

Gould, Matthew; Rablen, Matthew D.

Working Paper

Voluntary disclosure schemes for offshore tax evasion

IFS Working Papers, No. W18/07

Provided in Cooperation with:

Institute for Fiscal Studies (IFS), London

Suggested Citation: Gould, Matthew; Rablen, Matthew D. (2018) : Voluntary disclosure schemes for offshore tax evasion, IFS Working Papers, No. W18/07, Institute for Fiscal Studies (IFS), London,
<https://doi.org/10.1920/wp.ifs.2018.W1807>

This Version is available at:

<https://hdl.handle.net/10419/200296>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Voluntary disclosure schemes for offshore tax evasion

IFS Working Paper W18/07

Matthew Gould

Matthew D. Rablen

Voluntary Disclosure Schemes for Offshore Tax Evasion*

Matthew Gould[†]
gouldma@westminster.ac.uk

Matthew D. Rablen[‡]
m.rablen@sheffield.ac.uk

January 18, 2018

Abstract

Tax authorities worldwide are implementing voluntary disclosure schemes to recover tax on offshore investments. Such schemes are typically designed retrospectively following the bulk acquisition of information on offshore holdings, such as the recent “Paradise” and “Panama” papers. They offer an opportunity for affected taxpayers to make a voluntary disclosure, with reduced fine rates for truthful disclosure. We characterize the taxpayer/tax authority game with and without a scheme and show that a scheme increases net expected tax revenue, decreases illegal offshore investment, increases onshore investment, and could either increase or decrease total offshore investment (legal plus illegal).

JEL Classification: H26, D85.

Keywords: voluntary disclosure, offshore tax evasion, tax amnesty, third-party information.

*Acknowledgements: We are grateful to Duccio Gamannossi, Damian Pritchard, David Rawlings, Jonathan Shaw, James Trees, Nick Warrington; and participants at the Royal Economic Society Conference (Bristol), EEA ESEM (Geneva), LAGV 15 (Aix en Provence), the Tax Administration Research Centre Inaugural Workshop (Exeter), the IRS-TPC Research Conference (Washington, DC), PET 14 (Seattle) and the Shadow Economy International Conference (Münster) for very helpful comments. Both authors gratefully acknowledge financial support from the ESRC (ES/K001744/1). For information relating to disclosure schemes in various countries we thank Rohan Baxter (Australia), Duncan Cleary and Aisling Haughey (Ireland), Kurt Norell (Sweden) and Kim Bloomquist (United States).

[†]Westminster Business School, University of Westminster, 35 Marylebone Road, London, NW1 5LS, UK.

[‡]Department of Economics, University of Sheffield, 9 Mappin Street, Sheffield, S1 4DT, UK.

1 Introduction

An estimated eight percent of the global wealth of households is held in tax havens, much, though by no means all, of which goes unreported (Zucman, 2013). The loss of tax receipts due to offshore tax evasion by individuals for the US alone has been estimated as \$30-40 billion per annum (Gravelle, 2009). In recent years, data breaches have allowed tax authorities around the world to acquire information on the offshore investments of thousands of individuals. To recover any tax owing on these investments, tax authorities have, in many instances, offered affected taxpayers a one-off and time-limited opportunity to make a voluntary disclosure through a bespoke facility giving overt incentives for honesty (usually in the form of a lower fine rate). We term schemes of this form Incentivized Offshore Voluntary Disclosure Schemes (IOVDS), or just “schemes”. The net revenues arising from such schemes have been significant: in 2009 a United States (US) scheme netted \$3.4 billion (GAO, 2013) and a United Kingdom (UK) scheme netted nearly £500 million (Treasury Committee, 2012: 14). The UK scheme is estimated to have cost £6 million to administer (Committee of Public Accounts, 2008: 9), implying a return of 67:1. This compares favorably with reported yield/cost ratios in the UK of around eight-to-one for traditional audit-based enforcement programs (HMRC, 2006).¹ Moreover, such schemes typically raise revenue faster than do approaches relying on (often lengthy) audits. Yet, in offering incentives for voluntary disclosure, recent empirical evidence suggests that incentivized schemes might simply encourage illegal offshore investment in the first place. We shed light on this concern.

In this paper we appraise the use of offshore disclosure schemes using game theoretic tools. The model has two key features. First, we note that disclosure schemes are typically implemented in direct response to an information leak. By the time of the information leak, however, the act of illegal offshore evasion has already taken place. As it cannot retrospectively influence the illegal act, the best a tax authority can do is seek to recover any money owed. The importance of this observation lies in the fact that, in implementing incentivized schemes to efficiently recover tax owed from past evasion, the tax authority may inadvertently change the incentives for future acts of offshore evasion. Second, we recognize that there can be legitimate economic reasons for holding money in offshore accounts. As well as potential pecuniary benefits in the form of higher rates of interest than available in the domestic country, offshore investment may also offer non-pecuniary benefits: offshore providers are known to offer greater convenience and sophistication, presumably as they face lighter regulatory controls as compared with their onshore counterparts (Helm, 1997: 414).² One of the most colorful groups of people known to use offshore accounts for legitimate business

¹The ratio of 8:1 is based on the estimated yield/cost ratio for self-assessment non-business enquiry work in 2005-06 of 7.8-to-one.

²Relative to their onshore counterparts in the US, Helm argues that offshore funds have greater flexibility and less procedural delays in changing the nature, structure, or operation of their products, and they face fewer investment restrictions, short-term trading limitations, capital structure requirements, and governance provisions. For evidence on the impact of these differences on the behavior of onshore and offshore financial institutions see Kim and Wei (2002).

reasons are professional poker players, who must transact regularly in many world currencies (see O'Reilly, 2007). Accordingly, not all taxpayers who appear in data on offshore holdings owe tax.

In order to appraise the impact of disclosure schemes we first model the strategic interaction between taxpayers and the tax authority in the absence of a scheme.³ We then introduce a scheme into the model and compare the results. A taxpayer can decide to invest an exogenous lump-sum either onshore or offshore. An onshore investment must be made legally, but an offshore investment may be made either legal or illegally. If a taxpayer invests offshore, the investment is subsequently observed by the tax authority with a positive probability. In the absence of a scheme, if a taxpayer's offshore investment is observed, the tax authority can audit (at a cost) with a chosen probability. An equilibrium of this game is inefficient to the extent that the tax authority struggles to achieve a credible threat to audit, owing to its inability to distinguish between legal and illegal offshore investments. In the presence of a scheme, the tax authority chooses an incentivized fine rate that will apply to liabilities disclosed within the scheme, and taxpayers decide whether or not to make a disclosure under the scheme. If a taxpayer does not make a disclosure the tax authority audits with a chosen probability. If a taxpayer does make a disclosure they can either disclose their offshore investment to be illegal and pay a fine at the incentivized rate, or disclose their investment as legal. The tax authority audits those taxpayers who disclose their offshore investment to be legal with a chosen probability (for an illegal investment might be falsely disclosed as legal).

We find that the introduction of a disclosure scheme induces fewer taxpayers to invest offshore, and fewer taxpayers to invest offshore illegally, with the implication that the *number* of taxpayers investing onshore increases. When we consider aggregate investment amounts the picture is similar, but whereas the number of taxpayers investing offshore unambiguously falls, the total *amount* that is invested offshore may increase or decrease. Because aggregate illegal offshore investment falls, however, if aggregate offshore investment is observed to increase following the introduction of a scheme, the entire effect is driven by increased legal offshore investment. Thus, our model suggests that empirical evidence pointing to increased offshore investment following the introduction of a scheme is not evidence that such schemes generate additional offshore evasion. Tax authorities also benefit from schemes: expected net revenue increases due to the additional voluntary compliance that occurs when some taxpayers switch from investing offshore illegally to either investing onshore, or to offshore legally. Consistent with the design of schemes in the UK, the model predicts that the optimal scheme offers the lowest allowable fine rate permitted in legislation for truthful disclosure within the scheme.

³In this paper we focus solely on efficiency. There is, however, an equity concern when offering incentives to tax evaders. Moreover, only a subset of evaders (i.e., those that evade through an offshore investment) benefit. There are also moral and legal concerns where information on offshore investments that was obtained by illegal means has been purchased by tax authorities (see, e.g., Pfisterer, 2013). See, e.g., Bordignon (1993) and Rablen (2010) for studies of the role of equity in influencing tax evasion.

The paper proceeds as follows: Section 2 explains gives some historical context on the use and design of disclosure schemes in the offshore context, and section 3 casts our contribution in the context of the existing literature. Section 4 presents the model, which is developed in the absence of a sceme in section 5, and in the presence of a scheme in section 6. Section 7 gives a comparative analysis of the consequences of the introduction of a scheme for investment behavior, welfare, and for tax revenue; and Section 8 concludes.

2 Offshore Disclosure Schemes

Bulk leakages of offshore holdings data in recent decades have stimulated use of voluntary disclosure schemes by tax authorities around the world. Leakages have occurred through a number of channels. First, some tax authorities are aggressively exploiting legal powers that impel financial organizations to reveal tax-related information. One of the first IOVDS, the 2007 Offshore Disclosure Facility (ODF), was implemented in the UK following legal action by the tax authority to force five major UK banks to disclose details of the offshore accounts held by their customers. The ODF offered affected taxpayers time-limited access to a ten percent fine rate (the minimum allowable penalty under UK civil legislation) if they made a full disclosure. Ireland (2004) and Australia (2009) have also implemented schemes following similar legal action.

Second, tax authorities are cooperating with whistleblowers. In 2009 the IRS learned details of the offshore accounts of a number of US citizens with the Swiss bank UBS. It launched the Offshore Voluntary Disclosure Program (OVDP) in the same year and later implemented the Offshore Voluntary Disclosure Initiative in 2011.⁴ The UK implemented two schemes – the New Disclosure Opportunity and the Liechtenstein Disclosure Facility – in response to information relating to (i) 100 UK citizens with funds in Liechtenstein; and (ii) all British clients of HSBC in Jersey (Watt *et al.*, 2012). A list of offshore account holders of HSBC’s Geneva branch – seized by French police in 2009 – is still the subject of investigation by tax authorities worldwide, as are further lists published by the International Consortium of Investigative Journalists (the “Paradise” and “Panama” papers) and the Center for Public Integrity (Center for Public Integrity, 2013).⁵ Italy, France, Canada and Hungary are also known to have implemented disclosure schemes in response to information acquisitions (OECD, 2010).

Third, tax authorities are exploiting information arising from new legislation, such as occurred around the 2003 European Savings Directive (European Union, 2003). Last, tax authorities are taking steps to improve international cooperation through the signing of

⁴See Table 1 and Appendix II of GAO (2013) for a full account of the background to, and operation of, these two schemes.

⁵A subset of the former list is the so-called “Lagarde List” – which contains 1,991 names of Greeks with accounts in Switzerland. It was passed to the Greek authorities in 2010 by the then French Finance Minister, Christine Lagarde (Boesler, 2012).

tax information exchange agreements, with the G20 countries leading in this regard.⁶ The creation in 2013 of an OECD Common Reporting Standard (OECD, 2013) and the 2010 Foreign Account Tax Compliance Act (FATCA) passed in the US are leading to continuing information flows regarding offshore investments.⁷

3 Literature Review

To our knowledge, the only theoretical analysis dedicated to IOVDS is found in Langenmayr (2017). In her model, the tax authority is a first mover, deciding on the incentivized fine rate before taxpayers decide whether or not to evade tax. While the tax authority moving first is a good representation of the situation in, e.g., Germany, which has handled offshore data acquisitions through standing generic mechanisms for voluntary disclosure, our analysis (in which the tax authority moves last) is focused on the approach in the UK and US, where bespoke, and seemingly reactive, schemes have been introduced following specific data leakages.⁸

Langenmayr shows that, with the tax authority as a first mover, the introduction of a scheme increases the number of taxpayers who evade tax. Note, however, that this effect arises at the discretion of the tax authority as a consequence of its revenue maximizing strategy. That is, in equilibrium, the tax authority “permits” an increase in evasion as the loss of revenue through voluntary compliance is more than recouped through additional fine payments.⁹ In our model the tax authority takes evasion behavior as fixed, for the crime has already been committed at the point at which the scheme is designed. In this context, these apparently perverse incentives on the part of the tax authority do not arise. Rather, we find that the introduction of a scheme unambiguously reduces illegal offshore evasion, albeit the total amount of offshore investment (legal and illegal) may either increase or decrease.

Our analysis relates to a number of other literatures. We connect to a literature on the use by tax authorities of pre-audit settlements in which taxpayers can acquire full (e.g., Chu, 1990; Glen Ueng and Yang, 2001) or partial (Goerke, 2015) insurance from audit risk. These settlements are shown to yield a Pareto improvement relative to random auditing as

⁶Within eight months of the G20 summit of April 2009 tax havens had signed more than 300 treaties (Johannessen and Zucman, 2014). The UK has conducted several recent IOVDS using information obtained in this way. These include the 2009 Liechtenstein Disclosure Facility, and three schemes aimed at its dependencies The Isle of Man, Jersey and Guernsey. See Konrad and Stolper (2016) for a more general model of the problem of coordinating against tax havens.

⁷For more on the economic impact of FATCA see Dharmapala (2016).

⁸In assuming the tax authority moves last, our model has similarities with, e.g., Graetz *et al.* (1986). Different from this analysis, however, we assume that, for the tax authority to go to the trouble of carrying out an audit, it must be *strictly* gainful in expectation. This leads to tax authority to adopt a pure strategy, whereas Graetz *et al.* consider a mixed strategy for the tax authority.

⁹For another context in which a revenue-maximizing tax authority does not maximize voluntary compliance see Rablen (2014).

(i) the tax authority captures the positive risk premium of a risk averse taxpayer and (ii) the tax authority conducts fewer random audits. Such audit settlement schemes, however, rely on the tax authority moving first, before the taxpayer makes the evasion choice. They are, therefore, not directly applicable in our framework. It is also notable that, even were we to allow the tax authority to move first, such settlement procedures would not induce a Pareto improvement in our framework. We consider risk neutral taxpayers, so the tax authority is not able to extract a positive risk premium; and we assume the tax authority audits optimally with and without a scheme, which rules out random auditing. In particular, in our model, the tax authority does not gain from a reduction in the number of audits it performs *per se*, as it only ever audits when it is strictly gainful in expectation to do so.

A further important feature of the pre-audit settlement literature discussed above is that it fails to take into account the potential for the settlement to affect the incentives for taxpayers to evade in the first place. As our model examines both the initial decision by the taxpayer to evade, as well as the taxpayer's subsequent disclosure decision, it is in this sense more closely associated with the literature investigating tax amnesties, by which we mean voluntary disclosure schemes run in the absence of new information, which nevertheless offer taxpayers reduced penalties if they wish to disclose an illegal offshore investment. Tax amnesties are analyzed using theoretical (e.g., Andreoni, 1991; Franzoni, 2000; Macho-Stadler *et al.*, 1993; Malik and Schwab, 1991; Stella, 1991), empirical (e.g., Alm and Beck, 1993) and experimental (Alm *et al.*, 1990) methods. The taxpayers in our model would never disclose under an amnesty, but may make a disclosure under a scheme. The reason is that the tax authority learns new information between the taxpayer choosing to invest offshore illegally and the taxpayer being offered the opportunity to disclose under a scheme. In this way, voluntary disclosure takes place in the shadow of a credible threat of sanctions for non-disclosure. In contrast, an amnesty provides no new information to the taxpayer, so rational and fully-informed taxpayers will never participate (Andreoni, 1991; Malik and Schwab, 1991).¹⁰ Whereas the literature has cast doubt on the desirability to tax authorities of amnesties, our analysis of voluntary disclosure schemes arrives at more positive conclusions.

Our work also connects to the literature on law enforcement with self-reporting (e.g., Kaplow and Shavell, 1994). In this literature truthful disclosure is induced by allowing those who report to pay a sanction equal to the certainty equivalent of the expected sanctions they would otherwise face by not self-reporting. While our model also utilizes this insight, the key difference between our model and this literature is that the tax authority takes evasion behavior as given when setting the scheme parameters, for the evasion has already occurred. The insights of Kaplow and Shavell are sufficient to establish that, if a tax authority can precommit to a scheme before taxpayer's make their evasion (investment) choice, then a

¹⁰To overcome this difficulty, the amnesty literature posits that either (i) taxpayers learn new information regarding their own characteristics after the time of the initial reporting decision (e.g., Andreoni, 1991; Malik and Schwab, 1991) or (ii) the tax authority cannot control all of its enforcement parameters (Franzoni, 2000). Such assumptions are not necessary in the current context.

scheme can always be made unambiguously beneficial: it can be chosen to lower enforcement costs while holding incentives to commit evasion fixed. But, if the tax authority moves after the crime is committed, as we suppose, it is unclear that the desirable properties of self-reporting when the law enforcer moves first, are retained.

A further related literature is that on optimal auditing in the presence of signals (e.g., Scotchmer, 1987; Macho-Stadler and Pérez-Castrillo, 2002; Bigio and Zilberman, 2011). Under a scheme both the very act of making a disclosure, as well as its content, are signals the tax authority observes before deciding whether to audit. Last, as the ability of tax authorities to extract revenue from whistleblower data influences the degree to which they should incentivize such behavior, our findings inform the literature on the optimal incentivization of whistleblowing (Yaniv, 2001) and complement studies that analyze the effects on compliance of the presence of potential whistleblowers (Mealem *et al.*, 2010; Bazart *et al.*, 2014; Johannesen and Stolper, 2017).

4 Model

In this section we model IOVDS as a strategic interaction between taxpayers, who can invest either onshore or offshore, and the domestic tax authority.

Each taxpayer i belonging to the set T receives a lump-sum $w_i > 0$, unobserved by the tax authority. The lump-sum is distributed across taxpayers according to the function $W : [w, \bar{w}] \in \mathbb{R}_{>0} \mapsto (0, 1)$. Each taxpayer should, by law, declare the lump-sum for taxation at the marginal rate $\theta \in (0, 1)$. We assume, however, that taxpayers have three possible actions (i) invest the lump-sum offshore without declaring it for domestic taxation (illegal offshore investment); (ii) declare the lump-sum for domestic taxation and invest the remaining amount $[1 - \theta]w$ offshore (legal offshore investment); or (iii) declare the lump-sum for domestic taxation and invest the remainder onshore. Amounts invested offshore earn a rate of return $r_{OFF} > 0$, and amounts invested onshore earn a rate of return $r_{ON} > 0$. Taxpayers consume the investment (plus interest earned), upon its maturity.

We shall assume, for simplicity, that interest income accruing from investment is untaxed. That is, we focus on the evasion of tax on the source capital rather than the evasion (“sheltering”) of interest income. As well as giving tractability, we note that the former is of greater economic significance: the amount of source capital is typically many times the annual interest flow such that only when undeclared interest has accrued over many years does the tax liability from this source become of a comparable magnitude to that on the undeclared capital.¹¹

As discussed in the introduction, offshore investment may have both pecuniary and non-pecuniary benefits. We capture the former through the differential rates of return, r_{ON} and

¹¹See, e.g., Pritchard and Khan (2005) for a detailed discussion and empirical evidence on this point.

r_{OFF} , and the latter, for each taxpayer i , by a parameter $b_i > 0$: $b_i < 1$ signifies that the non-pecuniary benefits from investing offshore exceed those from investing onshore, while $b_i > 1$ signifies the reverse. b_i is independent of w_i , and is distributed across taxpayers according to the function $B : \mathbb{R}_{>0} \mapsto (0, 1)$.

An offshore investment (legal or illegal) is subsequently observed by the tax authority with probability $p \in (0, 1)$, where this probability reflects the possibility that, e.g., a whistleblower comes forward. The underlying inference problem for the tax authority is as follows: if it observes an offshore investment of y , this could be the illegal investment of a taxpayer with lump-sum $w = y$ or the legal investment of a taxpayer with lump-sum $w = y/[1 - \theta]$. Thus, observing an offshore investment w does not permit the tax authority to know whether the investment was made legally (i.e., after tax) or illegally (i.e., before tax).

In the event that offshore investments are observed, the tax authority can spend an amount $c > 0$ to perform a verification audit that reveals the nature of the taxpayer's offshore investment with certainty. If a tax liability is detected by an audit, the tax authority can levy a fine on the undeclared tax at a rate $f \in [\underline{f}, \bar{f}]$, where these upper and lower bounds are interpreted as being specified in legislation. Standard arguments (e.g., Kaplow and Shavell, 1994) ensure that a revenue-maximizing tax authority will choose $f = \bar{f}$. At the fine rate \bar{f} , the amount a taxpayer who has invested an amount y offshore illegally must pay if audited is denoted by

$$Q(\bar{f}, y) = \theta[1 + \bar{f}]y. \tag{1}$$

To simplify aspects of the analysis we make the following assumptions:

- A0. $Q(f, \underline{w}) > c$.
- A1. $p[1 + \underline{f}] > 1 > p[1 + \bar{f}]$.

Assumption A0 may be interpreted as requiring the investment amount w to be sufficiently large that, conditional on observing the investment, it is gainful in expectation for the tax authority to audit. Consistent with this assumption, observed offshore investments are typically large.¹² Moreover, to the extent that some of offshore holdings are too insignificant to be gainfully investigated, such holdings can be almost costlessly screened out by the tax authority. Assumption A1 implies that, at the maximum fine rate, \bar{f} , it is not gainful (in expectation) to invest offshore illegally if the tax authority, conditional on observing the investment, will audit with certainty. Conversely, at the minimum fine rate specified under legislation, \underline{f} , it is gainful to invest offshore illegally even if, conditional on observing the investment, the tax authority will audit with certainty. If the former inequality is not satisfied, illegal offshore investment is a one-way bet, for it pays even when the tax authority's

¹²According to Watt *et al.* (2012), the list of HSBC Jersey account holders obtained by HMRC in 2012 identifies 4,388 people holding £699 million in offshore current accounts, which implies an average holding of £159,000. The median account balance of more than 10,000 closed cases from the 2009 OVDP in the US is reported as \$570,000 in GAO (2013).

enforcement is maximal. If the latter inequality is not met, the tax authority’s enforcement is so strong that it can eliminate all offshore investment in the presence of a scheme.

Both taxpayers and the tax authority are assumed to be risk neutral. Taxpayers behave so as to maximize expected consumption and, for simplicity, we de-emphasize the intertemporal dimension of consumption by assuming a time preference rate of unity. The tax authority behaves so as to maximize revenue (comprising voluntary compliance, tax recovered by audit, and fines) net of enforcement costs. Denote the expected consumption from choosing to invest onshore by C_{ON} , from investing offshore legally by C_L , and from investing offshore illegally by C_I . Hence, as taxpayers maximize expected consumption, we may partition $\{w_i, b_i\}$ -space as follows:

$$\begin{aligned}\Omega_{ON} &= \{w_i, b_i\} : C_{ON} \geq \max\{C_L, C_I\}; & \Omega_{OFF} &= \{w_i, b_i\} : \max\{C_L, C_I\} > C_{ON}; \\ \Omega_L &= \{w_i, b_i\} : C_L > C_{ON}, C_L \geq C_I; & \Omega_I &= \{w_i, b_i\} : C_I > \max\{C_{ON}, C_L\}.\end{aligned}$$

Note that these definitions imply $\Omega_{OFF} = \Omega_L \cup \Omega_I$. Similarly, we may partition the set T into those taxpayers that invest onshore, offshore legally, and offshore illegally, $T = T_{ON} \cup T_{OFF} = T_{ON} \cup T_I \cup T_L$, where

$$\begin{aligned}T_{ON} &= i : \{w_i, b_i\} \in \Omega_{ON}; & T_{OFF} &= i : \{w_i, b_i\} \in \Omega_{OFF}; \\ T_L &= i : \{w_i, b_i\} \in \Omega_L; & T_I &= i : \{w_i, b_i\} \in \Omega_I.\end{aligned}$$

Conditional on having chosen to invest offshore, the probability that a taxpayer who has invested an amount y chooses to do so illegally is denoted $\phi = \phi(y) \in [0, 1]$. When the tax authority chooses its enforcement parameters $\phi(y)$ is already determined, though its value is not observed by the tax authority. We suppose, however, that the tax authority forms a (rational) expectation of this quantity: its prior is of the form $\tilde{\phi}(y) = \phi(y) + \tilde{\varepsilon}$, where $\mathbf{E}(\tilde{\varepsilon}) = 0$, such that $\mathbf{E}(\tilde{\phi}(y)) = \phi(y)$.

5 No Scheme

In order to appraise the use of disclosure schemes, we now model the “do nothing” benchmark case in which the tax authority does not offer a scheme (NS). The game in the absence of a scheme is set out in Figure 1. At the outset, nature determines each taxpayer’s lump-sum, w_i , and his/her level of non-pecuniary benefit, b_i , but this action is unobserved by the tax authority. Next taxpayers make an investment choice as described previously. Taxpayers who invest offshore have their investment subsequently observed by the tax authority with probability $p \in (0, 1)$.¹³ The distribution function of observed offshore investments is denoted by $Y(\cdot)$. If offshore holdings are not observed by the tax authority, any illegal offshore

¹³We assume here, for simplicity, that the tax authority acquires offshore data at zero cost, as was indeed the case in many of the schemes discussed in the Introduction. Even when payments were made, the amounts involved – where known – appear relatively modest in relation to the revenue generated. Bradley Birkenfeld, a UBS employee who acted as an IRS informer, received a payment of \$104 million, but in the context of

investment goes undetected with probability one, and the game ends. If offshore holdings are observed by the tax authority, it will audit each offshore investment with a probability $\alpha \in [0, 1]$. Any undeclared liabilities uncovered by an audit are fined at the rate \bar{f} . It follows that expected taxpayer consumption is given by

$$C_{ON} = b[1 + r_{ON}][1 - \theta]w; \quad (2)$$

$$C_L = [1 + r_{OFF}][1 - \theta]w; \quad (3)$$

$$C_I = [1 + r_{OFF}][w - p\alpha Q(\bar{f}, w)]; \quad (4)$$

where implicit in this formulation is that the taxpayer must repatriate some of their illegal offshore investment to meet any tax and fines payable as a result of audit, and therefore do not earn interest on this part of their investment.

The expected net revenue the tax authority will generate from the members of T is given by:

$$R_T(\alpha; \phi) = \int \int_{\Omega_{ON} \cup \Omega_L} \theta w \, dW dB + pR_{OFF}(\alpha; \phi), \quad (5)$$

where the first term is the revenue generated through voluntary compliance, and the second term is the expected net revenue from auditing taxpayers in OFF , $R_{OFF}(\alpha; \phi)$, given by

$$R_{OFF}(\alpha; \phi) = \int \int_{\Omega_{OFF}} \{ \phi \alpha [Q(\bar{f}, y) - c] - [1 - \phi] \alpha c \} \, dY dB.$$

Importantly, however, because the tax authority only observes the realized investment amount y of each member of the set T_{OFF} after those investments have been made, it takes as fixed both the total size of the set of the set T_{OFF} , and its decomposition between taxpayers who have invested offshore legally and illegally. Accordingly, choosing α to maximize $R_T(\alpha; \phi)$ becomes equivalent to simply choosing α to maximize $R_{OFF}(\alpha; \phi)$, i.e., the net revenue from auditing taxpayers in T_{OFF} . Differentiating $R_{OFF}(\alpha; \phi)$ with respect to α we obtain

$$\frac{\partial R_{OFF}(\alpha; \phi)}{\partial \alpha} = \int \int_{\Omega_{OFF}} [\phi Q(\bar{f}, y) - c] \, dY dB.$$

Hence, when observing an offshore investment of amount y , the tax authority chooses

$$\alpha(y; \phi) = \begin{cases} 0 & \text{if } \phi \leq \frac{c}{Q(\bar{f}, y)}; \\ 1 & \text{otherwise;} \end{cases}$$

some \$3.4 billion that was eventually raised by the resulting scheme (GAO, 2013). The UK tax authority is reported to have paid a former Liechtenstein bank employee a fee of just £100,000 for information regarding more than £100 million of offshore funds (Oates, 2008). Clearly, however, any amount paid to acquire information must be set against any tax revenues accruing from the scheme.

where here we adopt the convention that, if the tax authority is indifferent between auditing and not-auditing, it does not audit. Expected consumption, conditional on choosing to invest offshore, is therefore

$$C_{OFF}^{NS}(\phi, w) = \begin{cases} [1 + r_{OFF}] \{ \phi w + [1 - \phi] [1 - \theta] w \} & \text{if } \phi \leq \frac{c}{Q(\bar{f}, w)}; \\ [1 + r_{OFF}] \{ \phi [w - pQ(\bar{f}, w)] + [1 - \phi] [1 - \theta] w \} & \text{otherwise.} \end{cases} \quad (6)$$

For $\phi \leq c/Q(\bar{f}, w)$ the taxpayer's payoff in (6) is strictly increasing in ϕ . At $\phi = c/Q(\bar{f}, w)$ the payoff C_{OFF}^{NS} jumps downward discretely, due to the associated jump in α , and becomes strictly decreasing in ϕ thereafter (by A.1). Thus, there exists a maximum at

$$\phi(w) = \frac{c}{Q(\bar{f}, w)}. \quad (7)$$

Substituting (7) into (6) we obtain

$$C_{OFF}^{NS}(w) = [1 + r_{OFF}] \frac{c + [1 - \theta] [1 + \bar{f}] w}{1 + \bar{f}}. \quad (8)$$

The payoff in (8) is strictly preferred to the payoff from investing onshore in (2) if

$$b < \frac{1 + r_{OFF}}{1 + r_{ON}} \frac{c + [1 - \theta] [1 + \bar{f}] w}{[1 - \theta] [1 + \bar{f}] w} \equiv \tilde{b}^{NS}(w).$$

Proposition 1 *In the absence of a scheme, a taxpayer $i \in T$ invests offshore illegally with probability $\frac{c}{Q(\bar{f}, w_i)}$ and offshore legally with probability $\frac{Q(\bar{f}, w_i) - c}{Q(\bar{f}, w_i)}$ if $b_i < \tilde{b}^{NS}(w_i)$; and invests onshore with probability one otherwise.*

Proposition 1 is illustrated graphically in Figure 3. The line $\tilde{b}^{NS}(w)$ demarks the boundary between the sets Ω_{ON}^{NS} and Ω_{OFF}^{NS} : taxpayers falling below the line $\tilde{b}^{NS}(w)$ invest offshore, and mix over doing so legally or illegally, while taxpayers falling above the line $\tilde{b}^{NS}(w)$ invest onshore. A hallmark of the equilibrium outcome is that, owing to its inability to distinguish between legal and illegal offshore investments, the tax authority is only able to cap the propensity for illegal offshore investment at $\phi(w_i) = c/Q(\bar{f}, w_i)$. Below this propensity it is unable to sustain a credible audit threat.

6 The Scheme

We now suppose the tax authority offers a scheme in the event that offshore investments are observed. The game is set out in Figure 2. The initial hidden action by nature and the subsequent investment decision are modelled in the same way as in the absence of a scheme. If offshore investments are observed, however, the tax authority chooses the terms

of a scheme it then announces to taxpayers.¹⁴ A taxpayer of type j then chooses to enter or not-enter the scheme. If the taxpayer enters s/he discloses a type $d \in \{L, I\}$. A taxpayer disclosing $d = I$ accompanies their disclosure with a payment to the tax authority of $Q(\hat{f}, y)$, where $\hat{f} \in [\underline{f}, \bar{f}]$ is termed the “incentivized” fine rate. A taxpayer disclosing $d = L$ makes no accompanying payment. The tax authority audits the disclosure $d = L$ with probability $\alpha_I \in [0, 1]$ and never audits the disclosure $d = I$. Audited taxpayers have the nature of their offshore investment revealed with certainty: if the tax authority reveals a taxpayer to have disclosed falsely it levies a fine at the rate \bar{f} . When a taxpayer chooses to not-enter the scheme the tax authority can choose to audit them with probability $\alpha_O \in [0, 1]$. If an illegal investment is verified, the taxpayer is fined at the rate $f_O \in [\underline{f}, \bar{f}]$. Standard arguments ensure that the tax authority will set $f_O = \bar{f}$.

Owing to the revelation principle, attention may be confined to schemes (mechanisms) in which taxpayers disclose truthfully. Consider the subgame that arises when a taxpayer enters the scheme. If an investment is illegal, falsely disclosing $d = L$ results in an expected payment of $\alpha_I Q(\bar{f}, y)$, whereas disclosing $d = I$ results in a sure payment of $Q(\hat{f}, y)$. Hence truthful disclosure requires \hat{f} to satisfy $Q(\hat{f}, y) \leq \alpha_I Q(\bar{f}, y)$.¹⁵ As, in equilibrium, the tax authority will never find it optimal to set \hat{f} below that required to achieve truthful disclosure, it follows that

$$Q(\hat{f}, y) = \alpha_I Q(\bar{f}, y). \quad (9)$$

We now turn to the entry decision. A taxpayer with an illegal offshore investment faces a sure payment $Q(\hat{f}, w) = \alpha_I Q(\bar{f}, w)$ if they enter the scheme, and an expected payment $\alpha_O Q(\bar{f}, w)$ if they choose to not-enter. We assume that, in the case of perfect indifference, taxpayers enter the scheme. Accordingly, the taxpayer will enter the scheme if $\alpha_O \geq \alpha_I$. A taxpayer with a legal offshore investment is indifferent between entering and not-entering the scheme, so will enter.

If it observes the set of offshore investments the tax authority can again only seek to recover any outstanding revenue. Accordingly, it chooses the parameters of the scheme, $\{\alpha_I, \alpha_O, \hat{f}, f_O\}$, to maximize $R_{OFF}(\alpha_I, \alpha_O, y; \phi)$, the expected net revenue raised from taxpayers belonging to T_{OFF} . Using the equality in (9) T_{OFF} is given by

¹⁴In practice a tax authority may also face a second choice as to the set of taxpayers to whom it communicates the scheme. For instance, prior to the OVDP in the US, the Swiss authorities agreed to hand the IRS the names of approximately 4,450 US clients with accounts at UBS. The IRS then had the choice of (i) requiring UBS to write to the affected clients informing them that the details of their offshore holding had been handed to the IRS; or (ii) requiring UBS to write to a wider set of its clients (up to the set of all UBS clients with offshore holdings) informing them that the details of their offshore holding *might* have been handed to the IRS. In actuality, the IRS chose the second option, and – to prevent taxpayers from inferring whether their information had been handed over – negotiated a confidentiality clause with the Swiss that concealed the criteria by which the accounts were selected until after the OVDP deadline had passed (GAO, 2013). We abstract from this issue here, but note it as a potentially interesting avenue for future research.

¹⁵If an offshore investment is legal, falsely disclosing $d = I$ results in a sure loss of $[1 - \theta] Q(\hat{f}, y)$, whereas disclosing $d = L$ results in no loss. Hence, truthful disclosure by taxpayers in T_L is assured in equilibrium.

$$\int \int_{\Omega_{OFF}} \{ \phi \min\{\alpha_I, \alpha_O\} Q(\bar{f}, y) - \{ [1 - \phi] \alpha_I \mathbf{1}_{\alpha_I \leq \alpha_O} + \alpha_O \mathbf{1}_{\alpha_O < \alpha_I} \} c \} dY dB; \quad (10)$$

where $\mathbf{1}_A$ takes the value one if condition A is true, and the value zero otherwise. The first term in the integral in (10) is the revenue from the proportion $\phi(y)$ of taxpayers with an offshore investment of amount y who have invested offshore illegally. Here, the min condition acknowledges the taxpayer's endogenous entry decision, as discussed previously. The second term is the cost of auditing. Importantly, for a given y , only the proportion $1 - \phi(y)$ of taxpayers belonging to T_{OFF} who disclose $d = L$ are audited, whereas, in the absence of a scheme, the audit probability $\alpha(y)$ applies to *all* taxpayers belonging to T_{OFF} . The importance of this observation is that, relative to the equilibrium without a scheme, it expands the set of values of ϕ for which the tax authority is able to maintain a credible audit threat.

6.1 Audit Strategy

We now consider the optimal choice of the audit probabilities $\{\alpha_I, \alpha_O\}$. To deduce the optimal choice of $\{\alpha_I, \alpha_O\}$ we first consider the optimal choice of α_O conditional upon a given α_I .

Lemma 1 $\alpha_O(\alpha_I; \phi) \begin{cases} = 0 & \text{if } \phi \leq \frac{c}{c+Q(\bar{f}, y)}; \\ = \alpha_I & \text{otherwise.} \end{cases}$

Proof. If $\phi > c/Q(\bar{f}, y)$ then auditing is strictly gainful for $\alpha_O < \alpha_I$. At $\alpha_O = \alpha_I$ $R_{OFF}(\alpha_I, \alpha_O, y; \phi)$ jumps upwards discretely, and is then independent of α_O on the interval $\alpha_O \in [\alpha_I, 1]$. Hence, in this case, $R_{OFF}(\alpha_I, \alpha_O, y; \phi)$ is maximized w.r.t. α_O at $\alpha_O = \alpha_I$. If $\phi \leq c/Q(\bar{f}, y)$ then $R_{OFF}(\alpha_I, \alpha_O, y; \phi)$ is instead decreasing in α_O for $\alpha_O < \alpha_I$. Hence, $R_{OFF}(\alpha_I, \alpha_O, y; \phi)$ is maximized w.r.t. α_O at either $\alpha_O = 0$ or at $\alpha_O = \alpha_I$. To determine the conditions under which these two local maxima are global maxima note that, at $\alpha_O = 0$, we have $R_{OFF}(\alpha_I, 0, y; \phi) = 0$, and at $\alpha_O = \alpha_I$ we have $R_{OFF}(\alpha_I, \alpha_O, y; \phi) = \alpha_I \int \int_{\Omega_{OFF}} \{ \phi Q(\bar{f}, y) - [1 - \phi] c \} dY dB$. The latter is strictly positive (and therefore the global maximum) if, at each y , $\phi > c[c + Q(\bar{f}, y)]^{-1}$. As $c[c + Q(\bar{f}, y)]^{-1} < c/Q(\bar{f}, y)$ the result follows. ■

According to Lemma 1, if it is not gainful in expectation to audit outside the scheme, i.e., $\phi \leq c/Q(\bar{f}, y)$, then $\alpha_O = 0$. If it is gainful in expectation to audit outside the scheme then, the tax authority sets α_O such that the taxpayer is made indifferent between entering and not-entering the scheme: $\alpha_O = \alpha_I$. Clearly, any choice $\alpha_O > \alpha_I$ is also weakly optimal, as all such choices induce taxpayers to enter the scheme. Implicit in Lemma 1 is therefore the assumption that, if the tax authority does not have a unique equilibrium choice of audit probability, it chooses the lowest such probability.

It follows from Lemma 1 that we may rewrite $R_{OFF}(\alpha_I, \alpha_O, y; \phi)$ at the optimal α_O as

$$R_{OFF}(\alpha_I, y; \phi) = \int \int_{\Omega_{OFF}} \{\phi \alpha_I Q(\bar{f}, y) - [1 - \phi] \alpha_I c\} \mathbf{1}_{\phi > c/[c+Q(\bar{f}, y)]} dY dB.$$

We now differentiate $R_{OFF}(\alpha_I, y; \phi)$ with respect to α_I to deduce the optimal audit strategy:

Lemma 2 *In the presence of a scheme the net-revenue maximizing audit strategy is to set*

$$\alpha_O(y; \phi) = \begin{cases} 0 & \text{if } \phi \leq \frac{c}{c+Q(\bar{f}, y)}; \\ 1 & \text{otherwise;} \end{cases}$$

$$\alpha_I(y; \phi) = \begin{cases} \frac{1+f}{1+\bar{f}} & \text{if } \phi \leq \frac{c}{c+Q(\bar{f}, y)}; \\ 1 & \text{otherwise.} \end{cases}$$

Proof. Differentiating $R_{OFF}(\alpha_I, y; \phi)$ with respect to α_I we obtain that

$$\frac{\partial R_{OFF}(\alpha_I, y; \phi)}{\partial \alpha_I} = \int \int_{\Omega_{OFF}} \{\phi Q(\bar{f}, y) - [1 - \phi] c\} \mathbf{1}_{\phi > c/[c+Q(\bar{f}, y)]} dY dB.$$

If ϕ is sufficiently low, i.e., $\phi \leq c[c + Q(\bar{f}, y)]^{-1}$ then $\partial R_{OFF}(\alpha_I, y; \phi) / \partial \alpha_I \leq 0$, so the tax authority will not audit. It follows that, in this case, $R_{OFF}(\alpha_I, y; \phi)$ obtains a maximum at the lowest level consistent with the truth-telling restriction $Q(\hat{f}, y) = \alpha_I Q(\bar{f}, y)$. Hence $\alpha_I = [1 + \underline{f}][1 + \bar{f}]^{-1}$. If $\phi > c[c + Q(\bar{f}, y)]^{-1}$ then auditing is strictly gainful, so $R_{OFF}(\alpha_I, y; \phi)$ achieves a maximum at $\alpha_I = 1$. The optimal α_O corresponding to each value α_I of is then inferred from Lemma 1. ■

According to Lemma 2, above a critical level of ϕ , the tax authority will audit all taxpayers who enter the scheme and disclose their investment to be legal. Taxpayers with an offshore investment indeed enter the scheme, due to the (out of equilibrium) threat to audit with certainty outside the scheme. If the propensity to invest offshore illegally falls below the critical value $c[c + Q(\bar{f}, y)]^{-1}$, however, the tax authority cannot maintain a credible audit threat.

6.2 Investment Decision

With the nature of enforcement now determined, we analyze the taxpayer's investment decision. Expected consumption, conditional upon investing offshore illegally with probability $\phi \in [0, 1]$, is

$$C_{OFF}^S(\phi, w) = \begin{cases} [1 + r_{OFF}] \{\phi[w - pQ(\underline{f}, w)] + [1 - \phi][1 - \theta]w\} & \text{if } \phi \leq \frac{c}{c+Q(\bar{f}, w)}; \\ [1 + r_{OFF}] \{\phi[w - pQ(\bar{f}, w)] + [1 - \phi][1 - \theta]w\} & \text{otherwise.} \end{cases} \quad (11)$$

For $\phi \leq c[c + Q(\bar{f}, w)]^{-1}$ the taxpayer's payoff is strictly increasing in ϕ , as the tax authority cannot credibly commit to audit. But for $\phi > c[c + Q(\bar{f}, w)]^{-1}$ the taxpayer's payoff becomes strictly decreasing in ϕ , as the tax authority will now audit. It follows that $C_{OFF}^S(\phi)$ obtains a maximum in ϕ at

$$\phi(w) = \frac{c}{c + Q(\bar{f}, w)}. \quad (12)$$

Substituting (12) into (11), equilibrium consumption when investing offshore is

$$C_{OFF}^S(w) = \frac{[1 + r_{OFF}]w}{c + Q(\bar{f}, w)} \{c + [1 - \theta] Q(\bar{f}, w)\}. \quad (13)$$

The payoff $C_{OFF}^S(w)$ in (13) is strictly preferred to the payoff from investing onshore if

$$b < \frac{1 + r_{OFF}}{1 + r_{ON}} \frac{c + [1 - \theta] Q(\bar{f}, w)}{[1 - \theta] [c + Q(\bar{f}, w)]} \equiv \tilde{b}^S(w).$$

Proposition 2 *A taxpayer $i \in T$ invests offshore illegally with probability $\frac{c}{c + Q(\bar{f}, w_i)}$ and offshore legally with probability $\frac{Q(\bar{f}, w_i)}{c + Q(\bar{f}, w_i)}$ if $b_i < \tilde{b}^S(w_i)$; and invests onshore with probability one otherwise.*

Proposition 2 is illustrated graphically in Figure 3. The interpretation is analogous to the no-scheme case, except that it is now the line $\tilde{b}^S(w)$ that demarks the boundary between the sets Ω_{ON}^S and Ω_{OFF}^S . Although drawn for a particular set of parameter values, the figure leads to the conjecture that, in general, $\Omega_{ON}^{NS} \subset \Omega_{ON}^S$, for $\tilde{b}^S(w)$ is seen to be everywhere below $\tilde{b}^{NS}(w)$. The analysis of the next section will verify this conjecture.

7 Analysis

7.1 Investment and Evasion – Onshore and Offshore

By comparing the respective equilibria in the absence (Proposition 1) and presence (Proposition 2) of a scheme, we now analyze the consequences of introducing a scheme for both onshore and offshore investment volumes, and for the decomposition of offshore investments between those that are legal, and those that are illegal.

The expected proportion of taxpayers with lump-sum w who invest offshore legally, $\tau_L(w)$, and illegally, $\tau_I(w)$, are given, respectively, by

$$\tau_L^k(w) = [1 - \phi^k] B(\tilde{b}^k(w)); \quad \tau_I^k(w) = \phi^k B(\tilde{b}^k(w));$$

where $k \in \{NS, S\}$, and ϕ^k is the value of ϕ in state k . Hence, in aggregate, the expected proportions of taxpayers choosing each investment type are given by

$$\begin{aligned} |T_{ON}^k| &= \int [1 - \tau_L^k(w) - \tau_I^k(w)] dW; & |T_{OFF}^k| &= \int [\tau_L^k(w) + \tau_I^k(w)] dW; \\ |T_L^k| &= \int \tau_L^k(w) dW; & |T_I^k| &= \int \tau_I^k(w) dW. \end{aligned} \quad (14)$$

Expected aggregate onshore and offshore investment are given by

$$\begin{aligned} |ON^k| &= [1 - \theta] \int w[1 - B(\tilde{b}^k(w))] dW; \\ |OFF^k| &= \int w\{1 - \theta[1 - \phi^k(w)]\}B(\tilde{b}^k(w)) dW; \end{aligned}$$

where the latter may be further decomposed into its legal and illegal components:

$$\begin{aligned} |OFF_I^k| &= \int w\phi^k(w) B(\tilde{b}^k(w)) dW; \\ |OFF_L^k| &= [1 - \theta] \int w[1 - \phi^k(w)][1 - B(\tilde{b}^k(w))] dW. \end{aligned}$$

To establish the relative magnitudes of these sets, we first prove the following:

Lemma 3

- (i) $\tilde{b}^S(w) < \tilde{b}^{NS}(w)$
- (ii) $\phi^S(w) < \phi^{NS}(w)$

Proof. (i) We have

$$\begin{aligned} \tilde{b}^S(w) < \tilde{b}^{NS}(w) &\Leftrightarrow \frac{c+[1-\theta]Q(\bar{f},w)}{c+Q(\bar{f},w)} < \frac{\theta c+[1-\theta]Q(\bar{f},w)}{Q(\bar{f},w)} \\ &\Leftrightarrow \frac{Q(\bar{f},w)}{c+Q(\bar{f},w)} > \frac{Q(\bar{f},w)-c}{Q(\bar{f},w)} \\ &\Leftrightarrow 0 > -c^2 \end{aligned}$$

(ii) We have

$$\phi^S(w) = \frac{c}{c+Q(\bar{f},w)} < \frac{c}{Q(\bar{f},w)} = \phi^{NS}(w).$$

■

Part (i) of Lemma 3 confirms that the relationship $\tilde{b}^S(w) < \tilde{b}^{NS}(w)$ observed in Figure 3 holds in general. As an immediate corollary, $\Omega_{ON}^{NS} \subset \Omega_{ON}^S$. Whereas, however, Figure 3 focuses on the *extensive* margin, part (ii) of Lemma 3 addresses the *intensive* margin. In the presence of a scheme, the propensity towards illegal offshore investment, ϕ , falls. With these two findings it is straightforward to prove the following:

Proposition 3

- (i) $|T_{OFF}^S| < |T_{OFF}^{NS}|$ and $|T_{ON}^S| > |T_{ON}^{NS}|$;
- (ii) $|T_I^S| < |T_I^{NS}|$ but $|T_L^S| \geq |T_L^{NS}|$;
- (iii) $|ON^S| > |ON^{NS}|$ but $|OFF^S| \geq |OFF^{NS}|$;
- (iv) $|OFF_I^S| < |OFF_I^{NS}|$ but $|OFF_L^S| \geq |OFF_L^{NS}|$.

Proof. (i) $|T_{OFF}^S| = \int B(\tilde{b}^S(w)) dW < \int B(\tilde{b}^{NS}(w))dW = |T_{OFF}^{NS}|$ and $|T_{ON}^S| = 1 - |T_{OFF}^S| > 1 - |T_{OFF}^{NS}| = |T_{ON}^{NS}|$; (ii) $|T_I^S| = \int \phi^S B(\tilde{b}^S(w)) dW < \int \phi^{NS} B(\tilde{b}^{NS}(w)) dW = |T_I^{NS}|$ but $|T_L^S| = \int [1 - \phi^S] B(\tilde{b}^S(w)) dW \geq \int [1 - \phi^{NS}] B(\tilde{b}^{NS}(w)) dW = |T_L^{NS}|$; (iii) $|ON^S| = [1 - \theta] \int w[1 - B(\tilde{b}^S(w))] dW > [1 - \theta] \int w[1 - B(\tilde{b}^{NS}(w))] dW = |ON^{NS}|$ but $|OFF^S| = \int w\{1 - \theta[1 - \phi^S(w)]\} B(\tilde{b}^S(w)) \geq \int w\{1 - \theta[1 - \phi^{NS}(w)]\} B(\tilde{b}^{NS}(w)) dW = |OFF^{NS}|$; (iv) $|OFF_I^S| = \int w\phi^S(w) B(\tilde{b}^S(w)) dW < \int w\phi^{NS}(w) B(\tilde{b}^{NS}(w)) dW = |OFF_I^{NS}|$ but $|OFF_L^S| = [1 - \theta] \int w[1 - \phi^S(w)][1 - B(\tilde{b}^S(w))] dW \geq [1 - \theta] \int w[1 - \phi^{NS}(w)][1 - B(\tilde{b}^{NS}(w))] dW = |OFF_L^{NS}|$. ■

Parts (i) and (ii) of Proposition 3 focus on the proportion of taxpayers who invest offshore with and without a scheme. Part (i) clarifies that the introduction of a scheme induces a set of taxpayers – those with characteristics belonging to the shaded set in Figure 3 – to switch from investing offshore to investing onshore. According to part (ii), the introduction of a scheme also unambiguously reduces the proportion of taxpayers who invest offshore illegally. As, however, both T_{OFF} and T_I shrink, the proportion of taxpayers who invest offshore legally could either increase or decrease. In particular, if T_I shrinks by more than does T_{OFF} , then T_L expands.

Parts (iii) and (iv) of Proposition 3 are analogous to parts (i) and (ii), but instead focus on aggregate investment. Part (iii) clarifies that onshore investment unambiguously increases with the introduction of a scheme. Interestingly, however, whether offshore investment increases or decreases with a scheme is unclear a-priori. According to part (iv), illegal offshore investment unambiguously decreases with the introduction of a scheme, but whether legal offshore investment increases or decreases is unclear.

Empirically, Langenmayr (2017) finds that offshore investment increased following the introduction of the 2009 OVDP in the US, i.e., $|OFF^S| > |OFF^{NS}|$. What does our model predict in this case? Combining the results in (iii) and (iv), if $|OFF^S| > |OFF^{NS}|$, then – as $|OFF_I^S| < |OFF_I^{NS}|$ – it must hold that $|OFF_L^S| > |OFF_L^{NS}|$. Thus, our model runs counter to the interpretation of Langenmayr’s finding as evidence that the implementation of a disclosure scheme results in increased offshore evasion. If offshore investment is observed to increase following the implementation of a scheme, it must be that the increase is due entirely to an increase in legitimate offshore investment, for illegal offshore investment must fall.

7.2 Tax Revenue

Does the introduction of a scheme increase the expected net revenue of the tax authority?

Proposition 4 *The expected net revenue collected by the tax authority from the set of taxpayers T is increased by the introduction of a scheme: $R_T^S > R_T^{NS}$.*

Proof. As the choices of taxpayers in T_{OFF} make the tax authority indifferent between auditing and not-auditing (both with and without a scheme), it is straightforward to show that, in equilibrium, $R_{OFF}^S(y) = R_{OFF}^{NS}(y) = 0$. Hence, using (5) and (10), we have

$$R_T^k = \int \int_{\Omega_{ON}^k \cup \Omega_L^k} \theta w \, dW dB = \theta \int w [1 - \phi^k(w) B(\tilde{b}^k(w))] \, dW,$$

where $k \in \{NS, S\}$. The result then follows from the inequalities in Lemma 3. ■

The intuition for Proposition 4 is that the increased propensity to either invest onshore, or offshore legally, raises the level of voluntary compliance. This increase in expected revenue is not offset by reductions in fine revenue as the first-mover advantage enjoyed by taxpayers permits them to make choices that leave the tax authority just indifferent between auditing and not auditing, both with and without a scheme.

Were we to have assumed that the tax authority could choose the scheme parameters before investors make their investment choice, the finding that net revenue increases under a scheme would be unsurprising. As, however, we take the tax authority to move last, the implications for net revenue were initially uncertain. It is notable, therefore, that even when moving last, voluntary disclosure schemes still increase net revenue.

In practice, the increase in expected revenue identified in Proposition 4 may be an understatement. Whereas we consider a tax authority unfettered in its choice of fine rate from the interval $[f, \bar{f}]$, in many cases it is only in prescribed circumstances can the tax authority levy the lowest and highest allowable fine rates.¹⁶ In such cases, failing to respond to a disclosure opportunity and/or making a false disclosure, may provide grounds for applying higher fine rates than would otherwise be applied in the absence of a scheme.

7.3 Taxpayer Welfare

We now examine the impact of a scheme for expected taxpayer consumption (utility):

Proposition 5 *The welfare consequences of introducing a scheme are as follows:*

(i) For taxpayers belonging to $T_{ON}^{NS} \cup T_{ON}^S$, $C^{NS} = C^S$;

¹⁶In the UK, for instance, the fine rate that is applied is conditional upon the “behavioral” nature of the observed non-compliance: the lower bound applies if the non-compliance is judged to be through “careless error”, whereas the upper bound applies to “deliberate and concealed” inaccuracies (see, e.g., HMRC, 2012).

(ii) For taxpayers belonging to $T_{OFF}^{NS} \cup T_{OFF}^S$, $C^{NS} > C^S$;

(iii) For taxpayers belonging to $T_{OFF}^{NS} \cup T_{ON}^S$, $C^{NS} > C^S$.

Proof. (i) Immediate from (2); (ii) In equilibrium $C_L = C_I - [1 + r_{OFF}] \theta w$. Hence $C_{OFF}(\phi^k) = \phi^k C_I + [1 - \phi^k] \{C_I - [1 + r_{OFF}] \theta w\} = C_I - [1 - \phi^k] [1 + r_{OFF}] \theta w$. It follows that $C_{OFF}(\phi^S) < C_{OFF}(\phi^{NS}) \Leftrightarrow \phi^S < \phi^{NS}$, where the right-side holds by Lemma 3; (iii) As C_{ON} is unaffected by a scheme, taxpayers who invest offshore in the absence of a scheme but switch to investing onshore in the presence of a scheme must switch to a lower payoff. ■

Part (i) of Proposition 5 is for taxpayers who invest onshore irrespective of the provision of a scheme: such taxpayers are wholly unaffected. Part (ii) states that taxpayers who invest offshore irrespective of the provision of a scheme lose consumption in the presence of a scheme. This loss arises as the probability that taxpayer investing offshore decides to do so illegally is lower in the presence of a scheme. Thus, with a higher probability, the taxpayer loses consumption on account of paying tax on the lump-sum. Part (iii) is for taxpayers for whom the introduction of a scheme induces a switch from investing offshore to investing onshore. Given that the payoff to investing onshore is unchanged, it must be that $C_{OFF}^{NS} > C_{ON} \geq C_{OFF}^S$, in which case switchers are switching for a lower level of expected consumption, but nonetheless a higher level than they would achieve by continuing to invest offshore.

The loss of utility to investing offshore illegally appears desirable – after all, it is due to a reduction in incentives for breaking tax law. More generally, were we to model explicitly the benefits from taxation in the form of the public services it pays for, the increased tax revenue generated by schemes would generate utility for all taxpayers through increased provision.

7.4 Optimal Incentivized Fine Rate

For tax authorities seeking to understand the optimal design of disclosure schemes it is of interest to highlight a feature of the optimal scheme relating to the question of how to set the incentivized fine rate for those that enter the scheme. We have the following result:

Proposition 6 *In the optimal scheme it holds that $\hat{f} = \underline{f}$.*

Proof. Using the relationship $Q(\hat{f}, y) = \alpha_I Q(\bar{f}, y)$ established in Section 6, and substituting $\alpha_I = [1 + \underline{f}][1 + \bar{f}]^{-1}$ from Lemma 2, the result obtains. ■

According to Proposition 6, the incentivized fine rate is the lowest fine rate allowed under legislation. This is consistent with the design of disclosure schemes in the UK, which have offered those who disclose the minimum ten percent penalty permitted in law. This result arises as the tax authority does only the minimum level of auditing necessary to ensure

truthful disclosure by taxpayers within the scheme. To achieve this, the tax authority maximizes incentives for truth-telling by lowering the fine rate for truthful disclosure to its lower bound.¹⁷

8 Conclusion

Tax authorities around the world are using incentivized voluntary disclosure schemes (IOVDS) to recover tax on offshore investments. Such schemes offer discounted fine rates for those who voluntarily disclose (albeit in the shadow of the threat of subsequent enforcement). The amounts of revenue being recovered through such schemes are considerable, and international initiatives such as the OECD Common Reporting Standard are expected to result in the further use of such schemes. Given these developments, we appraise the use of such schemes, and their implications for tax authorities and for taxpayers.

A key feature of the voluntary disclosure schemes we examine is that they are conceived and implemented following an information leakage, which necessarily post-dates the criminal act. Accordingly, at the time of designing the scheme, the tax authority perceives no opportunity to influence criminal behavior, merely to try and recover as much of the uncollected revenue as possible. A second key feature is the recognition that neither is offshore investment in itself illegal, nor is all offshore investment driven by tax considerations.

We consider an environment in which taxpayers can invest a lump-sum onshore or offshore. Should they choose to invest offshore, they may do so legally or illegally. After investments have been made, the tax authority may potentially observe the offshore investments, but does not observe which were made legally, and which illegally. In this context, we find that the tax authority can increase its expected net revenue by implementing a disclosure scheme, rather than by simply using its regular audit regime. In particular, a hallmark of the optimal disclosure scheme is that it offers the minimum allowable fine rate in law to those that disclose honestly. Although the implementation of disclosure schemes is consistent with a rise in offshore investment, importantly our model predicts that the illegal component of offshore investment is always lower in the presence of a scheme. Thus, in a sense our model helps makes precise, it is possible to offer ex-post inducements for truthful disclosure without simply incentivizing the underlying criminal activity.

We note that our study represents a first step in the theoretical analysis of disclosure schemes and offer the following suggestions for future research. One extension would be to introduce risk aversion. This would require the use of simulation methods, or the simplification of other aspects of the model, however. A second possible extension would be to allow for the possible sheltering of interest in offshore accounts, alongside the possibility that the source

¹⁷A further factor that might account for the use of the minimum fine rate, albeit one that lies outside of our model, is the salience to taxpayers of a low headline incentivized fine rate. For nascent studies of taxpayer salience see, e.g., Chetty *et al.*, 2009 and Krishna and Slemrod, 2003).

capital may also be untaxed. Third, imperfect audit technology might be allowed for, as in Rablen (2014). Last, communication between affected taxpayers through a network, as in Hashimzade *et al.* (2014), might be introduced. Each of these avenues would further enrich the modelling and potentially provide new insights for those in tax authorities who design such schemes.

References

- Alm, J. and Beck, W. (1993). “Tax amnesties and compliance in the long run: A time series analysis”, *National Tax Journal* 46(1): 53–60.
- Alm, J., McKee, M. and Beck, W. (1990). “Amazing grace: Tax amnesties and compliance”, *National Tax Journal* 43(1): 23–37.
- Andreoni, J. (1991). “The desirability of a permanent tax amnesty”, *Journal of Public Economics* 45(2): 143–159.
- Bazart, C., Beaud, M. and Dubois, D. (2014). “On the efficiency of whistleblowing-based audit schemes to fight tax evasion: An experimental approach”, Paper presented at the International Tax Analysis Conference, London.
- Bigio, S. and Zilberman, E. (2011). “Optimal self-employment income tax enforcement”, *Journal of Public Economics* 95(9-10): 1021–1035.
- Boesler, M. (2012). *The Controversial ‘Lagarde List’ Has Leaked, and It’s Bad News for the Greek Prime Minister*, Business Insider, New York: Business Insider Inc. Available: <http://www.businessinsider.com>.
- Bordignon, M. (1993). “A fairness approach to income tax evasion”, *Journal of Public Economics* 52(3): 345–362.
- Center for Public Integrity (2013). *Secrecy for Sale: Inside the Global Offshore Money Maze*, Washington: Center for Public Integrity.
- Chetty, R., Looney, A. and Kroft, K. (2009). “Salience and taxation: Theory and evidence”, *American Economic Review* 99(4): 1145–1177.
- Chu, C.Y.C. (1990). “Plea bargaining with the IRS”, *Journal of Public Economics* 41(3): 319–333.
- Committee of Public Accounts (2008). *HMRC: Tackling the Hidden Economy*, HC 712, London: The Stationery Office.
- Dharmapala, D. (2016). “Cross-border tax evasion under a unilateral FATCA regime”, *Journal of Public Economics* 141(1): 29–37.

- European Union (2003). “Council directive 2003/48/EC of 3 June 2003 on taxation of savings income in the form of interest payments”, *Official Journal of the European Union* L157: 38–48.
- Franzoni, L.A. (2000). “Amnesties, settlements and optimal tax enforcement”, *Economica* 67(266): 153–176.
- GAO (2013). *Offshore Tax Evasion: IRS has Collected Billions of Dollars, but May be Missing Continued Evasion*, GAO-13-318, Washington: Government Accountability Office.
- Glen Ueng, K.L. and Yang, C.C. (2001). “Plea bargaining with the IRS: extensions and further results”, *Journal of Public Economics* 81(1): 83–98.
- Goerke, L. (2015). “Income tax buyouts and income tax evasion”, *International Tax and Public Finance* 22(1): 120–143.
- Graetz, M.J., Reinganum, J.F. and Wilde, L.L. (1986). “The tax compliance game: Toward an interactive theory of law enforcement”, *Journal of Law, Economics, and Organization* 2(1): 1–32.
- Gravelle, J.G. (2009). “Tax havens: International tax avoidance and evasion”, *National Tax Journal* 62(4): 727–753.
- Hashimzade, N., Myles, G.D., Page, F. and Rablen, M.D. (2014). “Social networks and occupational choice: The endogenous formation of attitudes and beliefs about tax compliance” *Journal of Economic Psychology* 40(1): 134–146.
- Helm, R.W. (1997). “Offshore investment funds”. In: Kirsch, C.E. (Ed.) *The Financial Services Revolution: Understanding the Changing Role of Banks, Mutual Funds, and Insurance Companies*, Ch. 17, Irwin: Chicago.
- HMRC (2006). *HMRC Annual Report 2005-06*, London: HMRC.
- HMRC (2012). *Penalties for Inaccuracies in Returns and Documents*, CC/FS7, London: HMRC.
- Johannesen, N. and Stolper, T.B.M. (2017). “The deterrence effect of whistleblowing – An event study of leaked customer information from banks in tax havens”, Working paper no. 2017-4, Max Planck Institute for Tax Law and Public Finance.
- Johannesen, N. and Zucman, G. (2014). “The end of bank secrecy? An evaluation of the G20 tax haven crackdown”, *American Economic Journal: Economic Policy* 6(1): 65–91.
- Kaplow, L. and Shavell, S. (1994). “Optimal law enforcement with self-reporting of behavior”, *Journal of Political Economy* 102(3): 583–606.

- Kim, W. and Wei, S.-J. (2002). “Offshore investment funds: monsters in emerging markets?”, *Journal of Development Economics* 68(1): 205–224.
- Konrad, K.A. and Stolper, T.B.M. (2016). “Coordination and the fight against tax havens”, *Journal of International Economics* 103(1): 96–107.
- Krishna, A. and Slemrod, J. (2003). “Behavioral public finance: Tax design as price presentation”, *International Tax and Public Finance* 10(2): 189–203.
- Langenmayr, D. (2017). “Voluntary disclosure of evaded taxes – increasing revenue, or increasing incentives to evade?”, *Journal of Public Economics* 151(1): 110–125.
- Macho-Stadler, I., Olivella, P. and Perez-Castrillo, J.D. (1993). “Tax amnesties in a dynamic model of tax evasion”, *Journal of Public Economic Theory* 1(4): 439–463.
- Macho-Stadler, I. and Pérez-Castrillo, J.D. (2002). “Auditing with signals”, *Economica* 69(273): 1–20.
- Malik, A.S. and Schwab, R.M. (1991). “The economics of tax amnesties”, *Journal of Public Economics* 46(1): 29–49.
- Mealem, Y., Tobol, Y. and Yaniv, G. (2010). “Whistle-blowers as a deterrent to tax evasion”, *Public Finance Review* 38(3): 306–320.
- Oates, J. (2008). *HMRC Pays Criminal for ‘Tax Dodger’ Discs*, The Register, London: Situation Publishing. Available: <http://www.theregister.co.uk>.
- OECD (2010). *Offshore Voluntary Disclosure: Comparative Analysis, Guidance and Policy Advice*, Paris: Organisation for Economic Co-operation and Development.
- OECD (2013). *Standard for Automatic Exchange of Financial Account Information: Common Reporting Standard*, Paris: Organisation for Economic Co-operation and Development.
- O’Reilly, R. (2007). “Complete guide to offshore bank accounts for funding online casino and poker play”, *Blackjack Forum* 26(1).
- Pfisterer, V.M. (2013). “Walking a fine line – a contextual perspective on the purchase of “stolen” banking data by German authorities”, *German Law Review* 14(7): 926–948.
- Pritchard, D. and Khan, N. (2005). “Offshore compliance: Using regression and risk modeling to select cases from large datasets”, Paper presented at the IRS Research Conference, Washington D.C.
- Rablen, M.D. (2010). “Tax evasion and exchange equity: A reference-dependent approach”, *Public Finance Review* 38(3): 282–305.
- Rablen, M.D. (2014). “Audit probability versus effectiveness: The Beckerian approach revisited”, *Journal of Public Economic Theory* 16(2): 322–342.

- Reinganum, J. and Wilde, L. (1986). “Equilibrium verification and reporting policies in a model of tax compliance”, *International Economic Review* 27(3): 739–760.
- Scotchmer, S. (1987). “Audit classes and tax enforcement policy”, *American Economic Review* 77(2): 229–233.
- Stella, P. (1991). “An economic analysis of tax amnesties”, *Journal of Public Economics* 46(3): 383–400.
- Treasury Committee (2012). *Closing the Tax Gap: HMRC’s Record at Ensuring Tax Compliance*, HC 1371, London: The Stationery Office.
- Watt, H., Winnett, R. and Newell, C. (2012). *HSBC Investigation: Clients of Britain’s Biggest Bank Exposed*, The Telegraph, 10th November, London: Telegraph Media Group. Available: <http://www.telegraph.co.uk>.
- Yaniv, G. (2001). “Revenge, tax informing, and the optimal bounty”, *Journal of Public Economic Theory* 3(2): 225–233.
- Zucman, G. (2013). “The missing wealth of nations: Are Europe and the U.S. net debtors or net creditors?”, *Quarterly Journal of Economics* 128(3): 1321–1364.

Figures

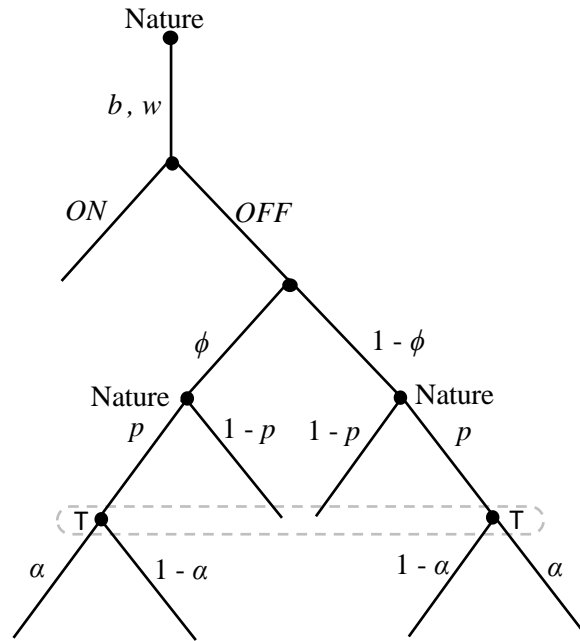


Figure 1: The offshore evasion game in the absence of an IOVDS.

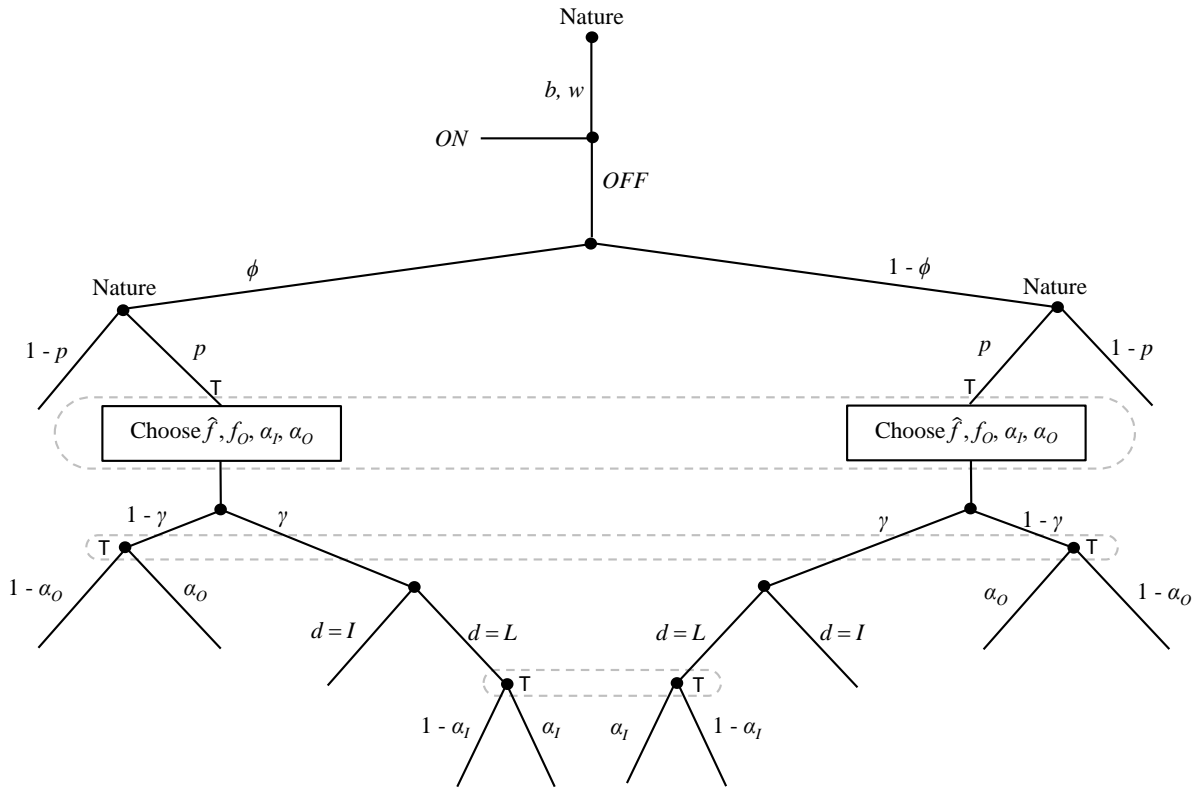


Figure 2: The offshore evasion game in the presence of an IOVDS.

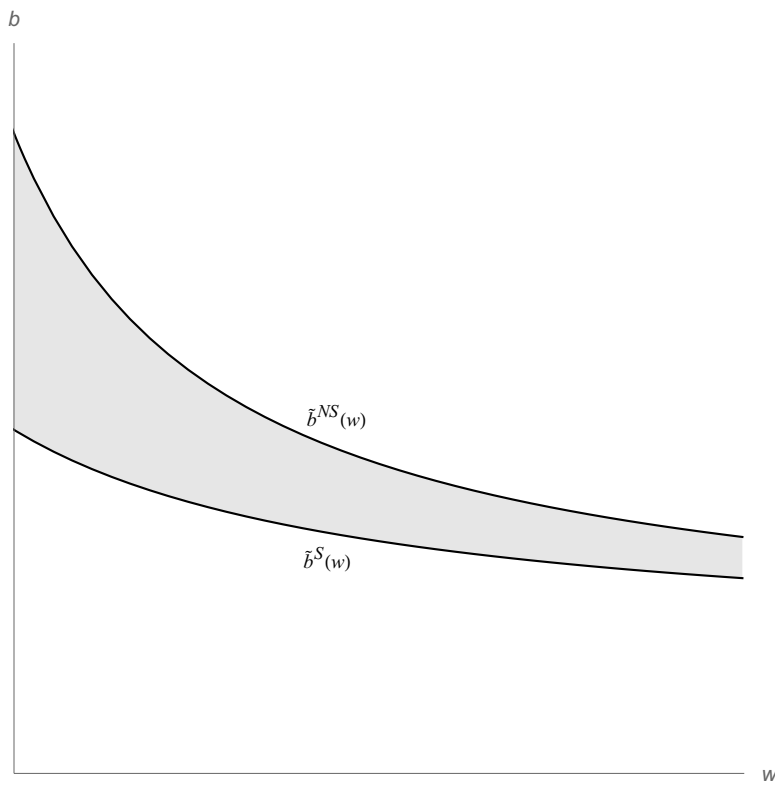


Figure 3: The equilibrium partition of (w, b) space into sets Ω_{ON} and Ω_{OFF} , with and without a scheme.