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Keen, M.; Ligthart, J.E.

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## **REVENUE SHARING AND INFORMATION EXCHANGE UNDER NON-DISCRIMINATORY TAXATION**

By Michael Keen, Jenny E. Ligthart

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# REVENUE SHARING AND INFORMATION EXCHANGE UNDER NON-DISCRIMINATORY TAXATION\*

Michael Keen<sup>†</sup> and Jenny E. Ligthart<sup>‡</sup>

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## Abstract

The international exchange of tax information, and its merits compared to withholding taxes, is the central topic in current debates in international tax policy. The purpose of this paper is to characterize and compare the tax regimes that emerge with and without information exchange, under the assumption that countries are unable to differentiate between the taxes they apply to residents and non-residents. It focuses in particular on the role of asymmetries in country size (capturing a key feature of tax havens) and on the impact and potential desirability of schemes to share the revenue raised by withholding (as under the new EU savings tax arrangements) or (more innovatively) as a consequence of information exchange. It is shown that (irrespective of country size difference) Pareto efficiency requires that all revenue collected from nonresidents be transferred to the residence country—which would require taking the EU practice even further from the norm, but is currently the norm in relation to information exchange. A withholding scheme with revenue fully reallocated in this way Pareto dominates information sharing, whatever the allocation under the latter. Comparing schemes in which there is no revenue sharing, however, shows that information exchange Pareto dominates simple withholding.

**JEL codes:** H77, H87, F42.

**Keywords:** revenue sharing; tax information exchange; tax competition; international tax evasion; withholding taxes.

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<sup>†</sup> Fiscal Affairs Department, International Monetary Fund, 700 19<sup>th</sup> Street, N.W., Washington D.C. 20431, United States. Tel: (+1)-202-623-4442, Fax: (+1)-202-623-4199, E-mail: [mkeen@imf.org](mailto:mkeen@imf.org).

<sup>‡</sup> Corresponding Author: Department of Economics and CentER, Tilburg University, P.O. Box 90153, 5000 LE Tilburg; and Department of Economics, Groningen University, the Netherlands. Tel: (+31)-466-8755, Fax: (+31)-466-3042, E-mail: [j.ligthart@uvt.nl](mailto:j.ligthart@uvt.nl).

## I. INTRODUCTION

The exchange of information on specific taxpayers between national tax authorities has emerged as a key topic in policy discussions on international taxation. The problem to which information exchange is addressed is an old one: the ease with which residents can escape capital income taxation under the residence principle by investing abroad and failing to declare the proceeds to their home tax authorities. Due to advances in technology and integration of national capital markets, tax authorities have to cope with an increasing number of ‘disappearing taxpayers,’ prompting calls for an internationally coordinated policy response. Much progress has indeed been made to strengthen information exchange, with the coming into effect of the EU savings tax directive in July 2005 and the refocusing of the OECD’s harmful tax practices project on transparency and information exchange (leading to the release in 2002 of the OECD’s model treaty for tax information exchange on request (OECD, 2002)).

The aim of the EU savings tax directive is to effectively tax savings income—in the form of interest paid to individuals of other member countries—in accordance with the tax laws of the investor’s country of residence. To this end, 22 member countries will automatically exchange with each other tax information on EU residents’ cross-border savings income. Two central features of the savings tax directive are taken up in this paper. First, instead of providing information, three of the smaller EU member countries (Austria, Belgium, and Luxembourg) are allowed to levy a withholding tax on the savings income of residents of other member countries.<sup>1</sup> In addition, six of the ten dependent and associated territories of the Netherlands and United Kingdom—with an average population of about 63,000—have opted to implement a nonresident withholding tax<sup>2</sup> in order to meet the savings tax directive’s requirement of the adoption of measures ‘similar’ to those of the EU member states. This raises the question, which others have also addressed,<sup>3</sup> of whether differences in country size can explain small countries’ apparent preference for withholding taxes rather than information sharing.

The second feature of the savings tax directive concerns its innovative revenue-sharing formula. Countries levying withholding taxes are required to transfer 75 percent of the

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<sup>1</sup> From the date of implementation of the savings tax directive, Austria, Belgium and Luxembourg will apply a withholding tax at a rate of 15 percent during the first three years, 20 percent starting from January 2008, and 35 percent from January 2011 onwards (European Commission, 2003). The 35 percent non-resident withholding tax corresponds to the Swiss resident withholding tax on interest and dividend income. It should be noted too that the savings tax directive requires key ‘third countries’ such as Switzerland and the United States to impose measures equivalent to those of Austria, Belgium, and Luxembourg. Accordingly, from 2011 onwards, Switzerland will apply a non-discriminatory withholding tax unless Austria, Belgium, and Luxembourg switch to automatic exchange of information, in which case Switzerland will implement automatic exchange too. (See Keen and Ligthart, 2005b).

<sup>2</sup> The six jurisdictions that will impose a nonresident withholding tax are: British Virgin Islands, Jersey, Guernsey, Island of Man, Netherlands Antilles and Turks and Caicos Island. Four jurisdictions—Aruba, Anguilla, the Cayman Islands and Montserrat—have chosen to share information.

<sup>3</sup> See in particular Huizinga and Nielsen (2003), Eggert and Kolmar (2004), and Keen and Ligthart (2005a)

revenue raised to the country of residence of the investor. While the EU appears to have designed this scheme to reallocate some of the revenue in accordance with the residence principle, it raises a series of (much less-studied) issues: Will these transfers in themselves affect countries' tax setting behavior and hence their tax revenues? If so, to which country should the revenue be allocated in order to maximize global revenue? Do countries' interests diverge in terms of the allocation of revenue?

Mirroring the EU's revenue sharing rule under withholding taxes, one could also envisage a novel revenue-sharing scheme, in which countries transfer some of the additional revenue collected from information sharing to the country that provided the information. Would such a revenue-sharing arrangement have positive incentive effects? More specifically, would it be able to induce small countries to switch from withholding taxation to information sharing? Could it be in the interest of high-tax countries to transfer revenue in this way?

The theoretical literature on tax information exchange remains relatively small. Central contributions are those of Bacchetta and Espinosa (1995, 2000), Eggert and Kolmar (2002a, 2002b, 2004), Huizinga and Nielsen (2003), and Keen and Ligthart (2005a): see Keen and Ligthart (2005b) for a survey.<sup>4</sup> A central feature of most of these analyses is the ability of each country to charge different capital income tax rates to residents and nonresidents.<sup>5</sup> The present paper, however, considers the case in which countries cannot discriminate in this way. More specifically, it applies Kanbur and Keen's (1993) partial equilibrium model of commodity taxation and cross-border shopping—which explicitly allows for differences in country size and non-discriminatory taxation—to the taxation of cross-border capital flows. Tax information exchange is integrated into the model with a view to analyze small countries' incentives to participate in bilateral information sharing agreements. The analysis focuses in particular on the revenue effects of innovative revenue-sharing arrangements as described above. In this respect, it builds on Keen and Ligthart (2005a), who study revenue-sharing arrangements when governments can discriminate between residents and nonresidents for tax purposes.

Why consider the case in which taxes must be non-discriminatory, when in practice many countries do formally apply different rates to residents and non-residents? Though not necessarily the leading case, it deserves consideration for three main reasons.

First, as a matter of descriptive reality such differentiation is for many countries very hard to enforce, with residents effectively able to masquerade as non-residents (in some cases, if need be, by round-tripping their funds through intermediaries abroad. Thus Lebanon, for example, applies its 5 percent tax on interest income to residents and non-residents alike in large part precisely because it knows the ease with which residents—many of them highly mobile—can represent themselves as non-resident. Even when there is formal discrimination, these practical difficulties can clearly make its enforcement problematic. And it seems likely

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<sup>4</sup> That paper also provides an overview of the institutional arrangements of information sharing.

<sup>5</sup> Notable exceptions are Bacchetta and Espinoza (1995) and Eggert and Kolmar (2004).

that developments in technology and the financial sector will only intensify these practical difficulties in the years ahead.

A second reason for giving some consideration to this case is that an important theme in recent discussions of international taxation has been precisely the question of whether or not it is in the collective interest to permit discrimination between residents and nonresidents; or, more generally, of whether it is desirable that countries offer favorable tax treatment to activities ‘ring-fenced’ from the domestic market.<sup>6</sup> Concern at such practices led the OECD (1998) to identify them as potentially harmful, as they also are under the EU’s code of conduct on business taxation. While the OECD subsequently dropped this criterion in its work on non-OECD members, the issue still hangs in the air. These policy developments have in turn led to a series of formal analyses comparing the outcomes of tax competition games with and without non-discrimination provisions.<sup>7</sup> That is not the purpose here, however: rather the point is that, for both practical and policy reasons, discriminatory treatment may become less tenable over the coming years, so that it is of importance to understand the implications of this for information sharing.

Finally, imposing non-discriminatory taxation provides a simple way of endogenizing the tax rate charged to residents, which Huizinga and Nielsen (2003) and Keen and Ligthart (2005a) take to be fixed at some arbitrary level common to both countries. In this respect, assuming the two tax rates to be identical but endogenous is not obviously less attractive than the approach adopted in those papers of fixing one at some arbitrary level common to both countries. One of the striking implications of the framework of a fixed resident tax, for instance, is that all tax rates are independent of country size. But this clearly fails to capture an important feature of reality; non-discrimination, it will be seen, establishes a purposive and plausible role for country size in the setting of taxes.

The next section sets out the model used, and analyzes the non-cooperative equilibrium with and without information sharing. Section III compares the two outcomes. Finally, Section IV concludes.

## II. REVENUE SHARING IN A TWO-COUNTRY MODEL

Drawing on Kanbur and Keen (1993), we consider a world consisting of two countries, ‘small’ (lower case) and ‘large’ (upper case), differing in population size. Each population, comprising immobile and risk-neutral households, is distributed uniformly within each country, with the number of people in the large country,  $N$ , assumed throughout to be at least as great as in the small,  $n$ ;  $\theta \equiv n/N \leq 1$  denotes the relative population size. Each individual

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<sup>6</sup> A number of ‘tax havens,’ for instance, charge enterprises that are formally resident but have no substantial activity in the domestic market a rate of corporation tax far below that charged to domestic firms: in the order of 1-5 percent, for example, rather than 30-40 percent.

<sup>7</sup> See Janeba and Peters (1999), Keen (2001), and Janeba and Smart (2003).

has one unit of savings to invest.<sup>8</sup> This they can do either at home or abroad: the former is costless, but the latter incurs transactions costs of  $\delta S$ , where  $S \in [0, 1]$  is an index representing the investor's 'distance' from the border and  $\delta > 0$  denotes unit 'transport' costs (reflecting communication, information, travel or other transactions costs associated with depositing funds abroad).<sup>9</sup> Governments, it is assumed, simply seek to maximize their tax revenue.<sup>10</sup> They play Nash in tax rates, taking as given the parameters describing arrangements for revenue sharing and tax information exchange, but taking into account the impact of tax rates on households' savings allocation. Households decide on their foreign savings after observing governments' choices of capital income tax rates.

A key assumption of the analysis is that countries reach binding agreements on information sharing but set tax rates non-cooperatively. This mimics an important feature of international tax negotiations, with countries more willing to agree on tax and information sharing treaties (which are long-term in nature) than on key tax rates and bases (which may be changed more easily). Given this sequencing of decisions, much of the attention in what follows focuses on the comparative static effects of changes in the revenue-sharing parameter.

Suppose then that each country sets a single capital income tax rate (in specific form,  $t$  in the small country and  $T$  in the large country), applying to residents and nonresidents alike, just as in Kanbur and Keen (1993). The pre-tax rate of interest,  $\rho$  (taken as fixed), is assumed to be the same in each country, with  $\rho - t - \delta S > 0$ . Further, to simplify the statement of results below it is convenient to assume that  $\rho$  is infinite. We also assume that governments have complete information about investments made within their own borders, but none on the investments abroad of their own residents: this captures the key concern that residents do not report their cross-border savings income to their home tax authorities. Accordingly, the household's investment decision turns on comparing the transactions costs incurred in investing abroad with the taxes saved in doing so.<sup>11</sup> An immediate implication, it should be noted, is that—in sharp contrast to the 'cross-hauling' that arises in Huizinga and Nielsen (2003) and Keen and Ligthart (2005a)—cross-border savings will go in one direction only: toward the country with the lower tax rate. Note too that if the gross interest rate is unboundedly large, the first-best (or cooperative) outcome has both  $t$  and  $T$  infinitely large.

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<sup>8</sup> We do not distinguish between physical capital (foreign direct investments) and financial capital (portfolio investments) so that we can use 'savings' and 'investments' interchangeably. See Eggert and Kolmar (2002a, 2002b, 2004) for a more elaborate model featuring such a distinction.

<sup>9</sup> Of course, transactions costs are in practice relevant for both domestic and foreign investments, but the former are not modeled; what matters is that there is a cost differential between the two.

<sup>10</sup> Results from the tax competition literature—especially Trandel (1994) and Haufler (1996)—suggest that similar conclusions to those below would be obtained if the objective of each government were instead to maximize domestic welfare (a weighted sum of tax revenues and the surplus enjoyed by residents on their savings), so long as the weights attached to the provision of local public goods in the two countries are not too dissimilar.

<sup>11</sup> Because investors are assumed to be risk neutral, non-tax motives for holding cross-border deposits—such as portfolio diversification—are abstracted from.

Below, we study two (non-cooperative) regimes to tax cross-border savings. First, we study ‘pure’ withholding, where countries have access to withholding taxes only and cannot exchange information. The second regime analyzed allows for information exchange combined with the levying of withholding taxes. This model feature—allowing countries to simultaneously exchange information and levy withholding taxes—differs from most previous treatments<sup>12</sup> but matches the reality of the EU savings tax directive and established information exchange treaties. For example, Article 16 of the EU savings tax directive states: “member states explicitly retain the right to impose withholding taxes in accordance with their national laws and double tax conventions.” If there were no withholding in our framework, the adoption of information exchange would entirely eliminate any revenue gain from attracting cross-border deposits.<sup>13</sup>

### A. Withholding Taxation Only

In this first case, a resident of the large country ‘located’ at a distance  $S$  from the border chooses to invest abroad if and only if  $\rho - t - \delta S > \rho - T$ . Assuming that it is the small country that sets the lower tax rate (as, it will be verified below, turns out to be the case in a Nash equilibrium), all those residents in the large country located closer to the border than  $\hat{S} \equiv (T - t)/\delta$  save abroad. (It is assumed that in case of equal returns, households prefer to save at home.)

Generalizing the novel feature of the EU savings tax directive stressed in the Introduction, we allow for revenue transfers between countries: a proportion  $\lambda$  of the withholding tax revenue that is collected from nonresidents is passed on by the source country to the residence country, which retains the remaining  $1 - \lambda$ . Thus the EU scheme corresponds to  $\lambda = 0.75$ . The case without revenue sharing (that is,  $\lambda = 0$ ) is referred to as ‘simple’ withholding whereas full revenue sharing is denoted by  $\lambda = 1$ . Revenues of the small and large countries are thus:

$$r(t, T, \lambda) = t(n + (1 - \lambda)N\hat{S}), \quad (1)$$

$$R(t, T, \lambda) = TN(1 - \hat{S}) + \lambda tN\hat{S}. \quad (2)$$

The first term of (2), for example, is the revenue that the large country collects from the proportion  $1 - \hat{S}$  of its own residents who save at home, whereas the second is the transfer that the large country receives in respect of the withholding tax paid abroad by its own residents who have invested in the small country. Equation (1) reflects the fact that residents of the small country do not save abroad ( $\hat{s} = 0$  because the small country sets the lower tax).

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<sup>12</sup> Note that this point is also taken up in Keen and Ligthart (2005a).

<sup>13</sup> An advantage to attracting savings could be created by adding profits or externalities from the activities of the financial sector (as in Huizinga and Nielsen (2003) and Eggert and Kolmar (2004)).

Each country chooses its tax rate to maximize national revenue, taking as given the tax rate set by the other country and the revenue-sharing parameter. Withholding tax rates in the non-cooperative equilibrium for the two countries are then routinely found to be:

$$t^* = \delta \left[ \frac{1 - \lambda + 2\theta}{(3 - \lambda)(1 - \lambda)} \right], \quad \lambda \neq 1, \quad (3)$$

$$T^* = \delta \left[ \frac{2(1 - \lambda) + (1 + \lambda)\theta}{(3 - \lambda)(1 - \lambda)} \right], \quad \lambda \neq 1, \quad (4)$$

where asterisks denote equilibrium values. Equilibrium tax rates<sup>14</sup> are now asymmetric, being lower in the small country (since  $(T - t)^* = \delta(1 - \theta)/(3 - \lambda) > 0$  for  $\theta < 1$ ), so that cross-border savings  $S^* = (1 - \theta)/(3 - \lambda) > 0$  do indeed go only from the large country to the small.<sup>15</sup> The reason for this is familiar: in cutting its tax rate, the smaller country has less to lose in terms of reduced revenue from its domestic tax base and more to gain by attracting some of the foreign tax base. If the countries are of the same size (that is,  $\theta = 1$ ) then  $t^* = T^* = \delta/(1 - \lambda) > 0$ , implying that there are no international capital flows.

We can now easily derive:

**Lemma 1:** *The withholding tax rates of both countries are increasing in the proportion of revenue from the withholding tax that the source country passes to the residence country.*

**Proof:** Differentiating (3) and (4) gives  $dt^*/d\lambda > 0$  and  $dT^*/d\lambda > 0$ .  $\square$

This is in sharp contrast to the finding of Keen and Ligthart (2005a) that when taxes are discriminatory the revenue sharing parameter has no effect on equilibrium withholding tax rates, and so affects only the distribution of a fixed amount of revenue. Here, that is no longer the case: tax rates in *both* countries are higher the smaller is the proportion of withholding tax revenue that is retained by the source country.

That the tax rate in the larger country increases with  $\lambda$  is not surprising: the higher is  $\lambda$  the less is the effective ability of residents of the large country to escape paying some kind of tax to their home government by saving abroad, and hence the less inclined is the large country to moderate its tax rate to prevent such capital flight. Note that the large country does not transfer any revenue itself because residents of the small country do not deposit their savings abroad, reflecting the lower tax rate at home. The much less obvious conclusion that taking revenue away from the small country will also induce it to set a higher tax rate reflects two considerations. The first is a negative *direct* effect, applying for any given level of the foreign tax rate: the higher is  $\lambda$ , the less the small country has to gain by attracting foreign

<sup>14</sup> The equilibrium is unique, as can be shown along the lines in Kanbur and Keen (1993).

<sup>15</sup> This is consistent with empirical evidence. Hines (1999) finds a positive relationship between country size and the level of capital income tax rates.

savers, since more of the tax they pay will be reallocated to the residence (or large) country. The second is a positive *strategic* effect. An increase in  $\lambda$  induces the large country to set a higher tax rate; and this enables the small country to increase its own tax rate without reducing the extent of inward savings, thereby increasing its revenue.<sup>16</sup>

It is clear from Lemma 1 that an increase in  $\lambda$  will increase the aggregate of tax revenues across the two countries. But it also shifts the distribution of those revenues away from the small country to the large. This suggest that the large country will benefit from an increase in the proportion of the withholding tax revenue that is transferred to it; for the small country, however, there are conflicting effects at work. The following verifies this for the large country, and shows too that for a sufficiently small country the adverse distributional effect of a little revenue sharing will outweigh any effect through increased aggregate revenues:

**Lemma 2:** *Under withholding taxation, revenue sharing has the following effects on national revenues:*

- (i)  $dR(\lambda, \theta)/d\lambda > 0 \quad \forall \lambda \in [0, 1) \quad \forall \theta$ ; and
- (ii)  $dr(0, \theta)/d\lambda < 0$  for  $\lambda = 0 \wedge 0 < \theta < 0.1$ .

**Proof:** Substituting (3)-(4) into (1)-(2) yields equilibrium revenues for the small and large country, respectively:

$$r(\lambda, \theta) = \left( \frac{\delta N}{1-\lambda} \right) \left( \frac{1-\lambda+2\theta}{3-\lambda} \right)^2, \quad (5)$$

$$R(\lambda, \theta) = \left( \frac{\delta N}{1-\lambda} \right) \left( \frac{4\theta + (1-\lambda)(4-\lambda+\theta^2)}{(3-\lambda)^2} \right), \quad (6)$$

where  $R(\lambda, \theta) > r(\lambda, \theta)$  strictly holds for all values of  $\lambda$  in the admissible range.

For part (i), from (6) it is readily verified that, as one would expect, the large country unambiguously gains from an increase in  $\lambda$ :

$$\frac{dR(\lambda, \theta)}{d\lambda} = \frac{\delta N \left[ 4\theta(5-3\lambda) + (1-\lambda)^2(5-\lambda+2\theta^2) \right]}{(1-\lambda)^2(3-\lambda)^3} > 0. \quad (7)$$

Part (ii) can be derived in a similar fashion. Differentiating (5) with respect to  $\lambda$  yields the revenue effect for the small country:

$$\frac{dr(\lambda, \theta)}{d\lambda} = \frac{\delta N(1-\lambda+2\theta) \left[ 2\theta(5-3\lambda) - (1-\lambda^2) \right]}{(1-\lambda)^2(3-\lambda)^3}, \quad (8)$$

<sup>16</sup> It is easy to show that the small country raises its tax rate by half the increase in the tax rate of the large country whereas the large country increases its tax rate by  $(1+\lambda)/2$ , which is larger than a  $1/2$  for  $\lambda > 0$ .

and by evaluating (8) at  $\lambda = 0$ , for instance, one finds

$$\frac{dr(0, \theta)}{d\lambda} = \frac{\delta N}{3^3} (1 + 2\theta)(10\theta - 1), \quad (9)$$

which is strictly negative for a very small country (that is,  $\theta < 0.1$ ).  $\square$

Part (ii) of the lemma shows that a very small country is harmed by a small transfer of its withholding tax revenue to the residence country. But it is also clear from (5) that its revenue becomes unboundedly large as the proportion of its receipts so transferred approaches 100 percent. Thus the relationship between the small country's revenue and the extent of revenue-sharing is not monotonic, and that, more specifically:

**Proposition 1:** *Pareto efficiency under withholding taxation requires that—counter to usual practice—all revenue collected from nonresidents is transferred to the residence country.*

**Proof:** From (5) and (6), revenues in each country increase without limit as  $\lambda \rightarrow 1$ , so enabling any other scheme to be Pareto dominated.  $\square$

In this case, a reallocation of revenue of the kind prescribed by the EU savings tax directive—with 75 percent transferred to the residence country—not only brings the allocation of revenues closer to that under the residence principle, but changes the strategic nature of the interaction between the countries in a way that is beneficial to both.

## B. Information Exchange

When information exchange is in place, investors not only pay the nonresident withholding tax on their foreign savings income, but also run the risk of being caught not reporting this income to their home tax authorities. With some probability  $p \in [0, 1)$ , assumed to be the same for both countries,<sup>17</sup> the source country passes on information to the residence country that enables its tax authorities to bring a resident's foreign source income into tax (with a full credit assumed to be given for taxes paid abroad). For simplicity, penalties for concealing foreign interest income are ignored. In addition, it is assumed that there are no costs associated with the collection and transmission of information. Thus, a resident of the large country located at a distance  $S$  from the border will save abroad if and only if  $\rho - t - p(T - t) - \delta S > \rho - T$ , so that the volume of cross-border savings is  $\hat{S} \equiv (1 - p)(T - t) / \delta$ .

The EU savings tax directive leaves all the additional revenue collected as a result of information sharing with the residence country, as is the wider international norm. The possibility suggests itself, however, that reallocating some of the revenue to the country that provided the information might improve matters by giving the latter a stronger incentive to

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<sup>17</sup> To retain symmetry, countries are assumed to face a similar  $p$ , which is a reasonable assumption for OECD countries exchanging information automatically under established treaties.

supply information. Thus, mirroring revenue sharing under withholding, we suppose that the residence country transfers to the source country a proportion  $1 - \mu$  of the revenue it collects as a result of information passed to it by the latter, retaining the rest ( $\mu \geq 0$ ) for itself.<sup>18</sup> We refer to the current norm,  $\mu = 1$ , as ‘simple’ information exchange. If, at the opposite extreme,  $\mu = 0$ , then all revenue is passed to the source country. The parameter  $p$  is taken as fixed in order to focus on the effects of revenue sharing.<sup>19</sup> To guarantee a stable equilibrium, one must further restrict the admissible range for  $p$ : we assume  $p \in [0, 1/(2(1 - \mu))]$  for  $\mu \in [0, 1/2]$  and  $p \in [0, 1/(2\mu)]$  for  $\mu \in [1/2, 1]$ . These bounds on  $p$  imply less than full information exchange. There are indeed likely to be limits on the ability of the residence country to make effective use of all the information it receives owing to, for example, the absence of a common taxpayer identification number or linguistic difficulties or both. Thus the parameter  $p$  could also be interpreted as the effectiveness of information sharing (see Keen and Ligthart, 2005a).

Revenues, inclusive of the side-payments to the small country are now

$$r(t, T, \mu) = t(n + N\hat{S}) + (1 - \mu)(T - t)pN\hat{S}, \quad (10)$$

$$R(t, T, \mu) = TN(1 - \hat{S}) + \mu(T - t)pN\hat{S}. \quad (11)$$

The second term of (10) is the revenue transfer that the small country receives from the large country; under simple information exchange, it vanishes. The second term in (11) is the revenue that the large country acquires by bringing into the tax net those of its own non-complying taxpayers who have been identified by the small country to have deposited funds there.

With  $p$  and  $\mu$  taken as exogenous, reflecting the long-term nature of information sharing treaties, each government maximizes revenue taking as given the tax rate of the other country. This is readily shown to imply equilibrium tax rates of:

$$t^* = \delta \left[ \frac{1 + 2\theta - 2p(1 - \mu(1 - \theta))}{(3 - 2p)(1 - p)} \right], \quad (12)$$

$$T^* = \delta \left[ \frac{2 + \theta - 2p(1 - \mu(1 - \theta))}{(3 - 2p)(1 - p)} \right], \quad (13)$$

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<sup>18</sup> Of course, the source country still retains any revenue from its withholding tax.

<sup>19</sup> It can be shown—See Appendix A—that when  $p$  is set endogenously and all revenues are retained by the residence country (that is,  $\mu = 1$ ), the small country has an incentive to provide information even without revenue sharing: due to the strategic effect, it will unilaterally set  $p$  as high as it can.

Subtracting (12) from (13) yields  $(T - t)^* = \delta(1 - \theta) / ((3 - 2p)(1 - p)) > 0$ , confirming that the small country indeed sets the lower tax rate in equilibrium.<sup>20</sup> More important for present purposes is Lemma 3.

**Lemma 3:** *For  $\theta < 1$ , the equilibrium tax rates of both countries are increasing in the proportion of the revenue associated with information sharing that is retained by the residence country (that is, increase with  $\mu$ ).*

**Proof:** Differentiating (12)-(13) with respect to  $\mu$  yields:

$$\frac{dt^*}{d\mu} = \frac{dT^*}{d\mu} = \frac{\delta 2p(1-\theta)}{(1-p)(3-2p)}, \quad (14)$$

which is positive for  $\theta < 1$ .  $\square$

Thus both tax rates are always higher—assuming asymmetric countries—the greater the proportion of the revenue from information sharing that is retained by the residence country and thus the less it transfers to the source country. The intuition for this is broadly as for revenue sharing under withholding, with each country having less to lose from setting a high tax rate (in terms of reducing its attractiveness relative to the other country) and each then able to set a higher tax rate in response to a higher tax rate abroad. Revenue sharing has no effect on equilibrium tax rates, however, when the two countries are equal in size (that is,  $\theta = 1$ ). The reason, loosely speaking, is that since the two countries in this case set the same tax rate in equilibrium, information exchange in itself raises no additional tax revenue (see the second term in (10)-(11)). At the margin, the existence of information exchange thus has no effect on the gain or loss that countries suffer from inducing a little more or less cross-border saving, and so has no effect on their incentives in tax setting.

When countries have the same size, the extent of revenue sharing under information sharing not only has no effect on aggregate revenue: it does not even affect the allocation of revenues across countries, since—tax rates being symmetric and cross-border savings zero—there is no revenue to share. With  $\theta < 1$ , on the other hand, one would expect both the general increase in tax rates and the reallocation of revenue to leave the large country better off as  $\mu$  increases. For the small country, the distributional effect again acts to counter the strategic gain from higher tax rates. The next proposition shows, however, that—in contrast to the discriminatory case of Keen and Ligthart (2005a)—the strategic effect always dominates.<sup>21</sup> Intuitively, as the residence country retains more of the revenue from information exchange, the small country gains more from the increase in tax rates this induces than it loses from the transfer itself.

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<sup>20</sup> The corresponding revenue expressions for the case of  $\mu = 1$  are equations (A.1)-(A.2) in Appendix A.

<sup>21</sup> In their framework of discriminatory taxation, revenue sharing may nevertheless have a useful role to play in alleviating the conflict between small and large countries.

**Proposition 2:** *When countries are asymmetric ( $\theta < 1$ ), revenues in both are strictly increasing in the proportion of the additional revenue raised from information sharing that is retained by the residence country. When countries are of the same size ( $\theta = 1$ ), aggregate revenue is independent of  $\mu$ .*

**Proof:** Note first, from (14), that cross-border savings  $\hat{S}$  (which depend on the difference in tax rates) remain unchanged in the face of an increase in both taxes induced by an increase in  $\mu$ . The results for  $\theta = 1$ , and for the small country more generally, follow from differentiating (10) and using (12)-(13) to find:

$$\begin{aligned} \frac{dr}{d\mu} &= \frac{dt^*}{d\mu} (n + N\hat{S}) - p(T-t)N\hat{S} \\ &= \frac{dt^*}{d\mu} n + N\hat{S} \frac{\delta p(1-\theta)}{(1-p)(3-2p)}, \end{aligned} \quad (15)$$

which is strictly positive for  $\theta < 1$  (from (14)) and zero for  $\theta = 1$ . Similarly, for the large country it is easily shown that:

$$\frac{dR}{d\mu} = \frac{dT^*}{d\mu} N(1-\hat{S}) + N\hat{S} \frac{\delta p(1-\theta)}{(1-p)(3-2p)}, \quad (16)$$

which is also strictly positive for  $\theta < 1$  and zero for  $\theta = 1$ .  $\square$

### III. COMPARING OUTCOMES WITH AND WITHOUT INFORMATION EXCHANGE

When the choice of revenue-sharing scheme is unrestricted, the comparison between the two taxation regimes is straightforward. Propositions 1 and 2 seem to give rise to a strong dominance result:

**Proposition 3:** *Revenue in both countries is always lower under information exchange, whatever revenue-sharing scheme is adopted, than under pure withholding with revenue from withholding allocated entirely to the residence country.*

**Proof:** From (5) and (6), under pure withholding revenues in both countries tend to infinity as  $\lambda \rightarrow 1$ .<sup>22</sup>  $\square$

Any outcome under information exchange can thus be Pareto dominated by a scheme in which information is not exchanged, but a sufficiently large proportion of the withholding tax revenue collected from nonresidents returned to the country of residence of the investor. Indeed, allocating all revenue to the residence country enables the first-best outcome to be

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<sup>22</sup> The essence of the result would clearly remain, but the proof and statement be more involved, if  $p$  were bounded but sufficiently high.

achieved without information exchange; under information exchange, in contrast, there is no way of sharing the revenues from information transfers so as to achieve the first best.

This differs from the finding in Keen and Ligthart (2005a) that, under discriminatory taxation, aggregate revenue is always higher under information exchange. Here, in contrast, aggregate revenues are higher—at least for some revenue sharing scheme—under non-discriminatory withholding. The reason for this difference, it seems, is that when discrimination is allowed information sharing tends to mute competition for mobile tax bases by tying the tax rate on nonresidents, over which countries compete, to the (higher) rate on residents (because those reported to their home authorities ultimately pay the rate on residents), and the strategic interaction in tax setting thus brings the resident tax rate to bear on the nonresident rate. This effect is not at work, however, when countries are unable to discriminate between residents and nonresidents; and the potential for information sharing to mitigate tax competition is consequently reduced.

The dominance result in Proposition 3 does not mean, however, that *any* withholding regime dominates *any* information-sharing regime. On the contrary:

**Proposition 4:** *Both countries prefer simple information exchange ( $\mu = 1$ ) to simple withholding taxation ( $\lambda = 0$ ) for all values of  $p$  in the admissible range.*

**Proof:** See Appendix B.  $\square$

This is the same conclusion as Keen and Ligthart (2005a) draw for the non-discriminatory case. It is thus a fairly robust result that both countries tend to prefer simple information sharing to withholding alone when the allocation of revenue under each is as under the international norm.

#### IV. CONCLUSIONS

The paper has studied the incentive effects of information exchange and revenue sharing in the effective taxation of cross-border capital flows when asymmetric countries cannot discriminate between residents and nonresidents.

A central conclusion is that in this case both countries—small (low tax) and large (high tax) prefer simple information exchange (under which all revenue arising from information sharing accrues to the residence country) to simple withholding (under which all revenue from the withholding tax is retained by the source country). This runs counter to the normal presumption—and the results of Keen and Ligthart (2005a)—that small countries prefer withholding. The reason for this is that the large country then responds to the reduced attractions of saving abroad consequent upon information exchange by raising the tax it charges on its residents, which is in itself a source of benefit to the small country.

The paper also emphasizes that revenue-sharing schemes not only affect the distribution of revenue across countries—they may also have important incentive effects. In the model analyzed here, efficiency—in terms of total tax revenue—requires that all revenue from

withholding be allocated to the residence country, not the source country that collects it. This runs counter to standard practice, but provides some support for the innovative revenue sharing feature of the new EU savings tax directive (though we doubt that the strategic effects driving this result were the underlying rationale for this measure). Large countries benefit more from revenue sharing under withholding than small countries, and if the disparity in country size is large enough, small countries may even lose revenue. In that case, the positive strategic effect of revenue sharing is dominated by the adverse distributional effect of passing revenue to the large country. Strikingly, the small (low-tax) country is sure to benefit from revenue sharing under a withholding tax scheme only if a sufficiently large share of the revenue is allocated away from it, towards the high-tax country (because it is only then that the strategic effect becomes large enough to dominate the adverse distributional one).

Under information exchange, on the other hand, tax revenues in both countries are strictly increasing in the proportion of revenue from information exchange that is retained by the residence country. Accordingly, efficiency requires that source countries not be compensated for their passing on of information. In this respect, the results here tend to validate (and by the same token perhaps also serve to explain) current international norms. There are of course many aspects of the information sharing issue that have not been taken into account here, such as the role of ‘third countries’ providing tax-free and information-free savings, the possibility of mixed regimes (where one country adopts information sharing and the other withholding taxes), and the role of bank profits on a country’s choice of taxation regime. These and other extensions would no doubt add further considerations to the analysis, but we suspect that the effects explored here would retain some force.

## APPENDIX

### A. Proof of Footnote 19

To arrive at the revenue expression for the small country for the case of simple information exchange, substitute equations (12) and (13) into (10) and set  $\mu = 1$ :

$$r(p, \theta) = \left( \frac{\delta N}{1-p} \right) \left( \frac{(1+2\theta(1-p))}{(3-2p)} \right)^2. \quad (\text{A.1})$$

Differentiation shows the term inside the second brackets to be increasing in  $p$  if  $\theta < 1$ , and independent of  $p$  otherwise; the result follows. Similar reason applies to the large country, with

$$R(p, \theta) = \left( \frac{\delta N}{1-p} \right) \left( \frac{(\theta+2(1-p))^2 + p(1-\theta)(5-4p+\theta)}{(3-2p)^2} \right). \quad (\text{A.2})$$

Note that there are limits to the gain of the small country. When  $p$  reaches the level at which the equilibrium  $T$  equals  $\rho$ , further increases will leave  $T$  unaffected and so must be disadvantageous to the low-tax country.  $\square$

### B. Proof of Proposition 4

Start with the small country. Using (5) with  $\lambda = 0$  and (A.1), yields the difference in revenue under simple information exchange (IE) and simple withholding taxation (WT) for the small country:

$$\gamma(p, \theta) \equiv r^{IE}(p, \theta)|_{\mu=1} - r^{WT}(\theta)|_{\lambda=0} = \delta N \left[ \frac{(1+2\theta(1-p))^2}{(1-p)(3-2p)^2} - \left( \frac{1+2\theta}{3} \right)^2 \right], \quad (\text{A.4})$$

with the following partial derivative with respect to relative country size:

$$\gamma_\theta(p, \theta) = \frac{\delta N 8p [3(2+\theta) - 2p(1+2\theta)]}{3^2(3-2p)^2} > 0. \quad (\text{A.5})$$

if  $p > 0$ . It also easily follows that the revenue difference is everywhere positive on  $\theta \in [0, 1]$  for values  $p \in (0, 1)$ :

$$\gamma(p, 1) = \frac{\delta N p}{1-p} \geq \gamma(p, 0) = \frac{\delta N [3^2 - (1-p)(3-2p)^2]}{3^2(1-p)(3-2p)^2} > 0, \quad (\text{A.6})$$

where  $\gamma(0, 1) = \gamma(0, 0) = 0$  for  $p = 0$ , while  $\gamma(p, 1)$  strictly dominates  $\gamma(p, 0)$  if there is a positive amount of information sharing.

For the large country, substitute  $\lambda = 0$  into (6) and use (A.2) to arrive at an expression for the revenue difference:

$$\begin{aligned} \Gamma(p, \theta) &\equiv R^{IE}(p, \theta)|_{\mu=1} - R^{WT}(\theta)|_{\lambda=0} = \\ &= \delta N \left[ \frac{(2(1-p) + \theta)^2 + p(1-\theta)(5-4p+\theta)}{(1-p)(3-2p)^2} - \left( \frac{2+\theta}{3} \right)^2 \right], \end{aligned} \quad (\text{A.7})$$

which varies as follows with country size:

$$\Gamma_\theta(p, \theta) = \left( \frac{\delta N}{1-p} \right) \left[ \frac{4p^2(2+\theta)^2 + 3(19+4\theta(1+\theta)) - 4p(16+\theta(7+4\theta))}{3^2(3-2p)^2} \right] > 0, \quad (\text{A.8})$$

for  $p > 0$  and so the revenue difference is everywhere positive on the interval  $\theta \in [0, 1]$ :

$$\Gamma(p,1) = \frac{\delta Np}{1-p} \geq \Gamma(p,0) = \frac{\delta Np(57-64p+16p^2)}{3^2(1-p)(3-2p)^2} > 0. \quad (\text{A.9})$$

where  $\gamma(0,1) = \gamma(0,0) = 0$  for  $p = 0$ .  $\square$

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