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Bank Secrecy, Illicit Money and Offshore Financial Centers

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Pierre M. Picard, CREA-University of Luxembourg

Patrice Pieretti, CREA-University of Luxembourg

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Pierre M. Picard and Patrice Pieretti[1]

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[1]Faculty of Law, Economics and Finance, University of Luxembourg, 162a, avenue de la Faïencerie, L-1511 Luxembourg. Tel.:+352 4666446633; fax: +352 4666446632. *E-mail address*: patrice.pieretti@uni.lu

Abstract

International and national institutions regularly put pressure on offshore financial centers and their clients to enforce compliance with anti-money laundering regulations and that in spite of the existence of bank secrecy. This paper discusses the winners and losers of such policies. Surprisingly, aggregate profits and tax revenues can increase under those policies. In addition, we show that offshore banks can be encouraged to comply with rigorous monitoring of the investor's identity and the origin of his/her funds when the pressure creates sufficiently high risk of reputational harm to this investor. Nevertheless, the efficient pressure policy is dichotomous in the sense that a social planner chooses zero pressure or the pressure that just entices offshore banks to comply. By contrast, the implementation of those pressure policies on an onshore institution may be inefficient. Finally, we show that deeper financial integration fosters compliance by the offshore center while it also gives better incentives for delegated organizations to effectively induce compliance.

Keywords: money laundering, offshore banking, compliance

JEL classification: F21, K42

1 Introduction

Offshore financial centers are often viewed as parasites that thrive by attracting tax cheaters and money-launderers.[1][2] In recent years, there have been concerted international initiatives to discipline them with the result that the legal and regulatory environment is beginning to change.[3] However, sovereignty and democratic independence limit the ability of international bodies to intervene directly in the private economy of offshore financial centers. As noticed by Abbott and Snidal (2000), "diminution of sovereignty makes states reluctant to accept hard legalization, especially when it includes significant levels of delegation". This difficulty is obviously emphasized by the fact that bank secrecy represents an important asset of offshore financial centers.

Since the early 1990s, there have been multilateral efforts to address money laundering. For example, the F.A.T.F. issued a list of recommendations "that set out the basic framework for anti-money laundering efforts[4] and are intended to be of universal application". These guidelines are not as tightly constraining as hard legal commitments and are more difficult to enforce. Pressure on Non-Cooperative Countries and Territories (N.C.C.T.) may however be exercised through blacklisting and indicating that repeat offenders may face counter-measures including a ban from dealing with the financial institutions of the

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[1]Like Rose and Spiegel (2006), we define offshore financial centers as jurisdictions that oversee a disproportionate level of financial activity by non-residents.

[2]The IMF (2004) defines money-laundering as "a process in which assets obtained or generated by criminal activity are moved or concealed to obscure their link with the crime".

[3]Driven by a growing political determination to fight against money laundering, international organizations like the Financial Action Task Force (FATF) housed at the OECD, the Basel Committee on Banking Supervision, the Commission of the European Communities, the Financial Stability Forum (FSF) and the IMF, have focused on decreasing the opacity of operations in offshore financial centers.

[4]These recommendations are especially concerned with the criminalisation of money laundering, the requirement of banks to know their clients, and the reporting of suspicious transactions to their governments.

The IMF has now become actively involved in anti money laundering issues, in particular with the launch in 1999 of the Financial Sector Assessment Programs. The Basel Committee (Basel 2) has extended its traditional remit in publishing best practice standards for customer identification, called the "know your customer" rule and this principle has been implemented by European regulation.

O.E.C.D. countries (The Economist, 2001).

Many authors are skeptical about the effectiveness of this soft law practice intended to combat money laundering by financial institutions. One argument often raised is that money laundering and bank secrecy are inextricably linked and efficiently fighting against financial crime can only be achieved by undermining confidentiality laws (Antoine, 1999). Other arguments are more specifically concerned with the lack of incentives to cooperate. Focusing on national policy makers' strategic behavior concerning the adoption of financial regulations, Masciandaro (2005) notes that notwithstanding the blacklist threat, various jurisdictions continue to be non-cooperative. According to FitzGerald (2004) compliance with international regulations must be especially enforced on financial intermediaries, but while states may face international sanctions, there is no direct means of punishing private sector actors, as they have no status in international law.

In the following, we take the viewpoint that successfully enforcing anti-money laundering standards relies on the existence of incentives for complying with these regulations. Mascandiaro (2005) addresses this problem by modelling national policy makers' choice of the optimal degree of laxity in financial regulation. In our paper, we rather focus on financial intermediaries' incentives to implement "know your customer" standards in order to identify and report dubious transactions. This choice is motivated by the fact that the nature of bank secrecy does not cause automatic compliance by intermediaries even within highly regulated institutional structures (FitzGerald, 2004).

According to Sharman (2004), public blacklisting by international organizations is an effective means of bringing about regulatory compliance by otherwise recalcitrant states. The reason is that this type of pressure hurts tax havens' reputations in the eyes of governments and investors and may thus lead to capital withdrawals and other economic damage. Zagaris (2001) notes that blacklists are not merely a way of naming and shaming offshore financial centers, but a way to impose economic sanctions. Blum et al. (1998,

p.47) observe that "if a haven develops too unsavory a reputation as a home for dirty money or a haunt of organized crime and drug traffickers, then not only will legitimate money go elsewhere as respectable companies move their businesses to avoid tarnishing their reputations but so too will more sophisticated criminals who want to avoid any taint by association".

The factor of loss of reputation owing to banks' lax behavior toward anti-money laundering practices is critical for analyzing offshore financial intermediaries' choice to comply with controlling rules. In that context, may these costs provide enough incentives for banks to respond appropriately? Will this occur despite the existence of bank secrecy?

To address these issues, we develop a model that endogenizes the strategic choice of an offshore financial center between lax and scrupulous attitudes toward controlling the origin of investments. In that context we assume that bank secrecy provided by the offshore center is not only seen as a possible channel for illegal money transfers but also as an opportunity for legal financial services coupled with tax advantages (Antoine,1999 ; Desai et al. 2006). According to Blum et al. (1998, p.40), the real question "is not to issue blanket condemnations or make efforts to eliminate bank secrecy and offshore financial services, but to ensure that the legitimate uses of these facilities remain available".

Recent papers have addressed the topic of offshore financial centers. There is one strand of the literature, which deals with their tax haven characteristic (Rose and Spiegel, 2006 ; Slemrod and Wilson, 2006 ; Desai et al. 2006). Other papers focus exclusively on the money-laundering aspect (Masciandaro, 2005, 2006). Our model takes into account both features without mixing them by introducing two types of clienteles: one that has criminal money to launder and another who seeks the most profitable destination of licit money.

In this paper we consider a two-country two-financial center model with two classes of investors. Ordinary investors seek the best return investment opportunity but feel

some (preference or geographical) distance from the offshore financial center. Criminal investors seek opaqueness and use the offshore banks' secrecy policy to launder money that is illegally obtained and that may be used for illegal purpose (e.g. terrorism). In this paper, we conform to the standards of existing literature by endogenizing interest rates and government taxes. Therefore, as is usual in the banking competition literature, we assume that financial centers compete to attract investors and, as is usual in the tax competition literature, we assume that governments independently set taxes on interest payments. In addition to those actions, national or international institutions have to decide to exert pressure on the offshore bank and country, for instance, by blacklisting policies and pressure on individuals who invest offshore.

The first objective of the paper is to highlight the winners and losers of the pressure policies. Our second objective is to establish the conditions under which the offshore financial center is enticed to comply with scrupulous monitoring of the investor's identity and the origin of his/her funds. The third objective is to analyze the efficiency of the decision in terms of the effort exerted to blacklist the offshore center and to campaign investors against offshore investment. Our final objective is to discuss the delegation of the pressure policy to possible institutions like tax administrations.

Our main results may be summarized as follows : First, we show that offshore banks and countries lose under the pressure policies. More interestingly, this conclusion also applies for any (non-criminal) onshore investors, individually or in the aggregate. Surprisingly, the aggregate profit and tax revenues can increase after the implementation of a pressure policy. This is because the pressure policy is not only likely to harm investors but also to weaken interbank competition. Second, offshore banks can be enticed to comply with scrupulous monitoring of the investors' identities and the origins of their funds when the pressure policy gets strong enough. To be effective this pressure policy should make ordinary investors incur a reputational harm that - in monetary equivalent terms

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- is larger than the monitoring cost of investors in banks. Third, the efficient pressure policy is dichotomous in the sense that a social planner chooses only two levels of pressure: either zero pressure or the pressure that just entices offshore banks to comply. Since offshore centers are very likely to be tax havens, anti money laundering actions exerted by onshore institutions may also be (partially) motivated by the desire to reduce tax losses. In that context, we show that pressure strategies decided by national or international institutions whose objectives are biased towards tax revenue may not be efficient. Indeed, the resulting pressure exerted on investors may be set at a sufficiently high level to make them choose the onshore banks but not to large enough level to make the offshore banks comply. Finally, we qualify the usual claim stating that deeper financial integration fosters financial criminality. We show in this model that deeper financial integration encourages compliance by offshore financial centers whereas it also gives better incentives for delegated organizations to use its pressure policy to effectively enforce compliance. So, deeper financial integration fosters the elimination of financial criminality.

The present paper is organized as follows. Section 2 presents the model. Section 3 and 4 derive the equilibrium under compliance and no compliance of offshore centers. Section 5 discusses the efficient pressure policy and the delegation to onshore institutions. Section 6 presents some extensions while Section 7 concludes.

2   Model

We consider a two-country two-financial center model. Let the onshore institutions be subscripted by H (home) and the offshore ones by F (foreign). The timing is as follows. First national or international institutions decide to exert pressure on the offshore bank and country, for instance, by blacklisting policies and pressure on individuals who invest offshore. Second, the offshore and onshore governments simultaneously set their tax

rates on deposits. Third, banks compete to attract investors by setting their interest rates. Fourth, investors choose the bank where they deposit their cash. Finally, the banks remunerate investors whereas investors pay their taxes on earned interests. We now describe each side of the financial centers.

Each financial center i $(i = H, F)$ collects funds from investors and offers a risk-free interest rate r_i. They invest those funds into risk-free assets that yield a given (world) rate of return r and make a profit on the intermediation margin $r - r_i$. We here consider a small offshore financial center that competes with a domestic financial center in order to attract investors located in the domestic jurisdiction. We thus underline the fact that offshore financial centers often have very small populations and offer intermediation services predominantly to investors residing in large foreign economies. The offshore jurisdiction provides strict bank secrecy while the onshore center does not. It follows that the offshore financial center is more vulnerable to money laundering than other market places where financial transactions are more transparent. Like Rose and Spiegel (2006) we consider that each jurisdiction contains only one bank. This allows us to focus on international financial competition.[5]

Financial centers are also asked to scrupulously monitor investors' identities and money origins. Because our focus is on the effect of the banks' monitoring of investors on the competition between financial centers and between governments, we simplify the monitoring technology by assuming that banks are able to discover the criminal identity and money origin of investors at a cost c proportional to the amount of monitored deposits. The main difference between the onshore and offshore financial centers is that the onshore financial center is obliged by law to comply to the monitoring of investors whereas the offshore center cannot be obliged to do so. Instead, the latter should be enticed to moni-

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[5]Competition is however imperfect, since we consider an international duopoly competing in offered interest rates.

tor investors by onshore governments or international institutions. Therefore, the offshore financial center has an additional decision variable $s \in \{m, o\}$, where $s = m$ denotes a scrupulous monitoring of the investors' money origins and $s = o$ a lax behavior on this issue.

Investors lend their capital to the financial centers. All investors reside in the home country H and are endowed with one unit of wealth that they deposit in the most advantageous financial center. The onshore economy contains S investors and the offshore financial center is assumed to have no local investors. Investors split into an ordinary and a criminal clientele. On the one hand we assume that there exist $(1 - \mu)S$ $(3/4 < \mu < 1)$ criminal investors who only seek opaqueness in order to conceal the origin of money that is illegally obtained. For simplicity we assume that those investors do not care about interest-earning and tax-saving: their demand for opaqueness is perfectly inelastic to the offered return. Individuals having money laundering intentions are supposed to opt exclusively for the offshore bank when the latter does not scrupulously monitor financial transactions. If both jurisdictions do implement a scrupulous monitoring, individuals who still seek opaqueness are supposed to look for another way of laundering money (e.g. in underground banking like casinos, Hawalawa [6]...). We simplify by assuming that owners of illegal money have no such option. Finally, we assume that the social cost of each illegal dollar invested is equal to β. As a result, the social cost of the criminal activity is equal to $\beta(1 - \mu)S$ when all criminal investors use the banking system. This parameter β captures the social cost of the criminality. It increases if the threat of criminality to society rises (as it can have been perceived in the U.S. after 11/9/2001). It also increases when substitute channels to the banking system for money laundering business become

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[6]Underground or ethnic banking systems are remittance systems that operate outside of (or parallel to) traditional financial channels. They are becoming more and more popular today as ethnic diasporas grow (Blum et al. 1998). The most commonly referred to informal systems are the Chinese chit or chop system of East and Southeast Asia, the black market peso exchange system of Latin America, and the hawala system, with its offshoot the hundi system in South Asia (FitzGerald, 2004) .

less numerous and less effective. In this case, the elimination of money laundering in the offshore financial centers brings more social benefit. This cost is assumed to vanish when the offshore financial centers monitor their investors.

On the other hand, the onshore country hosts μS ordinary investors who invest legal money and thus favor the financial center that offers the highest net rate of return. Independent of tax and return considerations, we suppose that ordinary investors incur a cost of moving assets abroad that mainly reflects their home country preference. This reluctance to invest abroad may in particular be explained by poor information about remote areas and thus by lack of confidence in foreign financial centers. We therefore assume that ordinary investors are uniformly distributed along the unit segment according to their preference for proximity, so that the "closer" to the border they are, the less they will favor their home financial center. Consequently, the aforementioned mobility cost of an individual located at x ($x \in [0, 1]$) equals the distance x that separates him from the border multiplied by a (constant) unit cost k. Improvements in technology that bolster global integration by creating international links between financial markets and by facilitating the access to foreign financial centers tend to lower transaction and information costs. We thus will interpret the coefficient k as measuring the degree of international financial integration. On the other hand, we consider that individuals seeking to conceal illegal money don't exhibit a preference for the home financial system.

Furthermore, according to Sharman (2004 p. 9),"it would be wrong to say that tax havens are undifferentiated units offering perfectly substitutable services or that customers are interested only in the bottom line." Consequently, one dollar invested in a known place like the home country does not, other things being equal, exactly represents the same amount invested in an offshore center. Offshoring money will cause investors to endure a premium that is likely to increase with the loss of reputation of the destination jurisdictions in which they deposit. In this vein, Sharman (2001 p.12) observes

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that, "investors tend to avoid or leave jurisdictions with bad reputations not only out of concern that their money will be misappropriated, but also because firms risk harming their own reputations, as reflected in their share prices. "Accordingly, to take account of the quality of the offshore center's reputation, we introduce a parameter a, which represents the disutility that the non-criminal investor incurs by offshoring his money to an offshore financial center that does not scrupulously monitor the origin of his/her deposits. This parameter encompasses various sources of utility losses that the ordinary investor associates with a deposit in a bad financial center (e.g. in terms of patriotism, warm glow, tax evasion tagging...). For the sake of convenience, we label this parameter a as the "investor's reputational harm" although we do not intend to model any reputation game in this paper. Hence, the utility function of an investor located at x who deposits in jurisdiction i $(i = H, F)$ is assumed to be given by

$$
U_i^s(x) = \begin{cases} r_H - t_H & \text{if } i = H \text{ and } s \in \{m, o\} \\ r_F - t_F - k \cdot x & \text{if } i = F \text{ and } s = m \\ r_F - t_F - k \cdot x - a & \text{if } i = F \text{ and } s = o \end{cases}
$$

In this definition, the first investor's option is to deposit in the home country and get the return r_H and pay the tax t_H per unit of deposit. The second option is to invest in the offshore financial center, get the return r_F and pay the tax t_F but incur a utility loss $k \cdot x$ that depends on the investor's distance from the offshore place. Finally, when the offshore place does not monitor, it is put under pressure by international organizations. This collective action may be achieved through campaigns in the media, new regulations, publication of reports and statistics, categorization of tax havens and strategies of "naming and shaming".[7] In the following we assume that investors who offshore their money

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[7]For example, the Financial Action Task Force (FATF) adopted by 1999 a 'name, shame and punish' strategy for countries that refused to comply with its recommendations for anti-money laundering.

are also stigmatized by the international pressure campaign and, in turn, incur a(n) (individual) reputational harm a.

In this paper, the investor's reputational harm is not an exogenous parameter. It depends on the pressure that national and/or international institutions put on the investors and the offshore financial center. Such institutions can put pressure on the offshore financial center by blacklisting them; they can put pressure on the ordinary investors by informing them or campaigning about the risks of investing offshore, by tagging and/or pursuing offshore investors, etc. We assume that the cost of exerting such a pressure is equal to $C(a) = \gamma a$. Finally, in accordance with standard tax competition literature, we assume that policy makers maximize their total tax proceeds, each one taking the tax of the other country as given.

We now derive the equilibrium deposit supplies, interest and tax rates when the offshore financial center either complies or not with the scrupulous monitoring of investors. We then derive the incentives of the offshore financial center to monitor investors and discuss the optimal pressure strategy.

3   Compliant offshore financial center

In this section, we derive the equilibrium of the sequential decisions of investors, banks and governments when each financial center decides to monitor the origin of invested funds and refuses to accept illicit money ($s = m$). In this case, deposits are supplied only by ordinary investors who do not incur any disutility from being associated to an offshore bank.

The deposit supplies are obtained as follows. If the offshore financial center monitors, criminals are unable to use the banking system to launder money while the share of ordinary investors lending their money in offshore financial center is determined by the

marginal (ordinary) investor x_F who is indifferent between both jurisdictions. We readily obtain that

$$x_F = \frac{1}{k}(r_F - r_H - t_F + t_H) \quad \text{and} \quad x_H = 1 - x_F$$

As a result, the deposit supply functions are equal to $D_i = \mu x_i S$ $(i = H, F)$.

The financial centers i $(i = H, F)$ select the interest rates that maximize their profits Π_i by taking as given the taxes and the rival's interest rate. That is,

$$\max_{r_i} \Pi_i = (r - r_i - c) D_i = \mu (r - r_i - c) x_i S$$

where c is the monitoring cost. The unique Nash equilibrium in interest rates yields

$$r_F^m = r - c - \frac{1}{3}(k + t_H - t_F) \quad \text{and} \quad r_H^m = r - c - \frac{1}{3}(2k + t_F - t_H)$$

where the superscript m denotes the equilibrium variables in the monitoring case. Accordingly, the interest rate differential is $r_H^m - r_F^m = -\frac{1}{3}[k + 2(t_F - t_H)]$. All taxes being equal, the onshore financial center sets a lower interest rate as it can take advantage of legal investors' preference for their home country.

Policy-makers individually choose their tax rate t_i that maximizes their total tax proceeds $T_i = t_i D_i$ $(i = H, F)$ taking the other country's tax as given. The best responses are $t_i^{BR}(t_j) = \frac{t_j}{2} + \frac{1}{2}k$ so that taxes are strategic complements as is usual in the tax competition literature. The tax equilibrium is uniquely determined to

$$t_F^m = \frac{4}{3}k > 0 \quad \text{and} \quad t_H^m = \frac{5}{3}k > 0$$

Since $t_H^m - t_F^m = \frac{k}{3} > 0$, the onshore country always sets higher taxes. As in many tax competition models, the offshore country sets a lower tax to attract a larger base of

taxable deposits.

At this equilibrium, the interest rates are equal to

$$r_F^m = r - c - \frac{4}{9}k \qquad \text{and} \qquad r_H^m = r - c - \frac{5}{9}k$$

The interest rate differential is equal to $r_H^m - r_F^m = -\frac{k}{9} < 0$. The onshore financial center offers a lower interest rate to compensate for ordinary investors' distance to it. Interest rates are positive and investors deposit their capital if and only if

$$c < r - \frac{5}{9}k \tag{1}$$

which we assume from now.

The equilibrium supplies are given by

$$D_F^m = \frac{4}{9}\mu S \qquad \text{and} \qquad D_H^m = \frac{5}{9}\mu S$$

whereas the banks' profits and tax proceeds write as

$$\Pi_i^m = \frac{k}{\mu}\left(D_i^m\right)^2 \qquad \text{and} \qquad T_i^m = 3\Pi_i^m \qquad (i = H, F)$$

We now analyze the interesting case of a non compliant offshore financial center.

4 Lax offshore financial center

We now suppose that the offshore financial center does not monitor investors' identity and money origin ($s = o$). In this case some pressure is exerted on investors who incur a reputational loss a. We derive the equilibrium of the sequential decision of depositors,

banks and governments in the following way.

When the offshore financial center is lax, criminal investors are able to launder money in the offshore center. The share of legal money invested in each financial center is determined by the marginal (ordinary) investor x_F who is indifferent between both jurisdictions. We readily compute

$$x_F = \frac{1}{k}(r_F - r_H - t_F + t_H - a) \quad \text{and} \quad x_H = 1 - x_F$$

The deposit supply functions are equal to

$$D_F = (\mu x_F + 1 - \mu) S \quad \text{and} \quad D_H = \mu x_H S$$

Each financial center selects the interest rate that maximizes its own profit by taking as given the rival's rate:[8]

$$\max_{r_F} \Pi_F = (r - r_F) D_F \quad \text{and} \quad \max_{r_H} \Pi_H = (r - r_H - c) D_H$$

The interest rates in this Nash equilibrium are given by

$$r_F^o = r - \frac{1}{3}\left(c - a + t_F - t_H + \frac{2-\mu}{\mu}k\right) \quad \text{and} \quad r_H^o = r - \frac{1}{3}\left(2c + a + t_H - t_F + \frac{1+\mu}{\mu}k\right)$$

Again, policy-makers determine their taxes t_i by maximizing their tax proceeds $T_i = t_i D_i$ $(i = H, F)$ taking the other tax as a given. It follows that country F and H's tax

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[8]When the offshore financial center adopts a lax behavior, it is not able to discriminate between criminal and ordinary customers because it does not control of the investors' identity and the origin of their funds.

best responses are equal to

$$t_F^{BR}(t_H) = \frac{t_H}{2} + \frac{1}{2}\left(c - a + \frac{2 - \mu}{\mu}k\right) \quad \text{and} \quad t_H^{BR}(t_F) = \frac{t_F}{2} + \frac{1}{2}\left(a - c + \frac{1 + \mu}{\mu}k\right)$$

Taxes are here also strategic complement. At the Nash equilibrium of the tax game, we get

$$t_F^o = \frac{1}{3}\left(c - a + \frac{5 - \mu}{\mu}k\right) \quad \text{and} \quad t_H^o = \frac{1}{3}\left(a - c + \frac{4 + \mu}{\mu}k\right)$$

where the superscript o denotes the equilibrium values under lax financial centers. This implies the following interest rates:

$$r_F^o = r - \frac{1}{9}\left(c - a + \frac{5 - \mu}{\mu}k\right) \quad \text{and} \quad r_H^o = r - \frac{1}{9}\left(a + 8c + \frac{4 + \mu}{\mu}k\right)$$

Equilibrium interest rates are positive if $r > \frac{1}{9}\left(a + 8c + \frac{4+\mu}{\mu}k\right)$, which is true for any large enough (world) interest rate r and, which is assumed from now for the sake of simplicity.

At this equilibrium, the marginal investor who is indifferent between the financial centers is given by

$$x_F^o = \frac{1}{9\mu k}\left[4\left(2\mu - 1\right)k - \mu\left(a - c\right)\right]$$

which belongs to the interval $[0, 1]$ if and only if

$$-\frac{4 + \mu}{\mu}k < a - c < \frac{8\mu - 4}{\mu}k \tag{2}$$

When $a - c$ is set above the highest boundary of this condition, investors' reputational loss a is so strong that ordinary investors avoid investing in that country. By contrast, when $a - c$ is set below the lowest boundary, the monitoring cost is so high that the onshore bank sets an interest rate that is unattractive for any ordinary investor. This last set of conditions (2) determines an non empty interval and will be assumed from now for the

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sake of simplicity. Note that both taxes are positive under conditions (2).

The equilibrium demands for deposits are then equal to

$$D^o_F = \frac{1}{9k}\left[(5-\mu)k - \mu(a-c)\right]S \qquad \text{and} \qquad D^o_H = \frac{1}{9k}\left[(4+\mu)k + \mu(a-c)\right]S$$

while banks' profits and tax proceeds simply write as

$$\Pi^o_i = \frac{k}{S\mu}(D^o_i)^2 \quad \text{and} \quad T^o_i = 3\Pi^o_i \qquad (i = H, F)$$

We can make the following remarks about tax and interest rate differentials.

4.1 Properties of tax and interest rates

On the one hand, the interest rate differential is equal to

$$r^o_H - r^o_F = -\frac{1}{9}\left[2a + 7c + \frac{2\mu-1}{\mu}k\right] < 0$$

So, the offshore bank sets higher interest rates. There are two reasons for this result. First, the offshore bank must raise its interest rate to attract legal investors who feel some moving cost (in terms of physical distance or preference). This effect diminishes however as the financial market becomes more integrated (lower k). Second, the offshore bank must also set a higher interest rate than its competitor to attract legal investors who suffer some reputational harm when they are associated to a lax offshore bank ($a > 0$).

On the other hand, the tax differential between the onshore and offshore countries can be computed as

$$t^o_H - t^o_F = \frac{1}{3}\left[2(a-c) + \frac{2\mu-1}{\mu}k\right] \tag{3}$$

This tax differential increases if investor's reputation is more strongly harmed by institu-

tional pressures like blacklisting policy (larger a). The tax differential also increases if the onshore financial center has a smaller compliance cost (smaller c) as this change allows the onshore center to increase its offered interest rate and to attract more deposits. The tax differential increases if the number of legal money investors rises (larger μ) as this raises the demand for onshore deposits. Finally, since $\mu > 3/4$, the tax differential decreases with financial integration (smaller k). Deeper financial integration reduces banks' intermediation markups, which in turn limits each country's opportunity to raise more tax on local investments.

It is important to note that, in contrast to the monitoring case and to tax competition literature (e.g. Kanbur and Keen, 1993), the (large) onshore country does not always set the largest tax rate. Indeed, by (3), *the onshore country sets a lower tax rate* if and only if

$$a < \overline{a} \equiv c - \frac{\mu - 1/2}{\mu} k \tag{4}$$

where $\overline{a}$ lies between the boundaries in conditions (2). The onshore country sets a lower tax rate if the investor's reputational harm is small enough compared to the monitoring cost. Higher monitoring costs oblige the onshore financial center to decrease the offered interest, reducing its markup and its attractiveness to investors. The onshore country is then forced to cut its tax rate. Similarly, a fall in investor's reputational harm makes the offshore center more attractive and forces the onshore country to cut its tax rate.

We now explore the effect on agents of an increase in the pressure on investors.

4.2 Winners and losers

The investor's reputational harm a impacts on the deposit supplies, interest rates and taxes. Indeed, it can readily be shown that an increase in a entices investors to move their investments from the offshore financial center to the onshore one ($dD_H^o/da > 0 >$

dD_F^o/da). To resist the outflow of investment, the offshore financial center raises its interest rate. By contrast, the onshore center can take advantage of a more captive set of investors and offers a less advantageous interest rate ($dr_H^o/da < 0 < dr_F^o/da$). Since tax proceeds are congruent with profits, the offshore policy maker then reacts to the outflow of investors by relaxing her tax pressure whereas the onshore policy maker takes advantage of the repatriated investments by augmenting its tax pressure ($dt_H^o/da > 0 > dt_F^o/da$). Hence, the offshore financial center and government are losers in this policy whereas the onshore center and governments are the gainers. It is then readily understood that the offshore financial lobbies and governments will be vividly opposed to the pressure policy whereas the onshore financial lobbies will be promoting it.

It is interesting to discuss the effect of investor's reputational harm on the aggregate surpluses of banks, governments and depositors. Note firstly that the onshore financial center and government can gain more than what the offshore center and government lose. Indeed, it is readily shown that the aggregate profit $\Pi^o = \Pi_H^o + \Pi_F^o$ increases with larger a if and only if

$$\frac{d\Pi^o}{da} = \frac{2k}{\mu S}\left(D_H^o \frac{dD_H^o}{da} + D_F^o \frac{dD_F^o}{da}\right) = \frac{4\mu S}{81k}\left(a - \overline{a}\right) > 0$$

where $\overline{a}$ is defined in expression (4). Therefore, the aggregate profit increases with the investor's reputational harm if and only if $a > \overline{a}$. In this case, ordinary investors who return to the onshore financial center accept a lower interest rate (1) because they do no longer feel any reputational harm and (2) because they deposit in the closer onshore. As a consequence, the onshore center is able to realize larger intermediation markups; its profit rises at a faster pace than the fall of offshore profits. It is remarkable that, by (4), this situation occurs when $t_H^o > t_F^o$; that is, if the offshore country is a tax haven. This allows us to conclude that the *aggregate profit increases with the investor's reputational*

harm if and only if the offshore country is a tax haven. Because profits are congruent with taxes, the same conclusion applies to tax revenues. So, when the offshore country is a tax haven, banks and governments could extract more revenues in the aggregate by supporting pressure on investors' reputation. Of course, their problem is that cooperation on those issues is hard to obtain.

We now look that the aggregate welfare of ordinary investors. In contrast to banks and governments, ordinary investors are always harmed by an increase in a. The ordinary investors' aggregate surplus

$$V^o = \left(r_H^o - t_H^o\right) \overline{D}_H^o + \left(r_F^o - t_F^o\right) D_F^o - a D_F^o - \frac{k}{2} \left(x_F^o\right)^2 \mu S$$

includes the net return of onshore investment, the net return of offshore investment minus the reputational harm a from pressure to offshore investors and finally the aggregate utility loss from distance to the foreign center. Differentiating this with respect to a yields

$$\frac{dV^o}{da} = \underbrace{\frac{d\left(r_H^o - t_H^o\right)}{da}}_{-} D_H^o + \underbrace{\left[\frac{d\left(r_F^o - t_F^o\right)}{da} - 1\right]}_{-} D_F^o$$

$$+ \underbrace{\left(r_F^o - t_F^o - a - k x_F^o - r_H^o + t_H^o\right)}_{0} \underbrace{\frac{dx_F^o}{da}}_{-} \mu S$$

where the last term is nil by the definition of the marginal investor x_F^o who is indifferent between the financial centers. We know from the above paragraphs that the return offered to onshore investors falls with larger reputational harm $(d(r_H^o - t_H^o)/da) < 0)$, which reduces their net utility. By contrast, the return of offshore investors rises $(d(r_F^o - t_F^o)/da) > 0)$ but this gain does not outweigh their reputational loss a $(d(r_F^o - t_F^o)/da < 1)$. Indeed, both the offshore financial center and government react to an increase in investor's reputational harm a by raising the offered interest rate r_F^o and decreasing the tax rate t_F^o;

however they can not offer to those investors a net return $r_F^o - t_F^o$ that fully compensates for their reputational harm. In the aggregate, investors are thus negatively affected by the larger reputational harm. This is because the harm on investor's reputation does not only destroy the value of offshore deposits but it also weakens the competition that disciplines the onshore center. Hence, any lobby that representing ordinary onshore investors or onshore investors, or both groups shall be reluctant to an increase in pressure resulting in a higher investor's reputational harm.

We now study the condition under which the offshore financial center is enticed to shift from a lax behavior to a scrupulous monitoring.

5   Efficient pressure policy and monitoring incentives

National governments and international institutions usual put effort in improving the regulatory compliance of offshore financial centers and in deterring investors to deposit their funds in those centers. Common practices include lobbying for blacklisting of non compliant offshore financial centers or organizing information campaigns about investors' risks in depositing offshore. United States Patriot Act and several E.U. member states explicitly rely on the O.E.C.D. (and F.A.T.F.) blacklists in drawing up their own national blacklists of tax haven jurisdictions (Sharman, 2004).

As stated in Section 2, criminality generates a social cost $\beta(1 - \mu)S$ whereas exerting pressure on offshore financial centers and investors has a cost $C(a) = \gamma a$. In addition to those costs, this paper has highlighted two additional costs, namely, the investor's reputational harm and the related weakening of banking competition. The purpose of this section is to discuss the balance between those costs. To be more precise, we ask the question about the intensity of the efficient pressure in terms of a. Toward this end, we first consider the offshore financial center's incentives to monitor its investors. We then

derive and discuss the optimal policy of a benevolent planner. We finally investigate the cost and benefit of delegating this policy to onshore institutions. For each case we discuss the impact of financial integration on the pressure policy.

5.1 Offshore monitoring incentives

The offshore financial center has an incentive to monitor the investor's identity and money origin if its profit is larger under monitoring than under lax behavior. That is, if

$$\Pi_F^m - \Pi_F^o = \frac{k}{\mu} \left[(D_F^m)^2 - (D_F^o)^2 \right]$$

is positive. For any a satisfying conditions (2), this happens if $D_F^m > D_F^o$, or if

$$a > a_F \equiv c + 5k \frac{1-\mu}{\mu}, \tag{5}$$

where a_F defines the threshold of investor's reputational harm above which the offshore financial center voluntarily complies and where a_F satisfies condition (2). The offshore center should suffer a sufficient demand loss (through larger a) to choose to monitor its depositors. Note firstly that the investor's reputational harm a should be set higher than the bank's monitoring cost c. This reflects the fact that the offshore center must be enticed to forego its profit on illegal money investors. If the number of illegal investors rises, the pressure exerted on ordinary investors should be even stronger (indeed, a_F decreases with μ). Note secondly that the offshore center is more likely to monitor its investors for higher degree of international financial integration (smaller k). Indeed, the investor's reputational harm a hurts more the offshore center as its intermediation margin falls because of the deeper financial integration.

5.2 Optimal pressure strategy

We now discuss the optimal pressure exerted by a benevolent social planner who maximizes an objective that encompasses the economic surplus and the criminality damage as follows:

$$W = \sum_{i=H,F} (V_i + \Pi_i + T_i) - \gamma a - \beta(1-\mu)S$$

where γa is the social cost of exerting pressure a and where $\beta(1-\mu)S$ is the social cost attached to the use of the banking system to criminal activity. The latter cost vanishes when the offshore financial center monitors their investors.

The economic surplus can readily be computed given that the total mass of ordinary investors is constant and equal to μS. For every unit of investment, the investor, the bank and the government share the risk-free rate interest r. Indeed, the investor earns $r_i - t_i$, the bank $r - r_i$ and the government t_i, which all add up to r. In addition, an offshore investor suffers from reputational losses from the pressure a and from the distance kx to the offshore place. The banks incur the cost c when they monitor their investors. Therefore, if the planner exerts a sufficient pressure to entice the offshore financial center to monitor $(a \geq a_F)$, the above objective writes as

$$W^m(a) = \left[r - \frac{1}{2}k\,(x_F^m)^2 - c \right]\mu S - \gamma a$$

This function obviously decreases in a.

If the planner exerts a too low pressure a $(0 \leq a < a_F)$, the offshore center does not monitor. The objective writes as

$$W^o(a,\beta) = \left[r - \frac{1}{2}k\,(x_F^o)^2 - ax_F^o - cx_H^o \right]\mu S + (r - r_F^o)\,(1-\mu)S - \gamma a - \beta\,(1-\mu)\,S$$

The first term in the square bracket includes the economic benefit induced by ordinary investors minus the welfare loss caused by their distance from the offshore bank and their reputational loss a and minus the monitoring cost in the onshore center. The second term represents the offshore economic benefit of accepting illicit money and making an earning on it (though the earning of illicit money holders r_F^o is nevertheless not considered by the planner). The third term is the cost of exerting pressure and the last term the social cost of criminality.

Differentiating this objective by a, we get

$$
\begin{aligned}
\frac{dW^o}{da} &= \left[(-kx_F^o - a + c) \frac{dx_F^o}{da} - x_F^o \right] \mu S - \frac{dr_F^o}{da} \mu S - \gamma \\
&= \frac{S}{81k} \left[17\mu (a - c) - (55\mu - 23) k \right] - \gamma
\end{aligned}
$$

One can check that, given that $\mu > 3/4$, the first square bracket is negative if $a < a_F$. Hence, the economic surplus decreases with stronger pressure and investor's reputational loss a. As mentioned above, the investor's reputational loss does not only destroy value for offshore investors and it also reduces the onshore's investor surplus through the effect of relaxing the competition for the benefit of the onshore financial center.

Because both objectives decrease in a on their respective supports, the planner's optimal pressure strategy is to set the smallest value of a on each support. As a result the planner sets either $a = 0$ if $W^m(a_F) < W^o(0, \beta)$ or $a = a_F$ if $W^m(a_F) \geq W^o(0, \beta)$. Given that the objective W^o decreases in β we can infer the following proposition:

Proposition 1 *There exists a threshold $\widetilde{\beta}$ for the social cost of criminality such that the social planner exerts no pressure if $\beta < \widetilde{\beta}$ and exerts the pressure $a = a_F$ otherwise.*

In her decision, the planner balances the social cost of criminality against the cost of reduced competition. The unexpected property of our model is the dichotomy in the

pressure policy. This dichotomy stems from the fact that the pressure policy reduces values for depositors (more than it increases profits and tax proceeds). The aggregate welfare therefore falls with the pressure level until the latter triggers compliance by offshore banks. At this point, welfare increases because of the sudden reduction of criminality. The planner thus chooses the pressure level a_F if the cost of criminality is high enough and a zero pressure level if it is sufficiently low.

We now turn to the issue of financial integration. How does the pressure policy change when differentiation between financial centers falls (smaller k)? Differentiating totally the equality $W^m(a_F) - W^o(0, \widetilde{\beta}) = 0$ we get

$$\frac{d\widetilde{\beta}}{dk} = -\frac{\frac{d}{dk}\left[W^m(a_F) - W^o(0, \widetilde{\beta})\right]}{\frac{d}{d\beta}\left[W^m(a_F) - W^o(0, \widetilde{\beta})\right]} = \frac{5\gamma}{\mu S} - \frac{17\mu^2 c^2 - 2(1-\mu)(37 + 15\mu) k^2}{162\mu(1-\mu) k^2}$$

A fall in k has two effects. On the one hand, it decreases the threshold level a_F, which is reflected in the first (positive) term in the above expression. Indeed, a fall in k decreases the profit of the offshore financial center more in the lax scenario than in the monitoring case and therefore makes the pressure policy more effective. So, the planner needs to exert a weaker pressure on investors. On the other hand, a fall in k increases banking competition and reduces the deadweight loss in the banking system. This effect is presented in the second term in the above expression. To sum up, a fall in k makes the pressure policy less costly but also less needed. Which effect dominates depends on the cost of exerting pressure, γ. Indeed,

$$\frac{d\widetilde{\beta}}{dk} > 0 \iff \gamma > \widehat{\gamma} \equiv \frac{S}{5}\left[\frac{17\mu^2}{162(1-\mu)}\frac{c^2}{k^2} - \frac{37+\mu}{81}\right]$$

The threshold $\widehat{\gamma}$ is more likely to be positive if the economy includes fewer criminals (large μ).

Proposition 2 *As financial markets integrate (smaller k), the social planner is more likely to entice the offshore bank to monitor by exerting the pressure $a = a_F$ if and only if $\gamma > \widehat{\gamma}$.*

This proposition qualifies the usual claim stating that financial globalization fosters criminality. We have here shown that deeper financial integration encourages compliance by offshore centers. It furthermore entices the social planner to use this pressure when the cost of financial criminality is high enough compared to the cost of reducing interbank competition. Under this condition, financial globalization reduces financial criminality.

The present analysis has relied on the existence of a social planner that aggregates the interests of all (non-criminal) participants in the economy. In reality pressure on offshore centers is implemented by international bodies which comprise various member states.[9] From that perspective it is not realistic to assume that pressure policies exerted on offshore centers are exclusively driven by concerns for the global welfare. Aggregate decisions are made through a multilateral negotiation process, which significantly differs from the utilitarian aggregation of the above social planner. Accordingly, member states may be inclined to take more or less account of national interests partly reflecting domestic lobbying demands. In particular, "the world's richest and most powerful countries have become increasingly concerned about revenue lost to tax havens, and fear that tax competition might spark a fiscal 'race to the bottom'" (Sharman, 2006, p.143). It follows that the interests of large onshore countries could be biased towards the desire to limit revenue losses caused by tax havens. In addition, efforts to curb money laundering may also be an indirect way to combat tax competition. In that context, The Economist (2001) wrote: "This raises the toughest question: what exactly are efforts against money

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[9]For instance, the Financial Action Task Force (FATF) is an inter-governmental organisation comprised of 34 members whose purpose is the development and promotion of national and international policies to combat money laundering and terrorist financing.

laundering trying to achieve?... Some suspect that the O.E.C.D. would like to use the fight against money laundering to advance its parallel and controversial campaign against an activity it calls "unfair" tax competition, because low rates in one place encourage tax evasion in another".

In fact, no institution can claim to behave according to the above socioeconomic objective. For this reason, it is important to discuss the pressure policy if the member states' objective is biased towards tax revenue maximization.

5.3   Delegating pressure policy to an onshore agency

We now focus on the case where an onshore agency wants to urge the offshore center to comply with anti-money laundering regulations. The intensity of pressure to exert is however biased towards onshore tax proceeds. Such a situation is likely to arise because (1) governments are supposed to have a fiscal interest in eliminating fraud, (2) they hold representation in the international process of targeting offshore tax havens, and (3) they also have audit instruments to check/threaten tax payers who possess offshore bank accounts. In addition since their tax proceeds are aligned with the onshore profits, they can readily get the support of the lobby of onshore banks. We here show that such a delegation strategy can be socially inefficient.

In this context, we assume that the onshore institution maximizes the tax proceed minus the social cost of criminality net of the cost of the pressure policy, which is equal to $\Omega^o(a, \beta) = T_H^o(a) - \gamma a - \beta (1 - \mu) S$ if $a < a_F$ and $\Omega^m(a) = T_H^m - \gamma a$ if $a \geq a_F$. We now derive the optimal pressure policy chosen by this institution.

Let us first look at the case where the offshore financial center is enticed to monitor its investors ($a \geq a_F$). Then, neither the onshore tax proceeds nor the criminality level depend on the level of the pressure policy a. As a result, the onshore institution optimally

sets $a = a_F$. Let us then consider the case where the offshore financial center is not enticed to monitor its investors ($a < a_F$). As noted in Section 4.2, the onshore tax proceeds $T_H^o(a)$ is an increasing and convex function of a (because $T_H^o(a) \propto [D_H^o(a)]^2$ and $D_H^o(a)$ is a linearly increasing function of a). So, from the onshore taxation point of view, there always exists an incentive to raise the pressure policy and set a above zero. However, the choice of the pressure policy also has a cost γa. Since the net tax benefit $T_H^o(a) - \gamma a$ is a convex function of a, the optimal pressure policy on the interval $[0, a_F)$ must be either $a = 0$ or $a = a_F - \varepsilon$, where $\varepsilon > 0$ is infinitely small. The second pressure policy, $a = a_F - \varepsilon$, is explained by the fact that the onshore institution (as well as the onshore banks) has an incentive to deter ordinary depositors from offshoring their money. Such a deterrence strategy increases depositors' demand for the onshore center and raises onshore profits and taxes. In addition, the onshore institution also has an incentive to entice illegal money depositors to go to the offshore bank. Indeed, because the offshore bank will take advantage of this captive clientele, it will be able to lower its offered interest rates so that the demand for the onshore bank will be boosted. The following proposition presents a full characterization of the pressure policy.

Let

$$
\begin{aligned}
\overline{\gamma} &= \frac{(13 - 3\mu)\,k - c\mu}{27k} S \\
\beta_1 &= \frac{1}{3}\frac{k}{\mu}\,(\mu + 9) \text{ and } \beta_2 = \frac{[4k(1-\mu) - c\mu]\,[2k(2 + 3\mu) - c\mu]}{27k\mu\,(1 - \mu)} + \frac{\gamma a_F}{(1 - \mu)\,S}
\end{aligned}
$$

Proposition 3 *The optimal pressure policy of the onshore institution is to implement*
(i) no pressure if $\gamma > \overline{\gamma}$ and $\beta < \beta_2$,
(ii) the pressure policy $a^* = a_F - \varepsilon$ if $\gamma < \overline{\gamma}$ and $\beta < \beta_1$ and
(iii) the pressure policy $a^* = a_F$ if $\beta > \max\{\beta_1, \beta_2\}$

Proof. See Appendix. ∎

Insert Figure 1 here

Figure 1 illustrates the optimal pressure policy for parameters (γ, β). According to this Figure and to Proposition 3, the onshore institution implements no pressure if the social cost of criminality is low enough and the cost of the pressure policy is high. It implements the pressure level $a_F - \varepsilon$ if the social cost of criminality is low and the cost of the pressure policy is low. Finally, it implements a pressure policy that eliminates criminality through the monitoring compliance of offshore financial center if the social cost of criminality is high enough.

The pressure policy of the onshore institution is not fully aligned with the social planner's choice. In particular if the cost of exerting pressure and the cost of criminality are small enough, the onshore organization exerts a pressure but never to the point where the offshore financial center monitors. It rather uses the pressure policy to relax inter-bank competition and repatriate investments back to the onshore bank. This interesting result highlights the impact of the tax repatriation motives in the fight against money-laundering. Such motives can indeed eliminate the incentives to have offshore financial centers actually comply with "know-your-customer" and reporting regulations. Hence, such a pressure policy, presented under the label of a fight against criminality, may in fact be diverted to the objective of tax collection, with the blessing of onshore financial centers.

We finally turn to the issue of financial integration. How does the pressure policy change when differentiation between financial centers decreases (smaller k)? It is firstly readily seen that $\overline{\gamma}$ decreases to zero and becomes negative as k falls. The intuition is that smaller differentiation between financial markets does not only reduce profits but also tax proceeds. So, the onshore institution is less enticed to exert pressure for tax motives. Secondly, the threshold β_1 also falls to zero with smaller k. Finally, the threshold β_2

also falls with smaller k if the mobility cost is small enough ($k < \sqrt{2}c\mu \sqrt{\mu - 3\mu^2 + 2}$ / $(4\mu - 12\mu^2 + 8)$) and eventually becomes negative as k falls further. It follows that the onshore agency will be more likelely to exert the pressure level ($a^* = a_F$) that forces the offshore center to comply when financial integration deepens. In particular if $k \longrightarrow 0$, we see that $\max\{\beta_1, \beta_2\} \longrightarrow 0$. Accordingly, when financial markets are perfectly integrated, the onshore agency exerts the pressure level that is exactly needed to bring into compliance the offshore finacial center.

Proposition 4 *The onshore agency is more likely to exert the pressure level $a^* = a_F$ that induces compliance when financial integration deepens.*

It is generally believed that financial globalization enhances offshore financial centers' attractiveness for illegal money. Our model does account for this feature by assuming that owners of criminal funds are perfectly mobile. The last proposition however shows that increased financial integration does also make the pressure policy more effective and augments offshore banks' incentive to comply with international anti-money laundering rules.

6   Conclusion

International and national institutions put pressure on offshore financial centers and their clients to entice those centers to comply with anti-money laundering regulations. Many observers consider such a soft law practice as inefficient policies to combat money laundering by financial institutions. They claim that money laundering and bank secrecy are indeed inextricably linked and that efficiently fighting against financial crime can only be achieved by undermining confidentiality laws. In this paper we discuss such pressure policies and assess the impact on money laundering. Towards this aim, we consider a

two-country two-financial center model with ordinary and criminal investors. Our modelling strategy fits with the standards of the economic literature not only by allowing interbank competition but also by modelling the tax competition between the onshore and offshore financial centers. This modelling strategy allows us to discuss the winners and losers of such pressure policies in a clear-cut way. We show that the aggregate profit and tax revenues can increase under the pressure policies because the pressure policy can induce a reduction in the interbank competition and in the countries' tax competition on bank products. In addition, we are able to show that offshore banks are enticed to comply with a scrupulous monitoring of the investors' identities and the origin of their funds when the pressure creates sufficient harm to an investor's reputation. We find that the efficient pressure policy is dichotomous in the sense that a social planner chooses zero pressure or the pressure that just entices offshore banks to comply. We also show that the implementation of those pressure policies by an onshore tax institution may be inefficient as it can be biased toward the banks' profits and can never induce the elimination of criminality. Finally, we qualify the claim stating that deeper financial integration fosters financial criminality. In this model, it fosters the elimination of financial criminality.

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7   Appendix: proof of Proposition 3

We look for the maximum of $\Omega(a)$, $a \in [0, \infty)$,where $\Omega(a) = \Omega^m(a)$ if $a \in [a_F, \infty)$ and $\Omega(a) = \Omega^o(a, \beta)$ if $a \in [0, a_F)$. Note that $\Omega^m(a)$ is decreasing in a so that $\arg\max_{a \in [a_F, \infty)} \Omega^m(a) = a_F$. Also, because $\Omega^o(a, \beta)$ is a convex function of a ($a \in [0, a_F)$) we get that $\arg\max_{a \in [0, a_F)} \Omega^o(a, \beta) \in \{0, a_F - \varepsilon\}$ where ε is an infinitely small positive number. Let us define the level $\overline{\gamma}$ such that $\lim_{\varepsilon \to 0} \Omega^o(a_F - \varepsilon, \beta) = \Omega^o(0, \beta)$. One readily shows that $\arg\max_{a \in [0, a_F)} \Omega^o(a, \beta)$ is equal to $a_F - \varepsilon$ if $\gamma < \overline{\gamma}$ and equal to 0 otherwise.

Consider first that $\gamma < \overline{\gamma}$. Then, the optimal pressure is $a^* = a_F - \varepsilon$ if $\Omega^o(a_F - \varepsilon, \beta) \geq \Omega^m(a_F)$ and $a^* = a_F$ otherwise (see Figure 2). This situation arises if and only if $\lim_{\varepsilon \to 0} T_H^o(a_F - \varepsilon) - \gamma(a_F - \varepsilon) - \beta(1 - \mu)S \geq T_H^m(a_F) - \gamma a_F$; that is, if $\beta \leq \beta_1 \equiv [T_H^o(a_F) - T_H^m(a_F)]/[(1 - \mu)S]$, which simplifies to the expression shown in the text. Accordingly, we get the optimal pressure $a^* = a_F - \varepsilon$ if $\beta < \beta_1$ and $a^* = a_F$ if $\beta \geq \beta_1$.

Consider secondly that $\gamma > \overline{\gamma}$ so that the optimal pressure is $a^* = 0$ if $\Omega^o(0, \beta) \geq \Omega^m(a_F)$ and $a^* = a_F$ otherwise (see Figure 3). That is, if $T_H^o(0) - \gamma \cdot 0 - \beta(1 - \mu)S \geq T_H^m(a_F) - \gamma a_F$. This is equivalent to $\beta \leq \beta_2 \equiv [T_H^o(0) - T_H^m(a_F) + \gamma a_F]/[(1 - \mu)S]$, which simplifies to the expression shown in the text. Therefore, the pressure policy is $a^* = 0$ if $\beta < \beta_2$, $a^* = a_F$ if $\beta > \beta_2$. If $\beta = \beta_2$, then $a^* \in \{0, a_F\}$. Since the latter case has a zero measure in the set of parameters (β, γ), we omit it in the proposition.
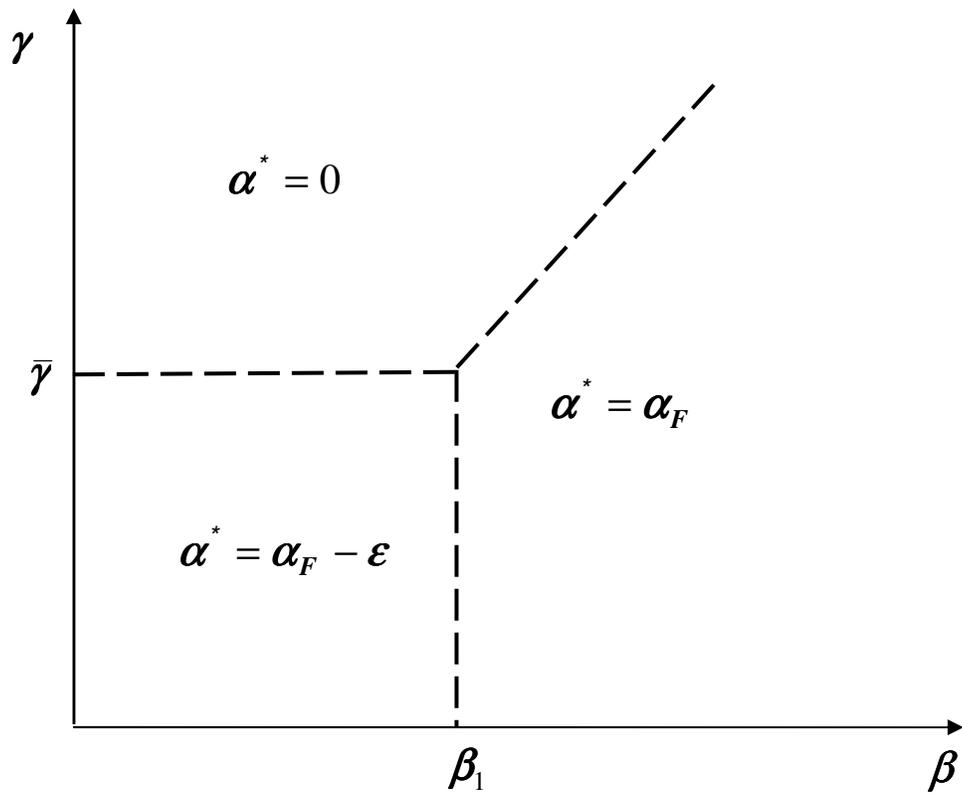
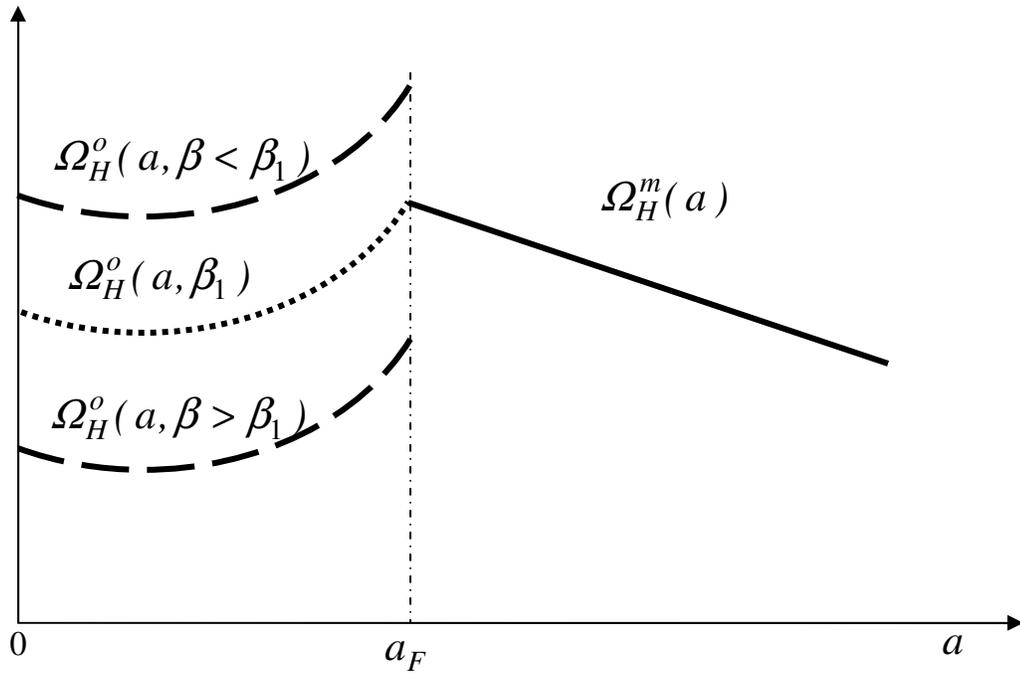Figure 1: Pressure policy under delegation to onshore agency

Figure 2: Objective function of onshore agency under delegation ($\gamma < \bar{\gamma}$)
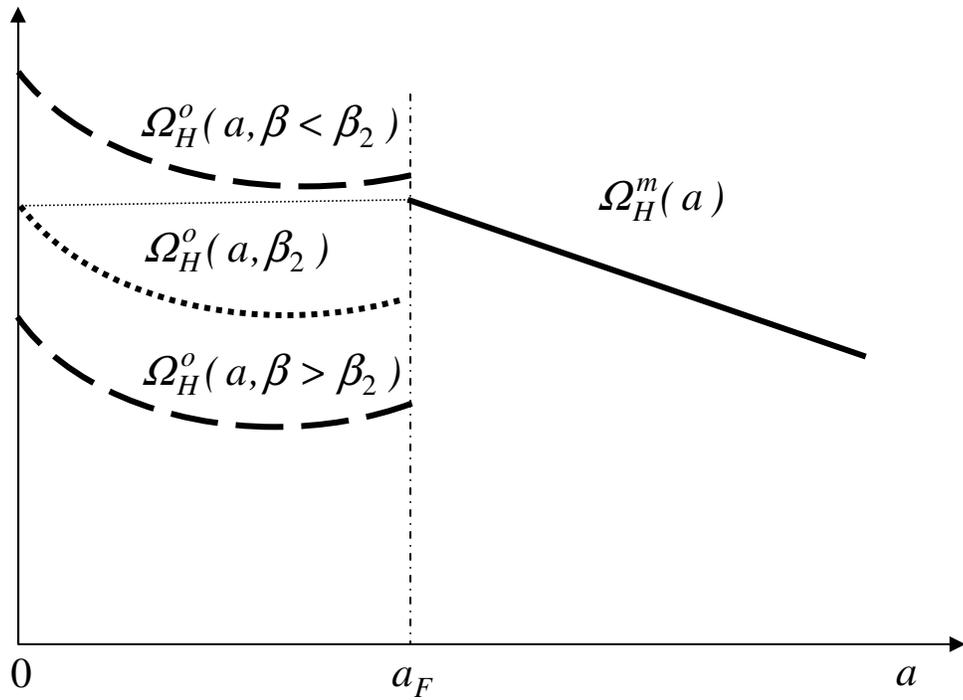

Figure 3: Objective function of onshore agency under delegation ($\gamma > \bar{\gamma}$)