the others remain unaffected. Concretely, those who used to declare their Swiss interest income to their home country before July 1st 2005 will now be recorded as "declarations under the Directive" but their tax rate will remain the one of their home country. For the others, two options are available. They can 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 can 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 The 35% Swiss advance tax

The Savings Tax Directive is theoretically not the first occurrence of a withholding tax applied to foreign residents' interest income in Switzerland. Since the Federal Act of 13 October 1965 on withholding tax, interest paid to Swiss and foreign residents on Swiss bank accounts and deposits are subject to an anticipatory tax (35% in current days). This means that any deposit account held with a Swiss bank, in which interest income is earned, will be subject to a 35% anticipatory tax on this income. Simple interest on a term deposit or a savings account is considered as Swiss source income, regardless of the currency of the account. However, it is easy to avoid the withholding tax by entrusting funds to a Swiss bank in its capacity as fiduciary agent. Swiss fiduciary deposits are deposits made by Swiss banks on behalf of their customers in banks in other jurisdictions. Since the interests paid by the other jurisdiction is not considered as Swiss-source, fiduciary deposits are exempt from the 35% Swiss anticipatory tax.

2.4 Coordination on the taxation of savings income, a recurrent idea

The first attempt to coordinate on the taxation of European savings income was led by the EU Commissioner Christiane Scrivener in 1989. The aim of her reform was to create a common withholding tax in all the EU Member States on interest income paid out to other EU residents. This proposal required unanimity to be passed and was not adopted because of the opposition of Luxembourg and the United Kingdom. The second attempt was directed by Mario Monti, at the time Commissioner for Internal Market, Financial Services and Financial Integration, Customs, and Taxation. Monti's proposal was milder than the previous attempt since it provided Member States with two alternatives: either a withholding tax levied at source, like in the one proposed by Scrivener, or a systematic exchange of information within EU borders. However, this proposed reform suffered the same fate as its predecessor. Finally, an agreement was reached in 2000 and led to the adoption of the EU Directive on Savings Income Taxation in 2003. The 2004/911/EC Council Decision sealed the agreement between the European Community and the Swiss Confederation providing for measures similar to those laid down in Council Directive 2003/48/EC on taxation of savings income in the form of interest payments. 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.

3 Data

The first data source is the Swiss Federal Fiscal Administration ("Administration fédérale des contributions") yearly publication on the amount of interests earned directly by each EU country and that are therefore either taxed at the withholding rate or report to the home country. Further, the publication separates the amount of interests that is taxed from the amount that is declared by EU citizens to their home administration. For instance, in 2013, French residents earned 338 million CHF in interest and declared 44 million CHF. This dataset is also used to compute, for the 2006-2013 period, the share of interest declared out of the total interests earned for all 27 European countries. In the example of France, this share is $44/338 = 13$ %.

The second important dataset is 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. Zucman (2013) is the first to use this dataset to investigate the wealth held offshore. Following his methodology, I extend the computation of EU offshore portfolio wealth held in Switzerland to 2014.

Combining yearly computations from the first dataset on the offshore wealth of EU households in Switzerland that was either taxed or declared under the Directive with computations from the SNB data on the total EU offshore wealth held in Switzerland, I am able to assess the share of the EU offshore wealth in Switzerland that is either taxed or declared.

The Swiss National Bank also provides a breakdown of securities held by foreigners (and Swiss residents) by asset categories (bonds, equities, mutual fund shares) and by type of holders (private customer, commercial customers or institutional investors)[7]. These breakdowns will allow us to analyse strategic patterns of re-investments following the Directive.

4 The scope of the Directive

While the Saving Tax Directive has been praised in policy circles as a major breakthrough in the fight against tax evasion,[8] my computations shows that the share of EU offshore wealth declared or taxed under the Directive was below 10% until 2010 and only reached 26% in 2013, leaving about three quarter of EU offshore wealth undeclared and untaxed. This section also explores the reasons behind this limited scope.

4.1 The effective tax base of the Directive

Using the same methodology as in Zucman (2013), Figure 1 shows the evolution of both total (grey line) and EU (blue line) offshore wealth in Switzerland. Despite the policies aimed at curbing tax evasion, total offshore wealth in Switzerland has significantly increased between 2002 and 2014, from about $1,300bn to $2,400bn, the only major drop is the financial crisis year of 2009. The red line tracks the total EU offshore wealth either taxed or declared under the Directive. Two main transformations of the raw data are done to obtain this estimate. First, while the Swiss Federal Fiscal Administration provides information on the amount of interest earned by EU households, it does not give the value of the underlying accounts. Therefore, we need to find the average interest rate on foreign-held accounts in Switzerland. Indications we have on the type of financial investments that foreigners make in Switzerland are limited. However, we observe in the Swiss National Bank data that, for investment in bond shares, the distribution is roughly 1/6 in public

[7] Let us note here that the later breakdown is fictitious. Indeed, there is no evidence that Swiss banks provide custody services for foreign corporations Zucman (2013)). Therefore, individuals are also the final holders of accounts registered as belonging to "Institutional investors".

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

sector and 5/6 in 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. In order to approximate the interest rate on public and private sector investment, I therefore chose to use, respectively, the returns on Vanguard Intermediate-Term Treasury Fund Investor Shares and Vanguard Total Bond Market Index Fund Investor Shares. For 2013, the estimated return is 2.41%. Considering that European evaders are high-net-worth individuals who are advised by qualified bank managers, these estimates are very conservative. Consequently, I obtain the lower-bound for the true interest rate and the upper-bound for the total interest yielding accounts taxed or declared under the Directive. Second, for the accounts that are declared, it is highly likely that not only the interest-yielding accounts but in fact all accounts were declared. Assuming that the portfolio of declarants has 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. Figure 2takes the ratio of the red line to the blue line, that is the share of total EU offshore wealth in the scope of the Directive. The share of EU offshore wealth declared or taxed under the Directive was below 10% until 2010 and had only risen to 26% in 2013.

4.2 Strategic reallocation in tax-free dividend-yielding assets

The Directive had two major blind spots that significantly restrained its efficacy. The first and most obvious one is that the European Commission decided to tax only interests, not dividends. From a purely static perspective, SNB data shows that only 45% of the total offshore wealth is invested in interest-yielding securities (bond issues, 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, I use monthly SNB data to compute the share of interest-yielding securities in non-residents portfolio between 1999 and 2013. I then use Swiss residents portfolio composition as the control group. Indeed, contrary to European investors, Swiss investors were not incentivised by the Directive to alter their investment behavior. Therefore, if common trend before 2005 is verified, Swiss residents' portfolio can be used as a counterfactual for non-residents'. Finally, it is important to note that I focus only on investments in foreign assets, that is assets emitted by non-Swiss entities, which represent about 70% of non-resident's portfolio. The reason is that Swiss securities are already subject to another

withholding tax, the 35% Swiss advance tax, so that they are unaffected by the Directive.

Figure 3 provides evidence that a tax-savvy behavior was adopted by offshore account holders. To understand this, let's first focus on the two curves: "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 in the portfolio of foreigners starts to decrease sharply: by July 2005, it had already gone down from 48% to 39%, 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. In the same time period, for Swiss residents, this share had remained above 40% at every point in time, 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 presents strong evidence 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 other foreign countries. Indeed, we can consider that the decrease in the share of interest-yielding securities in foreigners' portfolio is driven only by 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. Therefore, assuming that from January 2005 on, non-EU foreigners' share evolved in the same way as Swiss residents' one, we can simulate the evolution of EU residents' portfolio. According to this simulation, the share of interest-yielding accounts in Europeans' securities melts away. By December 2007, only 17% of EU countries' securities remain invested in bond issues or money market instruments.

A confounding scenario would be the following: from 2005 on, for an exogenous reason, foreigners and Swiss start investing differently. If this was true, then we should observe different trends not only in the couple of years after the Directive but also in 2013. Conversely, if the Directive is the only cause of the change, then once the active investors have switched their portfolio to dividend yielding

securities, the general trend should be back on the same tracks as Swiss residents. Empirically, we observe that from 2008 onwards, foreigners and Swiss residents' curves have parallel evolutions. This outcome conforts us in our analysis: the Directive is the main factor that can explain the dramatic drop in interest-yielding custody accounts held by the Savings Tax Directive countries.

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

The second blind spot of the Directive is that it only applies to securities held directly by EU citizens. This leaves yet another opportunity for evaders to circumvent the taxation of their offshore income. Indeed, they can transfer the ownership of their assets to a sham corporation outside of the EU. 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.

This effect of the Directive has been studied in depth by Johannesen (2014), who shows a decrease in EU-owned bank deposits in Switzerland of about 30-40% in the months following the enforcement of the Directive. This decline is not due to repatriation; instead, it is the result of a moderate shift of deposits in offshore centers outside the Savings Directive like Macao and by an increase of 129% in Panama-owned bank deposits, which suggests a shifting from direct ownership to the holding of accounts through sham corporations. To obtain these results, the author uses cross-border bank deposits from the Bank for International Settlements.

In this section, we complement his analysis by using a different dataset, the SNB publications, first to document the symmetrical pattern, namely that Switzerland recorded a decrease in the deposits directly held by EU citizens, and second to verify whether this trend held not only for deposits but also for custody accounts, that make up for the bulk of tax evaders' portfolio.

While fiduciary deposits represent a small share of European households' assets in Switzerland, they are interesting to study because there exist a country level breakdown of assets that allow to clearly define groups of EU vs. 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, vs 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 14%, a decrease of 44% from the previous year. In contrast, the share held by non-EU citizens slightly increase to 28%. The gap between the two groups persists over the 8 years following the application of the Directive. 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, transfer the ownership of their assets and therefore avoided the withholding tax.

Figure 5 presents the evolution of the share of custody accounts held by foreign private customers. 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, the share of custody accounts held by foreign private customers is the one possessed directly by individuals, while the share held by "institutional investors" is the one held through sham structures in offshore centers. First, note that opening 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, in contrast with the analysis of the share of interest-yielding securities in custody accounts, it is harder to consider the share of private customers in Swiss residents' data as a control group. However, these limitations do not prevent us from drawing conclusions on the impact of the Directive on the share of private customers in EU-owned custody accounts. Indeed, while the average annual decline between 2004 and 2014 (excluding 2005) is 2.1 percentage points, there is a sharp decline of 4.2 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 4 times the average decline between 2004 and 2014. Additionally, this decline 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 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 6.7 percentage points in only 6 months, that is more than 6 times the average decline between 2004 and 2014.

4.4 The absence of binding mechanism, the door open to deviations

For the interest income to be effectively taxed, banks should truthfully report the income of all their EU clients to tax authorities. In practice, to abide by the confidentiality principle, only aggregated

amounts are reported by banks. This implies that tax authorities, either Swiss or European, have no means to control that banks report accurately their clients' interest income and must therefore rely on the banks' good faith.

We can however check whether, on aggregate, the theoretical tax base of the Directive matches the total assets declared by banks. To compute the theoretical tax base of the Directive, we have to make several assumptions. Regarding fiduciary deposits, since they are subject to the Savings Tax as long as they are held directly by Europeans, I wave the deposits held through tax havens but assume that 100% of fiduciary deposits held directly by Europeans belong to private customers and should therefore be taxed. Regarding custody accounts, they are considered taxable only if they are both held directly by EU private customers and interest-yielding. To compute the share of interest-yielding securities held by EU citizens, I take the most conservative estimate (that is the smallest percentage share), namely the one derived under the simulation for EU (see Figure 3). Then, I compute the share of "theoretically" taxable accounts that are actually taxed. Non-compliance of banks would imply that this ratio is below 100%, that is that there are less accounts taxed than there should be. A final adjustment is made after computing the raw ratio. Indeed, it was equal to 164% in 2013. As there is no rationale for this measure to be above 100%, I set the ratio in 2013 at 100% and normalize all previous years using the 2013 raw estimate value. Figure 6 provides the evolution of this ratio over time. As we can observe, in the six years that followed the entry in force of the Directive, Swiss bankers declared at most half of the accounts they should have reported. Further, more than half of the variation in the ratio over the period 2006-2013 is due to a decrease in the theoretical tax base rather than to an increase in the total amount taxed or declared. This situation illustrates the limits of the *pacta sunt servanda* principle of international law: it relies on the good faith of all parties.

4.5 The profile of declarants

Alstadste$R^2$019 show that increases in enforcement are more effective in inducing evaders with the smallest accounts to become compliant. The data provided by the Swiss Fiscal Administration can be used to test whether this holds true in the context of the Directive. Indeed, the Swiss Fiscal Administration annual data on declarations provides, along with the total interest declared, the number of accounts declared. We can therefore derive the average interest account declared. While this statistic more than doubles during the period, it only reaches $ 523,000 on average for all EU countries in 2013. Even if we add dividend-yielding accounts to that total using

the portfolio breakdown we derived in Section 4.2 the average hidden offshore wealth of a declarant is only slightly above $ 1 million.

Table 1 allows us to understand better how this average wealth declared under the Directive ranks within each country's financial wealth distribution. In most countries, the average declared wealth under the European Directive is below the average financial wealth of the top1% in the evader's home country. Further, the median of wealth declared is systematically below the average amount declared which confirms that the bulk of declarants are in the lower end of the distribution of tax evaders.

This outcome is coherent with the idea that, in a context of increasing concentration of wealth (Piketty and Zucman (2015)) 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 profiles. 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)), the declarants likely have portfolios skewed towards more interest-yielding shares than the rest of evaders. While this paragraph is purely descriptive, the model and econometric approach in Section 5.2 and 6 allow us to explain why only small offshore account owners make the decision to sel-report their hidden wealth.

5 Modelling the drivers of declarations

5.1 Policies driving declarations

Over the period 2006-2013, a number of policies targeted offshore wealth: not only did the upfront tax in Switzerland go up from 15% in July 2005 to 35% from July 2011 on, but information treaties were signed between Switzerland and other European countries in the aftermath of the 2009 G20 summit. Simultaneously, several European countries offered to reduce the penalty imposed on evaders if they decided to self-report their offshore wealth. The advocates of each policy claimed that the increase in declarations reflected the success of their proposition. In practice, it is unlikely that all these policies impacted declarations, at least not to the same extent. It is therefore key to disentangle the real motivation of evaders when choosing to declare their accounts.

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 and, conversely, the higher the tax rate in Switzerland the more incentives there are to declare. Second, information exchange treaties between Switzerland and European countries can impact 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 decision to declare his 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. The last 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 some 60 billion euros (Baer and Le Borgne (2008)). In the aftermath of this successful disclosure program and since additional revenue are particularly welcomed in recession times, variants of this amnesty program emerged across several European countries in the years 2010 onwards as well as in the US (Johannesen et al. 2020). For instance, Spain offered a similar program under the name "Declaracion 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. Finally, 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 only pay, in penalties, five per cent of each of the understated taxes to the public treasury[9].

5.2 Modeling the behavior of tax evaders

In this section, I develop a simplified model of agents' returns to evasion in order to better understand the channels through which the public policies described above can affect the choice of evaders to declare their offshore wealth. For that purpose, let us consider a one period model with

[9] The evader also has to pay the evaded taxes and an interest rate of 6%.

a representative tax evader 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 a household 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. We can first try to assess the fiscal cost of declaration. Let us consider τ^c, the top tax rate on capital income in the home country c of the evader 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[10]. $\left[\tau^c + F_s^c\right]$ 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.

Let us now turn to the fiscal cost of evasion. We first need to define the following set of variables:

- p_i^c is the probability that the evader gets caught by his home country tax authorities
- F_d^c is the rate of the penalty in the event that the evader is discovered by his home country tax authorities.[11]
- τ^s is the tax rate in Switzerland applied on foreigner's capital income (European Savings Tax)
- s_i = share of offshore wealth taxable by the European Savings Tax, that is the interest income derived from accounts held directly by evader i.

Then, $\left[p_i^c \times \left(\tau^c + F_d^c\right) + \left(1 - p_i^c\right) \times \left(\tau^s.s_i\right)\right]$ can be interpreted as the tax rate that the evader faces by hiding his money in Switzerland. With a probability p_i^c, the evader will be caught by his home administration and 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 a 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 that he earns in interest from accounts he owns directly, s_i. Finally, the difference between $\left[\tau^c + F_s^c\right]$ and $\left[p_i^c \times \left(\tau^c + F_d^c\right) + \left(1 - p_i^c\right) \times \left(\tau^s \times s_i\right)\right]$ multiplied by the amount on which those rates are applied, w_i^c, represents the payoff of evasion which can be

[10] The subscript s stands for "Self-report".
[11] The subscript d stands for "Discovered".

expressed as follows:

$$\Pi_i = w_i^c \times \left[\left[\tau^c + F_s^c(VD^c, W_i^c) \right] - \left[p_i^c(T^c, W_i) \times \left[\tau^c + F_d^c(W_i^c) \right] + \left[1 - p_i^c(T^c, W_i^c) \right] \times \left[\tau^s \times s_i(W_i^c) \right] \right] \right] (1)$$

The variables in the payoff equation are expressed as functions of the public policies described in Section **??**:

- VD^c is a continuous variable indicating the generosity of voluntary disclosure program in country c ($VD^c = 0$ is equivalent to an absence of VD program)
- T^c is a continuous variable measuring the enforcement efficiency of information exchange treaties with Switzerland ($T^c = 0$ is equivalent to an absence of treaty).

Under this payoff function, the evader has two choices:

- keep his offshore funds hidden. This decision is made if the gains of evasion offset the costs incurred that is if $\Pi_i > 0$
- 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 the parameters of the profit function affect this decision. 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 :

- F_s^c is a function of the existence of voluntary disclosure programs. Indeed, voluntary disclosure programs provide for lower penalties in the event that the evader comes forward to his home tax administration. Therefore:

$$\frac{\partial F_s^c(VD^c, W_i^c)}{\partial VD^c} \leq 0 \longrightarrow \frac{\partial \Pi_i}{\partial VD^c} \leq 0 \quad (2)$$

- p_i^c 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.

$$\frac{\partial p_i^c(T^c, W_i^c)}{\partial T^c} \geq 0 \longrightarrow \frac{\partial \Pi_i}{\partial T^c} \leq 0 \quad (3)$$

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 sense, p_i^c should be an increasing function of W_i^c.

- s_i is a decreasing function of W_i^c. Indeed, 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:

$$\frac{\partial s_i(W_i^c)}{\partial W_i^c} \leq 0 \tag{4}$$

  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.

- Finally, both F_s^c and F_d^c are increasing functions of W_i^c. Indeed, the wealthier an evader is the more likely he is to face penal prosecutions and to get public attention. Moreover, from the French 2013 Voluntary Disclosure Program experience, it seems that the monetary penalty rate is increasing with wealth. But again, we can not 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. Indeed, τ^s - τ^c is a benefit (or a cost if $\tau^s > \tau^c$) the evader gains in the current period but also in all future periods. 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. In that sense, we can interpret τ^s-τ^c as a proxy for the long-term benefit of evasion (or the long-term cost of declaration). On the contrary, voluntary disclosure programs reduces 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 stories behind the increase in the declarations over the period 2006-2013:

- either 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.
- or 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.

6 Empirical strategy and results

6.1 Data for the regression analysis

In order to investigate the changes in the share of interest declared out of the total interest income under the scope of the Directive, several explanatory datasets are gathered.

The first one is the interest and dividend income tax rate of the 27 countries for the 2006-2013 period. The main sources of information are the International Bureau of Fiscal Documentation (IBFD) and the OECD tax database. Official government websites as well as consulting firms' tax

environment studies were also used to confirm the data. Importantly, in countries where tax rates differ between capital income derived domestically and capital income derived abroad, I selected the latter.

The OECD has made an inventory of the tax treaties signed between Switzerland and the other European countries on its Exchange of Tax Information Portal and I use this information to test the effect of tax treaties on declarations.

The last source of information I use is a unique dataset that lists all the Voluntary Disclosure Programs in each European country participating in the Directive. This dataset was constructed 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). 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 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 on the voluntary disclosure programs in these countries.

6.2 From the theoretical model to the econometric specification

Dependent variable: In the main specification we use the fraction declared, that is the ratio of interest income declared over the sum of interest income declared and taxed under the Directive, for a given country. This concept addresses the choice that individuals who remain taxed under the Directive face: do I keep my offshore account illegally and pay the upfront tax or do I declare to my home country? We also show results for the share of wealth declared under the Directive.[12] Figure 6 presents the fraction declared for different countries and demonstrates the existence of significant spatial disparities: while the initial fraction declared for Germany is 41.7%, it is 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 fraction declared.

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 measuring in a

[12] The reason we mainly use fraction declared is that 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 4.1.

sense the generosity of the programs, real world data are categorical. Therefore, we can only test the impact of the presence of a treaty versus the absence of a treaty. With 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 offer a low relief[13]. Finally, the only outcome for which data are available is declarations. Therefore, the intermediary impacts, notably, the impacts of explanatory variables on the payoff function of tax evasion and, for treaties and VD programs, on the parameters that define this payoff function, are not observable. Another important feature of the empirical analysis is that τ^s and τ^c are not the capital income tax rates but the interest income tax rates. This characteristic is not due to data limitation: I do have dividend income tax rate and I extrapolate a capital income tax rate by combining interest and dividend income tax rates using the Swiss National Bank to compute the shares of each type of investment in the offshore portfolio of tax evaders. However, after observing that declarants are at the lower end of the wealth distribution of tax evaders, my intuition is that their portfolio investment is not similar to the one of the average evader: declarants are likely the ones who mostly invested in lower-risk assets, that is interest-yielding ones. Therefore, I decided to keep to interest income tax rates in the main specification and leave the analysis on the estimated capital income tax rate to the robustness checks section.

6.3 Econometric specification

The main specification is the following:

$$FDEC_{it} = \beta_0 + \beta_1(\tau^s - \tau^c)_{it} + \beta_2 SVD_{it} + \beta_3 PVD_i + \beta_4 SIGNED_{it} + u_i + \epsilon_{it} \qquad (5)$$

where $FDEC_{it}$ is the fraction declared by country i at time t. Mathematically, $FDEC_{it}$ = [declared interest income / (declared + taxed interest income)] for country i at time t. $(\tau^s - \tau^c)_{it}$ = (Swiss withholding interest tax rate - home interest tax rate)$_{it}$, 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 and $SIGNED_{it}$ is a dummy equal to 1

[13] he determination of the generosity of VD programs is done on the following criteria. low : penalties only "mitigated" or remain >= 30 % of unpaid taxes or "depends on the case" or interest per year higher than 15%. medium: penalties remain >= 10% of unpaid tax. high: all penalties waived and sometimes tax as well. I choose not to take the "imprisonment" variable into consideration when computing the categories because in most cases self-reporters cannot be prosecuted and when the risk still exists, prison charges 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 through the Savings tax Directive.

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 one time-invariant independent variable - the permanent VD programs -, we also propose a specification that adds the cluster means of all time-varying covariates as regressors in the estimated model instead of fixed effects. This method was proposed by Mundlak (1978). The cluster means are invariant within cluster (and 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 - random effect with the Mundlak correction - is the following:

$$\begin{aligned} FDEC_{it} =& \beta_0 + \beta_1(\tau^s - \tau^c)_{it} + \beta_2 SVD_{it} + \beta_3 PVD_i + \beta_4 SIGNED_{it} + \\ & \beta_5\overline{(\tau^s - \tau^c)}_i + \beta_6\overline{SVD}_i + \beta_7\overline{SIGNED}_i + u_i + \epsilon_i t \end{aligned} \tag{6}$$

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

The dependent variable is a fraction. To handle these data properly, one must take into account the bounded nature of the response. Since a linear regression model on fractional data can generate predictions outside the unit interval, we need to find a transformation of FDEC that yields sensical predictions even for extreme values of the regressors. A common way to keep the predictions strictly within the unit interval is the logit transformation. Therefore, I will specify a model where :

$$Y_{it} = \log(\frac{FDEC_{it}}{1 - FDEC_{it}}) \tag{7}$$

and then

$$\begin{aligned} Y_{it} =& \beta_0 + \beta_1(\tau^s - \tau^c)_{it} + \beta_2 SVD_{it} + \beta_3 PVD_i + \beta_4 SIGNED_{it} + \\ & \beta_5\overline{(\tau^s - \tau^c)}_i + \beta_6\overline{SVD}_i + \beta_7\overline{SIGNED}_i + u_i + \epsilon_i t \end{aligned} \tag{8}$$

Figure 8 shows a binned scatter plot of the fraction declared as a function of $(\tau^s - \tau^c)$. We observe that the relationship is, as expected, increasing but we also see that 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 I also run equations (6) and (8) by splitting (τ^s - τ^c) into two subsets: (τ^s - τ^c) > 0 and (τ^s - τ^c) < 0. I also allow for a potential discontinuity in the intercept by adding a dummy variable equal to 1 if (τ^s - τ^c) > 0, $\mathbb{1}_{(\tau^s - \tau^c) > 0}$. This specification can be referred to as the piecewise regression. Finally, I separate voluntary disclosure into different levels of amnesty. The level denominated $PVDhigh$ corresponds to amnesties under which tax evaders are strongly incentivized to declare their accounts. For permanent programs, since I 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.

6.4 Main results

In Table 2, Column (1) provides results for the FE model and Column (2) provides the results for the Mundlak specification. We can first note that all the coefficients signs are in accordance with the model proposed in Section 5.2: 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 are the first driver of declarations: As a back of the envelope calculation, the increase in the effective withholding tax rate from 15% in 2005 to 35% in 2012 could have 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. While the coefficient is significant, the signature of treaties has a smaller effect on the change in declarations over the period. The logit transformation in column (5) provides better estimates for the comparison of coefficients' magnitude. From this specification, it appears that both temporary and permanent voluntary disclosure programs have higher coefficient estimate than the signature of a treaty. In particular, permanent programs have about 1.5 times the impact of treaty signature on the fraction of interest income declared in Switzerland. Permanent programs also have a higher coefficient than temporary programs[14]. Column (3) and (6) provide the results for the piecewise regression, both for the standard and logit transformation models.

[14] This result is in accordance with 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))

The two specifications point at the same conclusions: the coefficient for the impact of (τ^s - τ^c) on declarations is higher when (τ^s - τ^c) > 0 than when (τ^s - τ^c) < 0. This means that an increase of 1 percentage point in τ^s has a higher impact on declarations in countries where τ^s is greater than τ^c. This result illustrates the "threshold effect" mechanism described in Section 6.3: while the profit from evading is continuously decreasing in (τ^s - τ^c), evaders start declaring only when their profit becomes negative. The latter outcome is more likely when (τ^s - τ^c) > 0 than when (τ^s - τ^c) < 0. However, the fact that the coefficient is still positive when (τ^s - τ^c) < 0[15] indicates that other considerations than just monetary ones enter the decision function. These considerations are incorporated in 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.[16] Finally, columns (4) and (8) provide results when we breakdown voluntary disclosure programs in different levels in accordance with the generosity of the relief offered by the government. These results show that the only temporary programs that have a significantly positive effect on declarations are the ones that offer high reliefs to evaders. The coefficient on high relief special 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 (the coefficient on the second is 50% higher than on the first one) but low permanent programs still have a significant effect on the fraction declared, with an impact that is in fact still higher than the signature of a treaty.

These results demonstrate that, far from declaring mostly because of international agreements' pressure, the bulk of tax evaders decide to declare their accounts in reaction to monetary incentives. Consequently, it is not surprising that declarants are mostly "small" account holders[17] : 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 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.

[15] Even after controlling for other incentives to declare such as the signature of a treaty or a voluntary disclosure program.

[16] 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.

[17] the average account declared lies between $ 1 and $ 3 million over the 2006-2013 period, see Section

6.5 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 respectively the SIGNED, SVD and PVD variables. The results are reported in Column (1) of Appendix Table 1. While all interaction terms have a positive coefficient, none of them are significantly different from zero. This implies that we can't find a significant differential impact 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) to (4) of Appendix Table 1. The introduction of year fixed effect 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 8 year period, the effect of (τ^s - τ^c) is absorbed by the introduction of year fixed effects. The introduction of a year trend 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 (10% level) impact of (τ^s - τ^c) on the fraction declared. In the third specification including time related variables, I introduce two different trends, before and after 2009. The motivation behind this specification is that 2009 is simultaneously the year of the financial crisis[18] and the year of the "G20 crackdown on tax evasion"[19]. 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 in their home country. 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 should 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 the sample. As a consequence, a possible confounding scenario would be the following: treaty signed affect moderately the declaration of offshore accounts in Switzerland, but

[18] which can have impact differently the numerator and denominator of the fraction declared. We can for instance think that it has decreased the total wealth taxed or declared under the Directive because of an overall decrease in assets but that it has increased the declarations because smaller accounts owners are more prone to declarations.

[19] which could have entailed a surge in declarations if evaders strongly believed that tax havens were about to disappear.

they are at the origin of important repatriations that we do not account for. If that were 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 can estimate the following equation:

$$\begin{aligned}\log(deposit_{it}) =&\beta_0 + \beta_1(\tau^s - \tau^c)_{it} + \beta_2 SVD_{it} + \beta_3 PVD_i + \beta_4 SIGNED_{it} + \\ &\beta_5\overline{(\tau^s - \tau^c)}_i + \beta_6\overline{SVD}_i + \beta_7\overline{SIGNED}_i + u_i + \epsilon_i t\end{aligned} \tag{9}$$

The results are reported in column (5) of Appendix Table 1. Let us first note that the deposits considered here are the ones held directly by EU citizens. Therefore, a decrease in deposits held directly by evaders in Switzerland does not necessarily imply that evaders repatriate their account: it can also be that evaders decide to open a sham corporation in an offshore center such as Panama, through which they hold their account in Switzerland, or that they shift their accounts in offshore centers that did not abide by the Directive. The Savings Directive has indeed triggered such reactions, which have been thoroughly documented in Johannesen (2014). Therefore, the negative coefficient on (τ^s - τ^c) does not necessarily mean that people repatriate more when the difference in tax increases. It could also be that a higher difference in tax rate incentivize evaders to move their fund in another offshore center or add a further layer of secrecy by opening a dummy company. Conversely, the fact that the coefficient on SIGNED is not statistically different from zero implies that signing a treaty does not entail a higher decrease in deposits held by evaders. So 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.[20] Another source of concern is reverse causality bias. (τ^s - τ^c) 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) shows[21] that, prior to the signature of treaties starting in 2009, there was no significant difference in fraction declared between countries that end up signing a treaty with Switzerland and countries that do not. Therefore, reverse causality is ruled out for the SIGNED variable as well. Finally, we want to test that there is no strong difference in

[20] 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.

[21] Figure 7 of the paper

declarations, ex ante, between countries that launch temporary voluntary disclosure programs and countries that do not. Indeed, one could worry that voluntary disclosure programs are launched in reaction to under-performance, in terms of declarations, compared to other countries.

The next robustness check modifies the size of the sample on which the regressions are ran.[22] Results are reported in Appendix Table 2 to 4. The first restriction is to remove countries that are suspected of offshore activities. Indeed, these countries could be the tax residencies of evaders that are not their citizens[23]. 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, I remove Luxembourg, Malta and Ireland, which are well-known for their offshore activities. 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 $(\tau^s - \tau^c) > 0$ soars. 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 are 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. A second sample variation takes out all the countries that were not in the EU before 2004. Indeed, 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 the countries' offshore wealth in the tax haven, as well as declarations, we should make sure that the results still hold if we exclude these countries from the sample. We run this test alternatively including and excluding Luxembourg, Malta and Ireland. The results show that removing these countries leaves coefficients almost unchanged. There are however two interesting variations in the magnitude. First, permanent voluntary disclose programs seem to have an even larger impact on the restricted sample, second there is an even more important contrast in the slopes between $(\tau^s - \tau^c)<0$ and $(\tau^s - \tau^c) >0$: in the most restricted sample (Appendix Table 4), $(\tau^s - \tau^c)<0$ is not even significantly different from zero. I also display results using the share of offshore wealth declared under the Directive as a dependent variable in Appendix Table 5. The sign of coefficients is the same as for the fraction declared variable. However, the effect of $(\tau^s - \tau^c)$ seems to predominate even more on the share of

[22] Because of the initially small size of the sample (less than 200 observations) I decided to use the full sample in the main regression. However, the restrictions provide an interesting insight on coefficients when removing potential confounding countries.

[23] for instance,IMF (2000) lists Luxembourg, Malta and Ireland as offshore centers.

offshore wealth declared than on the fraction of interest income declared. A possible explanation for this outcome is that the nominator 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 2 to obtain the total wealth declared. Declarations therefore have a stronger impact on the numerator here than with the fraction declared.

6.6 Policy implications

The regression analysis shows that declarants are mostly driven by monetary incentives when deciding to come forward to their home tax administration. In light of these results, we could jump to the conclusion that public policies should focus on increasing these incentives and push tax treaties in the background. The policy implications of this paper are in fact the exact opposite. First, what the paper shows is not that tax treaties in general are inefficient but that the ones that were implemented were not highly credible threats to tax evaders, particularly the most wealthy ones. Conversely, treaties that would enforce automatic exchange of information looking through sham corporations would certainly have allowed to trigger many more declarations. We can make a quick back of the envelop computation in the event that automatic exchange of information was implemented: all Europeans countries would then be able to apply penalties at the full legal rate on all offshore accounts in Switzerland as well as bring back these accounts in their tax base for the current and future periods.[24]

Focusing on the last year of the program in the data, the year 2013, I compute the tax revenues lost that year and the possible gains from imposing penalties on tax evaders. Table 3 reports the results of this computation.

[24] These computations do not account for general equilibrium effects such as evaders switching their accounts to other offshore centers. However, we can imagine that automatic exchange of information would be implemented not only in Switzerland but also in all other offshore centers. Another general equilibrium effect that is harder to account for is labor supply elasticities: some evaders could decide that if the revenues from their capital are taxed at their home country's tax rate then they will decrease their labor supply and therefore their income taxed. However, as Piketty (2014) shows in Figure 8.4 of his book "Capital in the twenty-first century", revenues from capital exceed revenues from labor for the top 0.01% in France. Therefore, labor adjustments are likely to have limited impacts on the total taxable income for the subgroup of very high net wealth profiles that tax evaders are. A final general equilibrium effect we do not consider is investment adjustment: maybe tax evaders invested the revenue from their wealth in high-growth companies and taxing this revenue will consequently decrease investment and growth.

I find that $ 297 bn could be collected in penalties in the 20 countries that I study. This represents, on average, 25% of each country's undeclared offshore wealth in Switzerland[25]. Using data from Eurostat, we can assess that this represented more that 50% of the aggregated public deficits of the countries in the same year. The penalties also amount to the total public Research and Development expenditures in the same year for these countries[26]. Considering that Switzerland concentrates about half of European total offshore wealth, implementing automatic exchange of information worldwide would have allowed to cover fully the public deficit in 2013, or two times the public spendings in R&D. Furthermore, the benefits of ending tax dodging are not limited to a one-off revenue. It also allows to increase the tax base for the future periods. Let us take the example of France: taxing offshore wealth in Switzerland would bring $ 2.7 bn annually and extending this measure to all offshore centers would allow the state to collect $ 5.6 bn every year. This makes up for 8.3% of the income tax, "impôt sur le revenu des ménages", collected that year[27]. Let us keep in mind that, in comparison, the Savings Tax Directive only enabled France to collect $ 136 mn in 2013. On average, the Directive only allows to cover 4.2% of the tax revenues that worldwide, fully enforced automatic exchange of information could induce.

The regression results also show that voluntary disclosure programs have a significant impact on declarations. A policy maker could therefore advocate for their expansion, insisting that the ones offering high reliefs are the most effective. In fact, what I find is a partial equilibrium result. Indeed, as Langenmayr (2017) shows using empirical data on the 2009 U.S voluntary disclosure programs, these policies encourage tax evasion in the longer run. A more theoretical paper, Konrad and Stolper (2015), proves that, in a general equilibrium setting, reducing penalties for tax evaders who self-report their offshore wealth makes haven countries more robust against international pressure. Finally, even from a static perspective, offering evaders a fiscal gift is not the best way to maximize tax revenues.

The final element that I study in the regression analysis is (τ^s - τ^c). I show that it is the first driver of declarations: the higher (τ^s - τ^c), the higher the fraction declared. However, the two tax rates should be assessed separately when considering public policy implications. Indeed, the home country tax rate τ^c does not only apply to tax evaders but to the entire tax base. Therefore, decreasing this tax rate could be in fact harmful to the countries' total tax revenues. Additionally, since the most wealthy evaders find ways to avoid paying the tax in Switzerland, the home tax

[25] This is an unweighted average of all the countries. The weighted average is 34%
[26] This statistic was computed using the OECD Research and Development Statistics (RDS) database
[27] Source: Cour des comptes, rapport sur les recettes de l'Etat 2013

rate should be set at a very low level to make them return to their home country. Conversely, τ^s could be increased at no cost to the home country tax revenue as it only applies to tax evaders. Therefore, it is surprising that this tax rate was implemented at such a low rate (15%) in 2005. Setting it at least at the maximum top capital tax rate of all participant countries[28] would likely have triggered more declarations.

7 Conclusion

In the first part of the paper, I described how tax evaders reacted strategically to the introduction of a tax on offshore wealth in Switzerland. I identified three loopholes in the Savings Tax Directive: the taxation of interest-yielding accounts only, the tracking of accounts only when they are owned directly by Europeans and the absence of control mechanisms to ensure compliance from the banks.Then, using macro data from the Swiss National Bank and the Swiss Fiscal Administration, I demonstrate how tax evaders took advantage of each of these shortfalls to dodge taxation. The second part was motivated by the observation that the scope of the Directive has almost tripled between 2006 and 2013. This evolution is mostly due to declarations. With a simple model, I showed the mechanisms through which different public policies can impact declarations, then the empirical analysis provided the magnitude of each effect. I 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. The rest of the paper is dedicated to the policy implications of these findings.

After ten years of statu 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 at the end of 2018 and is an important topic for future research.

[28] and also applying it to all capital income

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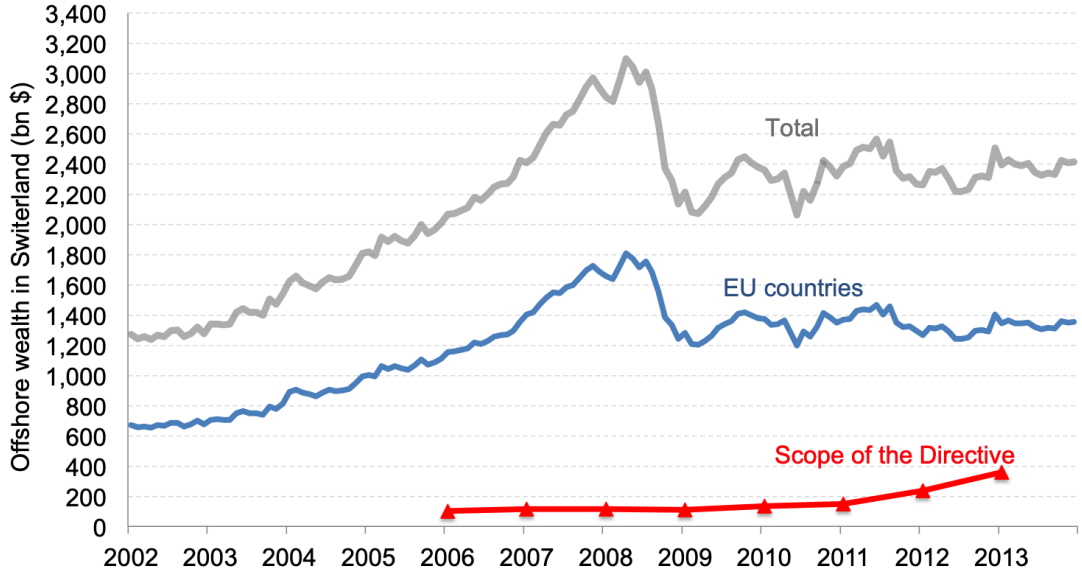
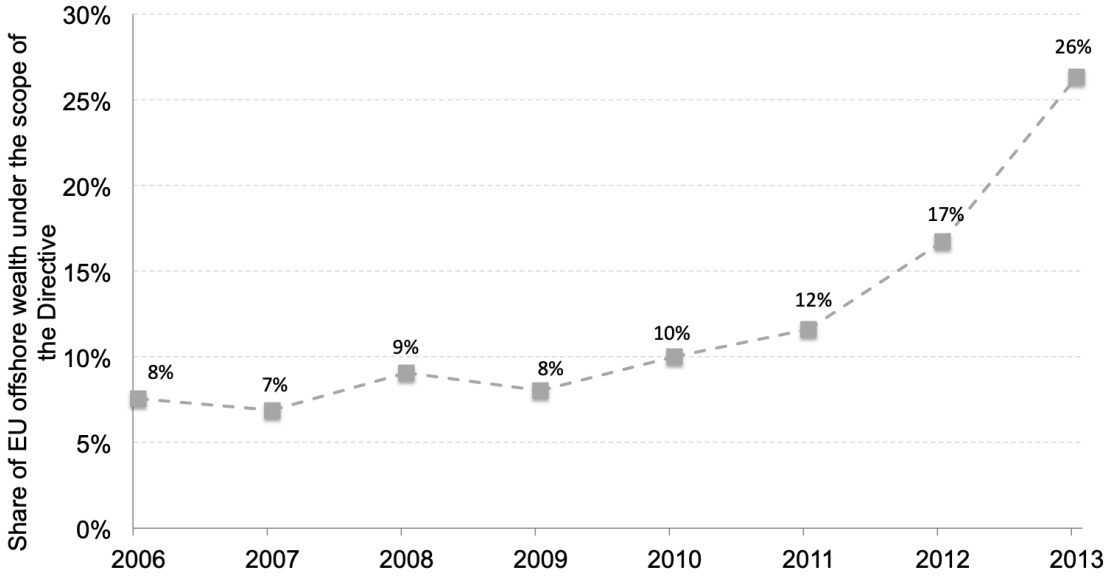
Figures

Figure 1: The evolution of the total and EU offshore wealth in Switzerland as well as the EU offshore wealth in the scope of the Directive



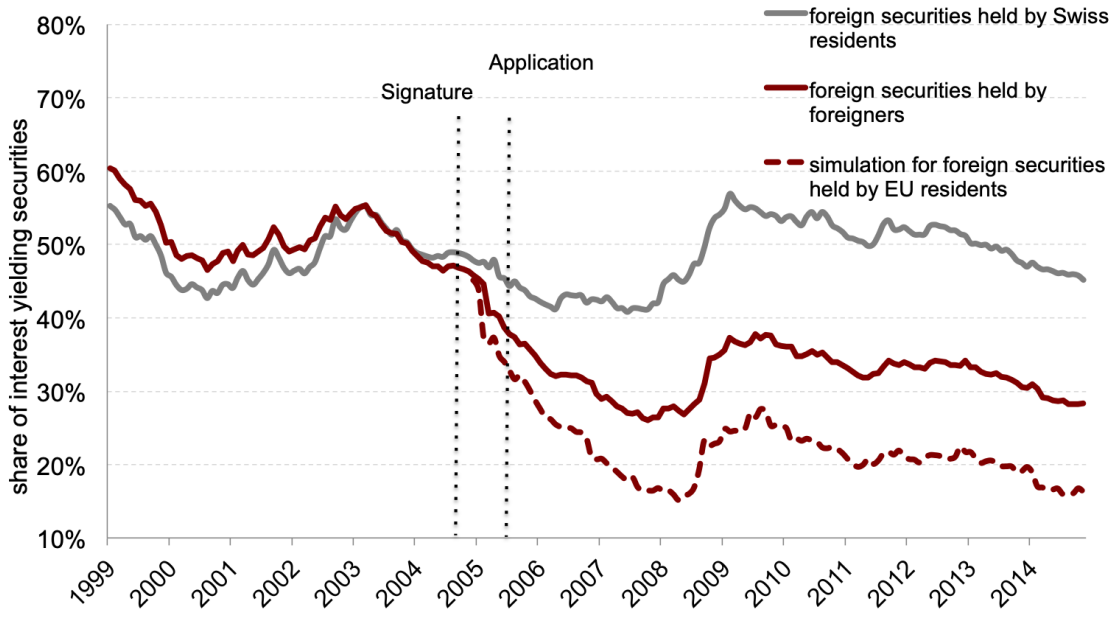
Notes: The figure reports monthly data and the date displayed on the x-axis are January of each year. Source: author's computations using SNB and SFFA data.

Figure 2: The change in the share of interest-yielding accounts in foreign asset portfolios



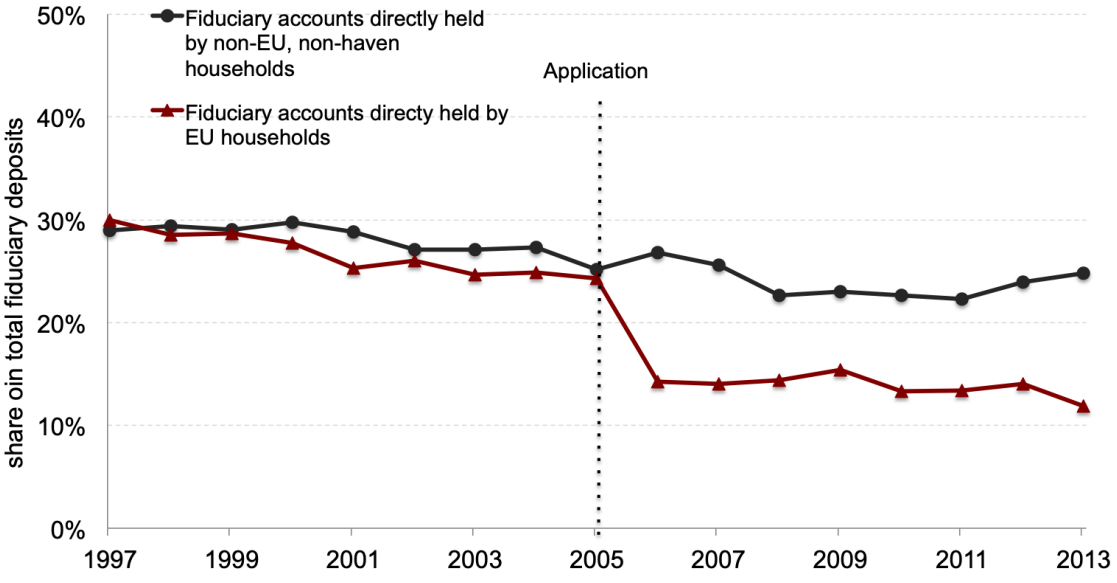
Notes: The figure reports monthly data and the date displayed on the x-axis are January of each year. Source: author's computations using SNB and SFFA data.

Figure 3: The change in the share of interest-yielding accounts in foreign asset portfolios



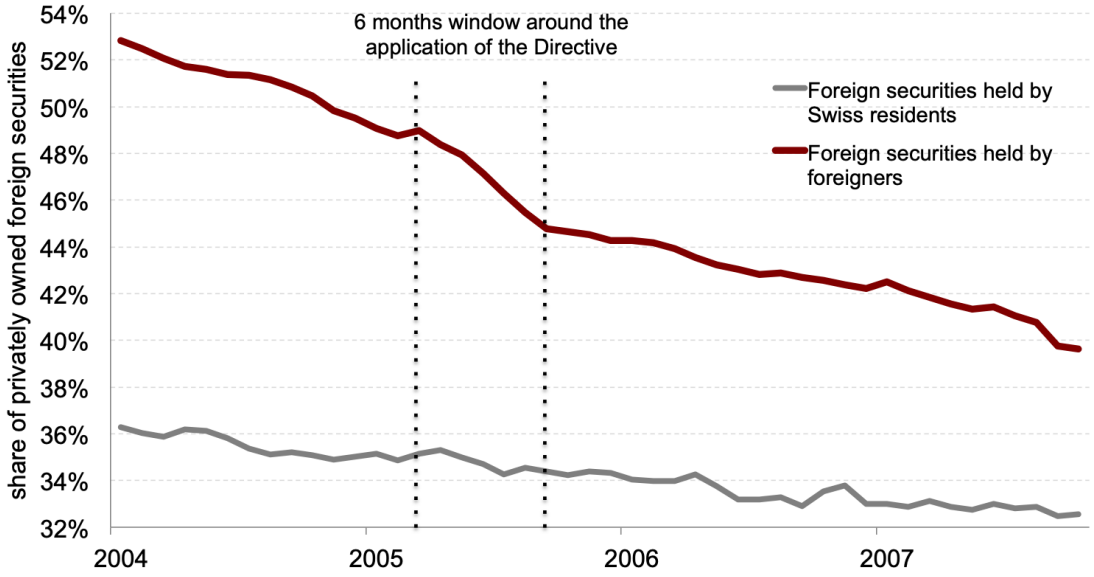
Notes: The figure reports monthly data and the date displayed on the x-axis are January of each year. Source: author's computations using SNB data.

Figure 4: The change in fiduciary deposits ownership in response to the Directive



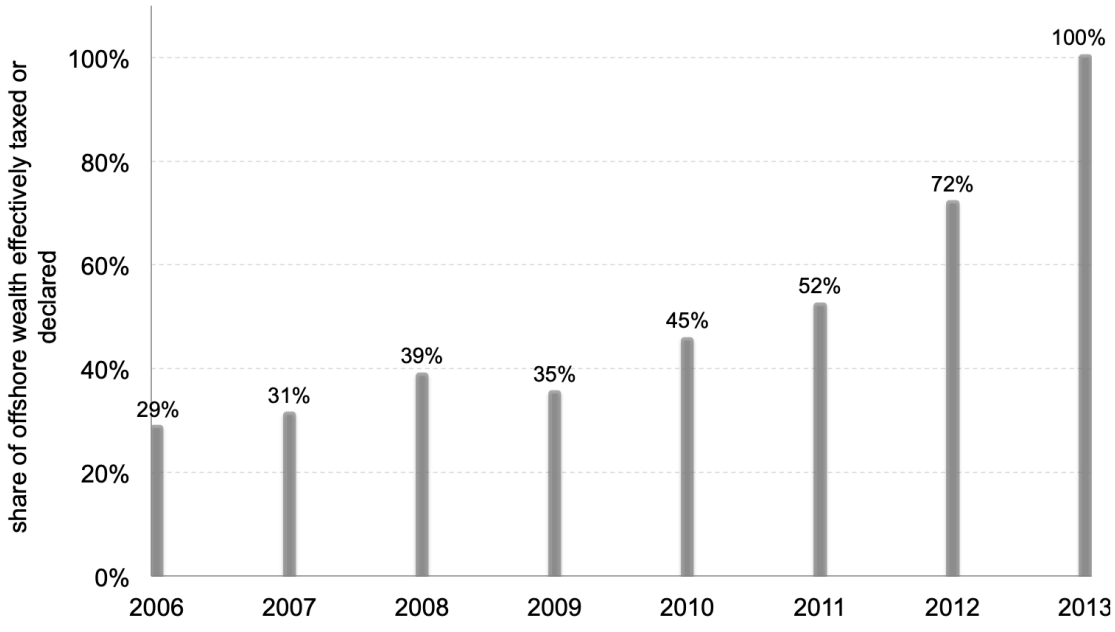
Notes: The figure reports monthly data and the date displayed on the x-axis are January of each year. Source: author's computations using SNB data.

Figure 5: The change in custody accounts ownership in response to the Directive



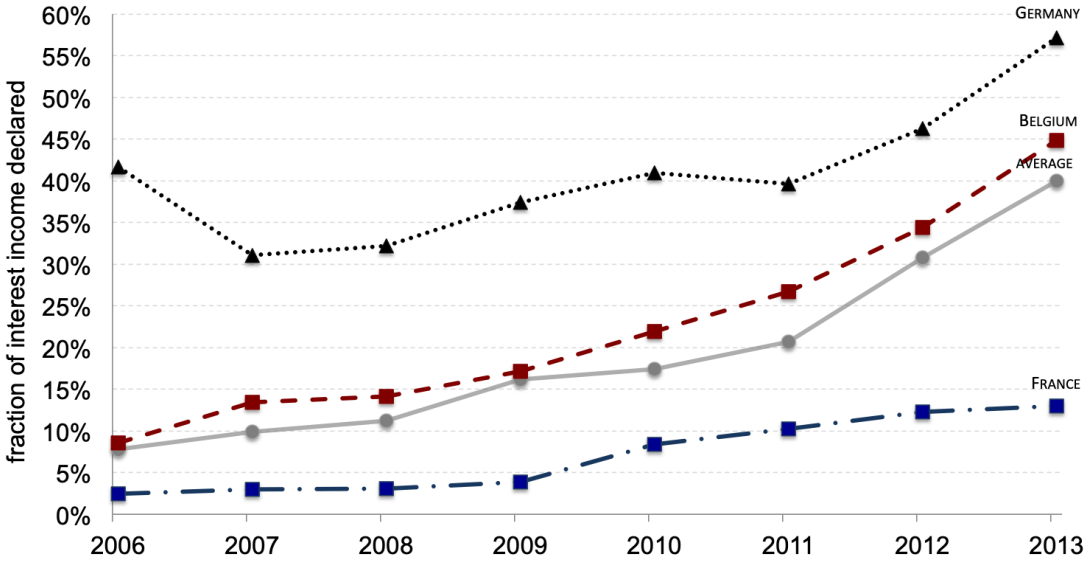
Notes: The figure reports monthly data and the date displayed on the x-axis are January of each year. Source: author's computations using SNB data.

Figure 6: Bank compliance



Notes: The figure reports annual data. Source: author's computations using AFC and SNB data

Figure 7: Country-level evolution of the fraction declared



Notes: The figure reports annual data. The"average" is an unweighted average of all countries for which the AFC reports a positive number of declarations.
Source: author's computations using AFC data.

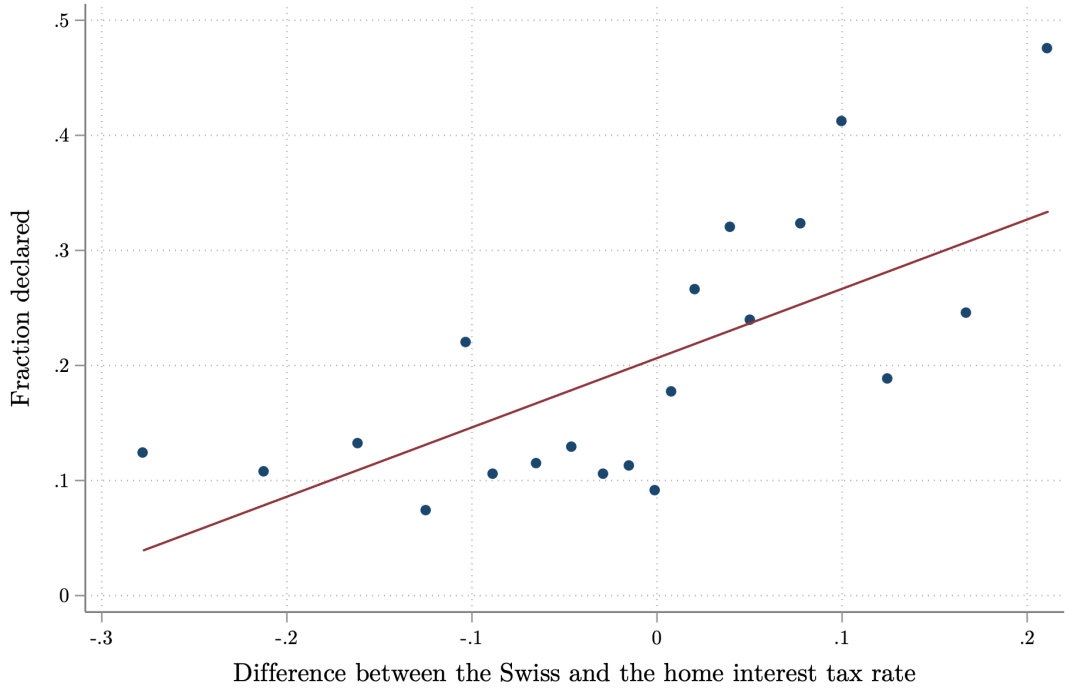


Figure 8: The fraction declared as a function of (τ^s - τ^c)

Tables

Table 1: Average declared wealth (in thousand $) and ranking of declarants in their home country's wealth distribution

Unit: thousand $	Average wealth declared under the Directive	Average financial wealth (per adult) in the country	Top 10% share of wealth in the country	Top 1% share of wealth in the country	Top 10% Average financial wealth in the country	Top 1% Average financial wealth in the country	Declarant position in the distribution of average wealth
Austria	1272	102	63,6%	29,0%	649	2961	between top10% and top1%
Belgium	1653	159	47,3%	17,3%	754	2757	between top10% and top1%
Czech Republic	2185	24	65,3%	36,3%	159	887	above the top1%
Denmark	1521	218	65,8%	27,6%	1432	6008	between top10% and top1%
Finland	1428	74	54,5%	22,0%	403	1627	between top10% and top1%
France	703	117	52,2%	20,5%	612	2404	between top10% and top1%
Germany	891	97	61,7%	28,0%	601	2729	between top10% and top1%
Greece	755	38	54,1%	24,6%	203	925	between top10% and top1%
Ireland	1629	123	58,4%	27,2%	717	3339	between top10% and top1%
Italy	747	100	50,6%	20,6%	504	2054	between top10% and top1%
Netherlands	1514	203	54,5%	22,4%	1105	4543	between top10% and top1%
Poland	3134	15	62,2%	32,4%	91	472	above the top1%
Portugal	2030	59	57,8%	26,4%	342	1561	above the top1%
Spain	1783	61	54,8%	26,0%	335	1588	above the top1%
Sweden	2011	179	68,8%	30,9%	1232	5534	between top10% and top1%
United Kingdom	1297	147	53,6%	22,8%	787	3350	between top10% and top1%

Source: AFC, SNB data, Credit Suisse annual Global Wealth Databook and author's computations. Some countries are missing because no data were available on the share of top1% and top10% in the country's wealth. Also note that data on top1% and top10% share in the country's financial wealth were not available in Credit Suisse annual Global Wealth Databook but that one can think of their share in total wealth as a lower bound for their share in the financial wealth.

Table 2: Regression results

Variables	FE model	RE Mundlak correction	Piecewise regression	VD levels	Logit Transformation	Piecewise Logit Transformation	Logit VD levels
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$(\tau^s - \tau^c)$	0.87***	0.87***			8.67***		
	(0.16)	(0.16)			(1.38)		
$(\tau^s - \tau^c) < 0$			0.46	0.48*		7.34**	7.58***
			(0.29)	(0.27)		(2.94)	(2.82)
$(\tau^s - \tau^c) > 0$			1.08***	1.09***		9.63***	9.68***
			(0.21)	(0.21)		(1.83)	(1.83)
$\mathbb{1}_{(\tau^s - \tau^c)>0}$			0.01	0.01		-0.00	-0.01
			(0.03)	(0.03)		(0.25)	(0.25)
$SIGNED$	0.10***	0.10***	0.11***	0.11***	0.54**	0.58**	0.55**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.25)	(0.26)	(0.25)
SVD	0.08*	0.08*	0.08*		0.67**	0.67**	
	(0.05)	(0.05)	(0.05)		(0.27)	(0.26)	
PVD		0.11***	0.10**		1.01***	0.89**	
		(0.03)	(0.05)		(0.27)	(0.40)	
$SVDlow$				0.01			0.02
				(0.03)			(0.11)
$SVDhigh$				0.12*			1.00***
				(0.07)			(0.32)
$PVDlow$				0.08*			0.84**
				(0.05)			(0.42)
$PVDhigh$				0.15**			1.20**
				(0.06)			(0.50)
Constant	0.18***	-0.02	-0.03	-0.05	-3.89***	-4.10***	-4.10***
	(0.01)	(0.03)	(0.09)	(0.08)	(0.21)	(0.56)	(0.51)
Nb Obs	190	190	190	190	189	189	189
Nb Clusters	24	24	24	24	24	24	24
R^2	0.602	0.567	0.579	0.620	0.568	0.572	0.585

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent is the fraction declared in country i at time t. Column (1) has country-level fixed effects. 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.

Table 3: Simulation of the revenues assuming automatic exchange of information with Switzerland in 2013

	Hidden offshore wealth in Switzerland in bn $	Offshore revenues in mn $	Top capital tax rates	Unpaid income tax, interest and penalties in bn$	Inheritance and wealth unpaid taxes in bn$	Annual income tax revenue in mn$	Annual inheritance and wealth tax revenue in mn$	Total one-off payments as a share of hidden offshore wealth
Austria	15,3	915	25%	4,2	0,0	166	0	27,5%
Belgium	68,8	4129	25%	14,8	6,9	707	673	31,5%
Czech Republic	5,7	342	15%	0,5	0,0	47	0	9,1%
Denmark	5,8	349	46%	2,9	0,4	68	18	57,3%
Estonia	1,1	63	5%	0,03	0,0	3	0	2,7%
Finland	2,3	136	25%	0,2	0,1	29	18	14,2%
France	146,6	8798	47%	45,0	46,1	1563	1190	62,1%
Germany	99,9	5992	26%	20,6	14,3	1029	928	34,9%
Greece	87,6	5255	16%	11,0	2,1	699	355	15,0%
Hungary	2,1	128	16%	0,2	0,1	18	16	12,7%
Ireland	16,0	961	44%	2,5	1,0	333	197	21,8%
Italy	185,9	11154	20%	28,3	1,8	1870	297	16,2%
Lithuania	0,4	25	19%	0,03	0,0	4	0	6,6%
Netherlands	88,5	5308	30%	46,8	10,1	568	300	64,3%
Poland	6,2	373	19%	1,6	0,1	52	15	26,8%
Portugal	38,1	2284	28%	4,2	0,0	569	0	11,1%
Slovak Republic	2,4	141	5%	0,1	0,0	7	0	2,6%
Slovenia	0,5	28	25%	0,1	0,03	5	2	30,7%
Spain	88,3	5296	27%	13,8	15,2	960	1152	32,9%
Sweden	9,9	596	30%	2,4	0,0	136	0	24,1%
Total (or average)	871,2	52274	25%	199,3	98,1	8832	5161	25,2%

Note: The expected annual tax revenue is computed using a capital income tax rate that combines interest and dividend income tax rates to reflect the investment portfolios of European investors in Switzerland, as described by the SNB data. The expected revenue from penalties is computed using the information from the 2010 and 2015 OECD reports on disclosure programs. Indeed, the reports provide details on the sanctions in the event that the evader gets caught. For annual inheritance tax, I use data collected in the IBFD annual publication of "The European Tax Handbooks". I removed the countries for which the computation of the share of offshore wealth in Switzerland is not possible, that is the countries that entered the EU after 2004 and countries that are offshore centers such as Luxembourg. Because of the non-dom rule, under which foreign residents in the UK are exempt from taxes on their international income under certain conditions, it is unclear which share of UK offshore wealth should actually be taxed. I therefore remove the country from my sample. The third and last column provide unweighted averages in the "Total" line while the other columns provide sums.

Table 4: Comparison of the revenues from the Directive and the potential revenues from "the end of bank secrecy" in 2013

	Annual fiscal revenues from automatic exchange in mn$	Annual income tax generated by the Directive in mn$	*as a% of expected tax revenues from automatic ex. with Switzerland*	*as a % of expected tax revenues from automatic ex. worldwide*
Austria	166	31,0	18,7%	9,3%
Belgium	1380	52,9	3,8%	1,9%
Czech Republic	47	5,7	12,2%	6,1%
Denmark	86	4,7	5,4%	2,7%
Estonia	3	0,3	7,9%	4,0%
Finland	47	2,2	4,8%	2,4%
France	2753	135,7	4,9%	2,5%
Germany	1957	469,7	24,0%	12,0%
Greece	1054	30,2	2,9%	1,4%
Hungary	34	5,4	15,8%	7,9%
Ireland	530	5,9	1,1%	0,6%
Italy	2167	103,5	4,8%	2,4%
Lithuania	4	0,7	16,0%	8,0%
Netherlands	868	45,2	5,2%	2,6%
Poland	67	8,8	13,1%	6,5%
Portugal	569	57,4	10,1%	5,0%
Slovak Republic	7	1,0	13,7%	6,9%
Slovenia	7	0,8	11,9%	5,9%
Spain	2112	199,9	9,5%	4,7%
Sweden	136	19,2	14,2%	7,1%
Total (or average)	13993	1180,2	8,4%	4,2%

Note: Same computational assumptions as in Table 4. Zucman(2013) shows that Switzerland concentrates about one third of offshore wealth. Since Europeans are the first beneficiaries of the Swiss bank secrecy we assume that half of their hidden wealth is in Switzerland. The fiscal revenues in column (1) encompass both income, inheritance and wealth taxes. For column (1) and (2) the total is provided, while for column (3) and (4) it is a weighted average.

8 Appendix Tables

Appendix Table 1: Robustness checks: interaction term, time trends and deposits

Variables	Interaction term	year FE	year trend	Different trend b/a 2009	log(deposit)
	(1)	(2)	(3)	(4)	(5)
$(\tau^s$ - $\tau^c)$	6.93***	0.45	1.96**	1.52*	-6.54***
	(1.91)	(1.66)	(0.86)	(0.90)	(1.50)
$SIGNED$	0.49**	-0.07	-0.06	-0.10	-0.14
	(0.24)	(0.23)	(0.23)	(0.22)	(0.23)
SVD	0.94**	0.48**	0.37	0.41*	0.02
	(0.41)	(0.24)	(0.23)	(0.22)	(0.25)
PVD	0.79**	1.01***	1.00***	1.01***	-0.02
	(0.32)	(0.28)	(0.27)	(0.27)	(0.82)
2007 dummy		0.56**			
		(0.22)			
2008 dummy		0.76***			
		(0.26)			
2009 dummy		1.13***			
		(0.26)			
2010 dummy		1.20***			
		(0.31)			
2011 dummy		1.67***			
		(0.31)			
2012 dummy		2.44***			
		(0.40)			
2013 dummy		2.80***			
		(0.42)			
$(\tau^s$ - $\tau^c) \times SVD$	3.96				
	(2.67)				
$(\tau^s$ - $\tau^c) \times PVD$	2.80				
	(2.29)				
$(\tau^s$ - $\tau^c) \times SIGNED$	-1.18				
	(1.65)				
year trend			0.34***		
			(0.05)		
year trend $<$ 2009				0.41***	
				(0.06)	
year trend $>$ 2009				0.41***	
				(0.06)	
Constant	-3.74***	-5.22***	-680.78***	-832.90***	4.68***
	(0.16)	(0.39)	(103.52)	(126.77)	(0.83)

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The dependent 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. 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 provide results for the logit transformation.

Appendix Table 2: Robustness check, changing the sample: removing potential offshore centers

Variables	RE Mundlak correction	Piecewise regression	VD levels	Logit Transformation	Piecewise Logit Transformation	Logit VD levels
	(1)	(2)	(3)	(4)	(5)	(6)
$(\tau^s - \tau^c)$	0.86***			8.60***		
	(0.17)			(1.42)		
$(\tau^s - \tau^c) < 0$		0.50	0.53*		6.03*	6.35**
		(0.32)	(0.31)		(3.12)	(3.04)
$(\tau^s - \tau^c) > 0$		1.17***	1.17***		10.87***	10.91***
		(0.22)	(0.22)		(1.78)	(1.79)
$\mathbb{1}_{(\tau^s - \tau^c)>0}$		-0.01	-0.01		-0.08	-0.09
		(0.03)	(0.03)		(0.27)	(0.26)
$SIGNED$	0.10***	0.12***	0.11***	0.58**	0.67**	0.63**
	(0.03)	(0.03)	(0.03)	(0.28)	(0.28)	(0.27)
SVD	0.07	0.06		0.60*	0.59*	
	(0.06)	(0.06)		(0.32)	(0.30)	
PVD	0.11***	0.12**		0.92***	0.76*	
	(0.03)	(0.05)		(0.27)	(0.41)	
$SVDlow$			0.01			0.04
			(0.03)			(0.09)
$SVDhigh$			0.11			1.01**
			(0.09)			(0.44)
$PVDlow$			0.12***			0.88*
			(0.05)			(0.46)
$PVDhigh$			0.14*			0.83
			(0.07)			(0.61)
Constant	-0.00	0.02	0.03	-3.76***	-4.12***	-3.92***
	(0.02)	(0.07)	(0.08)	(0.22)	(0.61)	(0.73)
Nb Obs	166	166	166	165	165	165
Nb Clusters	21	21	21	21	21	21
R^2	0.541	0.558	0.562	0.520	0.533	0.537

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The columns are the same as Column (2) to (7) in Table 2 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.

Appendix Table 3: Robustness check, changing the sample: keeping only countries that entered the EU before 2004

Variables	RE Mundlak correction	Piecewise regression	VD levels	Logit Transformation	Piecewise Logit Transformation	Logit VD levels
	(1)	(2)	(3)	(4)	(5)	(6)
$(\tau^s - \tau^c)$	0.83***			7.43***		
	(0.20)			(1.77)		
$(\tau^s - \tau^c) < 0$		0.36	0.40		5.99*	6.35**
		(0.32)	(0.32)		(3.08)	(2.98)
$(\tau^s - \tau^c) > 0$		1.35**	1.34**		11.40***	11.25***
		(0.67)	(0.67)		(2.89)	(2.79)
$\mathbb{1}_{(\tau^s - \tau^c)>0}$		0.04	0.05		-0.09	-0.08
		(0.04)	(0.04)		(0.26)	(0.26)
$SIGNED$	0.11***	0.11***	0.10***	0.68**	0.73**	0.68**
	(0.04)	(0.04)	(0.04)	(0.30)	(0.29)	(0.28)
SVD	0.08	0.08		0.65**	0.64**	
	(0.05)	(0.05)		(0.30)	(0.28)	
PVD	0.16***	0.19***		1.42***	1.44***	
	(0.03)	(0.06)		(0.27)	(0.48)	
$SVDlow$			0.01			0.04
			(0.04)			(0.08)
$SVDhigh$			0.13*			1.01***
			(0.08)			(0.36)
$PVDlow$			0.16***			1.43***
			(0.03)			(0.32)
$PVDlow$			0.26***			2.01***
			(0.06)			(0.46)
Constant	0.03	0.17	0.20	-3.51***	-3.15***	-2.10*
	(0.03)	(0.11)	(0.15)	(0.30)	(1.00)	(1.23)
Nb Obs	118	118	118	118	118	118
Nb Clusters	15	15	15	15	15	15
R^2	0.557	0.604	0.667	0.610	0.621	0.710

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The columns are the same as Column (2) to (7) in Table 2 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.

Appendix Table 4: Robustness check, changing the sample: removing potential offshore centers and keeping only countries that entered the EU before 2004

Variables	RE Mundlak correction	Piecewise regression	VD levels	Logit Transformation	Piecewise Logit Transformation	Logit VD levels
	(1)	(2)	(3)	(4)	(5)	(6)
$(\tau^s - \tau^c)$	0.83***			6.88***		
	(0.21)			(1.82)		
$(\tau^s - \tau^c) < 0$		0.39	0.44		4.60	5.09
		(0.38)	(0.37)		(3.26)	(3.21)
$(\tau^s - \tau^c) > 0$		1.53**	1.51**		12.31***	12.16***
		(0.66)	(0.65)		(2.84)	(2.72)
$\mathbb{1}_{(\tau^s-\tau^c)>0}$		0.01	0.01		-0.10	-0.11
		(0.04)	(0.03)		(0.27)	(0.26)
$SIGNED$	0.11***	0.12***	0.12***	0.71**	0.77**	0.72**
	(0.04)	(0.04)	(0.04)	(0.34)	(0.31)	(0.30)
SVD	0.06	0.06		0.59*	0.57*	
	(0.06)	(0.05)		(0.32)	(0.30)	
PVD	0.16***	0.17***		1.25***	1.05**	
	(0.03)	(0.06)		(0.29)	(0.41)	
$SVDlow$			0.01			0.06
			(0.03)			(0.10)
$SVDhigh$			0.10			0.96**
			(0.09)			(0.43)
$PVDlow$			0.17***			1.36***
			(0.04)			(0.34)
$PVDhigh$			0.29***			1.65**
			(0.11)			(0.83)
Constant	0.02	0.03	0.24	-3.45***	-4.64***	-2.66
	(0.03)	(0.17)	(0.28)	(0.35)	(1.46)	(2.10)
Nb Obs	102	102	102	102	102	102
Nb Clusters	13	13	13	13	13	13
R^2	0.546	0.575	0.629	0.565	0.597	0.662

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The columns are the same as Column (2) to (7) in Table 2 but the sample is restricted to countries that entered the EU before 2004 and are not suspected of being offshore centers. The R^2 for the RE regression is the R^2 overall.

Appendix Table 5: Robustness check, regression on the share of wealth declared in the total offshore wealth in Switzerland

Variables	RE Mundlak correction	Piecewise regression	VD levels	Logit Transformation	Piecewise Logit Transformation	Logit VD levels
	(1)	(2)	(3)	(4)	(5)	(6)
$(\tau^s - \tau^c)$	0.28***			10.41***		
	(0.07)			(1.79)		
$(\tau^s - \tau^c) < 0$		0.02	0.02		5.79*	6.08*
		(0.07)	(0.06)		(3.37)	(3.27)
$(\tau^s - \tau^c) > 0$		0.44***	0.44***		14.51***	14.52***
		(0.07)	(0.07)		(2.39)	(2.41)
$\mathbb{1}_{(\tau^s - \tau^c)>0}$		0.00	0.00		-0.14	-0.14
		(0.01)	(0.01)		(0.26)	(0.26)
$SIGNED$	0.03**	0.04***	0.04***	0.70**	0.86***	0.82***
	(0.01)	(0.01)	(0.01)	(0.32)	(0.30)	(0.28)
SVD	0.02	0.02		0.55*	0.52*	
	(0.02)	(0.02)		(0.32)	(0.29)	
PVD	0.03**	0.03*		0.93***	0.84*	
	(0.01)	(0.02)		(0.34)	(0.48)	
$SVDlow$			0.00			-0.05
			(0.01)			(0.10)
$SVDhigh$			0.03			0.88**
			(0.03)			(0.39)
$PVDlow$			0.02			0.62
			(0.01)			(0.51)
$PVDhigh$			0.04*			1.18**
			(0.03)			(0.52)
Constant	0.00	0.02	0.01	-5.93***	-6.18***	-6.14***
	(0.01)	(0.03)	(0.03)	(0.36)	(0.73)	(0.89)
Nb Obs	174	174	174	173	173	173
Nb clusters	22	22	22	22	22	22
R^2	0.368	0.417	0.444	0.526	0.549	0.576

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. The columns are the same as Column (2) to (7) in Table 2 but the dependent variable is the share of wealth declared in the total offshore wealth in Switzerland. The R^2 for the RE regression is the R^2 overall.