From the EU Savings Directive to the US FATCA, Taxing Cross Border Savings Income

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From the EU Savings Directive to the US FATCA, Taxing Cross Border Savings Income. *

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Abstract

This paper is motivated by the recent innovations regarding the taxation of cross-border savings that took place in the European Union and the United States. We develop a model to assess the functioning of the different systems of international taxation used on both sides of the Atlantic Ocean. We consider agents as investors able to diversify their portfolio between countries and kinds of financial assets. Furthermore, we show the effects of the various settings investigated not only on the taxation of foreign savings income, but also on the tax rates applied to domestic savings. Finally, comparing the respective merits of diverse regimes of information exchange and coordinated withholding taxation, we explore the consequences of the loopholes in both the EU Savings Directive and the US Qualified Intermediary mechanism, and cope with the cost of information sharing. We find that only three tax designs ensure efficiency: a framework of taxation based on the principle of residence, perfect information exchange for all substitutable assets and strategies, and a system of withholding taxation where the residence country can choose the withholding tax rate and also receives all the withholding tax revenues collected abroad.

Keywords: International Taxation, Taxation of Personal Income, Savings Taxation, European Integration.

JEL: H24, H26, H31, F36, F55.

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1 Introduction

On both sides of the Atlantic Ocean, the first twelve years of this new century have been rich of developments in the field of the international taxation of cross border savings income. In 2000, after decades of debates, the Member States of the European Union came to a compromise in the Portuguese city of Feira. They agreed to set up a system of information exchange concerning the sole interest income. This system has been applied by all Member States since mid-2005 with an exception for three of them (Austria, Belgium and Luxembourg). Discussions to enlarge its scope are now in progress.

On the 1st of January 2001, the United States (US) launched the Qualified Intermediary (QI) mechanism, designed to cope with tax evasion. Becoming qualified intermediaries of the US Internal Revenue Service, financial institutions committed to report information on US taxpayers' income from US sources. Due to the presence of loopholes in the QI legislation, in March 2010 the US authorities completed it through the Financial Accounts Tax Compliance Act (FATCA). Furthermore, in February 2012 the US moved from a unilateral to a cooperative FATCA. Through a joint statement, the United States and some major EU Member States "have agreed to explore a common approach to FATCA implementation through domestic reporting and reciprocal automatic exchange and based on existing bilateral tax treaties "(U.S. Treasury Department, 2012, p.2).

In this paper we turn these facts into an economic model allowing us to evaluate the economic incentives embedded in the tax rules of the different systems that have been in use on both sides of the Atlantic Ocean. Defining efficiency as a situation where both tax revenues are maximized and taxation does not distort the allocation of savings between assets and countries, we find that only three regimes can lead to a situation of first best: a pure residence-based setting, a framework of perfect exchange of information for all substitutable assets and strategies, and a system of withholding taxation where withholding tax rates are decided by the residence countries and the whole amount of withholding tax revenues collected abroad is fully transferred to the residence country.

The present work brings four contributions to the literature. First, it shows the effect of the various settings investigated not only on the taxation of foreign savings income, but also on the tax rates applied to domestic savings. Second, it considers agents as investors able to diversify their portfolio not only between countries but also between different kinds of financial assets. Third, it explores the consequences of the legislative loopholes present in both the EU Savings Directive and the US QI mechanism, putting forward that any attempt to reach an efficient tax design requires an equal treatment of all substitutable financial products or of all substitutable tax reporting strategies, in line with what pointed out by Hines (2009) using qualitative arguments. Finally, it copes with the cost of information sharing, distinguishing the case where a

country needing information on income paid abroad to its residents also needs to acquire such information and thus to support its costs, from the case where each partner country is made responsible for the transmission of information regarding income paid to non-residents by its local financial institutions.

The paper is organized as follows. Section 2 provides with some more details regarding the institutional background. Section 3 proposes a survey of the relevant economic literature. The baseline economic model is described in Section 4. Section 5 introduces exchange of information in the baseline scenario. Sections 6 and 7 assess respectively the EU Directive and US QI mechanisms. Section 8 examines a framework of withholding taxation. Section 9 concludes.

2 Institutional background

In an open economy, savings invested abroad can in principle be taxed by the country where income is generated and most often where that income is paid out - called the source country or the paying agent country -, or by the country where the investor has his residence - the residence country -, or even by both. For a long time, savings income rising from a foreign source was only subject to a withholding tax levied at source. No exchange of information was organized between the source and the residence country and each country was a tax heaven for its neighbor.

After the II World War, the Model Tax Convention on Income and Capital proposed by the Organization for Economic Cooperation and Development (OECD) was the first extended attempt to allow the residence country to effectively tax worldwide income of its residents.[1] The OECD Convention (OECD, 1963) allowed the source country to levy a withholding tax on non-resident investors' income, whilst the country of residence of the taxpayer was left free to subject that income to its own tax system, provided that a credit was granted for the withholding tax levied abroad. A consequence of this system was that the residence country needed to get information from the source country in order to properly tax foreign income of its resident taxpayers and apply the crediting mechanism. Residence country legal authorities were actually entitled to claim such exchange, but could not always get all the necessary details or a high enough degree of precision of the information required.[2]

[1] The League of Nations in 1921 began to work for eliminating double taxation through bilateral conventions. The first results of this effort were the Model Tax Convention of Mexico in 1943 and London in 1946. For a brief summary of the historical background of the OECD Model Tax Convention on Income and Capital, see the historical section of its 2010 full version (OECD, 2010).

[2] For example, this could happen because the source country administration was not entitled to legally obtain or to reveal to other subjects some information about foreign investors.

2.1 The EU approach: the EU Savings Directive

The absence of a well performing international tax scheme for capital income was rather unimportant as long as savings abroad remained contained. Within the European Union (EU), the increasing capital mobility resulting from the accomplishment of the Single Market in the late 1980's turned a marginal phenomenon into a larger one. The willingness to preserve undistorted capital movements across EU Member States, as well as the possibility of making foreign savings income contributing to government revenues, led the governments of the EU Member States to find a way for avoiding tax competition among countries. Two avenues were therefore suggested: either introducing a system of coordinated withholding taxes levied at source or systematically exchanging information among Member States.

The first attempt to coordinate the taxation of savings income was led by the EU Commissioner Christiane Scrivener. The proposal aimed at coordinating the withholding taxes levied by the EU Member States on interest income paid out to foreign investors having their residence in another EU Member State. The adoption of this proposal failed due to its rejection by a group of countries including Luxembourg and the United Kingdom, as in the EU unanimity is required in tax matters. The second attempt was directed by Mario Monti, at the time Commissioner for Internal Market, Financial Services and Financial Integration, Customs, and Taxation. Monti's suggested reform asked each Member State to decide for one of the following two options: either a withholding tax levied at source, like in the Scrivener proposal, or a systematic exchange of information across EU internal borders. Even the adoption of that proposal, however, failed. Finally, as already mentioned in the introduction, an agreement was reached in 2000. The text of this agreement served as basis for the EU Directive on Savings Income Taxation (EU Commission, 1989, 1998; Cattoir, 2006).

The EU Directive on Savings Income Taxation currently at work (EU Commission, 2001; Council of the EU, 2003) is based on a system of automatic exchange of information, but tentatively allows Austria and Luxembourg to apply the alternative system of coordinated withholding taxation that is also in use for tax relations with a series of countries not belonging to the European Union, namely Switzerland, Liechtenstein, Monaco, Andorra, and San Marino.[3]

The main concern with the EU Directive comes from the limitation of its scope to savings income in the form of interest payments and to some interest-based financial products. This leaves away from the field of application income from innovative financial products, insurance contracts, and dividends, which are close to debt claims. This is why in 2008 the EU Commission proposed an extension of the EU Savings Directive to a larger class of financial assets (EU Commission, 2008a). At present such extension is still under discussion.

[3]Belgium has stopped applying the withholding tax and started exchanging information since the 1st of January 2010.

2.2 The US view: QI and FATCA

On the 1st of January 2001, the United States launched the Qualified Intermediary (QI) mechanism. This system proposed US and foreign financial institutions to sign an agreement for becoming Qualified Intermediary of the US Treasury, committed to report information with regard to US taxpayers' income from US source. Two were the major loopholes. First, no reporting of non-US source income or assets was requested. Second, it was not clear whether the QI agreement obliged financial institutions to examine foreign shell entities owned by US taxpayers. As a result, nine years later the US authorities revised the system through another legislative bill called FATCA, an acronym for Financial Accounts Tax Compliance Act.

FATCA was initially adopted on the 18th of March 2010, as part of the Hiring Incentives Restore Employment Act (HIRE), but is deemed to come into application between 2013 and 2017. Under FATCA, on the one hand, US taxpayers holding foreign financial assets are required to report this information on their annual tax return. On the other hand, foreign financial institutions have to report directly to the US Internal Revenue Service name and details of all the accounts held by US persons or foreign entities in which a US taxpayer holds substantial ownership interest (U.S. Internal Revenue Service, 2012).

Both the EU Directive and the QI/FATCA approach are based on exchange of information, enabling the residence jurisdiction to know a taxpayer personal income and to tax it at an individualized, possibly progressive, rate decided by that residence jurisdiction. In other words, both systems aim to make possible the inclusion of foreign savings income into a worldwide income tax base in order to properly enforce a Haig-Simons global income tax (Haig, 1921; Simons, 1938). However, the two systems differ on a major issue. Although the primary agent in charge of providing information on the income paid out is in both cases the foreign financial institution - technically, the paying agent or the source country financial institution -, on the European side, the information is then channeled to the residence country tax authorities through the source country tax authorities, which are ultimately in charge of monitoring the quality of the information exchanged. By contrast, on the American side, this mission is up to the responsibility of the US tax authorities. In some sense, the US approach completely disregards local governments, being based on direct agreements between foreign financial institutions and US authorities.

As consequence of the QI/FATCA system, the US tax authorities bear the whole cost of monitoring foreign financial institutions, which is high notwithstanding the existence of penalties that act as deterrent for non-compliance. To alleviate this burden, the US has decided to shift from the current unilateral FATCA to a more cooperative mechanism. On the 8th of February 2012, the US, jointly with France, Germany, Italy, Spain and the United Kingdom, issued an agreement intending to restore foreign governments in the playing field (U.S. Treasury

Department, 2012).

3 Review of the literature

This paper forms part of two fields of literature: on the one hand, the literature on international taxation of savings and, on the other hand, the literature on tax evasion.

The literature on cross-border savings taxation has generally tried to assess whether countries strategically prefer a system of information exchange over a withholding tax system, for which reasons they can prefer one above the other, and what are the determinants of their choice. In their seminal papers Bacchetta and Espinosa (1995, 2000) examine the incentives leading a government to share information about foreign investments with another government. They reach the conclusion that the informational behavior of governments is a strategic variable that should be taken into account when designing the optimal international tax system. In addition, they show that the incentives to transmit information depend on the precise institutional setup of the international tax system. Indeed, they prove that, under some features of the tax system, there is no room at all for information sharing, while such exchange may exist and be used for strategic purposes under other institutional arrangements.

Similarly, Gordon and Bovenberg (1996) use asymmetric information to explain the international immobility of capital. Moreover, Eggert and Kolmar (2002, 2004) point out that, in a context of optimal taxation, the integration of international capital markets may lead governments to establish sub-optimal tax rates and, hence, to under-provide public goods. By contrast, cooperation among governments leads to another equilibrium solution, characterized by an efficient level of public goods provision as well as by complete and voluntary information exchange between national tax authorities.

More recent theoretical literature on the subject is inspired by the series of proposals formulated since the late 1980s by the EU Commission and culminated into the adoption of the EU Council Directive on Savings. Huizinga and Nielsen (2003), for example, analyze the minimum withholding tax proposal made by the EU Commissioner Christiane Scrivener in 1989. They set up a three-country model in which a typical EU country has to deal with an inside and an outside tax heaven. They investigate what happens to the welfare of each country when the inside tax heaven is forced to raise its withholding tax. In the same way, Keen and Ligthart (2006a, 2006b) and Gérard (2004) assess the impact on the social welfare of the innovative mechanisms of revenue sharing and shift from a source-based to a residence-based criterion of taxation, which the EU Commission implemented when the idea of a minimum withholding tax faced the opposition of some EU Member States. In particular, Keen and Ligthart (2006a, 2006b) demonstrate that any kind of withholding tax regime is Pareto dominated by a system

of residence-based taxation implying full exchange of information.

The adoption of the Savings Directive by the EU Council in 2003 gave also birth to some empirical literature. Huizinga and Nicodème (2004) investigate the determinants of international deposits, providing evidence that foreign deposits do react to taxation. Also, Ligthart and Voget (2012) analyze the key factors leading governments to exchange information and find that sharing decisions are taken on a reciprocal basis in most cases. Furthermore, Johannesen (2010) and Hemmelgarn and Nicodème (2010) show that the Directive did not lead EU residents to manage major shifts in their international allocation of savings. They, however, suggest that further analysis should be conducted in order to understand whether the adoption of the EU Directive influenced agents' portfolio choices among different kinds of assets.

The literature on tax evasion and the institutional designs able to limit such behavior plays also a role in this paper. The first contribution in this field is due to Allingham and Sandmo (1972), who model tax evaders as rationale agents. Over the last six years, by contrast, economists have studied when paying taxes can be rationally preferred to evading them. Alm and Torgler (2006) and Frey and Torgler (2007), for example, show that tax evasion is restrained by so called "tax morale". Likewise, Kleven *et alii* (2009, 2011) assess third-party tax reporting against self-reporting in the context of labor income taxation.

Developing Gérard (2004) and Keen and Ligthart (2006a, 2006b), in what follows we examine various tax designs for cross-border savings by adopting a formalization as close as possible to actual and potential institutional features. Namely, as baseline model we consider a pure decentralized source-based scenario where no information at all is exchanged and study how a shift towards a neutral and efficient residence-based solution looks like for this framework. We then compare this latter setting with the OECD tax model where information is exchanged upon request. We include automatic and systematic exchange of information in this scenario, so to use it as a proxy for the residence based system prescribed in the EU Directive and called upon by the US FATCA. We hence assess the limits of both the European and the US legislation and find out the conditions to restore tax neutrality and efficiency within each of these settings. Lastly, we study a third scenario based on a system of coordinated withholding tax, like the one currently at work between Austria or Luxembourg and the other EU Member States.

4 The baseline model

Throughout this paper we present a simplified version of the model, where the countries considered are characterized by the same size of the population and all the financial assets pay out the same interests. A complete version of the model is reported in the appendix.

Consider two countries, say *home* and *foreign*. Suppose that in each country there is an investor representative of the behavior of the whole population. The investor maximizes a utility function choosing the distribution of her portfolio between the two jurisdictions. In what follows, hence, we indicate with a superscript h the variables referring to the representative agent of population living in country *home* and with a superscript f those belonging to the representative agent of country $foreign$. In this simplified version of the paper, we abstract from the issues relative to different sizes of the population in the countries. In the appendix, instead, we will deal with this possibility and so we will explicitly take into account the country size.

To begin with we assume that there is a single kind of financial asset, providing investors from both countries with a pre-determined and given interest rate r. We make this assumption in order to keep the model simple and disregard monetary or exchange rate dynamics. We will relax the assumption of having a single financial asset in section 6. In the appendix, a distinction will also be made based on the country where the interests are paid out presumably being that of the issuer, that is the source country or the paying agent country. Therefore, a subscript h will indicate that interests are paid through a financial institution in country *home*, while a subscript f will refer to income paid out in country *foreign*.

In each country there is also a government which maximizes a social welfare function with respect to the tax rates under its authority. The model takes hence the form of a two-step non-cooperative game. In step 1, governments fix their respective tax rates on savings income in a non-cooperative way. In step 2, investors select their portfolio, that is they decide on the distribution of their savings among the two locations and thus among the places where they will have their interests paid out. We solve that model backward, first investigating the behavior of the investors, then of the governments.

4.1 Pure source-based setting (S)

4.1.1 The investors

The representative investor of each country has a positive and real wealth w, with $w \in \mathbb{R}_+$, and selects the share of wealth that she invests in both jurisdictions so as to maximize her investment income. In what follows we present only the simplest case where $w = 1$. In the appendix, where we present the solutions of the model in its more general form, we let $w \in \mathbb{R}_+$.

In this paper, we consider that the after-tax investment income fully corresponds to the utility of the representative agent. Therefore, we refer indifferently to the utility of the investor and her investment income. Besides, since agents can only invest in a single risk-free financial

product with a given interest rate and since agents keep their assets until maturity, they only care about maximizing their after-tax return. Thus agents' utility maximization problem boils down to maximizing the net return of the portfolio.[4]

Given an arbitrary initial allocation of agents' savings, the representative investor of country *home* decides where to invest her wealth solving the following maximization problem

$$\max_{a_h^h, a_f^h} \quad U^h = \sum_{k=h,f} z_k^h a_k^h - \frac{v}{2} \sum_{k=h,f} \left(a_k^h - a_{0,k}^h\right)^2, \tag{1}$$
$$s.t. \sum_{k=h,f} a_k^h = 1 \quad and \quad \sum_{k=h,f} a_{0,k}^h = 1,$$

where $a_{0,k}^h \in [0,1]$ and $a_k^h \in [0,1]$ are respectively the initial and chosen fraction of savings invested in country k with $k \in \{h, f\}$, $v \in (0,1)$ is the adjustment cost due to a change in the initial allocation of the agent's savings, and $z_k^h \in \mathbb{R}_+$ is the after-tax interest rate.[5] This latter can be written as

$$z_h^h = (1 - t_h^h)\, r, \qquad z_f^h = (1 - t_f^h)\, r, \tag{2}$$

where $r \in (0,1)$ stands for the before-tax interest rate paid out either in country *home* or in country $foreign$, while $t_k^h \in [0,1]$ indicates the tax rate on the interest paid out in country k to a resident of *home*.[6]

Assuming a quadratic cost in the utility function of the investor allows us not to impose any condition on the relation between the initial and final fraction of savings invested in a certain country. [7] Using the first order conditions linked to optimization problem in (1), we find that

$$a_h^{h*} = a_{0,h}^h + \frac{z_h^h - z_f^h}{2v}, \qquad a_f^{h*} = a_{0,f}^h + \frac{z_f^h - z_h^h}{2v}. \tag{3}$$

The representative agent of country $foreign$ acts similarly. Throughout the paper, we will hence report the results for country $foreign$ only when necessary.

[4]For the sake of simplicity, the game that we present in this paper is a one-period static game. The solutions presented hence correspond to a framework where investors and governments decide at one time portfolio allocations and tax rates and then keep their decisions for the rest of their life.

[5]Note that the adjustment costs do not refer to the degree of capital mobility, but to the transaction and information costs linked with the reallocation of capital. These latter can be thus modeled as a fraction v of the assets reallocated that the investor has to pay to a financial intermediary. Note also that these adjustments costs are supposed to increase with the share of the portfolio reallocated in another country because of the presence of higher administrative burdens linked with larger transactions, due for example to the presence of laws against money laundering.

[6]We have checked that the utility function U is concave and twice continuously differentiable with respect to its arguments. We have controlled for the validity of this result in all the sections of the paper. First and second conditions have been also verified throughout the whole development of the model presented in this work.

[7]Note that we are not dealing with the entry costs of the investment, which would lead to the concavity of the cost function. We suppose indeed that agents are already active investors and no longer have to sustain entry costs.

In each country the portfolio allocation of the representative agent depends on the initial share of wealth invested at home and the ratio between the differential between the after-tax net returns on the assets hold in the two countries and the adjustment costs. In other words, if no exchange of information takes place between jurisdictions, then the optimal portfolio allocation of representative agents corresponds to the initial share of wealth invested in each country, adjusted for net-of-tax differences in returns taking into account the adjustment cost.[8]

4.1.2 The governments

In the second step of the game, each government maximizes its tax revenue.[9] It chooses the tax rates under its control, knowing the best response function of investors. In this baseline scenario, where no information is exchanged between the two jurisdictions at stake, government of country *home* decides on the tax rate it charges on the domestic income of its residents, t_h^h, as well as on the withholding tax it levies on interest payments paid out in its territory to residents of the other country, t_h^f. The objective of government h is to[10]

$$\max_{t_h^h, t_h^f} W^h = r\left(t_h^h a_h^{h*} + t_h^f a_h^{f*}\right). \tag{4}$$

We have now supposed that each country is populated only by one agent. In the appendix, instead, we will present the solutions for the case of two countries of different size, with N^h and N^f being respectively the population of country *home* and of country $foreign$.

Solving the maximization programs of both governments, we obtain the best responses for the tax rates charged by *home*[11]

$$t_h^h = \frac{t_f^h}{2} + a_{0,h}^h \frac{v}{r}, \quad t_h^f = \frac{t_f^f}{2} + a_{0,h}^f \frac{v}{r}. \tag{5}$$

The tax rates charged turn out to be influenced by three factors. First, they are a positive function of the importance of adjustment costs v: the higher the cost that agents face for moving their savings, the higher can be the tax rate charged by a country. Second, they are also positive functions of the initial investment in a location: the higher the initial share of investors' wealth invested in a country, the higher the tax rate set by the government of that country,

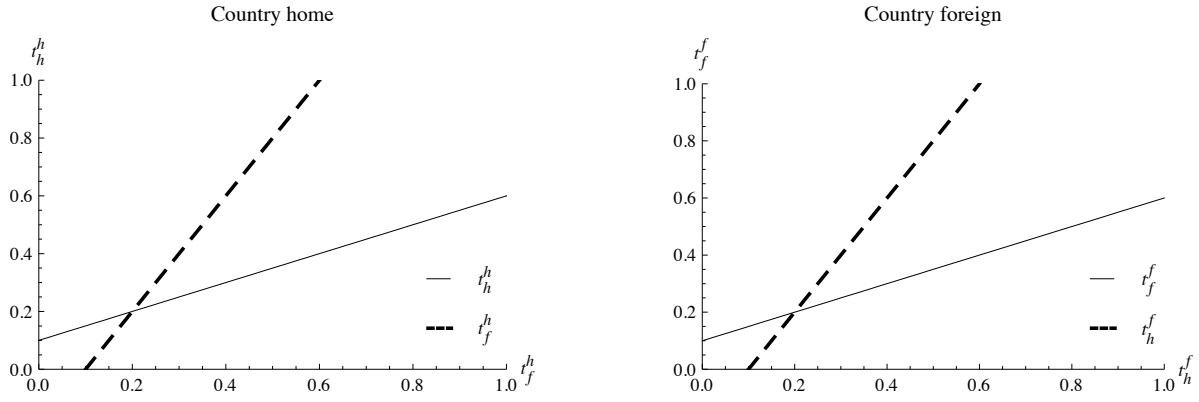
[8] Transaction costs are multiplied by two because agents are supposed to pay a cost both for transferring assets from *home* to $foreign$ and from $foreign$ to *home*.

[9] In this paper, the two governments are assumed to be Leviathan. For a justification of that assumption, see Keen and Ligthart (2006a,2006b).

[10] As for the agents' utility function, we have checked that government's revenue function is concave, with the concavity given by the presence of the portfolio allocation functions. Moreover we have also verified that the function is twice continuously differentiable with respect to its arguments as well as controlled for the validity of this result in all the sections of the paper. First and second conditions have been also examined for any of the described scenarios.

[11] In this paper we only consider interior solutions and focus on realistic values of the tax rates.

reflecting the lower need to attract further savings from the partner jurisdiction. Third, tax rates raise when the complementary tax rate paid by agents domestically or abroad increases.



(a) (b)

Figure 1: Best response functions for the domestic tax rate in country *home* (a) and country *foreign* (b). In this figure, the initial portfolio is considered as evenly distributed among products, v is set equal to 0.01, while the interest rate is fixed at 5 percent.

The Nash equilibrium tax rates are equal to

$$t_h^{h*} = \frac{2v}{3r}(1 + a_{0,h}^h), \quad t_h^{f*} = \frac{2v}{3r}(1 + a_{0,h}^f). \tag{6}$$

In a context of pure source-based withholding taxation, countries have the possibility to discriminate between domestic rate for resident and non-resident investors. Countries can hence try to attract foreign capitals. For equal rate of returns and wealth in the two countries, tax rates charged to non-resident investors tend to be smaller whenever agents prefer to invest more in their domestic country ($a_{0,h}^h > a_{0,h}^f$). Moreover the tax rates increase with the cost of reallocating the portfolio, as a higher value of v implies a higher degree of captivity of the taxpayers. By contrast, similarly to the best response functions, an increase of the interest rate decreases the equilibrium tax rates. This derives from the fact that governments care only about maximizing their revenues. Higher interests paid out allow them to reach the maximum of their revenue function with lower tax rates.

4.2 Pure residence-based setting (R)

With this simple setting, it is easy to show that shifting the power to tax from the source to the residence country increases tax revenues. Taxing at the same rate the income received by the residents of each jurisdiction domestically and abroad, in country *home* we have that $t_h^h = t_f^h = t^h$.

From (3), the optimal allocation chosen by the representative agent in each country corresponds to the initial allocation,

$$a_h^{h*} = a_{0,h}^h, \qquad a_f^{h*} = a_{0,f}^h. \tag{7}$$

The government maximization problem in (4) instead becomes

$$\max_{t^h} W^h = r\left(a_h^{h*} + a_f^{h*}\right) t^h.$$

Each country is now free to fix its tax rate without taking into account the choices of its partner country. Each country can for example set a tax rate t^*, that is t^{h*} in the case of country *home*.[12]

Substituting the tax rates of equilibrium into the revenue functions, we can show under which conditions tax revenues increase when a government can tax the global income of its residents. For an even distribution of agents' initial portfolio, proposition I shows that the tax revenues collected by the government of country *home* under a residence-based regime are larger than that collected under a source-based principle of taxation when adjustment costs are low with respect to the interest rate. For adjustment costs tending to zero, $v \to 0$, the residence principle of taxation ensures larger tax revenues than the source principle for all positive values of the tax rate t^{h*}. Equivalently, the residence regime increases tax revenues when the optimal tax rate t^* chosen by a government under this setting is higher than the ratio between adjustment costs and the interest rate.

Proposition I: The residence-based scenario assures a higher level of revenues across the two countries the lower adjustment costs are with respect to the interest rate. For given adjustment costs and interest rate, moving from a source to a residence regime raises tax revenues if the optimal tax rate t^* under the residence regime is higher than the ratio between adjustment costs and interest rate.

Proof: For country *home* we have that:

$$W_R^h > W_S^h \text{ if } r\left(a_{0,h}^h + a_{0,h}^f\right) t^{h*} > r\left(t_h^{h*} a_h^{h*} + t_h^{f*} a_h^{f*}\right) <=> t^{h*} > \frac{v}{r}.$$

■

5 Information exchange (IE)

Information exchange is a way of getting closer to a situation where governments can tax the global income of their residents, as in residence-based regime. Interests continue to be taxed at

[12] Countries are now independent because investors are supposed to be immobile.

source by the paying country, which can still discriminate between local and foreign investors. However, unlike in the framework based on the sole source principle, the residence country now may also tax interests obtained abroad by its residents, provided it grants them a credit for the withholding tax levied in the partner country and gets the relevant information. Different settings belonging to this scenario are spontaneous transmission of information or self-reporting, to adopt the terminology of Kleven, Kreiner and Saez (2009), exchange of information upon request as advocated by the OECD, and automatic and systematic provision of information by the paying agent, either directly to the residence government of the investor, or indirectly through the agency of the tax authorities of the source jurisdiction (third party reporting in the terminology of those authors).

In this section we assume that getting or providing information is costless. We will relax this assumption in the next two sections, where we concentrate on the EU Savings Directive and on the evolution of the US practice from QI to unilateral and then cooperative FATCA. We will show especially under which conditions those settings replicate or are proxies for the residence-based framework described in section 4.2. Furthermore, we assume that the information got by the country of residence of the taxpayer does not always come in the desired quality. Different national tax regulations can in fact allow public administrations to gather and so to transmit different taxpayer details. Conversely, if investors rather than foreign administrations are those in charge to provide information to the government of the residence country, then this self-reported information may be partial.

The representative agent of country *home* faces the same utility maximization problem as in (1). The return on the share of her savings invested abroad, however, now also depends on the tax rate applied to her domestic income, whenever this rate is higher than the withholding tax charged in country $foreign$. Besides, it is a function of the quality of the information p regarding her cross-border savings, which is provided to the authorities of *home* either by the financial institutions or by the authorities of country $foreign$, in case of third party reporting, or even by the investor herself, in case of self reporting. We introduce the parameter p^f for qualifying the quality of the information obtained by country *home* from country $foreign$ and, similarly, the parameter p^h to indicate the quality of information obtained by country $foreign$ from country *home*. Consequently, p^h and $p^f \in (0, 1)$. Upper and lower boundaries are excluded because, in the context of this institutional device, reporting is in principle mandatory for administration or investors so that people with a high degree of risk aversion (Allingham and Sandmo, 1972) or tax morale (Alm and Torgler, 2006; Frey and Torgler, 2007) will report some foreign income at least. For similar reasons we rule also out the possibility to have perfect exchange of information, as we assume that the exactitude of the reporting cannot be checked (Gérard and Hadhri, 1994).

We model the effect of the quality of information reported by modifying the definitions of the after-tax returns. For instance, for the representative resident of country *home*, these are now defined as

$$z_h^h = \left(1 - t_h^h\right) r, \qquad z_f^h = \left[1 - t_f^h - max\left\{0, p^f \left(t_h^h - t_f^h\right) \right\}\right] r. \tag{8}$$

The credit granted to taxpayers in their country of residence for the withholding tax paid abroad is generally limited to the domestic tax liabilities on the income at stake. Therefore a country cannot charge a withholding tax larger than the upper limit of the creditable amount. In what follows, we consider that national tax rates are higher than foreign rates, so that investors have incentives to invest abroad positive shares of their savings and the model does not reduce to a pure source-based regime as the one already described in section 4.1.

The allocation of savings for the representative investor of country *home* continues to follow the formula found in (3), where after-tax returns are defined as in (8). The share of savings invested in the country of residence hence continues to decrease when the domestic tax rate rises $\left(\frac{\partial a_h^h}{\partial t_h^h} < 0\right)$ and to increase when the foreign withholding tax rate goes up $\left(\frac{\partial a_h^h}{\partial t_f^h} > 0\right)$. Nonetheless the outflow of savings toward the partner jurisdiction is cushioned by the importance of the exchange of information, as the share of savings invested abroad decreases $\left(\frac{\partial a_f^{h*}}{\partial p^f} < 0, \frac{\partial a_h^{f*}}{\partial p^h} < 0\right)$ when the quality of the information exchanged improves.

The objective function of each of the two governments now integrates a new source of tax revenue, i.e. that raising from their capacity to tax foreign income of their residents thanks to the cross border exchange of information. As a result, the government of country *home* faces the following maximization program:

$$\max_{t_h^h, t_h^f} W^h = r\left(t_h^h a_h^{h*} + t_h^f a_h^{f*}\right) + p^f \left(t_h^h - t_f^h\right) a_f^{h*} r.$$

The optimal tax rates charged by *home* are given by

$$t_h^{h*} = \frac{2(1 + a_{0,h}^h)}{[(3 - 2p^f)(1 - p^f)]} \frac{v}{r}, \qquad t_h^{f*} = \frac{2\left[1 + a_{0,h}^f (1 - p^h)\right]}{[(3 - 2p^h)(1 - p^h)]} \frac{v}{r}. \tag{9}$$

Tax rates are positive functions of the quality of the information exchanged with the other country. An increase in the quality of information exchange reduces tax motivated outflows of savings and thus allows governments to increase their respective domestic tax rate ($\frac{\partial t_h^{h*}}{\partial p^f} > 0$). Similarly, it incentivizes governments to increase the withholding tax on income paid out to non-residents ($\frac{\partial t_h^{f*}}{\partial p^h} > 0$), since this is credited on tax liabilities in the country of residence of the investors.

Nevertheless, exchanging information remains an intermediate solution between the source-based and the residence-based scenarios both with regard to tax rates and revenues. For low values of the quality of the information exchanged, this scenario tends to the source-based optimal solutions. On the contrary, when that quality is almost perfect, this setting resembles a pure residence-based setting, where the investor becomes insensitive to the difference between the domestic tax rate and the foreign withholding tax and keeps unchanged the initial distribution of her savings in order to avoid unprofitable and costly portfolio reallocations. Proposition II formalizes this result.

Proposition II: Tax revenues under the information exchange regime tend to the level of revenues obtained under a regime based on the residence principle for the quality of information tending to one, while they tend to a level of revenues corresponding to a pure-source scenario for the quality of information tending to zero. For country *home*,

$$W_{IE}^h \to W_S^h \text{ if } p^h = p^f \to 0, \qquad W_{IE}^h \to W_R^h \text{ if } p^h = p^f \to 1.$$

Proof: The proof of this proposition directly derives from (9). ■

If the governments of the two countries could choose what quality of information to exchange, then they would face a prisoner dilemma. Receiving high quality information increases the domestic tax rate - t_h^{h*} in (9) - and so rises tax revenues of the receiving country. However, transmitting high quality information makes the withholding tax rate imposed on foreign investor - t_h^{f*} in (9) - going up with the result that a country can loose its attractiveness for foreign investors. Consequently, the information exchange regime cannot evolve into pure residence-based regime.

Corollary: Tax revenues under the information exchange regime are lower than under a regime based on the residence principle, but higher than in a scenario purely based on the source principle. In each country,

$$W_S < W_{IE} < W_R.$$

6 EU Savings Directive (EU)

The 2003 EU Council Directive on Savings Income, in its version currently applied by all EU Member States apart Austria and Luxembourg, has shifted the power to tax cross-border savings from the source to the country of residence of the investors. This framework in principle could constitute an application of the second scenario we have presented in the baseline model, that is the pure residence-based setting analyzed in section 4.2. Indeed, in this system of taxation each country can tax its citizens on the basis of their European-wide income. The EU Savings Directive, however, applies only to savings income in the form of interest payments and

to some interest-based financial products.

The limited scope of the Directive may incentivize agents to hold products falling out of its range of application like insurance contracts. To show this, we consider that in both countries there exists a financial product falling out of the range of application of the Directive. Agents' income coming from holding this asset is taxed exclusively by the country where interests are paid out. In this case, the representative agent of country *home* maximizes the following utility function:

$$\begin{aligned} \max_{a^h_h, a^h_{h'}, a^h_{f'}} \quad & U^h = \sum_{l=h,h',f'} z^h_l a^h_l - \tfrac{v}{2} \sum_{l=h,h',f'} \left(a^h_l - a^h_{0,l}\right)^2, \\ & s.t. \sum_{l=h,h',f'} a^h_l = 1 \quad and \quad \sum_{l=h,h',f'} a^h_{0,l} = 1, \end{aligned} \tag{10}$$

where h now represents the financial product issued by country *home* and regulated by the Directive, whilst h' is the insurance product issued only in country *home* and f' is the one issued only in country $foreign$. Note that the financial asset f is no longer relevant for the agent in country *home*. Due to the introduction of the Directive, indeed, the financial asset f becomes a product equivalent to h for the agent in country *home*. The after-tax interest rate perceived on h' and f' can be written as:

$$\begin{aligned} z^j_{h'} &= (1 - t^j_{h'})\, r, \\ z^j_{f'} &= (1 - t^j_{f'})\, r, \end{aligned} \tag{11}$$

where $t^j_{h'}$ and $t^j_{f'}$ are respectively the tax rate at which the income coming from the detention of an insurance product is taxed by country *home* and by country $foreign$ disregarding the nationality of the asset owner, i.e. $j \in \{h, f\}$.

As in (3), the solution to the agent's maximization problem is given by

$$\begin{aligned} a^{h*}_h &= a^h_{0,h} + \frac{(z^h_h - z^j_{f'}) + (z^h_h - z^j_{h'})}{3v}, \qquad a^{j*}_{f'} = a^j_{0,f'} + \frac{(z^j_{f'} - z^h_h) + (z^j_{f'} - z^j_{h'})}{3v}, \\ a^{j*}_{h'} &= a^h_{0,h'} + \frac{(z^j_{h'} - z^h_h) + (z^j_{h'} - z^j_{f'})}{3v}. \end{aligned} \tag{12}$$

The government of this country fixes its respective tax rates according to the following maximization problem:

$$\begin{aligned} \max_{t^h_h, t^j_{h'}} \quad & W^h = r\left[t^h_h a^{h*}_h + t^j_{h'}(a^{h*}_{h'} + a^{f*}_{h'})\right], \\ & s.t. \;\; t^h_h, t^j_{h'} \leq 1. \end{aligned} \tag{13}$$

The best response functions for the government of country *home* are

$$t_h^h = \frac{3va_{0,h}^h + r(2t_{h'}^j + t_{f'}^j)}{4r}, \quad t_{h'}^j = \frac{3v(a_{0,h'}^h + a_{0,h'}^f) + r[2(t_h^h + t_{f'}^j) + t_f^f]}{8r}.$$

Tax rates are interdependent, implying that tax rates on financial products not regulated by the EU Savings Directive influence those that are taxed according to its rules. Equilibrium tax rates are now equal to

$$\begin{aligned} t_h^{h*} &= \frac{3[a_{0,h}^h + a_{0,f}^f + 2(1 + a_{0,f'}^f - a_{0,h'}^h)]v}{10r}, \\ t_{h'}^{j*} &= \frac{[a_{0,h}^h + 2a_{0,f}^f + 4(a_{0,f'}^h + a_{0,f'}^f)]v}{5r}. \end{aligned} \tag{14}$$

Tax revenues under the EU Directive regime correspond to a scenario of pure source-based international taxation of savings. To see this, the assets taxed according to the rules of the EU Directive can be compared to national assets taxed by the residence country, while the assets escaping the application of the Directive are similar to foreign assets taxed at a different rate established by the source country. This scenario thus conveys a level of tax revenues that is lower than in a situation of pure residence-based taxation. A pure residence-based taxation setting, in fact, would imply the application of the Directive to all financial assets. Similarly, corresponding to a pure source-based system of taxation, a limited application of the Directive leads governments to collect a lower level of tax revenues than in a framework of information exchange.

Proposition III: For an even allocation of investors' portfolio, tax revenues under the EU Directive regime equal those collected in a scenario of pure source-based taxation, hence lower than under a regime of information exchange or in a scenario where international taxation is purely based on the residence principle.

Proof: For country *home*, we have that

$$W_{EU}^h = W_S^h, \qquad W_{EU}^h < W_R^h \text{ if } r > v, \qquad W_{EU}^h < W_{IE}^h \text{ if } 0 < \{p^h, p^f\} < 1.$$

■

7 The US model

As already pointed out in section 2, in the United States the QI and FATCA systems are attempts to reach the outcome of a residence-based scenario by having all the necessary information about resident taxpayers. Like the EU Savings Directive though, the QI and FATCA systems in the US have been confronted with serious limitations. Because of these loopholes,

the QI and FACTA regimes have turned out to be not at all equivalent to the scenario with perfect exchange of information they were aiming at.

Two questions are separately addressed in this section, building extensions of the model developed in section 5. First, under the QI mechanism, US taxpayers could escape its application by channeling their income through a non US person. In section 7.1 we show how, due to the exemption granted to foreigners, the QI mechanism has not had the expected positive effect on the level of tax revenues in the US.

Second, notwithstanding the US authorities decided to reinforce the QI mechanism with FATCA rules, acquiring or supplying information remains a costly activity. Indeed, under the EU Savings Directive mechanism, it is up to each EU Member State to provide its partner countries with such information. Under the QI and what we call unilateral FATCA, the US authorities are permitted to audit the primary supplier of the information, i.e. foreign financial institutions. In section 7.2 we demonstrate why the costs of this direct audit may explain the change in the attitude of the US authorities in favor of a cooperative FATCA based on an intergovernmental agreement.

7.1 QI loopholes

If an alternative channel for getting interest income from foreign assets exists, e.g. through an incorporated person subject to taxation at source instead of a regime of information exchange, then the after-tax foreign income for an investor having residence in country *home* in (8) becomes

$$z_f^h = \max\left\{ \left[1 - t_f^{hIE} - p^f \left(t_h^{hIE} - t_f^{hIE}\right)\right] r,\ (1 - t_f^{hS} - \tilde{c})r \right\},$$

where $\tilde{c}$ is the cost of that alternative channel, t_h^{hIE} and t_f^{hIE} are the two tax rates imposed domestically by country *home* or abroad by country $foreign$ under a regime of information exchange, while t_f^{hS} is the tax rate imposed by the source country - country $foreign$ - linked to that possibly more sophisticated device. Indeed $\tilde{c}$ might be understood as a fee paid to bankers or tax advisers. As a consequence the US taxpayer will invest through a local firm, if

$$\tilde{c} < t_f^{hIE} + p^f \left(t_h^{hIE} - t_f^{hIE}\right) - t_f^{hS} \equiv RHS.$$

Substituting the two tax rates with their equilibrium values found respectively in (6) and (9), figure 2 shows that making use of more sophisticated devices is convenient only when the quality of the information exchanged is low enough. Higher values of the quality of information exchange either require more sophisticated and so more costly strategies ($\tilde{c'} > \tilde{c}$) to be used, or make inconvenient the use of alternative devices.

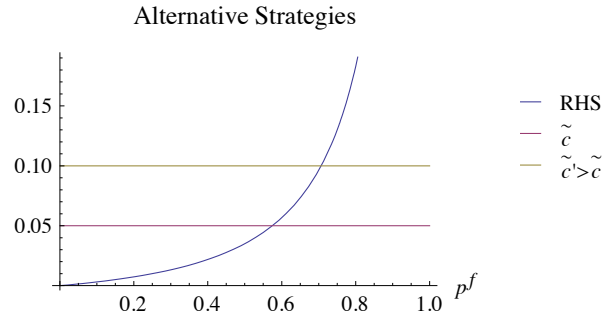


Figure 2: Costs of alternative strategies. The values of the initial portfolio allocation, interest rate and transaction costs are set as in Figure 1.

7.2 Costly information (CI)

The QI mechanism was improved thanks to the adoption of FATCA. This system however requires high level of information exchange for delivering all its effects. So far, we have assumed that getting information was costless for the recipient country. By contrast, the FACTA system implies that the US supports the whole burden of acquiring information. In this section we thus investigate the consequences of the existence of these costs.

If acquiring information is costly, jurisdiction *home* will support the cost ϕ of p^f. This cost is modeled as part of the taxpayers' portfolio allocated abroad that the government is not able to tax. With $\phi \in [0,1]$, the tax revenue function becomes then

$$\max_{t_h^h, t_h^f} W^h = r\left[t_h^h a_h^{h*} + t_h^f a_h^{f*} + p^f (t_h^h - t_f^h)(1-\phi) a_f^{h*}\right]. \tag{15}$$

Due to the presence of ϕ, the equilibrium tax rates in (9) become

$$t_h^{h*} = \frac{2(1+a_{0,h}^h)}{[3-2(1-\phi)p^f]\,(1-p^f)}\frac{v}{r}, \qquad t_h^{f*} = \frac{2\{1+a_{0,h}^f[1-(1-\phi)p^h]\}}{[3-2(1-\phi)p^h]\,(1-p^h)}\frac{v}{r}. \tag{16}$$

The presence of a cost for acquiring information decreases the internal tax rate $\left(\frac{\partial t_h^{h*}}{\partial \phi} < 0\right)$ as well as the external tax rate $\left(\frac{\partial t_h^{f*}}{\partial \phi} < 0\right)$. Tax revenues hence decrease for increasing values of ϕ. In particular, when ϕ assumes value 1 or the quality of information tends to zero, then the optimal tax rates becomes equal to the source-based solution seen in section 4.1; whilst, for $\phi = 0$, this framework is equivalent to the information exchange setting analyzed in section 5.

Moving from a unilateral mechanism to a cooperative agreement where each partner provides information regarding foreign accounts on its territory transforms (15) into

$$\max_{t_h^h, t_h^f} W^h = r\left[t_h^h a_h^{h*} + t_h^f a_h^{f*} + p^f\,(t_h^h - t_f^h)\,(1-(1-\chi)\phi)\,a_f^{h*} - \chi\phi p^h (t_f^f - t_h^f) a_h^{f*}\right].$$

The equilibrium solutions are now equal to

$$\begin{aligned} t_h^{h*} &= \frac{2\left[(1+a_{0,h}^h)(1+\chi\phi p^f)\right]}{\left[3-2(1-\phi)p^f\right](1-p^f)}\frac{v}{r}, \\ t_h^{f*} &= \frac{2\{1+a_{0,h}^f\left[1-p^h\left(1-(1-\chi)\phi\right)\right]+2\chi\phi p^h\}}{\left[3-2(1-\phi)p^h\right](1-p^h)}\frac{v}{r}. \end{aligned}$$

A higher value of $\chi \in [0,1]$, that is a higher share of the information cost ϕ paid by the partner country pushes up the internal tax rates and lowers the external tax rates. For a value of χ equal to 0, as in the unilateral FACTA mechanism, the tax rates chosen by the government of country *home* corresponds to those found in (16). As tax rates in (16) are lower than those corresponding to a situation of costless information, also the tax revenues collected by the government of country *home* are lower than in a framework of costless information exchange. By contrast, when the burden of acquiring information is totally supported by the partner jurisdiction $\chi = 1$, optimal tax rates are higher than in (16) and even higher than in a situation of costless information as in section 5,

$$\begin{aligned} t_h^{h*} &= \frac{2\left[(1+a_{0,h}^h)(1+\phi p^f)\right]}{\left[3-2(1-\phi)p^f\right](1-p^f)}\frac{v}{r}, \\ t_h^{f*} &= \frac{2\{1+a_{0,h}^f\left[1-p^h\right]+2\phi p^h\}}{\left[3-2(1-\phi)p^h\right](1-p^h)}\frac{v}{r}. \end{aligned}$$

Proposition IV: In a framework of information exchange, if acquiring information is costly ($\phi \neq 0$), tax revenues decreases with the burden of acquiring information that a country needs to support.

Proof: Comparing tax revenues in case of costless and costly information, for country *home* we have that

$$W_{CI}^h < W_{IE}^h \text{ if } \chi \to 0, \qquad W_{CI}^h > W_{IE}^h \text{ if } \chi \to 1.$$

■

8 Coordinated withholding taxation (W)

This last section before the conclusion is inspired by the innovative practice adopted by the EU for Member States allowed to not exchange individualized information, as well as for the tax relations with third countries. In general, withholding taxation does not require the collection of detailed and personalized information in order to function. It is hence a regime to be preferred to a regime of information exchange whenever two countries refuse any exchange of information (as in the case of some European Member States) or when the quality of information reported about taxpayers is very low.

Under this scenario country *home* and $foreign$ do not exchange individualized information but each of them transfers to its counterpart a fraction, 75 percent in the EU case, of the revenue collected from a withholding tax levied on interests paid to residents of that partner country. This transfer is done anonymously - the names of the investors are not mentioned. In the EU case, the rate of that withholding tax was initially set equal to 15 per cent and it has progressively increased up to 35 per cent.

Nothing changes concerning investor decisions with respect to the baseline model. They continue to solve the maximization problem explained in (1) and invest their savings according to (3). On the contrary, the maximization problem for the government of country *home* can be modified as follows

$$\max_{t_h^h, t_h^f} W^h = r\left[t_h^h a_h^{h*} + x\, t_f^h a_f^{h*} + (1-x)\, t_h^f a_h^{f*}\right], \tag{17}$$

where $x \in [0,1]$ is the percentage of the withholding tax that the two countries have exogenously agreed ex-ante to pass to each other. The best response functions of the tax rates charged by country *home* are now equal to

$$t_h^h = a_{0,h}^h \frac{v}{r} + \frac{(1+x)t_f^h}{2}, \quad t_h^f = a_{0,h}^f \frac{v}{r} + \frac{t_f^f}{2},$$

so that, the Nash equilibrium is constituted by,

$$t_h^{h*} = \frac{2v[1 + a_{0,h}^h + x\, a_{0,f}^h]}{r(3-x)}, \quad t_h^{f*} = \frac{2v(1+a_{0,h}^f)}{r(3-x)}. \tag{18}$$

The tax rates levied by the two countries correspond to those found in (6), apart for the presence of the sharing factor x. In particular, in a system of coordinated withholding taxation, the slope of the reaction function of the domestic tax rate is larger than under no exchange of information due to the sharing agreement. The reaction function of the withholding tax rate charged to foreign investors, by contrast, keeps following the case of source-based taxation. Moreover, for $x = 0$, the expressions of the optimal tax rates found in this section coincide with those of the source-based scenario assessed as baseline model. For $x > 0$, the optimal tax rates in this scenario become higher than those found under a pure source-based setting studied in section 4.1. Consequently, with coordinated withholding taxes tax revenues are also a function of the sharing coefficient x, as detailed in proposition V.

Proposition V: In a regime of coordinated withholding taxation, a positive sharing factor $x > 0$ increases tax revenues with respect to a regime of taxation at source.

Proof: From (18), for country *home* we have that

$$W_W^h \to W_S^h \text{ if } x \to 0, \qquad W_W^h > W_S^h \text{ if } x > 0.$$

■

8.1 Mixing withholding taxation with information exchange

In this section dedicated to coordinated withholding taxation, we have disregarded exchange of information up to now. However the transfer of a fraction x of the revenue collected at source through the coordinated withholding tax to the state of residence of the investor does not exonerate the investor to report her foreign income in her state of residence, receiving a credit for the tax withheld at source.

Including reporting information of quality p in the coordinated withholding tax scheme modifies both the utility function for the investors and the function of tax revenues for the governments. The former change involves information exchange in characterizing agents' portfolio allocation. The latter combines equations (9) and (18). It turns out that the two optimal tax rates at Nash equilibrium are now equal to

$$t_h^{h*} = \frac{2v[1 + a_{0,h}^h + x\, a_{0,f}^h]}{r(1-p^f)(3-2p^f-x)}, \quad t_h^{f*} = \frac{2v\left[1 + a_{0,h}^f(1-p^h)\right]}{r(1-p^h)(3-2p^h-x)}.$$

Self-reporting and withholding sharing reinforce each other to increase tax rates and tax revenues. The results for tax revenues are similar to what stated by proposition V. In particular, if $x \to 0$ and $p^h, p^f \to 0$, the tax revenues under this regime tend to the level of revenues collected in a pure-source scenario. If $x \to 1$ and $p^h, p^f \to 1$, this regime tend to a residence-based framework. Finally, if $x \to 0$ and $0 < p^h, p^f < 1$, this regime restitutes the same level of tax revenues as under a setting of information exchange.

8.2 Mixing withholding with a residence-based principle

Gérard (2004) suggests to substitute taxing foreign income at residence, on the basis of a transmission of individualized information, with a system of income taxation at source. The tax rate should be decided by the country of residence and all collected revenues should be transferred anonymously to the country of residence. The rationale behind that proposition is that it fulfills the necessary conditions of the cross border enforcement of a Dual Income Tax (DIT), at least for the version of the DIT where capital income is taxed at a flat rate (Sorensen, 1994). This mechanism is also sufficient to enforce the Dutch Box 3 mechanism (Cnossen and Bovenberg, 2001).

In this last case, the program of the government is

$$\max_{t_h^h, t_f^h} W^h = r\left[t_h^h a_h^{h*} + t_f^h a_f^{h*}\right] \tag{19}$$

The first order condition with regard to t_h^h is the same as in a pure source-based scenario, while the second first order condition is now computed with regard to t_f^h instead of t_h^f. The two optimal tax rates correspond to (6), where t_h^f is replaced by t_f^h,

$$t_h^{h*} = \frac{2v}{3r}(1 + a_{0,h}^h), \quad t_f^{h*} = \frac{2v}{3r}(1 + a_{0,h}^f). \tag{20}$$

For an even distribution of the initial agents' portfolio allocation, neutrality of taxation can be obtained under this framework whenever governments decide that foreign income should be taxed at source but at the same rate than domestic income. Domestic and foreign tax rates become then identical and taxation no longer influences agents' investment decisions. Tax revenues reach the same level as in the pure-residence based scenario analyzed in section 4.2.

9 Summary and conclusion

Summarizing what has been found so far, we can say that in a framework of residence-based taxation or perfect exchange of information for all assets, the allocation of assets depends only on the initial allocation and return differentials. Any asset mobility due to taxation disappears. If the residence criterion applies to only some assets, tax rates levied on financial products for which the residence criterion holds are direct functions of the tax rates levied on products taxed according to a source criterion. Any change in these latter rates has consequences also for the tax rates of the assets following residence-based rules, meaning that governments can compete and distort the allocation of assets by choosing the tax rates levied on products not subject to the residence criterion. Also, if the quality of information exchanged between jurisdictions is limited, tax rates levied by partner countries play a role in the determination of domestic tax rates. As a result, only full exchange of information or a residence criterion applied to all products can avoid mobility of assets due to tax reasons and can increase government revenues. Extending the scope of the Directive, hence, is a way to restore the neutrality of taxation. Removing the limits of its application, the principle of residence would be valid for all kinds of assets paying interest rates.

Tax neutrality could be reached also thanks to a regime of withholding taxation, when the withholding tax rate is chosen by the residence country and all the collected revenues are transferred to that country of residence. In this case, it is sufficient that the withholding tax rate levied at source is set equal to the domestic tax rate. Defining efficiency as a situation

where tax revenues are maximized and taxation does not distort the allocation of savings between assets and countries, only three regimes can lead to a situation of first best: 1) a pure residence-based setting; 2) a framework of perfect exchange of information concerning all substitutable assets - like in an extended version of the EU Directive - or strategies - like in the FATCA regulation; 3) a system of withholding taxation where withholding tax rates are decided by and the whole amount of withholding taxes is fully transferred to the residence country.

Proposition VI: A regime of international saving taxation is efficient if it is based on the residence principle of taxation or on perfect information exchange for all substitutable assets and strategies or on a system of withholding taxation where the residence country can choose tax rates and receives all the withholding taxes collected abroad.

To conclude, this paper is motivated by the numerous innovations regarding the taxation of cross-border savings, which took place or are expected to take place in a nearly future on both sides of the Atlantic Ocean. On the European side, the principle of a Directive was decided in the year 2000 and enforced since mid-2005. It has however many loopholes currently under examination. On the American side, the Qualified Intermediary status was proposed in 2003 to all banks across the world in order to make the US administration able to tax US taxpayers on the worldwide savings income. In front of the loopholes of that mechanism, a new piece of legislation has been launched under the appellation of FATCA. This enlarges the application of the QI mechanism but remains characterized by the US getting information directly from foreign financial institutions, thus disregarding local governments. In February 2012, however, the US has issued a joint statement with the largest EU Member States for exploring a cooperative version of FATCA.

Against this background, we have developed a model comparing the respective merits of information exchange and levy of coordinated withholding taxes. Using that model we have contributed to meet the following four issues. First, unlike the pieces of literature our model is based on, we show the effect of the various settings investigated not only on the taxation of foreign savings income, but also on the tax rates applied to domestic savings. Second, we consider agents as proper investors that can diversify their portfolio between countries as well as between different kinds of financial assets.Third, we explore the consequences of the loopholes in both the EU Savings Directive and the QI mechanism. The model sets forth that an equal treatment between all substitutable assets at home and abroad is required for any attempt to reach the efficient design depicted in the paper. By all substitutable assets we not only mean all substitutable products but also substitutable strategies to gain the return on those products. Fourth, we cope with the cost of information sharing, making a distinction between two situations. In the first one, the country which needs the information also needs to acquire it and thus supports its costs, for example in terms of auditing financial institutions across the

world. This situation is characteristic of US QI and unilateral FATCA. In the second one, each partner country is made responsible for the transmission of information regarding income paid to non-residents by its local banks or financial institutions. This alternative situation refers to the EU Savings Directive mechanism and to a cooperative version of FATCA.

We show that an efficient system of taxation allowing countries to tax individuals on their income could be achieved through an extension of the scope of the Directive and through a regime of perfect information exchange concerning all strategies and assets, like in the FATCA regulation. Moreover, we show that if accompanied by a residence-based choice of the withholding tax rate, a withholding tax setting constitutes an alternative efficient solution to the game. Indeed an alternative way to solve information sharing problems is to substitute taxing foreign income at residence with taxing that income at source but at a rate decided by the country of residence and with all collected revenues transferred to the country of residence.

Finally, in the appendix, we also report the optimal tax rates that we obtain once country size, agents' wealth and interest rates are not longer equal in both countries. Further research can concentrate on the quality of information and the dynamical aspects of the model. In this paper we have considered a static Nash game, whilst a future work can investigate if the optimal solutions of a repeated Nash game differ from what shown in this paper. Moreover, the quality of information exchanged can be made an endogenous variable of the model depending, for example, on the size of the countries. Leaving apart the determination of the optimal domestic tax rates, such analysis can determine information exchanged as a function of the population of the two countries, showing that for smaller countries there is no incentive to participate in international agreements for exchanging information.

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Appendix

In this appendix, we present the model in its complete version, once interest rates, agent's wealth and country population are let to be different in the two jurisdictions. The two rates, r_h for country *home* and r_f for country $foreign$, can in fact differ for various reasons, including differences in terms of country risk or other country specific issues. Similarly, representative agents can dispose of different levels of wealth to invest, say w^h for country *home* and w^f for country $foreign$. Countries also are not meant to be of equal size in terms of population. In what follows, we hence indicate with N^h the size of population in country *home* and N^f the size of population in country $foreign$.

A. Source-based framework

As already pointed out, in the baseline scenario governments can choose different tax rates for local and foreign investors, because foreign interests are taxed at source by the host country and no information at all is exchanged between the residence and the host country. In such a framework, the representative investor of each country has a positive and real wealth w, with $w \in \mathbb{R}_+$, and selects the share of her wealth that she invests in both jurisdictions so to maximize her investment income.

Given an arbitrary initial allocation of agents' savings, the representative investor of country *home* decides how to invest her wealth solving the following maximization problem

$$\begin{aligned} \max_{a_h^h, a_f^h} \quad & U^h = w^h \sum_{k=h,f} z_k^h a_k^h - \tfrac{v}{2} \sum_{k=h,f} \left(a_k^h - a_{0,h}^h\right)^2, \\ & s.t. \sum_{k=h,f} a_k^h = 1 \quad and \quad \sum_{k=h,f} a_{0,k}^h = 1. \end{aligned}$$

The after-tax interest rate, $z_k^h \in \mathbb{R}_+$, can be written as

$$z_h^h = (1 - t_h^h)\, r_h, \qquad z_f^h = (1 - t_f^h)\, r_f,$$

where $r_k \in \mathbb{R}_+$, with $k \in \{h, f\}$, stands for the before-tax interest rate paid out in country k.

Using the first order conditions, we find that

$$a_h^{h*} = a_{0,h}^h + \frac{z_h^h - z_f^h}{2} \frac{w^h}{v}, \qquad a_f^{h*} = a_{0,f}^h + \frac{z_f^h - z_h^h}{2} \frac{w^h}{v}.$$

In each country the portfolio allocation of the representative agent depends not only on the initial share of the agent's portfolio invested in that country and the differential between the after-tax net returns on the asset in the two jurisdictions, but also on the ratio between adjustment costs and agent's wealth. As shown in section 4, if no exchange of information takes place between jurisdictions, then the optimal portfolio allocation of representative agents keeps corresponding to the initial share of wealth invested in each country, adjusted for a function of possible country differences in returns net of taxation.

In the second step of this game, each government maximizes its revenue and chooses the tax rates under its control, knowing the best response functions of investors. In this baseline scenario, the objective function of the government of country *home* is equal to

$$\begin{aligned} \max_{t_h^h, t_h^f} W^h &= t_h^h a_h^{h*} r_h w^h N^h + t_h^f a_h^{f*} r_h w^f N^f, \\ s.t. \;\; & t_h^h, t_h^f \leq 1, \end{aligned}$$

with N^h and N^f being respectively the population of country *home* and $foreign$.

Solving the maximization programs of both governments, we obtain the best responses for the tax rates charged by *home*,

$$\begin{aligned} t_h^{h*} &= \frac{1}{r_h}\left[a_{0,h}^h \frac{v}{w^h} + \frac{r_h - r_f(1-t_f^h)}{2}\right], \\ t_h^{f*} &= \frac{1}{r_h}\left[a_{0,h}^f \frac{v}{w^f} + \frac{r_h - r_f(1-t_f^f)}{2}\right], \end{aligned}$$

as well as the optimal tax rates,

$$\begin{aligned} t_h^{h*} &= \left(1 + a_{0,h}^h\right) \frac{2v}{3r_h w^h} + \frac{(r_h - r_f)}{3r_h}, \\ t_h^{f*} &= \left(1 + a_{0,h}^f\right) \frac{2v}{3r_h w^f} + \frac{(r_h - r_f)}{3r_h}. \end{aligned}$$

The tax rates charged result to be influenced by three factors. First, they are a positive function of the importance of adjustment costs v with respect to agent's wealth. The higher the cost that agents face to move their savings, the higher can be the tax rate charged by a country. Second, they are also positive functions of the initial investment. The higher the initial share of investors' wealth invested in a country, the higher the tax rate set by the government of that country, reflecting the lower need of this latter to attract further savings from the partner jurisdiction. Third, the rates increase with the difference between the interest paid out in the two countries.

B. Residence-based framework

Shifting the power to tax cross-border savings from the source to the paying agent country, the representative agent of country *home* continues to maximize the same utility function as in the source-based framework, but her after-tax real net return on the two assets is now given by

$$z_h^h = \left(1 - t_h^h\right) r_h, \qquad z_f^h = \left(1 - t_h^h\right) r_f.$$

The return on foreign savings income is subject to the tax rate applied to domestic revenues by country *home*. The optimal allocation of investors having residence in country *home* does not change with respect to the source-based framework. In the simplified setting presented in the body of this work, the two after-tax real net returns become equal and the final portfolio allocation always reflect the initial choice of agents.

The maximization problem for the government becomes

$$\begin{aligned} \max_{t_h^h} \; & W^h = \left(t_h^h a_h^{h*} r_h + t_h^h a_f^{h*} r_f\right) w^h N^h, \\ & s.t. \;\; t_h^h \leq 1. \end{aligned}$$

Each country has just one tax rate to choose. Using the first order condition, it is easy to derive that for country *home*, it is optimal value is given by

$$t_h^{h*} = \frac{1}{2} + \frac{\left(a_{0,h}^h r_h + a_{0,f}^h r_f\right)}{\left(r_h - r_f\right)^2} \frac{v}{w^h}.$$

The tax rate equilibrium value is obtained straight from the first order condition, implying that each country fixes independently its tax rate. Proposition I holds and taxation is neutral for the allocation of savings as stated in proposition IV. The only difference with respect to the simplified scenario presented in the text of the article is that the optimal tax rates chosen by the countries no longer need to have the same value. As in the source-based framework, interest rates and agents' wealth influence the value of the optimal tax rate.

C. Information exchange

In a regime of information exchange, the representative agent of country *home* faces the same utility maximization problem as in source-based framework, but with the return coming from the share of her savings invested abroad depending also on the tax rate applied on her domestic

income, if this rate is higher than the withholding tax charged in country $foreign$, and on the quality of the information regarding her cross-border savings.

The after-tax real net returns for the representative resident of country *home* are defined similarly to (8):

$$z_h^h = \left(1 - t_h^h\right) r_h, \qquad z_f^h = \left[1 - t_f^h - max\left\{0, p^f \left(t_h^h - t_f^h\right) \right\}\right] r_f.$$

The allocation of savings for the representative investor of country *home* follows the formula found in (3). If exchange of information does take place between jurisdictions, then the share of representative agent's portfolio invested in the domestic asset is a positive function of the quality of the information exchanged between jurisdictions.

The government of country *home* faces the following maximization program:

$$\begin{aligned} \max_{t_h^h, t_h^f} W^h &= \left[t_h^h a_h^{h*} r_h + p^f \left(t_h^h - t_f^h\right) a_f^{h*} r_f\right] w^h N^h + t_h^f a_h^{f*} r_h w^f N^f, \\ s.t. \;\; & t_h^h, t_h^f \leq 1, \end{aligned}$$

with the equilibrium solutions for the tax rates charged by *home* given by

$$\begin{aligned} t_h^{h*} &= \frac{2v\left[a_{0,h}^h \left(r_h - p^f r_f\right) + r_h(1 - p^f) - p^f(r_h - r_f)\right] + (r_h - r_f)\left(r_h - p^f r_f\right) w^h}{\left(3 - 2p^f\right)\left(r_h - p^f r_f\right)^2 w^h}, \\ t_h^{f*} &= \frac{2v\left[a_{0,h}^f (r_f - p^h r_h) - r_f\right] + (r_f - r_h)\left(r_f - p^h r_h\right) w^f}{\left(3 - 2p^h\right) r_h \left(r_f - p^h r_h\right) w^f}. \end{aligned}$$

Tax rates are positive functions of the quality of the information received from the partner country. Proposition II keeps holding. In addition, the larger is the population of a country, the more this country will have incentives to participate in international agreements for exchanging information, in order to retrieve taxes on savings invested abroad.

D. EU Savings Directive

The EU Directive applies only to savings income in the form of interest payments and to some interest-based financial products. As in section 6, if both countries emit a financial product falling out of the range of application of the Directive, h' and f', then agents' income coming from holding h and f is taxed exclusively by the country of residence of the taxpayer, while income from h' and f' is taxed only by the country where interests are paid out.

In country *home*, the agent's maximization problem is

$$\max_{a_h^h, a_{h'}^h, a_{f'}^h} \quad U^h = \sum_{l=h,h',f'} w^h z_l^h a_l^h - \tfrac{v}{2} \sum_{l=h,h',f'} \left(a_l^h - a_{0,l}^h\right)^2,$$
$$s.t. \sum_{l=h,h',f'} a_l^h = 1 \quad and \quad \sum_{l=h,h',f'} a_{0,l}^h = 1.$$

Similarly to (12), the solution to the agent's maximization problem is given by

$$a_h^{h*} = a_{0,h}^h + \frac{(z_h^h - z_{f'}^j) + (z_h^h - z_{h'}^j)}{3} \frac{w^h}{v}, \qquad a_{f'}^{j*} = a_{0,f'}^j + \frac{(z_{f'}^j - z_h^h) + (z_{f'}^j - z_{h'}^j)}{3} \frac{w^h}{v},$$
$$a_{h'}^{j*} = a_{0,h'}^h + \frac{(z_{h'}^j - z_h^h) + (z_{h'}^j - z_{f'}^j)}{3} \frac{w^h}{v}.$$

The government of this country fixes its respective tax rates according to the following maximization problem

$$\max_{t_h^h, t_{h'}^j} \quad W^h = t_h^h (a_h^{h*} r_h + a_f^{h*} r_f) w^h N^h + t_{h'}^j (a_{h'}^{h*} w^h N^h + a_{h'}^{f*} w^f N^f) r'_h,$$
$$s.t. \;\; t_h^h, t_{h'}^j \leq 1,$$

whose optimal solution are equal to

$$t_h^{h*} = \frac{\left(w^{h2} N^h + w^{f2} N^f\right) \left[70 w^{h2} N^h + w^f N^f \left(29 w^h + 36 w^f\right)\right]}{9r \left(8 w^{h4} N^{h2} + 17 w^{h2} N^h w^{f2} N^f + 8 w^{f4} N^{f2}\right)} \frac{v}{w^h},$$
$$t_{h'}^{j*} = \frac{2v \left[26 w^{h3} N^{h2} + 16 w^{f3} N^{f2} + w^h N^h w^f N^f \left(19 w^h + 20 w^f\right)\right]}{9r \left(8 w^{h4} N^{h2} + 17 w^{h2} N^h w^{f2} N^f + 8 w^{f4} N^{f2}\right)}.$$

Optimal tax rates are even functions of the relative size of the two countries in terms of population and wealth. Having two tax rates to establish, each country can set its domestic tax rate at a higher level and use the withholding tax rate to attract foreign savings. Proposition III holds, with the proviso that larger countries may establish higher values for the optimal tax rates and so face larger leakages of savings towards assets escaping the application of the EU Directive.

E. The US model with costly information

As explained in section 7, when acquiring information is costly, in a regime of information exchange jurisdiction *home* supports the cost (ϕ) of p^f. The tax revenue function becomes then

$$\max_{t_h^h, t_h^f} W^h = t_h^h a_h^{h*} w^h N^h r_h + p^f \left(t_h^h - t_f^h\right) a_f^{h*} (1 - \phi) w^h N^h r_f + t_h^f a_h^{f*} w^f N^f r_h.$$

Due to the presence of ϕ, the equilibrium tax rates in (9) become

$$\begin{aligned} t_h^{h*} &= \frac{2v\left[(a_{0,h}^h - 2p^f)(r_h - p^f r_f) + \left(r_h + (1-2\phi)p^f r_f\right)\right] + (r_h - r_f)\left(r_h - p^f r_f\right) w^h}{(3-2p^f)\left(r_h - p^f r_f\right)^2 w^h}, \\ t_h^{f*} &= \frac{2v\left[a_{0,h}^f(r_f - p^h r_h) + (r_f - \phi p^h r_h)\right] + (r_f - r_h)\left(r_f - p^h r_h\right) w^f}{(3-2p^h)\, r_h \left(r_f - p^h r_h\right) w^f}. \end{aligned}$$

Moving from a unilateral mechanism of getting information on financial accounts of its residents to a cooperative agreement where each partner provides information regarding foreign accounts on its territory transforms the government maximization problem into

$$\max_{t_h^h, t_h^f} W^h = t_h^h a_h^{h*} w^h N^h r_h + p^f (t_h^h - t_f^h) a_f^{h*} \left[1 - (1-\chi)\phi\right] w^h N^h r_f + (\chi\phi) p^h (t_h^f a_h^{f*} w^f N^f r_h),$$

with the optimal solution given by

$$\begin{aligned} t_h^{h*} &= \frac{2v\left[(a_{0,h}^h - 2p^f)(r_h - p^f r_f) + \left(r_h + (1-2\phi)p^f r_f\right)\right] + (r_h - r_f)\left(r_h - p^f r_f\right) w^h}{(3-2p^f)\left(r_h - p^f r_f\right)^2 w^h}, \\ t_h^{f*} &= \frac{2v\left[a_{0,h}^f(r_f - p^h r_h) + (r_f - \phi p^h r_h)\right] + (r_f - r_h)\left(r_f - p^h r_h\right) w^f}{(3-2p^h)\, r_h \left(r_f - p^h r_h\right) w^f}. \end{aligned}$$

As stated in proposition IV, for higher values of χ, that is for larger parts of the information cost ϕ paid by the partner country, the internal tax rate is higher while the external tax rate is lower. Tax revenues increase.

F. Coordinated withholding taxation

Under this scenario countries *home* and $foreign$ transfer each other part of their respective revenues coming from cross-border savings taxation. Nothing changes for the agents decision with respect to what said in the source-based framework. On the contrary, the maximization problem for the government of country *home* can be modified as follows:

$$\begin{aligned} \max_{t_h^h,\, t_h^f} \;& W^h = \left(t_h^h a_h^{h*} r_h + x t_f^h a_f^{h*} r_f\right) w^h N^h + (1-x)\, t_h^f a_h^{f*} r_h w^f N^f, \\ & s.t. \;\; t_h^h, t_h^f \leq 1. \end{aligned}$$

The optimal rates charged by country *home* are now equal to

$$\begin{aligned} t_h^h &= \frac{2v[(1+x)+a_{0,h}^h(1-x)]+(r_h-r_f)w^h(1-x)}{r_h(3-x)w^h} \\ t_h^f &= \frac{2v(1+a_{0,h}^f)+(r_h-r_f)w^f}{r_h(3-x)w^f} \end{aligned}$$

In a framework of coordinated withholding taxation, tax rates are higher than those levied in case of no exchange of information due to the sharing agreement. Proposition V thus holds insofar as the sharing agreement increases the tax revenues of a country.

Finally, allowing the two countries to differ in terms of population, interest rates, and agents' wealth does not affect the efficiency of the tax systems analyzed in this paper. These differences affect agents' portfolio allocation, the value of the optimal tax rates chosen by the governments and consequently the tax revenues collected in each country. As stated in proposition VI, however, only three are the framework ensuring the efficient taxation of international savings: a pure residence-based setting, a framework of perfect exchange of information concerning all assets or strategies, and a system of withholding taxation where withholding tax rates are decided by the country of residence and the whole amount of withholding tax revenues is fully transferred to that country.

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