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Tax avoidance with cross-border hybrid instruments ☆

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ABSTRACT

The rules demarcating debt and equity for tax purposes differ between countries, hence the possibility that a hybrid financial instrument is treated as equity in one country and debt in another. This may create a scope for tax avoidance by allowing firms that invest in foreign countries to combine tax deductible interest expenses in the host country and tax favored dividend income in the home country. In this paper, we first develop a formal model of hybrid instruments and show that, for a given pair of countries, firms in at least one country and sometimes in both can avoid taxes on investment in the other country with a cross-border hybrid instrument. We then investigate why countries tend to allow the use of hybrid instruments for tax avoidance and show that even if effective anti-avoidance rules are available, there exists a global policy equilibrium in which no country uses such rules.

1. Introduction

> "*In exchange for capital, corporations can offer investors any set of rights that can be described by words, subject to any conceivable set of qualifications, and in consideration of any conceivable set of offsetting obligations*".
>
> [Hariton (1994)]

While hybrid financial instruments may combine characteristics of debt and equity in any number of ways, tax systems generally categorize all such instruments as either debt or equity. Just as tax rules vary between countries in other respects, there is considerable variation in the rules that demarcate debt and equity. In the U.S., the demarcation rule takes into account many different characteristics of the instrument, for instance whether it has a fixed maturity; whether its return represents a legally enforceable claim; whether such a claim is subordinate to the claims of general creditors; and whether its holder has voting rights. In other countries, demarcation rules are markedly different. In France, for instance, the classification of a financial instrument as debt or equity depends solely on whether voting rights are conferred on the holder or not (Connors and Woll, 2001).

International differences in demarcation rules introduce the possibility that the same financial instrument is categorized as debt in one country and equity in another country. For instance, a perpetual loan is treated as equity in some countries with reference to the equity-like characteristic that the principal is never reimbursed and as debt in other countries with reference to the debt-like characteristics that holders have no voting rights and do not fully share the risk of the business venture. As pointed out by several legal scholars, such cross-border hybrid instruments represent an important tax planning opportunity for multinational firms (Rosenbloom, 1999; Krahmal, 2005). To see this, consider a firm that invests in a foreign subsidiary with a hybrid instrument treated as debt in the host country and equity in the home country. The payments on the instrument are treated as tax deductible interest expenses in the host country and as tax favored dividends in the home country. Clearly, this creates a tax saving compared to standard debt where payments are fully taxable in the home country or standard equity where payments are non-deductible in the host country.[1]

Quantifying the use of cross-border hybrid instruments is extremely challenging because the tax treatment of financial instruments cannot be inferred from financial statements or standard business surveys. Qualitative evidence suggests, however, that cross-border hybrid instruments are widely used and have contributed significantly to the decline in effective tax rates on cross-border investment. First, legal analysis documents the international differences in demarcation rules (Connors and Woll, 2001) and describes the specific opportunities for cross-border hybrid instruments (Krahmal, 2005). Second, recent policy papers count hybrids among the main drivers of tax base erosion (OECD, 2013) and list a handful of cases where hybrid arrangements have been used to reduce tax payments by billions of dollars (OECD,

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[1] Note that hybrid instruments may also play a role in the context of a closed economy by combining debt treatment for tax purposes and equity treatment for either financial reporting purposes (Engel et al., 1999; Mills and Newberry, 2005) or regulatory purposes (Keen and de Mooij, 2012).

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2012). Third, auditing firms advertise that they can assist firms in developing cross-border hybrid structures (*e.g.* KPMG, 2007).

The first part of this paper studies the conditions under which tax avoidance with cross-border hybrid instruments is feasible. At the heart of the analysis is a simple model of hybrid instruments and their classification for tax purposes. The model posits that demarcation rules have two components: an *assessment function* that translates the characteristics of financial instruments into a measure of equityness and a *threshold level* of equityness. Hybrid instruments with a level of equityness above the threshold are treated as equity; those with a level of equityness below the threshold are treated as debt. To see how the model works, consider a perpetual loan that combines the equity-like characteristic that the principal is never reimbursed and the debt-like characteristic that the holder has no voting rights. If the assessment function puts a large weight on the maturity-dimension of financial instruments, the perpetual loan is considered to be relatively equity-like; if the assessment function puts a large weight on the voting-dimension, it is considered to be relatively debt-like. Whether the perpetual loan is ultimately treated as debt or equity for tax purposes depends both on the weights of the assessment function and the threshold.

Equipped with this model, we ask: Under what conditions can firms finance foreign investment with an instrument that is treated as equity in the home country and debt in the host country? We find that for a given pair of countries with different demarcation rules, this type of tax avoidance is always feasible for firms in one of the countries and, provided that the assessment functions differ sufficiently between the two countries, it is feasible for firms in both countries. To see the intuition for this result, reconsider the U.S. tax rules that take into account many different characteristics to determine whether an instrument is debt or equity and the French tax rules that only take into account a single characteristic, voting rights. If a U.S. firm finances an investment in France with an instrument that is equity-like in all dimensions except that it does not confer voting rights on the holder, the instrument is likely to be considered equity in the U.S. and debt in France. If, on the other hand, a French firm finances an investment in the U.S. with an instrument that is debt-like in all dimensions except that it confers voting rights on the holder, the instrument is likely to be considered debt in the U.S. and equity in France. Hence, in this example tax avoidance is feasible for U.S. firms investing in France as well as for French firms investing in the U.S. Clearly, the scope for avoidance derives from the two countries emphasizing different attributes of financial instruments when assessing their equityness.

We also consider the scope for tax avoidance when hybrid instruments can be embedded in more complex financial structures involving conduit entities in several countries. In this setting, firms investing in a foreign country can always achieve equity treatment in the home country and debt treatment in the host country regardless of the properties of the demarcation rules in the two countries. Intuitively, conduit structures allow firms to exploit differences in demarcation rules not only between the home country and the host country but also between any pair of third countries, which eliminates any limitation on the use of hybrid instruments for tax avoidance.

This analysis contributes to a vast literature on the capital structure of multinational firms (*e.g.*, Desai et al., 2004; Huizinga et al., 2008). While most of these papers study the choice between equity and internal debt, the present paper is the first to examine the scope for an alternative and for tax purposes often dominant type of financing, hybrid instruments. Moreover, by pointing to an important role for conduit entities in financing with hybrid instruments, the analysis also relates to an emerging literature aiming to explain the ownership structures of multinational firms (Mintz and Weichenrieder, 2010; Lewellen and Robinson, 2013). Finally, the model of the demarcation rule, which defines financial instruments as debt or equity as a function of their underlying characteristics relates to a broader literature on characteristics approaches to taxation (*e.g.* Kleven and Slemrod, 2009).

The second part of the paper investigates why the vast majority of countries permit tax avoidance with hybrid instruments although it appears relatively simple to combat with anti-avoidance measures: a host country could arguably eliminate the scope for cross-border hybrids by conditioning deductibility of interest payments to foreign entities on non-exemption in the home country and, analogously, a home country could condition exemption of dividends on non-deductibility in the host country (OECD, 2012). To address this question, we develop a model of the world economy where multinational firms coexist with domestic firms and governments use a corporate tax to redistribute income from capital owners to workers. Multinational firms employ skilled labor in the home country (in the "headquarters") and unskilled labor and capital in the host country (at the "production plant"). Hybrid instruments can be used to avoid taxes on foreign investment unless either the home country or the host country employs anti-avoidance measures.

We show that there exists an uncoordinated policy equilibrium where no countries employ anti-avoidance measures and multinational firms successfully use hybrids to avoid taxation. From the perspective of a host country, it is not optimal to deviate from this equilibrium by taking anti-avoidance measures. This would introduce effective taxation of multinational firms investing in the country and because both the capital and the foreign labor employed by these firms can be absorbed by untaxed multinational firms investing in other host countries, the incidence of the tax would be entirely on the workers of the country itself. Clearly, a distortive tax that is borne by domestic workers is not optimal policy. Likewise, from the perspective of a home country, anti-avoidance measures would introduce taxation of multinational firms headquartered in the country and because both the capital and the foreign labor employed by these firms can be absorbed by untaxed multinational firms based in other home countries, the incidence of the tax would be entirely on the workers of the country itself.

While the results explain why individual countries may find it in their interest to allow tax avoidance with hybrids and thus go some way towards explaining observed policy outcomes, they do not imply that anti-avoidance rules are undesirable from the perspective of the world as a whole. We do not explicitly model international policy cooperation, but would expect a coordinated ban on hybrid instruments to have *a priori* ambiguous welfare effects: it would effectively subject multinational firms to tax and thus increase the global tax revenue for given tax rates, however, it would also induce countries to lower their tax rates to attract multinational firms.[2]

This analysis is closely related to Hong and Smart (2010) who show that host countries optimally allow tax avoidance by multinational firms. We complement this result by showing, first, that also home countries optimally allow tax avoidance and, second, that these results hold when firms use immobile production factors in several countries. These findings are not trivial. Indeed, one might have expected that the burden of a tax on the mobile factor would be shared between the two immobile factors thus creating a tax exporting motive for taxation of multinational firms in home as well as host countries. This tax exporting mechanism does not come into play, however, because of the organizational flexibility of multinational firms whereby skilled workers may enter in productive relations with unskilled workers in any foreign country and *vice versa*. This mechanism is clearly distinct from international mobility of capital, which is usually cited as the reason why small countries should not tax multinational firms.

More generally, the second part of the paper relates to a growing literature on government policy in the presence of multinational firms engaged in various forms of tax avoidance. Directly related to hybrid instruments, Johannesen (2011) shows how international differences in demarcation rules, which the present paper take as given, may emerge endogenously in a tax competition setting. Other related papers study transfer pricing rules (Peralta et al., 2006), thin capitalization rules

[2] See Haufler and Runkel (2012) for a related analysis of the desirability of thin capitalization rules from the perspective of individual countries and the world as a whole.

(Haufler and Runkel, 2012) and taxation of interest flows to tax havens (Johannesen, 2012a).

2. When is tax avoidance with hybrids feasible?

To see precisely why hybrid instruments may be an attractive tool for tax avoidance, consider a firm investing in a foreign subsidiary and assume that the home country operates a territorial tax system. If the investment is financed with equity, there is no tax deduction for payments on the instrument in the host country and no taxation in the home country. If the investment is instead financed with a loan, the payments are tax deductible in the host country and taxable in the home country. Hence, compared to equity, debt creates a tax saving of $t^{HOST} - t^{HOME}$ per dollar paid on the instrument, which may obviously be positive or negative. If the investment is financed with a hybrid instrument treated as equity in the home country and debt in the host country, payments on the instrument are deductible in the host country and tax exempt in the home country thus creating a tax saving of t^{HOST} compared to equity financing and t^{HOME} compared to debt financing. In the case where the home country operates a worldwide tax system instead of a territorial system, hybrid financing still dominates both debt and equity by combining deductibility in the host country with a tax credit in the home country for corporate tax paid in the host country.

In this part of the paper, we aim to identify conditions under which firms can realize the tax benefits of hybrid financing. Section (2.1) develops a simple model of hybrid instruments and their treatment for tax purposes; Section (2.2) uses the model to establish when firms can finance foreign investment with a hybrid instrument treated as equity in the home country and debt in the host country; Section (2.3) analyzes to what extent conduit financing affects the scope for tax avoidance with hybrid instruments; and Section (2.4) discusses the limitations of the framework.

2.1. Tax treatment of hybrid instruments

We assume that financial instruments can differ in N dimensions. An example of a dimension is *maturity*: debt can have a maturity of a day, a year or 100 years whereas instruments such as perpetual debt and standard equity never mature. Another example is *voting rights*: in many cases all shares carry the same number of votes but it is perfectly possible to endow shares with extra voting rights (*e.g.* "Class A shares") or very limited voting rights (*e.g.* "Class B shares"). Yet another example is the *return*, which may be predetermined as is the case with a fixed interest rate loan or to some extent depend on firm profits as is the case with a profit sharing loan and a loan that can be converted into equity by the holder. Based on these observations, it seems reasonable to consider each of the N dimensions as a continuum ranging from the most debt-like characteristic (*e.g.*, short maturity, no voting rights or a fixed interest rate) to the most equity-like characteristic (*e.g.*, no maturity, maximum voting rights and a return left to the discretion of the firm). We thus scale each of the N dimensions to range the interval [0;1] where values closer to one imply that the instrument is more equity-like and values closer to zero imply that the instrument is more debt-like in this dimension. With these assumptions, a financial instrument is fully described by a vector $\mathbf{z} = (z_1, z_2 \ldots z_N)$ where $z_n \in [0; 1]$ for $n = 1,\ldots,N$. We let $\mathbb{Z}$ denote the set of financial instruments.

Tax systems generally treat all financial instruments as either debt or equity and therefore include a rule that assign hybrid instruments to one of these categories. We posit that such a demarcation rule consists of two elements: a continuous and differentiable *assessment function* $F(\mathbf{z})$, which assigns a value to each vector $\mathbf{z}$ that reflects the position of the instrument on the debt-equity continuum, and a *threshold level of equityness* y. Under the demarcation rule $\{F(\cdot);y\}$, an instrument $\mathbf{z}$ is categorized as debt if $F(\mathbf{z}) < y$ and as equity if $F(\mathbf{z}) \geq y$. Mirroring real-world corporate tax systems, demarcation rules thus classify any financial instrument as either debt or equity.

We impose some structure on demarcation rules in the form of the following three relatively weak assumptions:

Assumptions. Any demarcation rule $\{F(\cdot);y\}$ must satisfy:

(1) $F_n(\mathbf{z}) \geq 0$ for any n and any $\mathbf{z} \in \mathbb{Z}$
(2) $F_n(\mathbf{z}) > 0$ for at least one n and any $\mathbf{z} \in \mathbb{Z}$
(3) $F(0,0,\ldots,0) < y < F(1,1,\ldots,1)$

where $F_n(z)$ denotes the partial derivative of $F(z)$ with respect to z_n. The first assumption requires that partial derivatives of $F(\cdot)$ are non-negative so that endowing a financial instrument with more equity-like characteristics in a single dimension does not move the global assessment of the instrument in direction of debt. The second assumption imposes that at least one partial derivative of $F(\cdot)$ is strictly positive so that endowing a financial instrument with more equity-like characteristics in all dimensions moves the global assessment of the instrument in direction of equity. The final assumption ensures that demarcation rules allow for both debt and equity instruments.

Moreover, it is convenient to introduce the following scaling of demarcation rules:

Lemma 1. *For any demarcation rule $\{F(\cdot);y\}$ there exists a unique equivalent demarcation rule $\{G(\cdot);x\}$ satisfying that*

(a) $G(\mathbf{z}') \geq G(\mathbf{z}'')$ *if and only if* $F(\mathbf{z}') \geq F(\mathbf{z}'')$
(b) $G(\tilde{\mathbf{z}}) = \tilde{z}$ *for any* $\tilde{\mathbf{z}} = (\tilde{z}, \tilde{z}\ldots, \tilde{z})$

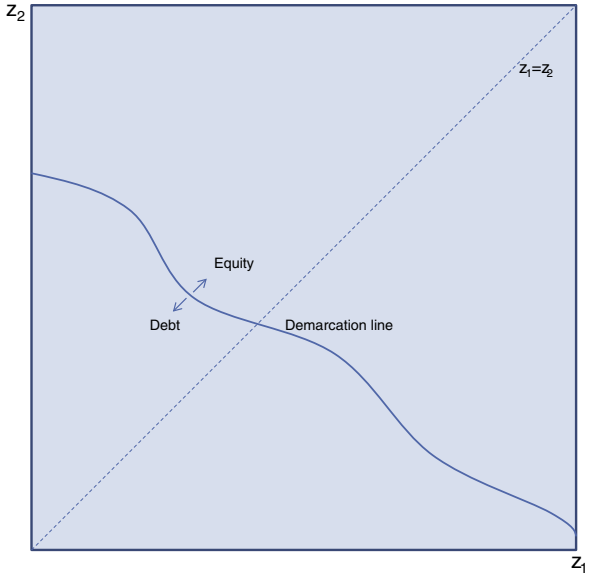
Proof. See Appendix. ■

Intuitively, the assessment function $F(\cdot)$ produces ordinal measures of the distance between any financial instrument and standard debt. By performing monotonic transformations of $F(\cdot)$ that retain the ranking of instruments on the debt–equity continuum while appropriately adjusting the threshold distance y that triggers equity treatment rather than debt treatment, we may construct any number of demarcation rules that produce the same outcomes as the original demarcation rule $\{F(\cdot);y\}$. From this set of equivalent demarcation rules, we pick out the single rule $\{G(\cdot);y\}$ which satisfies $G(\tilde{z}) = \tilde{z}$ for any $\tilde{z} = (\tilde{z}, \tilde{z}, \ldots, \tilde{z})$. This particular demarcation rule has several convenient properties. First, it scales assessed equityness to the interval between zero and one. Second, the threshold value x can be interpreted as an index of the general tendency of the tax rule to categorize hybrid instruments as debt. Both properties will be useful in the next section where we analyze cross-border hybrid instruments and therefore need to compare the outcomes of two different demarcation rules. Finally, we let $\nabla G(z)$ denote the vector of first-order derivatives of $G(\cdot)$. This vector can straightforwardly be interpreted as the *weights* on the N dimensions of financial instruments in the assessment function.

Fig. 1a provides an illustration of a demarcation rule in the two-dimensional case ($N = 2$). The shaded square represents the full set of financial instruments $\mathbb{Z}$. The demarcation line depicts the subset of financial instruments satisfying that $G(z_1,z_2) = x$. This is the set of *marginal hybrid instruments* with characteristics that are just sufficiently close to equity to be categorized as such by the demarcation rule. Financial instruments above the demarcation line satisfy $G(z_1,z_2) > x$ and qualify as equity whereas financial instruments below the demarcation line satisfy $G(z_1,z_2) < x$ and qualify as debt. The slope of the demarcation line is negative reflecting that an increase in the equityness of a financial instrument in one dimension requires a reduction in the equityness in the other dimension to keep the overall level of equityness of the instrument constant.[3]

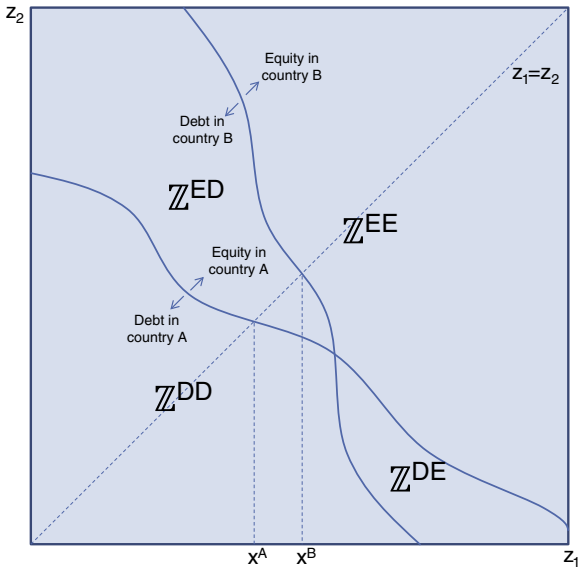
[3] By the implicit differentiation theorem, the slope of the line is $-(\partial G(\mathbf{z})/\partial z_1)/(\partial G(\mathbf{z})/\partial z_2)$ which is negative under Assumptions 1 and 2.

a) Two-dimensional example of a demarcation rule



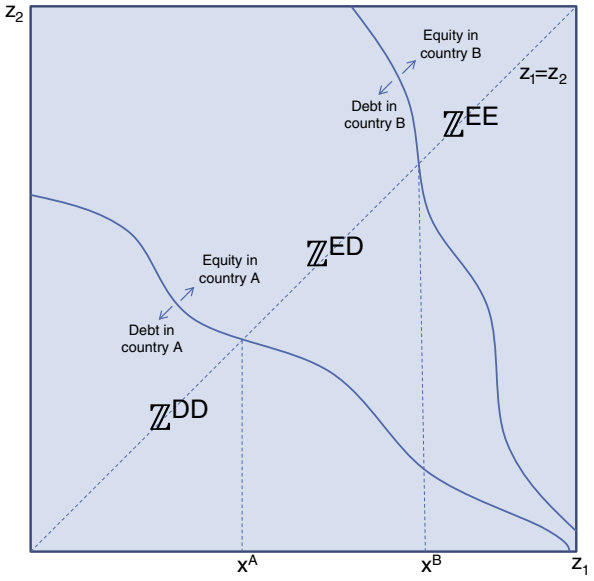
Note: The shaded square represents the set of financial instruments. The demarcation line defines the subset of instruments treated as debt and the subset treated as equity.

b) Cross-border hybrid instruments in two directions



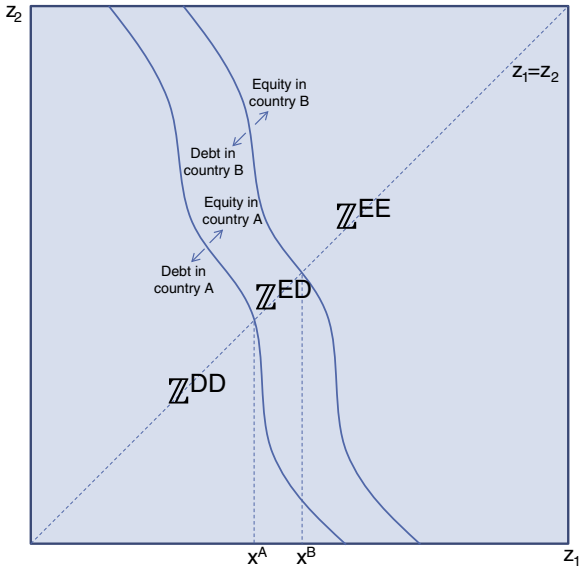
Note: The figure shows the demarcation lines of two countries. The lines define four subsets of instruments: Z^{DD} implies debt treatment in both countries, Z^{EE} implies equity treatment in both countries, Z^{DE} implies debt treatment in country A and equity treatment in country B, Z^{ED} implies equity treatment in country A and debt treatment in country B.

c) Cross-border hybrid instruments in one direction



Note: The figure shows the demarcation lines of two countries. The lines define three subsets of instruments: Z^{DD} implies debt treatment in both countries, Z^{EE} implies equity treatment in both countries, Z^{ED} implies equity treatment in country A and debt treatment in country B. There are no instruments treated as debt in country A and equity in country B.

d) Cross-border hybrid instruments in one direction



Note: The figure shows the demarcation lines of two countries. The lines define three subsets of instruments: Z^{DD} implies debt treatment in both countries, Z^{EE} implies equity treatment in both countries, Z^{ED} implies equity treatment in country A and debt treatment in country B. There are no instruments treated as debt in country A and equity in country B.

Fig. 1. The scope for cross-border hybrid instruments. Note: Each shaded square represents the set of financial instruments. Each full line represents a given country's demarcation line, which defines the subset of instruments treated as debt and the subset treated as equity.

This model of hybrid instruments and demarcation rules is obviously a stylized representation of reality. Real-world demarcation rules are not observable on the mathematical form posited here, but are laid down in laws, regulations and jurisprudence that do not explicitly describe the tax treatment of any conceivable financial instrument. The model is still, however, likely to be a useful tool for understanding the tax treatment of hybrids, at least if one is willing to accept the fundamental premise that tax authorities and courts are consistent in their treatment of financial instruments. If identical hybrids tend to receive the same tax treatment either because the tax rules are so detailed that the correct tax treatment of any hybrid can be inferred with little uncertainty or because the discretion of tax authorities and courts is constrained by previous decisions, then our framework appears to be appropriate and demarcation rules while not directly observable could in principle be estimated using information about the actual tax treatment of different hybrids. If, on the other hand, the tax treatment of hybrids depends to a large extent on random factors and idiosyncrasies, a view that is indeed upheld by some strands of legal thought, then our framework is clearly less appropriate.

2.2. Cross-border hybrid instruments

With this basic framework, we analyze the scope for tax avoidance with cross-border hybrid instruments. Specifically, considering two countries A and B with scaled demarcation rules $\{G^A(\cdot); x^A\}$ and $\{G^B(\cdot); x^B\}$ respectively, we seek to identify conditions under which it is possible to construct (i) a hybrid classified as equity in A and debt in B and (ii) a hybrid classified as debt in A and equity in B.

It is instructive to start with some graphical illustrations. Fig. 1b provides an example of two scaled demarcation rules $\{G^A(\cdot); x^A\}$ and $\{G^B(\cdot); x^B\}$ that differ in two respects: First, A applies a lower threshold level of equityness than B. This is reflected in the property that the 45-degree line intersects the demarcation line of A before the demarcation line of B. Second, A assigns more weight to z_2 relative to z_1 than B. This is reflected in the property that the demarcation line of A is flatter than the demarcation line of B. The two demarcation lines divide the set of financial instruments $\mathbb{Z}$ into four subsets labeled $\mathbb{Z}^{DD}$, $\mathbb{Z}^{ED}$, $\mathbb{Z}^{EE}$ and $\mathbb{Z}^{DE}$ where D and E denote debt and equity and the two superscripts refer to the classification in A and B respectively. The figure thus shows that there exists a set of hybrid instruments $\mathbb{Z}^{ED}$ classified as equity in A and debt in B and another set $\mathbb{Z}^{DE}$ classified as debt in A and equity in B. Another example is provided in Fig. 1c where the distance between the threshold levels of equityness in the two countries is larger than in Fig. 1b. This causes $\mathbb{Z}^{DE}$ to vanish, implying that there exists no hybrid classified as debt in A and equity in B, whereas $\mathbb{Z}^{ED}$ remains. A final example is provided in Fig. 1d where the weights applied by the two countries are more similar than in Fig. 1b. Again, $\mathbb{Z}^{DE}$ vanishes whereas $\mathbb{Z}^{ED}$ remains.

The examples suggest that for a given pair of countries it is generally possible to construct cross-border hybrids in one direction, either an instrument treated as equity in A and debt in B or an instrument treated as equity in B and debt in A, whereas depending on the properties of the demarcation rules it may or may not be possible to construct cross-border hybrids in both directions, an instrument treated as equity in A and debt in B and an instrument treated as equity in B and debt in A. Moreover, the examples point to particular features of demarcation rules that appear to facilitate the use of cross-border hybrids. Specifically, the examples suggest that more similar threshold values and less similar weights in the assessment functions make it more likely that cross-border hybrids exist in both directions. We state these insights formally in the following proposition.

Proposition 1. *Consider two countries A and B with scaled demarcation rules $\{G^A(\cdot); x^A\}$ and $\{G^B(\cdot); x^B\}$ that differ with respect to the threshold values ($x^A > x^B$) and the weights of the assessment functions ($\nabla G^A(\mathbf{z}) \neq \nabla G^B(\mathbf{z})$ at any $\mathbf{z}$).*

(a) *There exists a hybrid instrument categorized as equity in B and debt in A.*
(b) *There exists a hybrid instrument categorized as equity in A and debt in B if the threshold values x^A and x^B are sufficiently similar.*
(c) *There exists a hybrid instrument categorized as equity in A and debt in B if the weights $\nabla G^A(\cdot)$ and $\nabla G^B(\cdot)$ are sufficiently different.*

Proof. See Appendix. ■

When two countries employ different demarcation rules, it is generally possible for firms in at least one of the countries to implement financial instruments that are categorized as debt in the host country and equity in the home country and sometimes it is possible for firms in both countries to achieve this result. Specifically, firms in the country that treat relatively more hybrids as equity (lower x) always have access to such cross-border hybrid instruments (part a) whereas firms in the country that treat relatively more hybrids as debt (higher x) have access to cross-border hybrid instruments provided that the threshold levels of equityness do not differ too much between the two countries (part b) or that the weights in the assessment functions differ enough (part c).

While the proofs are technical and therefore relegated to the Appendix, they can be explained in a fairly intuitive manner. A hybrid instrument that has the same level of equityness c in all dimensions has the same overall level of equityness regardless of the assessment function (*i.e.* $G^A(\mathbf{z}) = G^B(\mathbf{z}) = c$). It is therefore possible to construct an instrument with the same intermediate level of equity in all dimensions that is considered equity in the country with the lower threshold level (*i.e.* $G^B(\mathbf{z}) > x_B$) and debt in the country with the higher threshold level (*i.e.* $G^A(\mathbf{z}) < x_A$). This explains part (a) of the proposition. Generally the assessment of financial instruments differs between the two countries. Notably, instruments that are relatively equity-like in dimensions where A puts more weight than B and relatively debt-like in dimensions where B puts more weight than A will be considered more equity-like in A than in B (*i.e.* $G^A(\mathbf{z}) > G^B(\mathbf{z})$). If the threshold level of equityness does not differ too much between the two countries, it is therefore possible to construct an instrument that is considered equity in the country with the higher threshold (*i.e.* $G^A(\mathbf{z}) > x_A$) and debt in the country with the lower threshold (*i.e.* $G^B(\mathbf{z}) < x_B$). This explains part (b). Finally, the more different the weights of the assessment functions in the two countries, the more differently they tend to assess the equityness of a given instrument. In the most extreme case, A puts zero weight on all the dimensions where B puts positive weight and B puts zero weight on all the dimensions where A puts positive weight. In this case, an instrument that is fully equity-like in dimensions taken into account by A but disregarded by B and fully debt-like in dimensions taken into account by B but disregarded by A is therefore considered as equity-like as pure equity in A (*i.e.* $G^A(\mathbf{z}) = 1$) and as debt-like as pure debt in B (*i.e.* $G^B(\mathbf{z}) = 0$). This instrument is treated as equity in A (*i.e.* $G^A(\mathbf{z}) > x_A$) and debt in B (*i.e.* $G^B(\mathbf{z}) < x_B$) regardless of the threshold levels of equityness in the two countries. This explains part (c).[4]

2.3. Conduit structures with hybrid instruments

The previous section derived conditions under which a firm in one country can finance an investment in another country with a hybrid treated as equity in the home country and debt in the host country. We focused entirely on simple financial structures where hybrids were issued directly by the foreign subsidiary to the parent company. It is well-known, however, that the tax planning of multinational firms often involves multiple jurisdictions. An emblematic example is the use of finance entities in tax havens to reduce the effective corporate tax burden on foreign investment (Desai et al., 2006). Another example is the use of conduit entities in third countries to minimize withholding taxes on internal capital flows (Johannesen, 2012a). A thorough empirical analysis of the factors that induce firms to funnel foreign investment through intermediate entities is offered by Mintz and Weichenrieder (2010).

This section explores the significance of intermediate entities in the context of hybrid instruments. The question we ask essentially remains the same as in the previous section: Under what conditions can a firm that undertakes foreign investment combine the advantages of equity financing in the home country and debt financing in the host country? The present analysis, however, allows firms to involve entities in third countries in the financial structure.

Specifically, we consider a financial structure involving two conduit entities in two different third countries. As illustrated in Fig. 2, funds are passed from the parent company to the first conduit entity in the form of equity, from the first conduit entity to the second conduit entity in the form of a hybrid and finally from the second conduit entity to a subsidiary in the host country in the form of debt. This *conduit hybrid structure* clearly achieves the desired combination of equity treatment in the home country and debt treatment in the host country. Moreover, if the hybrid between the two conduit entities is treated as equity in the first

[4] An earlier version of this paper (Johannesen, 2012b) devotes considerable attention to the special case where assessment functions are linear (where $\nabla G(\mathbf{z})$ is a vector of constants). In this case, it is possible to derive explicit formulas for the set of policy parameters that permits cross-border hybrid instruments.

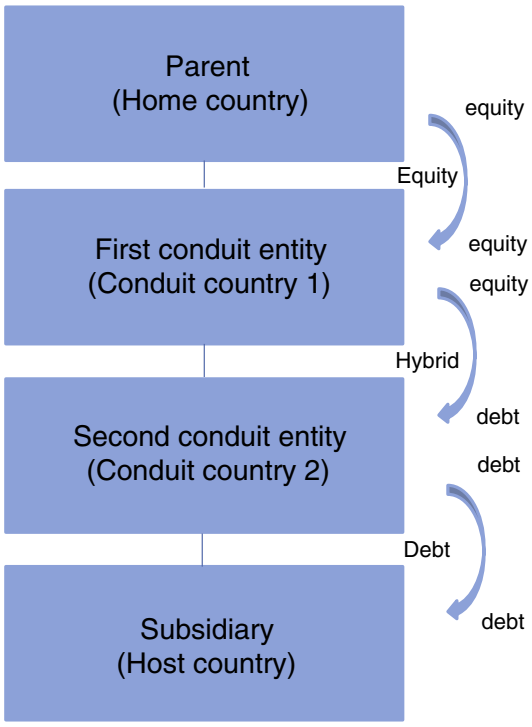


Fig. 2. Conduit hybrid structure. Note: The figure illustrates how a cross-border hybrid instrument can be embedded in a double conduit hybrid structure to create equity treatment in the home country and debt treatment in the host country. The parent finances the first conduit entity with pure equity. The funds are passed on to the second conduit entity in the form of a hybrid instrument, which is treated as equity in the first conduit country and as debt in the second conduit country. Finally, the second conduit entity passes on the funds to the subsidiary in the form of pure debt.

conduit country and debt in the second conduit country and the cash-flows of the three financial instruments match, no tax burden arises in the two conduit countries.

Formally, let the vector $\mathbf{d} = \{C_1, C_2, \mathbf{z}\}$ denote a conduit hybrid structure with conduit entities in countries *C1* and *C2* and a hybrid z issued by the entity in *C2* to the entity in *C1*. We may then characterize the scope for tax avoidance with conduit hybrid structures in the following proposition;

Proposition 2. *Consider two countries A and B with scaled demarcation rules* $\{G^A(\cdot); x^A\}$ *and* $\{G^B(\cdot); x^B\}$ *and assume that* $x^i \neq x^j$ *for two third countries* $i \neq A, B$ *and* $j \neq A, B$. *There exists a conduit hybrid structure* $\mathbf{d} = \{C_1, C_2, \mathbf{z}\}$ *satisfying that* $\mathbf{z}$ *is categorized as equity in* C_1 *and as debt in* C_2.

Proposition 2 has the striking implication that firms in any country investing in any other country may combine the benefits of equity treatment in the home country and debt treatment in the host country by means of a conduit hybrid structure. The only requirement is that there exists a hybrid treated as equity in some third-country *C1* and debt in some other third-country *C2*. By Proposition 1, this is the case under very weak conditions, for instance that not all third-countries apply the exact same threshold level of equityness. Hence, conduit hybrid structures imply a notable increase in the scope for tax avoidance as compared to the simple use of hybrid instruments analyzed in the previous section. Intuitively, under conduit hybrid structures firms can exploit differences in demarcation rules between any pair of third countries, which implies that the particular features of demarcation rules in the host and home countries are completely irrelevant.

2.4. Discussion

The framework developed above obviously relies on a number of simplifying assumptions. This section discusses how relaxing these assumptions affects the conclusions, notably with respect to the advantages and disadvantages of conduit hybrid structures relative to direct hybrid instruments.

First, demarcation rules are not perfectly deterministic and in reality there may be some degree of *a priori* uncertainty about the tax treatment of a given hybrid instrument. Suppose that for an instrument with $G(\mathbf{z}) > x$, there is a positive probability of debt treatment, which is decreasing in the distance $G(\mathbf{z}) - x$, while for an instrument with $G(\mathbf{z}) < x$, there is a positive probability of equity treatment, which is decreasing in the distance $x - G(\mathbf{z})$. In such a setting, a conduit hybrid structure can reduce the risk of an undesired classification of a hybrid instrument relative to a direct hybrid instrument. To see this, note that firms may choose conduit countries with very different demarcation rules so as to maximize the "safety margins" $G^{C_1}(\mathbf{z}) - x^{C_1}$ in C_1 and $x^{C2} - G^{C2}(\mathbf{z})$ in C_2. Alternatively, firms may locate conduit entities in countries offering advance tax agreements, which settle the tax treatment of a given financial instrument before implementation and thus effectively eliminate any *a priori* uncertainty.[5]

Second, one way to combat tax avoidance with direct hybrid instruments is to condition deductibility of interest payments to foreign entities on taxation in the home country and condition exemption of dividends from foreign entities on non-deductibility in the host country (OECD, 2012).[6] While such anti-avoidance rules eliminate the scope for tax planning with direct hybrid instruments, they would need additional provisions to effectively combat conduit hybrid structures. In Fig. 2, the dividend income in *A* is effectively matched by a non-deductible dividend payment in *C1* and the deductible interest payment in *B* is matched by taxable interest income in *C2*. Hence, in order to effectively combat conduit hybrid structures, the anti-avoidance rules need to look through the chain of foreign conduit entities. It is essentially necessary to establish whether the dividend income in *A* ultimately derives from a deductible payment by the subsidiary in *B* or from a non-deductible payment from another source.

Third, the tax savings generated by conduit hybrid structures in the home and host countries may in some cases be at least partly offset by tax liabilities in the conduit country. We noted above that if the different financial instruments composing a conduit hybrid structure are designed so as to generate identical cash flows, no tax liabilities arise in the conduit countries. This argument, however, sidesteps the fact that matching cash flows may effectively constrain the choice of financial instruments. In Fig. 2, if the hybrid instrument is a profit sharing loan with a return linked to the stochastic financial performance of the host country investment and the debt instrument is a standard loan with a fixed return, then the cash flows going in and out of *C2* generally do not match. It follows that the conduit entity earns profits in some states of the world and incurs losses in other states of the world. If the conduit country does not allow tax losses to be carried forward and backward, the conduit entity may be liable to taxes even when the net present value of its income stream is zero.

Fourth, many countries have tax rules targeting tax avoidance involving financing with conduit entities. One example is anti-abuse regulation that allows the tax authorities to recharacterize financial transactions involving multiple related parties as transactions directly between two entities for tax purposes. Another example is so-called Controlled Foreign Corporation rules whereby home countries in some cases treat foreign subsidiaries in low-tax countries as domestic subsidiaries for tax purposes. Yet another example is withholding taxes on

[5] Advance tax agreements are unavailable in most OECD countries but are used in certain smaller countries, such as Luxembourg, presumably with a view to attracting business related to international tax planning.

[6] Note that such anti-avoidance rules would not require information exchange with foreign countries because the relevant information may be obtained directly from the firms. For instance, a home country may require that a firm wishing to benefit from a reduced rate on dividends must be able to document, by disclosing foreign tax accounts or otherwise, that the dividends are not deductible against the tax base in the host country. Such a requirement would not imply an administrative burden of any significance for the firm.

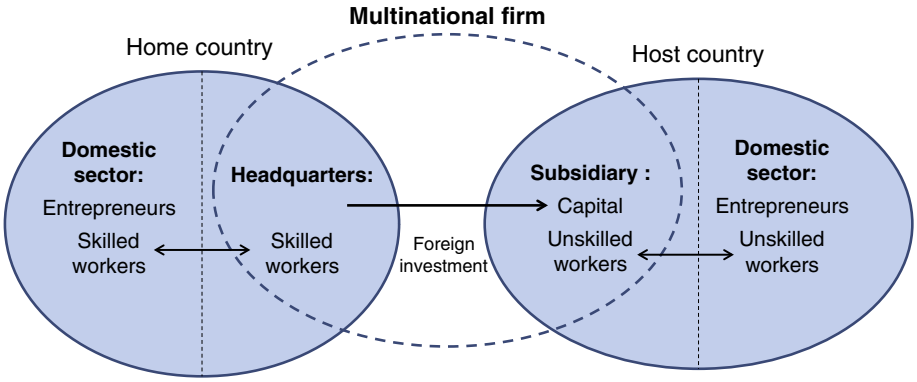


Fig. 3. A sketch of the global economy.

interest and dividend payments to tax haven jurisdictions. Clearly, such rules can potentially limit the scope for tax planning with conduit hybrid structures as well as other types of tax avoidance such as financing by entities in tax havens. This points to the particular advantage of direct hybrid instruments that they do not involve layers of entities and transactions, which the tax authorities may tax or choose to ignore for tax purposes, but a single financial instrument running directly from the parent company to the operating subsidiary.

Finally, it should be noted that because we do not model firms' optimal financial choices but merely characterize a set of financial instruments that generate a specific tax advantage, we are unable to explicitly address the interesting question of tax-driven financial innovation.[7] In other words, it is not clear whether the set of cross-border hybrid instruments identified in the model represents true tax-motivated financial innovation because the model does not tell us which financial instruments firms would optimally choose with and without taxes. It is, for instance, conceivable that some firms would use certain hybrid instruments for cross-border financing even in the absence of taxes if the instruments have characteristics that are sufficiently attractive from a non-tax perspective.[8]

3. Why do countries allow tax avoidance with hybrids?

This part of the paper aims to rationalize that most countries allow hybrid instruments as a means for multinational firms to avoid taxation on cross-border investment despite the fact that seemingly suitable anti-avoidance measures are readily available. If the exemption of dividend payments from foreign entities would be conditioned on non-deductibility in the host country and the deductibility of interest payments would be conditioned on non-exemption in the home country, it would clearly limit the scope for tax avoidance with cross-border hybrid instruments. Yet, this type of anti-avoidance rules exists in very few countries (OECD, 2012).

The analysis proceeds in the following way: First, we develop a model of the world economy where multinational firms can use hybrid instruments to finance investment and governments use corporate taxes to redistribute income from capital owners to workers (Section 3.1). Second, we characterize the non-cooperative equilibrium in tax rates under the assumption that no country employs anti-avoidance measures against hybrid instruments so that multinational firms can successfully avoid corporate taxation (Section 3.2). Finally, we show that from the perspective of a single country, employing anti-avoidance measures unilaterally reduces welfare (Section 3.3). In other words, the absence of anti-avoidance measures against hybrid instruments is a global non-cooperative equilibrium.

3.1. Model

The world economy is composed of a large number of countries populated by workers and entrepreneurs. Workers are either skilled in which case they are endowed with $\overline{S}$ units of skilled labor or unskilled in which case they are endowed with $\overline{U}$ units of unskilled labor. Entrepreneurs are endowed with $\overline{K}$ units of mobile capital (*e.g.* physical capital) and $\overline{Q}$ units of immobile capital (*e.g.* entrepreneurial capital). In each country, there is one worker who is either skilled or unskilled and n entrepreneurs. All individuals are internationally immobile and supply their capital and labor inelastically on competitive factor markets.

Each country has two economic sectors as illustrated in Fig. 3. In the domestic sector, entrepreneurs employ immobile capital and labor (skilled labor S or unskilled labor U depending on the country). In the multinational sector, firms employ unskilled labor U, skilled labor S and mobile capital K. Since unskilled and skilled workers do not coexist in any single country, multinational firms operate in two countries. Specifically, we assume that the technology requires skilled labor at the firm headquarters and unskilled labor and capital at the production plants. This has the organizational implication that multinational firms locate their headquarters in countries with skilled workers and invest in countries with unskilled workers. In other words, countries with unskilled workers are host countries of foreign investment whereas countries with skilled workers are home countries.

In both sectors, profits are subject to a standard corporate income tax at the rate t. The after-tax profit function of an entrepreneur is given by Eq. (1) in countries with skilled labor and by Eq. (2) in countries with unskilled labor:

$$\pi^S = (1-t)\left\{H(Q,S) - w^S S\right\} \tag{1}$$

$$\pi^U = (1-t)\left\{G(Q,U) - w^U U\right\} \tag{2}$$

where $H(Q, S)$ and $G(Q, U)$ are standard production technologies with constant returns to scale and w^S and w^U are the wage rates for skilled and unskilled workers respectively. The after-tax profits of a multinational firm can be written as:

$$\Pi = F(K,S,U) - rK - w^S S - w^U U - T \tag{3}$$

where $F(K, S, U)$ is a standard production technology with constant returns to scale; r is the rental rate for mobile capital; and T is the tax cost.

[7] See for instance Gergen and Schmitz (1997) for an account of the interplay between tax law and financial innovation in the U.S.

[8] Kleven and Slemrod (2009) provide a thorough analysis of tax-driven product innovation in the context of commodity taxation.

Table 1
Tax costs under different financial structures and tax policies.

	Instrument	Anti-avoidance		Tax cost of firm in i investing in j
		in i	in j	
(1)	Equity	–	–	$t^j\{F(K,S,U) - w^{Si}S - w^{Uj}U\}$
(2)	Debt	–	–	$t^j\left\{F(K,S,U) - w^{Si}S - w^{Uj}U - \frac{rK}{1-t_i}\right\} + t^i\frac{rK}{1-t_i}$
(3)	Hybrid	No	No	$t^j\{F(K,S,U) - w^{Si}S - w^{Uj}U - rK\}$
(4)	Hybrid	No	Yes	$t^j\{F(K,S,U) - w^{Si}S - w^{Uj}U\}$
(5)	Hybrid	Yes	No	$t^j\left\{F(K,S,U) - w^{Si}S - w^{Uj}U - \frac{rK}{1-t_i}\right\} + t^i\frac{rK}{1-t_i}$

The tax cost depends on how the firm finances its foreign investment as well as the anti-avoidance policies applied by the home and host countries as specified in Table 1. Under financing with a standard equity instrument (row 1), the tax base in the host country is production net of labor costs while there is no tax cost in the home country. With a standard debt instrument (row 2), the tax base in the host country is further reduced by interest payments $rK/(1-t_i)$, which are then taxed in the home country.[9] With a hybrid instrument, the tax treatment depends on anti-avoidance policies. If none of the two countries target hybrid financing with anti-avoidance measures (row 3), capital costs are considered deductible interest payments in the host country and non-taxable dividends in the home country. If the host country conditions deductibility of interest payments on non-exemption in the home country (row 4), capital costs are taxed in the host country and the global tax treatment of the hybrid instrument is equivalent to that of an equity instrument. If the home country conditions exemption of dividends on non-deductibility in the host country (row 5), capital costs are taxed in the home country and the global tax treatment of the hybrid instrument is equivalent to that of a debt instrument.

Table 1 assumes that it is always possible to achieve the desired tax treatment of hybrid structures with equity treatment in the home country and debt treatment in the host country when none of the countries apply anti-avoidance rules (row 3) whereas it is never possible when either the home or the host country applies such rules (row 4–5). These assumptions may not always hold in the real world, but, if anything, they stack the deck in favor of anti-avoidance rules by making the potential avoidance problem as large as possible and by making anti-avoidance rules as effective as possible. Moreover, it is assumed that all countries apply territorial tax systems under which dividends from foreign entities are fully tax exempt. The results would not change if it were instead assumed that countries applied worldwide tax systems under which such dividends are taxable but carry a tax credit for the underlying foreign corporate tax.

The objective of the government is to maximize the sum of the utilities enjoyed by workers and entrepreneurs:

$$\Omega = U\left(C^W\right) + nU\left(C^E\right) \tag{4}$$

where C^W is the consumption of workers (skilled or unskilled depending on the country) and C^E is the consumption of entrepreneurs. The government sets the corporate tax rate and the anti-avoidance policy so as to maximize Ω. We make three key assumptions: First, the parameters are such that absent taxation, entrepreneurs enjoy higher consumption than workers. This provides a rationale for redistributive tax policies. Second, government transfers can be targeted workers. Since there is no public good, the entire government revenue is therefore transferred to workers in a lumpsum fashion. Third, a fraction δ of taxes collected in the domestic sector are lost. The loss may be interpreted either as direct collection costs or a deadweight loss associated with, for instance, tax evasion by entrepreneurs. The role of this is to ensure that there remains a potential for welfare-improving redistributive taxation of the multinational sector by making governments unwilling to push taxation of the domestic sector all the way to the point where consumption is equalized between workers and entrepreneurs. Under these assumptions, we can write the consumption of workers and entrepreneurs in a home country with skilled workers as:

$$C^W = \bar{S}w^S + R \tag{5}$$

$$C^E = (1-t)\left\{H(Q,S) - w^S S\right\} + r\bar{K} \tag{6}$$

where R is the government revenue. The income of workers consists of labor income and a transfer from the government whereas entrepreneurs extract rents from the domestic sector and receive income from their endowment of physical capital. Analogous expressions apply to host countries with unskilled workers.

3.2. All countries allow hybrid treatment

This section solves the model under the assumption that no home countries condition exemption of dividends on non-deductibility in the host country and no host countries condition deductibility of interest payments on non-exemption in the home country. This implies that multinational firms can finance foreign investments with hybrid instruments and obtain full tax deduction for capital expenses in the host country with no pick up of income in the home country. Hence, inserting the tax costs from Table 1 row 3 into (3), we obtain the following after-tax profit function for multinational firms:

$$\Pi = (1-t)\left\{F(K,S,U) - rK - w^S S - w^U U\right\}. \tag{7}$$

We start by determining the economic equilibrium taking tax policies for given. In particular, we search for an equilibrium that is symmetric in the sense that outcomes are identical for *ex ante* identical countries but may differ between countries with skilled and unskilled workers. In the multinational sector, Eq. (7) implies that firms rent capital until $F_K(K,S,U) = r$ and hire skilled labor and unskilled labor until $F_S(K,S,U) = w^S$ and $F_U(K,S,U) = w^U$ respectively. In the domestic sector, Eqs. (1)–(2) imply that entrepreneurs hire workers until $H_S\left(\overline{Q},S\right) = w^S$ and $G_U\left(\overline{Q},U\right) = w^U$ in countries populated with skilled and unskilled workers respectively. In the equilibrium, the rental cost of capital r adjusts so as to ensure that the combined demand for mobile capital from all multinational firms equals the fixed supply. Under symmetry, this requires that the demand for mobile capital by multinational firms in any given home country equals $n(1+m)\bar{K}$ where m is the number of host countries per home country in the global economy. This demand corresponds to the entire endowment of a home country, $n\bar{K}$, plus a fraction m of the endowment of a host country, $mn\bar{K}$.[10] Moreover, wages w^S and w^U adjust so as to ensure that in each country the combined demand for workers from the domestic and multinational sector equals the fixed supply. Clearance of a market for skilled labor requires that multinational firms in any given home country demand $\omega\bar{S}$ units at the same time as domestic entrepreneurs absorb $(1-\omega)\bar{S}$ units. Clearance of a market for unskilled labor requires that multinational firms in any given home country demand $\alpha m\bar{U}$ units of unskilled workers at the same time as domestic entrepreneurs absorb $(1-\alpha)\bar{U}$ units.[11]

[9] In order to be able to pay investors the capital rental cost rK, the before-tax interest payments must equal $rK/(1-t_i)$.

[10] Let I denote the number of home countries with skilled workers and J denote the number of host countries with unskilled workers so that $m = J/I$. The global supply of mobile capital equals $(I+J)n\bar{K}$. When the demand of the multinational firms in each home country equals $n(1+m)\bar{K}$, global demand equals $(I+J)n\bar{K}$ and the market clears.

[11] The global supply of unskilled labor equals $J\bar{U}$. When the demand of the multinational firms in each home country equals $\alpha m\bar{U}$ and the demand by domestic entrepreneurs in each host country equals $(1-\alpha)\bar{U}$, the total demand from multinational firms in I home countries and J host countries equals $J\bar{U}$ and the market clears.

Inserting the conditions for clearing of capital and labor markets into the first-order conditions for profit maximization yields the following five equilibrium conditions:

$$F_K\left(n(1+m)\overline{K},\omega\overline{S},\alpha m\overline{U}\right)=r \tag{8}$$

$$F_S\left(n(1+m)\overline{K},\omega\overline{S},\alpha m\overline{U}\right)=w^S \tag{9}$$

$$F_U\left(n(1+m)\overline{K},\omega\overline{S},\alpha m\overline{U}\right)=w^U \tag{10}$$

$$H_S\left(n\overline{Q},(1-\omega)\overline{S}\right)=w^S \tag{11}$$

$$G_U\left(n\overline{Q},(1-\alpha)\overline{U}\right)=w^U. \tag{12}$$

These five conditions jointly determine the equilibrium level of the three factor prices r, w^S and w^U and the equilibrium allocation of production factors between sectors in the two countries ω and α.

We are now prepared to study how governments optimally set tax rates. We first observe that tax rates have no bearing on the equilibrium conditions Eqs. (8)–(12), hence r, w^S, w^U, ω and α are all unaffected by the choice of tax rate. In other words, regardless of which tax rates are set by which governments, the factor prices and the resource allocation between sectors and countries do not change. To see why this is the case, note that under hybrid financing, the corporate tax base of a multinational firm, which is given by the curly brackets in Eq. (7), equals zero by Euler's theorem. The multinational sector is thus effectively exempt from corporate taxation and only profits in the domestic sector are taxed. In the domestic sector, since labor costs are tax deductible, only returns to the immobile entrepreneurial capital is subject to tax. In sum, the corporate tax acts as a lumpsum tax on the rents earned by entrepreneurs.

Equipped with this insight, it is straightforward to characterize the optimal corporate tax rates in a world where all countries allow tax avoidance with cross-border hybrid instruments:

Proposition 3. *Conditional on all countries allowing hybrid instruments, the optimal corporate tax rate t^* is characterized by:*

$$\frac{U'\left(C^W\right)}{U'\left(C^E\right)}=\frac{1}{1-\delta}. \tag{13}$$

Proof. See the Appendix. ■

This result is very intuitive. The corporate tax simply acts to transfer rents from entrepreneurs to workers. The government therefore raises the tax rate until the marginal gain from redistributing one unit of consumption from entrepreneurs to workers $U'(C^W) - U'(C^E)$ equals the marginal deadweight loss $U'(C^W)\delta$.

3.3. A single country disallows hybrid treatment

In this section, we investigate whether a single country can improve its welfare by deviating from the international tax regime in which all countries allow tax avoidance with cross-border hybrid instruments.

We first consider a host country j that disallows interest expenses when the corresponding income is exempt in the home country. Inserting the tax costs from Table 1 row 4 into Eq. (3), we obtain the following after-tax profit function for a firm in country i that invests in country j:

$$\Pi^{ij}=\left(1-t^j\right)\left\{F(K,S,U)-w^S S-w^{Uj}U\right\}-rK \tag{14}$$

where we have added superscript j to highlight that the tax rate and wage rate for unskilled labor will now be specific to country j. The profit function of firms investing in other host countries than j is still given by Eq. (7). It follows that the required return to mobile capital equals $r/(1-t^j)$ for firms investing in country j whereas it remains r for firms investing in other host countries The first-order conditions for demand of skilled and unskilled labor are unchanged relative to Section 3.2. It is now relatively straightforward to show the following result:

Proposition 4. *A country, which is hosting investment by foreign multinational firms, achieves higher welfare by allowing hybrid instruments than by disallowing them when all other countries allow them.*

Proof. See the Appendix. ■

To understand this result, it is instructive to consider what happens when a single host country disallows hybrid tax planning structures. The immediate effect of the increased capital cost in country j is that multinational firms employ less capital in this country. These firms perceive a decrease in the productivity of skilled as well as unskilled workers and therefore demand less of both. However, since each country is only a small fraction of the world economy, firms operating in country j account for a small fraction of the total demand for skilled workers in any home country i. It follows that for other firms to absorb the skilled workers laid off by firms operating in country j, only a negligible reduction in w^S is required. Likewise, multinational firms investing in country j account for a small fraction of the total demand for mobile capital, hence clearing of the global capital market requires only a negligible reduction in r. In other words, w^S and r can be considered fixed from the perspective of a single host country. Conversely, the multinational sector in country j constitutes a significant part of the labor market for unskilled workers in this country, hence a non-negligible reduction in w^{Uj} is required to restore full employment in country j. In the new equilibrium, multinational firms operating in country j employ less of all three production factors in absolute terms and less capital and less skilled workers per unskilled worker.

In sum, when a country *de facto* introduces taxation of multinational firms by disallowing tax planning with hybrid instruments, the tax incidence is only on the country's own workers. Moreover, the policy is associated with a deadweight loss because the factor demand of the multinational firms operating in country j is distorted. Finally, there is an effective transfer of resources from workers to entrepreneurs in the domestic sector of country j because the wage rate is depressed in the new equilibrium. These three effects imply that the anti-avoidance policy unambiguously lowers the welfare of country j: Instead of redistributing resources from the entrepreneurs to the workers, the policy effectively finances a transfer to the workers with a tax on the workers themselves and in the process creates production inefficiencies in the multinational sector and transfers resources away from the workers to the entrepreneurs through its effect on the wage rate in the domestic sector.

We now consider a home country i that denies the tax exemption of foreign source dividends that have been treated as tax deductible interest payments in the host country. Inserting the tax costs from Table 1 row 5 into Eq. (3), we obtain the following after-tax profit function for a firm in country i that invests in country j:

$$\Pi^{ij}=\left(1-t^j\right)\left\{F(K,S,U)-w^{Si}S-w^{Uj}U-\frac{rK}{1-t^i}\right\}. \tag{15}$$

The profit function of firms based in other countries than i is still given by Eq. (7). It follows that the required return to mobile capital equals $r/(1-t^i) > r$ for firms based in country i whereas it remains r for firms based in other countries. The first-order conditions for demand of skilled and unskilled labor are unchanged relative to Section 3.2. It is now straightforward to show the following result:

Proposition 5. *A country, which is home to multinational firms with foreign investments, achieves higher welfare by allowing hybrid instruments than by disallowing them when all other countries allow them.*

Proof. See the Appendix. ■

The mechanisms underlying this result are quite similar to the case of a host country employing anti-avoidance measures to hybrid structures. The higher cost of capital for firms based in country i induces these firms to use less capital, which in turn depresses their demand for skilled and unskilled labor. Since firms based in country i account for a negligible fraction of labor demand in any host country j and a negligible fraction of the global demand for mobile capital, the policy leaves both w^U and r unchanged but requires a drop in w^{Si} to equilibrate the labor market in country i. In the new equilibrium, multinational firms based in country i employ less of all three production factors in absolute terms and less capital and less unskilled workers per skilled worker. As in the case of a host country, the policy is undesirable because it finances a transfer to workers with a distortive tax that effectively falls on the workers themselves and, in the process, transfers resources away from the workers to the entrepreneurs through its effect on the wage rate in the domestic sector.

Having shown that neither host countries nor home countries have an incentive to employ anti-avoidance measures against hybrid instruments when no other countries employ such measures, the following proposition follows directly.

Proposition 6. *There exists a non-cooperative policy equilibrium in which no countries employ anti-avoidance measures against hybrid instruments and corporate tax rates are set in accordance with Eq. (13).*

These results relate closely to Hong and Smart (2010) who show that host countries optimally allow tax avoidance by multinational firms. Our analysis adds to this insight, first, by showing that also home countries optimally allow tax avoidance by multinational firms and, second, by pointing to the organizational flexibility of multinational firms as an important mechanism by which this feature of optimal policy prevails: Multinational firms allow workers to enter into productive relations with other workers in any foreign country, hence a tax on multinational firms in any single country cannot be shifted to the foreign workers employed by these firms but fall entirely on the workers of the country itself. This mechanism is clearly distinct from international mobility of capital, which is usually cited as the reason why small countries should not tax multinational firms.

4. Concluding remarks

This paper has studied an important type of tax avoidance by which multinational firms finance foreign investment with a hybrid instrument treated as debt in the host country and equity in the home country. By combining tax deductible interest payments in the host country and tax favored dividend payments in the home country, such cross-border hybrid instruments can generate significant tax savings relative to financing with standard debt and equity instruments.

The first part of the paper characterized the scope for tax avoidance with cross-border hybrid instruments under different assumptions about the complexity of the financial structures used by firms. We first showed that, for any pair of countries, firms in at least one of the countries and possibly in both countries can finance investment in the other country with a hybrid instrument treated as equity in the home country and debt in the host country. We then considered hybrid instruments embedded in conduit finance structures and showed that, for any pair of countries, firms in both countries can finance investment in the other country so as to achieve equity treatment in the home country and debt treatment in the host country. Intuitively, whereas simple cross-border hybrid instruments rely on differences in demarcation rules between the home country and the host country, conduit structures can exploit such differences between any pair of third countries. This implies that the particular features of the demarcation rules in the host and home countries have no bearing on the scope for tax avoidance with hybrids.

The second part of the paper investigated why governments have generally done very little to combat the use of cross-border hybrid instruments for tax avoidance. We developed a model of the world economy where multinational firms can avoid taxation by means of hybrids unless either the home country or the host country apply anti-avoidance rules and showed that there exists a global policy equilibrium where no countries apply anti-avoidance rules. Intuitively, a country eliminating the scope for tax avoidance with hybrids effectively introduces taxation of multinational firms operating in the country and because both the capital and the foreign labor employed by these firms can be used by untaxed multinational firms operating in other countries, the incidence of the tax is entirely on the workers of the country itself. This points to the organizational flexibility of multinational firms, which allows workers in one country to enter into productive relations with workers in any other country, as a key reason why it is suboptimal to tax multinational firms from the perspective of individual countries. It should be emphasized that the results do not imply that a coordinated anti-avoidance rules are undesirable from the perspective of the world as a whole. While we did not explicitly study international policy cooperation, we expect a coordinated ban on hybrid instruments to have offsetting effects on welfare: it would effectively subject multinational firms to tax and thus increase the global tax revenue for given tax rates, however, it would also induce countries to lower their tax rates to attract multinational firms.

Appendix

Proof of Lemma 1. Define $\mathbb{Z}_a \equiv \{\mathbf{z} \in \mathbb{Z} : \mathrm{F}(\mathbf{z}) = \mathrm{a}$. Moreover define $\mathbf{z}^E = (1, 1, \ldots, 1)$ and $\mathbf{z}^D = (0, 0, \ldots, 0)$. Let $\tilde{\mathbf{z}}$ denote a financial instrument with identical elements $(\tilde{z}, \tilde{z} \ldots \tilde{z})$. Assumption 1 implies that $F(\cdot)$ takes no higher values than $F(\mathbf{z}^E)$ and no lower values than $F(\mathbf{z}^D)$. The continuousness of $F(\cdot)$ thus ensures that for each $a \in [F(\mathbf{z}^D); F(\mathbf{z}^E)]$, the set $\mathbb{Z}_a$ contains at least one vector $\tilde{\mathbf{z}}$ whereas Assumption 2 ensures that any set $\mathbb{Z}_\mathrm{a}$ contains no more than one vector $\tilde{\mathbf{z}}$. Hence, for each $a \in [F(\mathbf{z}^D); F(\mathbf{z}^E)]$ there is one and only one number $\tilde{z}$ for which $F(\tilde{z}, \tilde{z}, \ldots, \tilde{z}) = a$. Denote this number by $\tilde{z}(a)$ and note that, by Assumption 2, it holds that $\tilde{z}(a') \geq \tilde{z}(a'')$ for any $a' \geq a''$. Define $G(\cdot)$ in the following way: for $\mathbf{z} \in \mathbb{Z}_a : G(\mathbf{z}) \equiv \tilde{z}(a)$ for all $a \in [F(\mathbf{z}^D); F(\mathbf{z}^E)]$. This definition implies that $G(\cdot)$ ranks financial instruments $\mathbf{z}$ in the same way as $F(\cdot)$ while satisfying $G(\tilde{z}) \equiv \tilde{z}$. Define $x \equiv \tilde{z}(y)$. This definition implies that the same set of financial instruments attains the threshold level of equityness under the demarcation rules $\{F(\cdot); y\}$ and $\{G(\cdot); x\}$. Consider a vector z with $F(\mathbf{z}) = b$ where $b \geq y$. By construction $\tilde{z}(b) \geq \tilde{z}(y)$. This in turn implies that $G(\mathbf{z}) \geq x$. Hence, any instrument classified as equity under the rule $\{F(\cdot); y\}$ is also classified as equity under the rule $\{G(\cdot); x\}$. An identical argument applies to any instrument classified as debt under the rule $\{F(\cdot); y\}$. It follows that the two demarcation rules $\{F(\cdot); y\}$ and $\{G(\cdot); x\}$ are equivalent. As for uniqueness, it is easy to see that $G(\cdot)$ is the only monotonic transformation of $F(\cdot)$ that satisfies (b). Moreover, given the definition of $G(\cdot)$ any other threshold than x would result in non-equivalence with $\{F(\cdot); y\}$.

Proof of Proposition 1. Define the instrument $\mathbf{z}^1 = (c, c, \ldots, c)$ where $x^B < c < x^A$. By construction of the scaled demarcation rule, it holds that $G^A(\mathbf{z}^1) = G^B(\mathbf{z}^1) = c$. It follows that $\mathbf{z}^1$ is categorized as equity in B and debt in A. This proves part (a). Define the instrument $\mathbf{z}^2 = (x^A, x^A, \ldots, x^A)$ for which it holds that $G^A(\mathbf{z}^2) = G^B(\mathbf{z}^2) = x^A$. The fact that $G(\tilde{\mathbf{z}}) = \tilde{z}$ for any $\tilde{\mathbf{z}} = (\tilde{z}, \tilde{z}, \ldots, \tilde{z})$ implies that $\sum_n G_n(\tilde{\mathbf{z}}) = 1$. The assumption that $\nabla G^A(\mathbf{z}) \neq \nabla G^B(\mathbf{z})$ for any z therefore implies that $G^A_m(\mathbf{z}^2) > \partial G^B_m(\mathbf{z}^2)$ for at least one m and that $G^A_k(\mathbf{z}^2) < G^B_k(\mathbf{z}^2)$ for at least one k. Consider the instrument $\mathbf{z}^3$ which is identical to $\mathbf{z}^2$ except that it is marginally more equity-like in dimension m and marginally more debt-like in dimension k and where the marginal deviations from x^A in these two dimensions are scaled such that the overall assessment in A is unchanged. By construction, it holds that $G^A(\mathbf{z}^3) = x^A$ and $G^B(\mathbf{z}^3) < x^A$. Hence, $\mathbf{z}^3$ is categorized as equity in A and, provided that x^B is

sufficiently close to x^A, as debt in B. This proves part (b). Consider a subset $\mathbb{Q}$ of the N dimensions and define an instrument $\mathbf{z}^4$ for which $z_n^4 = 1$ when $n \in \mathbb{Q}$ and $z_n^4 = 0$ when $n \notin \mathbb{Q}$. Clearly, it could be the case that $G^A(\mathbf{z}^4)$ is larger than $G^B(\mathbf{z}^4)$ or *vice versa*. Define for country A a new assessment function $H^A(\mathbf{z})$ in the following way:

$$H_n^A(\mathbf{z}) = \begin{cases} G_n^A(\mathbf{z}) + \varepsilon & \text{for } n \in \mathbb{Q} \\ G_n^A(\mathbf{z}) - \mu(\mathbf{z})\varepsilon_n^A(\mathbf{z}) & \text{for } n \notin \mathbb{Q} \end{cases}$$

where $\varepsilon_n^A(\mathbf{z}) = \min(\varepsilon, G_n^A)$ and $\mu(z)$ is a scaling parameter satisfying for each z that:

$$\sum_{n \in \mathbb{Q}} \varepsilon = \sum_{n \in \mathbb{Q}} \mu(\mathbf{z})\varepsilon_n^A(\mathbf{z})$$

Relative to $G^A(\cdot)$, the assessment function $H^A(\cdot)$ adds to the marginal weight on all dimensions belonging to $\mathbb{Q}$ at all $\mathbf{z}$ and subtracts from the marginal weight on all dimensions not belonging to $\mathbb{Q}$ while ensuring that marginal weights are never negative and that the increase in overall equityness following from a marginal increase in the equityness in all dimensions is the same for $G^A(\cdot)$ and $H^A(\cdot)$. Similarly, define for country B a new assessment function $H^B(\mathbf{z})$ in the following way:

$$H_n^B(\mathbf{z}) = \begin{cases} G_n^B(\mathbf{z}) - \mu(\mathbf{z})\varepsilon_n^B(\mathbf{z}) & \text{for } n \in \mathbb{Q} \\ G_n^B(\mathbf{z}) + \varepsilon & \text{for } n \notin \mathbb{Q} \end{cases}$$

where $\varepsilon_n^B(\mathbf{z}) = min(\varepsilon, G_n^B)$ and $\mu(z)$ is a scaling parameter satisfying for each z that:

$$\sum_{n \in \mathbb{Q}} \mu(\mathbf{z})\varepsilon_n^B(\mathbf{z}) = \sum_{n \notin \mathbb{Q}} \varepsilon$$

Relative to $G^B(\cdot)$, the assessment function $H^B(\cdot)$ subtracts from the marginal weight on all dimensions belonging to $\mathbb{Q}$ and adds to the marginal weight on all dimensions not belonging to $\mathbb{Q}$ In other word, an increase in ε changes the weights of the assessment functions in countries A and B in opposite directions. For the particular hybrid instrument $\mathbf{z}_4$, it is clear that $H_n^A(\mathbf{z}^4)$ is increasing in ε to the point where $H_n^A(\mathbf{z}^4) = 1$ whereas $H_n^B(\mathbf{z}^4)$ is decreasing in ε to the point where $H_n^B(\mathbf{z}^4) = 0$. Hence, for a sufficiently large ε, it holds that $H_n^A(\mathbf{z}^4) \geq x^A$ such that $\mathbf{z}^4$ is treated as equity in country A and that $H_n^B(\mathbf{z}^4) < x^B$ such that $\mathbf{z}^4$ is treated as debt in country B. This proves part (c).

Proof of Proposition 3. We evaluate Eq. (4) for a home country (where workers are skilled) and differentiate with respect to t to obtain the first-order condition for the optimal tax rate:

$$\frac{U'\left(C^W\right)}{U'\left(C^E\right)} = -\frac{ndC^E/dt}{dC^W/dt}. \tag{16}$$

The tax revenue amounts to:

$$R = t\left\{H\left(n\overline{Q}, (1-\omega)\overline{S}\right) - w^S(1-\omega)\overline{S}\right\}(1-\delta).$$

Since ω is determined by Eqs. (8)–(12) and thus exogenous to the choice of tax rate, differentiating Eqs. (5) and (6) with respect to t yields:

$$\frac{dC^W}{dt} = \left\{H\left(n\overline{Q}, (1-\omega)\overline{S}\right) - w^S(1-\omega)\overline{S}\right\}(1-\delta) \tag{17}$$

$$\frac{dC^E}{dt} = -\frac{1}{n}\left\{H\left(n\overline{Q}, (1-\omega)\overline{S}\right) - w^S(1-\omega)\overline{S}\right\}. \tag{18}$$

Finally, we insert Eqs. (17) and (18) into Eq. (16) to obtain:

$$\frac{U'\left(C^W\right)}{U'\left(C^E\right)} = \frac{1}{1-\delta}.$$

This proves the proposition for home countries; completely analogous arguments apply to host countries.

Proof of Proposition 4. The model assumes that the corporate tax bases in the two sectors are subject to the same tax rate t. Assume, however, for the sake of this proof, that it is possible to differentiate taxation of the two sectors and let q denote the tax rate applying to profits in the multinational sector while t remains the tax rate applying to the domestic sector. Under this assumption, the tax bill of a multinational firm in home country i investing in a host country j that disallows deduction of interest payments on hybrid instruments is given by:

$$T^{ij} = q^j\left\{F(K,S,U) - Sw^{Si} - Uw^{Uj}\right\}.$$

Define $k \equiv K/U$; $s \equiv S/U$; $f(k,s) \equiv F(K/U, S/U, 1)$ and use these definitions to rewrite the after-tax profits of such a firm as:

$$\Pi^{ij} = U\left[\left(1-q^j\right)\left\{f(k,s) - sw^{Si} - w^{Uj}\right\} - rk\right].$$

The first-order conditions with respect to k, s and U are given by:

$$f_k\left(k^j, s^i\right) = \frac{r}{1-q^j} \tag{19}$$

$$f_s\left(k^j, s^i\right) = w^{Si} \tag{20}$$

$$f\left(k^j, s^i\right) - sw^{Si} - \frac{rk}{1-q^j} = w^{Uj}. \tag{21}$$

We consider how a small increase in q changes the equilibrium. Note that w^{Si} and r do not change in response to an increase in q. The assumption of a large number of countries implies that absorption of redundant skilled workers and mobile capital by firms investing in other host countries requires only a negligible reduction in w^{Si} and r. Holding w^{Si} and r constant, differentiating Eqs. (19) and (20) and combining yields:

$$\frac{dk}{dq^j} = \frac{r}{(1-q^j)^2}\frac{f_{ss}}{f_{kk}f_{ss} - f_{sk}f_{sk}} < 0 \tag{22}$$

$$\frac{ds}{dq^j} = \frac{r}{(1-q^j)^2}\frac{-f_{sk}}{f_{kk}f_{ss} - f_{sk}f_{sk}} < 0 \tag{23}$$

where the arguments of $f(\cdot)$ are suppressed for notational simplicity (the negative sign follows from strict concavity of the production function, which implies that $f_{kk}f_{ss} > f_{sk}f_{sk}$). Differentiating Eq. (21) while using Eqs. (19) and (20) yields:

$$\frac{dw^{Uj}}{dq^j} = -\frac{kr}{(1-q^j)^2} < 0. \tag{24}$$

Finally differentiating $G_U\left(n\overline{Q}, (1-\alpha)\overline{U}\right) = w^U$ yields

$$\frac{d\alpha^j}{dq^j} = \frac{dw^{Uj}}{dq^j}\frac{1}{-G_{UU}} < 0 \tag{25}$$

Eqs. (22)–(25) jointly describe how a small increase in q^j changes the equilibrium. The increase in q^j directly increases the cost of capital, which depresses capital demand and hence also labor demand by firms operating in country j. The wage rate for unskilled workers,

being the only factor price that can adjust, decreases (Eq. (24)) which mitigates the drop in demand for this factor. In the new equilibrium, firms therefore employ less capital per unskilled worker (Eq. (22)) and less skilled workers per unskilled worker (Eq. (23)). The unskilled workers that are laid off in the multinational sector are absorbed by the domestic sector (Eq. (25)).

We now turn to the implications for welfare. Government revenue may be written in the following way:

$$R^j = t\left\{G\left(n\overline{Q}, \left(1-\alpha^j\right)\overline{U}\right) - w^U\left(1-\alpha^j\right)\overline{U}\right\}(1-\delta) + q^j\alpha^j\overline{U}\left\{f\left(k^j, s^i\right) - sw^{Si} - w^{Uj}\right\}$$

where the first term reflects revenue from the domestic sector and the second term reflects revenue from the multinational sector. Differentiating with respect to q^j yields:

$$\frac{dR^j}{dq^j} = -t\left(1-\alpha^j\right)\overline{U}(1-\delta)\frac{dw^U}{dq^j} + \frac{\alpha^j\overline{U}kr}{\left(1-q^j\right)^2} + \frac{q^j\alpha^j\overline{U}r}{\left(1-q^j\right)}\frac{dk}{dq^j} + \frac{q^j\overline{U}kr}{\left(1-q^j\right)^2}\frac{d\alpha^j}{dq^j}.$$

The first term reflects that the increase in entrepreneurial rents that follows from lower wages is partly taxed away. The second term represents the (positive) mechanical revenue effect of raising the tax rate in the multinational sector. The last two terms represent the (negative) behavioral revenue effect due to the decrease in capital demand by multinational firms investing in country j. The total decrease in K is decomposed into a decrease in k for a given U (third term) and a decrease in U for a given k (fourth term).

We may now write up the equilibrium change in consumption for entrepreneurs and workers following a small increase in taxation of the multinational sector:

$$\frac{dC^W}{dq^j} = \left(1-\alpha^j\right)\overline{U}\{1-t(1-\delta)\}\frac{dw^U}{dq^j} + \frac{q^j\alpha^j\overline{U}r}{\left(1-q^j\right)}\frac{dk}{dq^j} + \frac{q^j\overline{U}kr}{\left(1-q^j\right)^2}\frac{d\alpha^j}{dq^j} < 0 \tag{26}$$

$$\frac{dC^E}{dq^j} = -\left(1-\alpha^j\right)\overline{U}(1-t)\frac{dw^U}{dq^j} > 0. \tag{27}$$

These expressions reveal that the consumption of workers decreases for two reasons. First, the wage drop of workers in the multinational sector is larger than the revenue gain from increased taxation of multinational firms (two last terms of Eq. 26). Second, the drop in wages also affects workers in the domestic sector and the wage drop is only partly recouped by the government through taxation of the resulting increase in entrepreneurial rents (first term of Eq. 26). The consumption of entrepreneurs increases exactly because the increase in entrepreneurial rents that follows from lower wages is only partly taxed away.

Hence, by causing a transfer of resources from workers to entrepreneurs and by introducing a deadweight loss in the multinational sector, taxation of multinational firms is undesirable. It follows directly that allowing the use of hybrid instruments, which effectively implements a zero-tax on multinational firms, $q^j = 0$, while allowing for taxation of entrepreneurial rents at the rate of t^*, entails a higher level of welfare than disallowing it, which amounts to imposing the same tax rate on the two sectors.

Proof of Proposition 5. This proof resembles the proof of Proposition (4). Consider a home country i that disallows tax planning with hybrid instruments and assume for the purposes of the proof that it is possible for home country i to levy a tax rate q on profits in the multinational sector and another tax rate t on profits in the domestic sector. The after-tax profit function of a multinational firm based in country i and investing in country j is given by:

$$\Pi^{ij} = \left(1-t^j\right)\left(F(K,S,U) - w^{Si}S - w^{Uj}U - \frac{rK}{1-q^i}\right).$$

Define $\kappa \equiv K/S$; $u \equiv U/S$; $\phi(\kappa, u) \equiv F(K/S, 1, U/S)$ and use these definitions to rewrite the after-tax profits of such a firm as:

$$\Pi^{ij} = S\left[\left(1-t^j\right)\left(\phi(\kappa,u) - w^{Si} - uw^{Uj} - \frac{r\kappa}{1-q^i}\right)\right].$$

The first-order conditions with respect to κ, u and S are given by:

$$\phi_\kappa\left(\kappa^j, u^j\right) = \frac{r}{1-q^i} \tag{28}$$

$$\phi_u\left(\kappa^j, u^j\right) = w^{Uj} \tag{29}$$

$$\phi\left(\kappa^j, u^j\right) - uw^{Uj} - \frac{r\kappa}{1-q^i} = w^{Si}. \tag{30}$$

We consider how a small increase in q changes the equilibrium. Note that w^{Uj} and r do not change in response to an increase in q. The assumption of a large number of countries implies that absorption of redundant unskilled workers and mobile capital by firms in other home countries requires only a negligible reduction in w^{Uj} and r. Holding w^{Uj} and r constant, differentiating Eqs. (28) and (29) and combining yields:

$$\frac{d\kappa}{dq^i} = \frac{r}{\left(1-q^i\right)^2}\frac{\phi_{uu}}{\phi_{\kappa\kappa}\phi_{uu} - \phi_{u\kappa}\phi_{u\kappa}} < 0 \tag{31}$$

$$\frac{du}{dq^i} = \frac{r}{\left(1-q^i\right)^2}\frac{-\phi_{u\kappa}}{\phi_{\kappa\kappa}\phi_{uu} - \phi_{u\kappa}\phi_{u\kappa}} < 0 \tag{32}$$

where the arguments of $\phi(\cdot)$ are suppressed for notational simplicity (the negative sign follows from strict concavity of the production function, which implies that $\phi_{\kappa\kappa}\phi_{uu} > \phi_{u\kappa}\phi_{u\kappa}$). Differentiating Eq. (30) while using Eqs. (28) and (29) yields:

$$\frac{dw^{Si}}{dq^i} = -\frac{r\kappa}{\left(1-q^i\right)^2} < 0 \tag{33}$$

Finally differentiating $H_S\left(n\overline{Q}, (1-\omega)\overline{S}\right) = w^S$ yields

$$\frac{d\omega^i}{dq^i} = \frac{dw^{Si}}{dq^i}\frac{1}{-H_{SS}} < 0. \tag{34}$$

Eqs. (31)–(34) jointly describe how a small increase in q^i changes the equilibrium. The increase in q^i directly increases the cost of capital, which depresses capital demand and hence also labor demand by firms based in country i. The wage rate for skilled workers, being the only factor price that can adjust, decreases (Eq. 33) which mitigates the drop in demand for this factor. In the new equilibrium, firms therefore employ less capital per skilled worker (Eq. 31) and less unskilled workers per skilled worker (Eq. 32). The skilled workers that are laid off in the multinational sector are absorbed by the domestic sector (Eq. 34).

We now turn to the implications for welfare. Government revenue may be written in the following way:

$$R^i = t\left\{H\left(n\overline{Q}, (1-\omega)\overline{S}\right) - w^{Si}\left(1-\omega^i\right)\overline{S}\right\}(1-\delta) + q^i\omega^i\overline{S}\frac{r\kappa}{1-q^i}$$

where the first term reflects revenue from the domestic sector and the second term reflects revenue from the multinational sector. Differentiating with respect to q^i yields:

$$\frac{dR^i}{dq^i} = -t\left(1-\omega^i\right)\overline{S}(1-\delta)\frac{dw^{Si}}{dq^i} + \omega^i\overline{S}\frac{r\kappa}{\left(1-q^i\right)^2} + q^i\omega^i\overline{S}\frac{r}{1-q^i}\frac{d\kappa}{dq^i} + q^i\overline{S}r\kappa\frac{d\omega^i}{dq^i}.$$

The first term reflects that the increase in entrepreneurial rents that follows from lower wages is partly taxed away. The second term represents the (positive) mechanical revenue effect of raising the tax rate in the multinational sector. The last two terms represent the (negative) behavioral revenue effect due to the decrease in capital demand by multinational firms investing in country j. The total decrease in K is decomposed into a decrease in κ for a given S (third term) and a decrease in S for a given κ (fourth term). We may now write up the equilibrium change in consumption for entrepreneurs and workers following a small increase in taxation of the multinational sector

$$\frac{dC^W}{dq^i} = \left(1-\omega^i\right)\bar{S}\{1-t(1-\delta)\}\frac{dw^S}{dq^i} + q^i\omega^i\bar{S}\frac{r}{1-q^i}\frac{d\kappa}{dq^i} + q^i\bar{S}r\kappa\frac{d\omega^i}{dq^i} \tag{35}$$

$$\frac{dC^E}{dq^j} = -\left(1-\omega^i\right)\bar{S}(1-t)\frac{dw^{Si}}{dq^i} > 0. \tag{36}$$

These expressions reveal that the consumption of workers decreases for two reasons. First, the wage drop of workers in the multinational sector is larger than the revenue gain from increased taxation of multinational firms (two last terms of 35). Second, the drop in wages also affects workers in the domestic sector and the wage drop is only partly recouped by the government through taxation of the resulting increase in entrepreneurial rents (first term of 35). The consumption of entrepreneurs increases exactly because the increase in entrepreneurial rents that follows from lower wages is only partly taxed away.

Hence, by causing a transfer of resources from workers to entrepreneurs and by introducing a deadweight loss in the multinational sector, taxation of multinational firms is undesirable. It follows directly that allowing the use of hybrid instruments, which effectively implements a zero-tax on multinational firms, $q^i = 0$, while allowing for taxation of entrepreneurial rents at the rate of t^*, entails a higher level of welfare than disallowing it, which amounts to imposing the same tax rate on the two sectors.

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