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The Sovereign Bond Issuance and Tax Competition for Portfolio Investment

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1 Introduction

In this study, we extend a tax-competition model centered on interest income to incorporate two distinct investment options: sovereign bonds and loans to corporations. We employ this enhanced framework to examine how disparities in initial capital allocation between two jurisdictions influence differences in tax rates and investment in public and private inputs. Specifically, we consider two jurisdictions that are linked by either a bilateral Tax Information Exchange Agreement (TIEA) or a bilateral Double Taxation Agreement (DTA). We investigate how the form of international tax cooperation—information exchange under a TIEA versus comprehensive tax coordination under a DTA—affects outcomes in terms of governmental fiscal policy and private portfolio investment.

A TIEA is primarily aimed at curtailing tax evasion by eliminating banking secrecy in tax havens and enhancing transparency. A DTA is a more comprehensive treaty, established primarily to prevent double taxation by allocating taxing rights and often including provisions for reduced tax rates at source and information sharing. Both agreements are rooted in broader frameworks of international cooperation. In 2002, the OECD established the OECD Model TIEA, beginning the formal signing of bilateral treaties. DTAs, having been continuously negotiated over many years, have proliferated in alignment with the OECD Model Tax Convention on Income and on Capital, notably accelerated by the OECD/G20 BEPS (Base Erosion and Profit Shifting) Project's revision efforts in 2010s. The number of DTAs has continued to grow, particularly those embedding tax information exchange clauses. At one time, the U.S. had signed TIEAs with 74 jurisdictions (OECD, 2009). The U.S. Department of the Treasury (2025) indicates the U.S. maintains TIEAs with 11 jurisdictions—primarily tax-haven jurisdictions such as the Cayman Islands, Hong Kong, Jersey, Panama, and Singapore—representing a marked decline in TIEA partners. This suggests that TIEAs and DTAs might to some extent be substitutional initiatives aimed at mitigating tax evasion.

Following Huizinga and Nielsen (2002), our tax-competition model incorporates substantial residence-based taxation of interest income from cross-border portfolio investment.[1] Specifically, each jurisdiction's government chooses (i) the volume of sovereign bond issuance, (ii) the tax rate on interest income, and (iii) whether to report interest income earned by foreign creditors within its jurisdiction to their home jurisdiction. In each of the two jurisdictions, the population comprises workers and creditors, with workers constituting the majority. We employ a political-economy view in that the government maximizes the utility of the majority—that is, the workers.

First, we examine fiscal policies implemented under the TIEA. Interest income from portfolio investment is taxed at a uniform rate for both domestic and foreign creditors. If a source jurisdiction reports foreign creditors' interest income to the residence jurisdiction, it is ultimately taxed on a residence basis. When the degree of creditors' home bias is not especially pronounced and portfolio investment exhibits a moderate elasticity to after-tax rates of return, a jurisdiction with smaller capital tends to favor a lower tax rate compared to the one with larger capital. Moreover, the jurisdiction with limited capital is less likely to facilitate information exchange. This confidentiality is characteristic of so-called tax havens.

Subsequently, we introduce a DTA that requires both governments to tax interest income earned by foreign creditors at a specified source-based withholding rate. The analysis shows that the two jurisdictions then adopt identical tax rates on domestic creditors. Consequently, the jurisdiction with smaller capital is able to expand its provision of public inputs on a larger scale than the other jurisdiction.

Some studies examine the incentives for tax authorities to engage in information exchange with their counterparts (e.g., Eggert and Kolmar, 2002; Keen and Ligthart, 2006a) and the substitutability between information exchange and withholding taxes (Bacchetta and Espinosa, 1995; Huizinga

[1]Our model also draws upon Nielsen's (2001) cross-border shopping framework, as the concept of cross-border portfolio investments being subject to withholding taxes in the investee jurisdiction parallels the mechanism of commodity taxation in cross-border shopping scenarios.

and Nielsen, 2002; Keen and Ligthart, 2006a, 2006b). As the literature theoretically and empirically points out, countries with smaller populations or areas are more likely to become tax havens (Huizinga and Nielsen, 2002; Dharmapala and Hines, 2009; Keen and Konrad, 2013). These studies show that they are more likely to set low tax rates to encourage profit-shifting and tax arbitrage so they are likely to gain the least from information sharing.

In contrast, in our model, the regional capital position affects which jurisdictions become tax havens. Countries with significant assets invest substantial capital abroad and earn considerable interest income from these investments. For such countries, adopting residence-based taxation—taxing the worldwide income of their residents—and choosing higher tax rates allow them to secure revenue. However, countries with fewer assets pay large amounts of interest to foreign lenders. By adopting source-based taxation—taxing income generated within their own jurisdiction without reporting it to the residence jurisdiction—and setting lower tax rates, they can secure tax revenue. Our model successfully describes this fact.

Tax havens and investors' tax-evasion behavior have long been a focus of research in public finance (see, e.g., Hines and Rice, 1994; Desai et al., 2006; Dharmapala and Hines, 2009; Hines, 2010; Zucman, 2013). Zucman (2013) shows that official statistics substantially underestimate the net foreign asset positions of the euro area and the U.S. because they fail to capture most of the assets held by households in offshore tax havens. Recently, there has been significant progress in understanding and adjusting for the role of tax havens in international financial positions.[2] Drawing on newly published macroeconomic statistics, Alstadsæter et al. (2018) conclude that approximately 10% of the world's GDP is held in tax havens globally. Some recent works, using micro-level data (e.g., by each investor and security), reallocate the holdings of assets by tax haven countries to the countries of the ultimate investors (Coppola et al., 2021; Beck et al., 2023).

[2]Florez-Orrego et al. (2024) review the recently surging literature in the area of international macroeconomics and finance.

This study also contributes to a growing literature on governments' capacity to borrow from global capital markets. Miyazawa et al. (2019) provide a theoretical analysis of the relationship between capital tax competition among debt-financed governments and fiscal sustainability within an endogenous growth framework. Ballard-Rosa et al. (2021), using comprehensive data on sovereign bond issues, identify the political and macroeconomic conditions that enable nations to issue debt. Cormier and Naqvi (2023) present evidence that asset managers replicate benchmark indices, which can dilute market discipline on borrowing governments. Their analysis reveals that countries included in prominent indices are less constrained by typical country-specific factors previously thought to restrict bond market access.

The above-mentioned studies have typically analyzed tax havens and sovereign borrowing as separate phenomena. This study distinguishes itself by integrating both elements into a unified analytical framework. This integrated approach facilitates a comprehensive examination of how increased tax revenue can stimulate private capital formation and enhance overall economic value creation. By capturing these dynamics within a single model, the study offers novel insights into the interplay between fiscal policy and private sector investment.

2 Framework

2.1 Government

There exist two jurisdictions $i = 1, 2$. The government in jurisdiction i (referred to as government i) simultaneously and independently makes decisions about the quantity of government bond issuance $g_i(\geq 0)$, which is measured on per-worker basis, tax rate on interest income $\gamma_i(\geq 0)$, and the ratio $x_i \in [0, 1]$ of interest income to be reported to the government $j = 1, 2$, $j \neq i$, to total interest income that is earned in jurisdiction i by jurisdiction-j creditors. The tax authority of jurisdiction i can adjust x_i by deliberately avoiding collecting information on interjurisdictional deposits in

financial institutions or enacting a law that makes tax avoidance challenging to identify.

The government borrows from the market to supply a public input that is used by the firm in the jurisdiction. The instances of a public input include infrastructure, or government officials who serve to establish legal frameworks for market transaction. Let $r_i(\geq 0)$ denote the coupon rate of the government bond. It is set as generating the same rate of return for creditors to hold government bonds or the other option, as described in Section 2.3.

When making decisions, each government only takes into account the utility of domestic labor. In our model, the population comprises creditors and workers, and this supposition reflects stronger preferences of the incumbent government toward the majority of the electorate. In reality, individuals who only earn from portfolio investment occupy a very small portion of the population. Therefore, examining this scenario is plausible even if we do not describe the electoral process explicitly.

The government also requires workers to pay lump-sum labor income tax as long as interest income tax revenue is insufficient to cover the principal and interest payments to bondholders. Let t_i denote the lump-sum labor income tax for each worker; if negative, its absolute value equals the amount of subsidy. Let b_i denote the base to be imposed as interest income tax. Then, government i is faced with the fiscal constraint:

$$t_i = (1 + r_i)g_i - \gamma_i b_i. \tag{1}$$

2.2 Workers

A continuum of immobile and homogeneous workers dwell in each jurisdiction i and their mass is equal to 1. Each of them supplies one unit of labor inelastically and earns wage w_i. An individual worker's consumption is $c_i = w_i - t_i$, and their utility is given by $u(c_i) = c_i$.

2.3 Creditors

Jurisdiction i has a continuum of immobile risk-neutral creditors whose mass is less than 1. The total capital they initially possess is a_i, which is, again, measured on a per-worker basis. We suppose asymmetric financial ability between two jurisdictions: $a_1 > a_2 > 0$. The total quantity of capital supplied in both jurisdictions is $a_1 + a_2 = a$.

Creditors, whether residing in or out of jurisdiction i, can purchase bonds issued by government i. Alternatively, creditors can finance their funds to another option, such as corporate bonds and loans and earn returns with rate r_i. We refer to this option as *loan*. As Section 2.4 shows, the funds are used by the firm for investment in private capital.

Creditors in a jurisdiction are homogeneous except in their degree of home bias. As a benchmark, let both domestic and foreign creditors face the same interest income tax rate. The after-tax profit from a unit of before-tax interest income that is earned by creditors in jurisdiction i is modelled as

$$\begin{cases} (1-\gamma_i)+v_i, & \text{if investing in jurisdiction } i; \\ x_j(1-\gamma_i)+(1-x_j)(1-\gamma_j), & \text{if investing in jurisdiction } j, \end{cases} \tag{2}$$

where v_i represents an extent of home bias, being uniformly distributed within the interval $[0, d]$ with density $\frac{1}{d}(> 0)$. The uniform distribution with density $\frac{1}{d}$ first-order stochastic dominates the uniform distribution with density $\frac{1}{d'}$ if $\frac{1}{d} < \frac{1}{d'}$. Therefore a greater value of d indicates that home bias is more prominent. Recall that x_j represents the ratio of jurisdiction-i creditors' interest income earned in jurisdiction j and reported by government j to government i, indicating how strictly government j complies with the residence principle. Government j deducts tax from jurisdiction-i creditors' unreported interest income at source with rate γ_j. For reported interest income, the creditors are liable for additional taxation in jurisdiction i at $\gamma_i - \gamma_j$, with tax credit being given for taxes paid abroad; therefore, the total tax is ultimately the same as the full home rate.

2.4 Firm

A firm in jurisdiction i produces a good whose market price is equal to 1, by using a public input, private capital, and labor. To employ private capital $k_i(\geq 0)$ per worker, the firm borrows the amount k_i from creditors in jurisdictions 1 and 2 via the capital market.

Technology to produce output y_i per worker is described as

$$y_i = g_i k_i - \frac{(k_i)^2}{2}. \tag{3}$$

Following the literature using tax-competition models, we suppose that the residual profit after paying interest rk_i to creditors is paid to workers as wages.

2.5 Timing

Events unfold as follows.

1. Government $i = 1, 2$ simultaneously and independently chooses the amount of government bonds to be issued, g_i.

2. Government $i = 1, 2$ simultaneously and independently chooses interest income tax rate, γ_i, and the ratio of reporting to government j, x_i.

3. Creditors in jurisdiction i purchase government bonds issued by government i or j, or finance funds to riskless loans in jurisdiction i or j.

4. The firm in jurisdiction i borrows k_i and spends it on employing private capital k_i for production.

We explore the subgame perfect Nash equilibrium by solving the game backwards. The outcome derived from the benchmark-model analysis in Section 3 corresponds with the outcome when

encouraging information exchange is the sole purpose of a bilateral treaty called the TIEA. In Section 4, we modify the benchmark model to analyze the agents' choices under the DTA, which is supposed to not only encourage an information exchange but also enforce the withholding tax rate at its source.

3 Benchmark: The outcomes under the TIEA

3.1 Production

Given the supply of public input in two jurisdictions g_i and g_j, the firm in jurisdiction i chooses k_i to maximize its profit

$$g_i k_i - \frac{k_i^2}{2} - r k_i. \tag{4}$$

The firm can borrow and creditors can lend in either jurisdiction i or j, so that the interest rate is common interjurisdictionally ($r = r_1 = r_2$). Then, the optimal quantity of private capital should satisfy

$$g_i - k_i = r. \tag{5}$$

From (5) and the resource constraint

$$g_i + k_i + g_j + k_j = a, \tag{6}$$

we derive

$$r = g_i + g_j - \frac{a}{2}; \tag{7}$$

$$k_i = -g_j + \frac{a}{2}. \tag{8}$$

For derivation see the Appendix. With regard to (7), providing a large quantity of public input in any jurisdiction raises the demand for capital, and therefore, the interest rate. This cancels out the crowding-in effect generated by public input provision, and consequently crowds out investment in private capital, as shown in (8).

3.2 Portfolio investment

Arbitrage works when creditors consider allocating their funds between two jurisdictions. Creditors residing in a jurisdiction may be attracted to invest in another jurisdiction due to profits gained by tax evasion. If they have strong home bias, however, they may hesitate to make an overseas portfolio investment.

The rates of return are the same interjurisdictionally because the interest rate r is common across jurisdictions. Then, from (2), a creditor in jurisdiction i invests in jurisdiction i if

$$v_i \geq (1 - x_j)(\gamma_i - \gamma_j). \tag{9}$$

The term on the right-hand side of (9) indicates the benefit of tax evasion. For $\gamma_i > \gamma_j$, larger capital flight occurs from jurisdiction i to jurisdiction j, overcoming the home investment inclination, if government j behaves in a less cooperative way as a source jurisdiction and the difference in interest income tax rates is larger. When it is sufficiently large and exceeds d, all capital flows to jurisdiction j. This result is consistent with Huizinga and Nielsen (2002) who assert that the effective cross-

border tax is determined by the source country. When $\gamma_i < \gamma_j$, no creditors in jurisdiction i gain through overseas portfolio investment. Thus, the fraction of creditors who invest in their home jurisdiction i is calculated as

$$1 - \min\left[\frac{1-x_j}{d}\max\left[\gamma_i - \gamma_j, 0\right], 1\right]. \tag{10}$$

Thus, introducing heterogeneity in creditors' home bias allows some creditors to invest in their home jurisdiction, while others invest abroad.

The interest income tax base for government i, b_i, is decomposed into three elements:

(i) $ra_i\left\{1 - \min\left[\frac{1-x_j}{d}\max\left[\gamma_i - \gamma_j, 0\right], 1\right]\right\}$ that is earned in jurisdiction i by jurisdiction-i creditors;

(ii) $rx_j a_i \min\left[\frac{1-x_j}{d}\max\left[\gamma_i - \gamma_j, 0\right], 1\right]$ that is earned in jurisdiction j by jurisdiction-i creditors and is reported to government i;

(iii) $r(1-x_i)a_j \min\left[\frac{1-x_i}{d}\max\left[\gamma_j - \gamma_i, 0\right], 1\right]$ that is earned in jurisdiction i by jurisdiction-j creditors and is not reported to government j,

and their total is

$$b_i = r\left\{a_i - (1-x_j)a_i \min\left[\frac{1-x_j}{d}\max\left[\gamma_i - \gamma_j, 0\right], 1\right] + (1-x_i)a_j \min\left[\frac{1-x_i}{d}\max\left[\gamma_j - \gamma_i, 0\right], 1\right]\right\} \tag{11}$$

3.3 Governments' choice of tax rate and public input

From (1) and (11), the worker utility is

$$\begin{aligned} u(c_i) &= w_i + \gamma_i b_i - (1+r)g_i \\ &= g_i k_i - \frac{k_i^2}{2} - rk_i \\ &\quad +\gamma_i r \left\{ a_i - (1-x_j)a_i \min\left[\frac{1-x_j}{d}\max\left[\gamma_i - \gamma_j, 0\right], 1\right] + (1-x_i)a_j \min\left[\frac{1-x_i}{d}\max\left[\gamma_j - \gamma_i, 0\right], 1\right]\right\} \\ &\quad -(1+r)g_i. \end{aligned} \tag{12}$$

In (12), $g_i k_i - \frac{k_i^2}{2} - g_i$ represents the value generated by public investment, and $r(g_i + k_i)$ corresponds with payment to factors other than labor. Furthermore, the tax revenue $\gamma_i b_i$ from interest income comprises three elements. The term $\gamma_i r a_i$ is government i's interest income tax revenue when two governments completely comply with the TIEA. The term $\gamma_i r(1-x_j)a_i \min\left[\frac{1-x_j}{d}\max\left[\gamma_i - \gamma_j, 0\right], 1\right]$ is associated with tax revenue lost by jurisdiction-i creditors' tax-avoidance behavior. The term $\gamma_i r(1-x_i)a_j \min\left[\frac{1-x_i}{d}\max\left[\gamma_j - \gamma_i, 0\right], 1\right]$ captures tax revenue gained from jurisdiction-j creditors' tax-avoidance behavior.

Proposition 1 demonstrates the outcome of tax competition in Stage 2 (derivations of propositions are gathered in the Appendices). It suggests a jurisdiction with smaller capital endowment can be a tax haven.

Proposition 1. Under the supposition that interest rate is positive:

- Government $i = 1, 2$ adopts $\gamma_i = \frac{d(2a_i + a_j)}{3a_1}$. That is, government 2, which initially has a smaller capital position, sets a lower interest income tax rate than government 1.
- The tax rates of two jurisdictions, $\gamma_1 = \frac{d(2a_1 + a_2)}{3a_1}$ and $\gamma_2 = \frac{d(2a_2 + a_1)}{3a_1}$, decrease as the ratio $\frac{a_2}{a_1}$ decreases; that is, as interjurisdictional inequality in the initial capital distribution becomes

larger.

- The difference in tax rates between the two jurisdictions, $\gamma_1 - \gamma_2 = \frac{d(a_1-a_2)}{3a_1}$, becomes larger as interjurisdictional inequality increases.
- With lower d, tax rates of two jurisdictions approach 0.
- Any degree of compliance with information exchange $x_1 \in [0, 1]$ is indifferent to government 1, while government 2 prefers $x_2 = 0$.

In our model, jurisdictions differ in initial capital position. The jurisdiction with initially lower capital tends to set a lower tax rate and exhibits less compliance effort, effectively functioning as a tax haven. The greater the interjurisdictional disparity, the lower the tax rates in both jurisdictions, with the reduction being particularly pronounced in the jurisdiction with a smaller quantity of capital.

See Figure 1, which depicts the best responses by government 1 (in bold black lines) and government 2 (in bold blue lines) in the areas $\gamma_1 > \gamma_2$ and $\gamma_1 < \gamma_2$ against another government's choice. The government of jurisdiction 2, which has smaller capital than that of jurisdiction 1, might synchronize with government 1, giving up attracting more portfolio investment from jurisdiction 1. Under this strategy, intersection A might be a potential candidate for an equilibrium. However, the proof in the Appendix excludes it. Alternatively, government 2 sets a further lower tax rate to more strongly induce creditors in jurisdiction 1 to invest in jurisdiction 2. The unique equilibrium is marked by intersection B, where jurisdiction 2 is a tax haven.

Noteworthy in Proposition 1 is the effect of d, which captures the strength of the creditors' home bias or, in other words, how unresponsive their tax-evasion motive is to the difference in tax rates of two jurisdictions. As home bias is stronger, interest income tax rates are diverged between two jurisdictions. With lower d, that is, with weak home bias, tax competition is more evident,

and eventually, jurisdictions are involved in a *race to the bottom*. Lowering an interest income tax rate induces tax-avoidance behavior by foreign creditors, while suppressing tax-avoidance behavior by domestic creditors.[3]

Regarding the degree of effort on information transmission, Proposition 1's results are analogous of Bacchetta and Espinosa (1995) and Huizinga and Nielsen (2002), who show that incentives to transmit information exist for jurisdictions with a large population. Favoring $x_i = 0$ can be interpreted as preferring implementation of source-based taxation, with a higher x_i describing increased preferences toward the residence principle. Indeed, there is a rationale for nations with significant assets to favor residence-based taxation of interest income. They invest substantial capital abroad and earn considerable interest income from these investments. Thus, adopting residence-based taxation and taxing the worldwide income of their residents allow these countries to secure revenue. Meanwhile, nations with small assets prefer source-based taxation because they likely pay large amounts of interest to foreign lenders. By adopting source-based taxation and taxing income generated within their own jurisdiction, they can secure tax revenue from non-residents.

Proposition 2 shows that the interjurisdictional disparity also affects the outcome of the governments' decisions in Stage 1.

Proposition 2. Suppose that the amounts of bond issuance and interest rate are positive. Then:

- The quantity of public input in jurisdiction 1, g_1, is larger than that in jurisdiction 2, g_2, by $\frac{d\left[(a_1)^2-(a_2)^2\right]}{3a_1}$.
- The quantity of private capital in jurisdiction 1, k_1, is larger than that in jurisdiction 2, k_2, by $\frac{d\left[(a_1)^2-(a_2)^2\right]}{3a_1}$.
- Wage income is higher in jurisdiction 1.

[3]In (9) it is assumed that if the tax rates are the same interjurisdictionally, no capital outflow occurs.

- If home bias is weak and interjurisdictional inequality in the initial capital distribution is apparent $\left(d\left(1+\frac{a_2}{a_1}\right)<\frac{3}{2}\right)$, jurisdiction 1 exports capital while jurisdiction 2 imports it; otherwise the opposite occurs.

The quantities of both public and private inputs are greater in jurisdiction 1, implying that its output level is also higher. However, whether a jurisdiction becomes a capital-importer or exporter depends on the degree of home bias and interjurisdictional inequality. These results are associated with the interest income tax revenue divided by the interest rate, expressed as $\frac{d(2a_i+a_j)^2}{9a_1}$. The interjurisdictional difference in this measure, $\frac{d\left[(a_1)^2-(a_2)^2\right]}{3a_1}$, influences the disparity in public and private inputs between jurisdictions 1 and 2. If d is sufficiently large, indicating strong home bias, this difference becomes large enough to make jurisdiction 1 a capital-importer. A significant inequality in the initial distribution of capital also increases the disparity in public and private inputs. However, in this case, jurisdiction 1 remains a capital-exporter and jurisdiction 2 is a capital-importer because of the amplified disparity in initial capital positions.

4 The outcomes under the DTA

This section focuses on comparing the effects of TIEAs and DTAs, with particular attention to the latter's provisions concerning withholding taxation on non-residents. Article 11 of the Model Tax Convention on Income and on Capital by the OECD provides that the country of residence has the primary right to tax interest income, while also allowing the source country limited taxing rights (OECD, 2019). Many member countries tend to restrict the source country's taxing rights through bilateral treaties. Huizinga and Nielsen (2002) highlight a key distinction between the non-resident withholding tax regime and interjurisdictional information exchange regime from the perspective of tax revenue recipients: withholding taxes are levied at the source, whereas information exchange

mechanisms reinforce the residence principle. In contrast, our analysis emphasizes the differential tax treatment between residents and non-residents under the DTAs as they also promote the exchange of information.

We assume that under a DTA, the withholding tax rate on non-residents is constrained to $\underline{\gamma}$. This corresponds to a level that prevents double taxation and grants the source country a limited taxing right. Suppose $0 \leq \underline{\gamma} \leq d$, which ensures the existence of an equilibrium in the subsequent analysis. Subject to the DTA, Stage 2 in the sequence of events in Section 2.5 should be modified as each government i's adoption of interest income tax rate on domestic creditors, which is denoted by γ_i^*, and the ratio of reporting to government j, which is denoted by x_i^*. We apply the usage of this superscript to other variables. The following proposition yields implications that diverge from those of Proposition 1 which exclusively analyzed the impact of engagement in information exchange.

Proposition 3. Let the DTA constrain governments 1 and 2 to set non-resident withholding tax rate at $\underline{\gamma}$ $\left(0 \leq \underline{\gamma} \leq d\right)$. Under the supposition that interest rate is positive:

- Government $i = 1, 2$ adopts $\gamma^* = \frac{d+\underline{\gamma}}{2}$. This rate is equal to or higher than $\underline{\gamma}$ and increases with the degree of creditors' home bias, d.

- Government $i = 1, 2$ prefers $x_i^* = 0$, except when $d = \underline{\gamma}$, in which case any degree of compliance with information exchange, $x_i \in [0, 1]$, is indifferent to government i.

- For jurisdiction 1, γ^* is higher than γ_1 indicated in Proposition 1 if and only if $\frac{a_2}{a_1} < -\frac{1}{2} + \frac{3}{2}\frac{\underline{\gamma}}{d}$. For jurisdiction 2, γ^* is higher than γ_2 in Proposition 1 if and only if $\frac{a_2}{a_1} < \frac{1}{4} + \frac{3}{4}\frac{\underline{\gamma}}{d}$.

As shown in Proposition 3, the DTA allows the contracting jurisdictions to set the same resident tax rate above the withholding tax rate on non-residents. Given $\underline{\gamma}$, when governments no longer

need to maintain low tax rates to attract foreign creditors through tax avoidance, they prefer higher taxes on residents to ease the burden on labor. A stronger home bias among creditors further increases the resident tax rate.

Unlike a regime without restrictions on non-resident withholding tax rates, a bilateral tax treaty that constrains such rates inadvertently weakens the incentives for information exchange. Instead, both governments become inclined to conceal interest income earned by foreign creditors in order to attract portfolio investment.

Figure 2 depicts the relationship among γ^*, γ_1, and γ_2 described in Proposition 3, which depends on $\frac{\underline{\gamma}}{d}$ and $\frac{a_2}{a_1}$. A higher source-based withholding tax rate, $\underline{\gamma}$, raises the equilibrium resident tax rate γ^* under the DTA. A more unequal distribution of capital endowment, reflected in a lower $\frac{a_2}{a_1}$, has a similar effect relative to the TIEA, because the tax rates of two jurisdictions under the TIEA are lower as the ratio $\frac{a_2}{a_1}$ decreases, which is demonstrated in Proposition 1. When interjurisdictional inequality in the initial capital distribution is large, jurisdiction 2, often regarded as a tax haven, imposes a resident tax rate γ^* exceeding γ_2.

The following proposition describes factor employment and the resultant capital flows under the constraint on withholding tax rates at source.

Proposition 4. Let the DTA constrain governments 1 and 2 to set non-resident withholding tax rate at $\underline{\gamma}$ $\left(0 \leq \underline{\gamma} \leq d\right)$. Suppose that the amounts of bond issuance and interest rate are positive. Then:

- The quantity of public input in jurisdiction 1, g_1^*, is larger than that in jurisdiction 2, g_2^*, by $\frac{a_1-a_2}{4d}\left(d^2+3\underline{\gamma}^2\right)$.
- The quantity of private input in jurisdiction 1, k_1^*, is larger than that in jurisdiction 2, k_2^*, by $\frac{a_1-a_2}{4d}\left(d^2+3\underline{\gamma}^2\right)$.

- Wage income is higher in jurisdiction 1.
- The increase in public input in jurisdiction 2 under the DTA relative to the TIEA exceeds the corresponding increase in jurisdiction 1, that is, $g_2^* - g_2 > g_1^* - g_1$, if and only if $\frac{a_2}{a_1} > -\frac{1}{4} + \left(\frac{3}{2}\frac{\gamma}{\overline{d}}\right)^2$.

A comparison of Propositions 2 and 4 indicates that, even when the non-resident withholding tax rate is constrained, jurisdiction 1 retains its advantage in employing factors of production, thereby generating a higher level of output. However, this constraint may enable jurisdiction 2 to expand government bond issuance and increase investment in public inputs under the DTA relative to the TIEA, compared with jurisdiction 1. Figure 2 illustrates the region where $g_2^* - g_2 > g_1^* - g_1$, located to the left of the bold dotted curve, indicating that government 1 is induced to set a lower interest income tax rate on residents under the DTA than under the TIEA, whereas government 2 is not necessarily induced to do so.

A range of theoretical propositions may help to account—at least in part—for observed trends in governmental revenues and expenditures among tax-haven jurisdictions. In the early 2000s, the OECD initiated an information-exchange framework, which was followed in the 2010s by the proliferation of the DTAs as the BEPS measures. Consistent with Proposition 4, Figure 3 shows that during the 2010s, tax-haven countries' average total expenditure ratio of general governments (measured relative to GDP) increased, approaching OECD averages—though this trajectory was subsequently disrupted by the COVID-19 pandemic.[4] Figure 4 presents the average general government revenue ratios relative to GDP with respect to tax-haven and OECD countries. Notably,

[4] 32 countries that are included both in the list of tax havens in Dharmapala and Hines (2009) and in the IMF's World Economic Outlook Database, April 2025 are listed here as tax-haven countries. This group includes Andorra, Antigua and Barbuda, Aruba, Bahrain, Barbados, Belize, Cyprus, Dominica, Grenada, Hong Kong SAR, Ireland, Jordan, Lebanon, Liberia, Luxembourg, Macao SAR, Maldives, Malta, Marshall Islands, Mauritius, Nauru (since 2009), Panama, Samoa, San Marino (since 2004), Seychelles, Singapore, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Switzerland, Tonga, and Vanuatu. Additionally, 38 OECD countries as of June 2025 are included in the corresponding category. Ireland and Luxembourg belong to both categories.

tax-haven countries exhibited increasing revenue ratios throughout the 2010s in comparison with a relatively constant trend in OECD members. This finding suggests that, during that period, the revenue-enhancing effects of international tax coordination might have been explicit in tax-haven countries, although a more granular decomposition of revenue components is necessary to isolate the specific influence of such coordination.[5]

5 Conclusion

In this article, we extend the traditional tax-competition model to encompass intergovernmental competition for portfolio investment. Despite the typically adopted residence-based taxation of financial income, considerable personal funds are held in low-tax jurisdictions, commonly referred to as tax havens. This observation suggests that countries may still engage in competition to attract portfolio investments through tax rate adjustments accompanying other means, such as financial secrecy. Models incorporating the concealment of account information from the investor's country of residence already exist. However, our study aims to develop a comprehensive model incorporating the government's and firm's borrowing, to compare the effects of two types of tax cooperation: the establishment of bilateral treaties for information exchange between tax authorities and bilateral treaties which are originally designed to prevent double taxation. This approach provides insights into how international tax cooperation influences an interplay between tax evasion by creditors and private and public capital formation in the context of global portfolio investment competition.

Our analysis indicates that the two forms of international cooperation yield different outcomes in how so-called tax-haven countries set their tax rates and provide public inputs. Under a bilateral treaty that promotes only information exchange, a jurisdiction with initially low levels of capital tends to choose a lower tax rate than another jurisdiction to attract capital. However, under a

[5]In the IMF's World Economic Outlook Database, revenue consists of taxes, social contributions, grants receivable, and other revenue.

bilateral treaty designed not only to facilitate information exchange but also to prevent double taxation—emphasizing a low withholding tax rate on income earned by investors from the partner jurisdiction—the governments of the two jurisdictions adopt the same tax rate for resident investors. This, in turn, enables the jurisdiction with smaller capital to increase its investment in public inputs on a larger scale than the other jurisdiction. These theoretical predictions may clarify why, during the implementation of the OECD/G20 BEPS Project, which promoted the establishment of DTAs, public expenditure as a percentage of GDP in tax-haven countries increased, in contrast to a declining trend in OECD member states.

This analysis is subject to several limitations. First, the government's decision is modeled as reflecting the interests of the majority—namely, workers. In practice, however, governments may engage in more strategic behavior that prioritizes the pursuit of alternative forms of political rent. Second, the current framework treats the withholding tax rate at source as exogenous, whereas in a more comprehensive setting that incorporates intergovernmental bargaining, it could be endogenously determined. These limitations suggest promising directions for future research.

Glossary

Double Taxation Agreement (DTA): An agreement between countries designed to prevent the same income from being taxed in multiple jurisdictions.

Residence principle of taxation: A concept dictating that residents of a particular jurisdiction are taxed on their worldwide income.

Source principle of taxation: A concept dictating that a jurisdiction is allowed to impose tax on income that originates within its borders, regardless of the taxpayer's residence.

Tax Information Exchange Agreement (TIEA): An agreement between countries that facilitates the exchange of tax-related information upon request.

Withdrawing tax: A tax that the payer of income deducts at the source before making the payment to the recipient.

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Appendix A Derivation of (7) and (8)

From (5) we have

$$g_i - k_i = r = g_j - k_j. \tag{A.1}$$

Subject to (6),

$$g_i - k_i + g_j - k_j = g_i + g_j - (a - g_i - g_j) = 2r, \tag{A.2}$$

so that we obtain (7). The substitution of (7) into (A.1) leads to (8).

Appendix B Proof of Proposition 1

In (12), suppose that $\frac{1-x_j}{d}\max[\gamma_i-\gamma_j,0]\geq 1$ holds in equilibrium. This means $\gamma_i>\gamma_j$. Then, with g_i and g_j being determined and r being given by (7), government i could increase workers' utility by marginally increasing γ_i. This contradicts the assumption that such a relationship holds in equilibrium. Therefore, if an equilibrium exists, it must be that $\frac{1-x_j}{d}\max[\gamma_i-\gamma_j,0]<1$.

Next, suppose that $\frac{1-x_i}{d}\max[\gamma_j-\gamma_i,0]>1$ holds in equilibrium. This means $\gamma_i<\gamma_j$. In this case, government i could increase workers' utility by marginally increasing γ_i while still maintaining this relationship. Therefore, if an equilibrium exists, it must be that $\frac{1-x_i}{d}\max[\gamma_j-\gamma_i,0]\leq 1$.

Based on these discussions, the procedure for solving government i's optimal choice of γ_i and x_i is as follows. First, we assume $\frac{1-x_j}{d}\max[\gamma_i-\gamma_j,0]<1$ and $\frac{1-x_i}{d}\max[\gamma_j-\gamma_i,0]\leq 1$, and solve the corresponding maximization problem. Subsequently, we verify that the values of γ_i and x_i obtained based on the assumptions actually satisfy the assumptions.

Define the interest income tax revenue divided by interest rate as

$$z_i\equiv\frac{\gamma_i b_i}{r}=\gamma_i\left\{a_i-a_i\frac{(1-x_j)^2}{d}\max[\gamma_i-\gamma_j,0]+a_j\frac{(1-x_i)^2}{d}\max[\gamma_j-\gamma_i,0]\right\}. \tag{B.1}$$

Under the supposition that r is positive, x_i that maximizes $u(c_i)$ in (12) should maximize z_i, and γ_i that maximizes $u(c_i)$ should maximize z_i.

First of all, we can exclude $\gamma_i=0$, which implies $z_i=0$, from the set of candidate equilibrium strategies. For any x_j and γ_j, government i increases z_i by marginally increasing γ_i. This also applies to the choice of γ_j by government j.

Then, taking γ_j and x_j as given, the first derivative of (B.1) with regard to x_i is

$$\frac{\partial z_i}{\partial x_i} \;=\; -2\gamma_i a_j\frac{1-x_i}{d}\max[\gamma_j-\gamma_i,0]. \tag{B.2}$$

Thus, the optimal choice of x_i by government i, when it would like to select $\gamma_i < \gamma_j$, is setting 0. Otherwise any $x_i \in [0, 1]$ is indifferent and included in its best choices. We can apply this logic to the choice of x_j by government j.

Next we examine government i's optimal choice of γ_i by categorizing the relative position of γ_i to γ_j into (i) to (iii) below.

(i) For the area $\gamma_i > \gamma_j$,

$$\frac{\partial z_i}{\partial \gamma_i} = a_i \left(1 - \frac{2\gamma_i}{d} + \frac{\gamma_j}{d}\right) = 0, \tag{B.3}$$

gives us government i's best choice in the area against γ_j:

$$\gamma_i = \frac{d}{2} + \frac{\gamma_j}{2}, \tag{B.4}$$

because the second derivative is negative.

(ii) For the area $\gamma_i < \gamma_j$, in the similar manner,

$$\frac{\partial z_i}{\partial \gamma_i} = a_i \left(1 - \frac{2a_j}{da_i}\gamma_i + \frac{a_j}{da_i}\gamma_j\right) = 0, \tag{B.5}$$

obtains government i's best choice in the area against γ_j:

$$\gamma_i = \frac{da_i}{2a_j} + \frac{\gamma_j}{2}. \tag{B.6}$$

(iii) $\gamma_i = \gamma_j$ is not included in the set of government i's best reactions because of the strict concavity of (B.1) regarding γ_i (see the middle expressions in (B.3) and (B.5)) and the continuity of (B.1) (and of (12)), except for $\gamma_1 \in \left[d, \frac{da_1}{a_2}\right]$ where government 1 cannot increase workers'

utility by deviating from $\gamma_1 = \gamma_2$.

Based on these discussions, we can draw Figure 1 in Section 3.3, where bold lines depict (B.4) and (B.6) for $i = 1, 2$. Intersection B indicates the unique equilibrium in which government i adopts $\gamma_i = \frac{d(2a_i+a_j)}{3a_1}$, meaning $\gamma_1 > \gamma_2$. The difference of γ_1 and γ_2 is calculated as $\gamma_1 - \gamma_2 = \frac{d(a_1-a_2)}{3a_1}$, which is greater with a lower $\frac{a_2}{a_1}$. Note that a symmetric pair of $\gamma_1 = \gamma_2 = d$ at intersection A is not an equilibrium because government 2 can increase workers' utility by deviating from d to a lower tax rate.

Finally, we verify that the pair of $\gamma_i = \frac{d(2a_i+a_j)}{3a_1}$ and $\gamma_j = \frac{d(2a_j+a_i)}{3a_1}$ satisfies the assumptions $\frac{1-x_j}{d} \max[\gamma_i - \gamma_j, 0] < 1$ and $\frac{1-x_i}{d} \max[\gamma_j - \gamma_i, 0] \leq 1$. Since $\gamma_i - \gamma_j = \frac{d(a_i-a_j)}{3a_1}$, we have $|\gamma_i - \gamma_j| < \frac{d}{3}$. Therefore,

$$\frac{1-x_j}{d} \max[\gamma_i - \gamma_j, 0] \quad < \quad \frac{1}{3}, \tag{B.7}$$

and

$$\frac{1-x_i}{d} \max[\gamma_j - \gamma_i, 0] \quad < \quad \frac{1}{3}, \tag{B.8}$$

which actually satisfy the assumptions.

Appendix C Proof of Propotition 2

Taking g_j as given and anticipating $((\gamma_i, x_i), (\gamma_j, x_j))$, because $\frac{\partial r}{\partial g_i} = 1$ from (7), the first-order condition for maximizing (12) with regard to g_i gives us government i's best reaction:

$$g_i = -\frac{g_j}{2} + \frac{a}{4} - \frac{1}{2} + \frac{z_i}{2}. \tag{C.1}$$

The pair of (C.1) and the comparable relation with i and j interchanged obtains government i's choice of g_i as

$$g_i = \frac{a}{6} - \frac{1}{3} + \frac{2z_i}{3} - \frac{z_j}{3}. \tag{C.2}$$

Because $z_i = \frac{d(2a_i+a_j)^2}{9a_1}$ and the same applies to z_j as well, from (C.2),

$$g_i = \frac{a}{6} - \frac{1}{3} + \frac{\left[2(\gamma_i)^2 - (\gamma_j)^2\right] a_1}{3d}. \tag{C.3}$$

Also, from (C.2) we obtain $g_i - g_j = z_i - z_j = \frac{d\left[(a_i)^2-(a_j)^2\right]}{3a_1}$, indicating $g_1 > g_2$.

The quantity of private capital is

$$k_i = \frac{a}{3} + \frac{1}{3} - \left(\frac{2z_j}{3} - \frac{z_i}{3}\right) = \frac{a}{3} + \frac{1}{3} + \frac{\left[(\gamma_i)^2 - 2(\gamma_j)^2\right] a_1}{3d}. \tag{C.4}$$

Because $k_i - k_j = z_i - z_j = \frac{d\left[(a_i)^2-(a_j)^2\right]}{3a_1}$, we obtain $k_1 > k_2$. Moreover, using (5), wage income is derived as

$$g_i k_i - \frac{(k_i)^2}{2} - rk_i = (g_i - r)k_i - \frac{(k_i)^2}{2} = \frac{(k_i)^2}{2}, \tag{C.5}$$

indicating that workers in jurisdiction 1 earn higher wage income.

Regarding the final assertion in Proposition 2,

$$\begin{aligned} a_i - (g_i + k_i) &= a_i - \left(\frac{a}{2} + z_i - z_j\right) = a_i - \left[\frac{a}{2} + \frac{d\left[(a_i)^2 - (a_j)^2\right]}{3a_1}\right] \\ &= (a_i - a_j)\left(\frac{1}{2} - \frac{da}{3a_1}\right). \end{aligned} \tag{C.6}$$

If home bias is weak and inequality in initial capital distribution is apparent $\left(d\left(1 + \frac{a_2}{a_1}\right) < \frac{3}{2}\right)$,

$a_1 - (g_1 + k_1) > 0$ and $a_2 - (g_2 + k_2) < 0$, indicating that jurisdiction 1 exports capital while jurisdiction 2 imports it. If home bias is prominent or interjurisdictional inequality is not apparent $\left(d\left(1 + \frac{a_2}{a_1}\right) > \frac{3}{2}\right)$, the opposite occurs.

Appendix D Proof of Propotition 3

Subject to the bilateral treaty that requires a government of a source jurisdiction to impose withholding tax rate $\underline{\gamma}$ for foreigners, (12) is revised as

$$\begin{aligned} u(c_i) &= g_i^* k_i^* - \frac{(k_i^*)^2}{2} - r^* k_i^* \\ &\quad + r^* \gamma_i^* \left\{ a_i - (1 - x_j^*) a_i \min\left[\frac{1 - x_j^*}{d} \max\left[\gamma_i^* - \underline{\gamma}, 0\right], 1 \right] \right\} \\ &\quad + r^* \underline{\gamma} (1 - x_i^*) a_j \min\left[\frac{1 - x_i^*}{d} \max\left[\gamma_j^* - \underline{\gamma}, 0\right], 1 \right] \\ &\quad - (1 + r^*) g_i^*. \end{aligned} \tag{D.1}$$

There are several differences from (12). First, government i imposes $\underline{\gamma}$, instead of γ_i^*, on the interest income earned in jurisdiction i by creditors from jurisdiction j. Second, creditors calculate the profit from tax-avoidance behavior using $\underline{\gamma}$.

In (D.1), suppose that $\frac{1-x_j*}{d} \max\left[\gamma_i^* - \underline{\gamma}, 0\right] \geq 1$ holds in equilibrium. This means $\gamma_i^* > \underline{\gamma}$. Then, with g_i^* and g_j^* being determined and r^* being given by (7), government i could increase workers' utility by marginally increasing γ_i^*. This contradicts the assumption that such a relationship holds in equilibrium. Therefore, if an equilibrium exists, it must be that $\frac{1-x_j^*}{d} \max\left[\gamma_i^* - \underline{\gamma}, 0\right] < 1$.

The same logic applies for government j. Then, we can rewrite (D.1) as

$$u(c_i) = g_i^* k_i^* - \frac{(k_i^*)^2}{2} - r^* k_i^* + r^* z_i^* - (1+r^*)g^*; \tag{D.2}$$

$$z_i^* = \gamma_i^* \left\{ a_i - a_i \frac{(1-x_j^*)^2}{d} \max\left[\gamma_i^* - \underline{\gamma}, 0\right] \right\} + \underline{\gamma} a_j \frac{(1-x_i^*)^2}{d} \max\left[\gamma_j^* - \underline{\gamma}, 0\right]. \tag{D.3}$$

First, $x_i^* = 0$ is government i's optimal choice if $\gamma_j^* > \underline{\gamma} > 0$. Otherwise any $x_i^* \in [0,1]$ is indifferent and included in its best choices. The same applies to the choice of x_j^* by government j.

Next, any $\gamma_i^* < \underline{\gamma}$ is not included in the set of candidate equilibrium strategies. With a positive r^*, a marginal increase in γ_i^* while still maintaining $\gamma_i^* < \underline{\gamma}$ raises z_i^*, and therefore, increases $u(c_i)$. For $\gamma_i^* \geq \underline{\gamma}$, by using the derived optimal choice of x_j^* by government j, we have $\frac{(1-x_j^*)^2}{d} \max\left[\gamma_i^* - \underline{\gamma}, 0\right] = \frac{\gamma_i^* - \underline{\gamma}}{d}$. The logic used in the proof of Proposition 1 obtains

$$\frac{\partial z_i^*}{\partial \gamma_i^*} = a_i \left(1 - \frac{2\gamma_i^*}{d} + \frac{\underline{\gamma}}{d}\right) = 0, \tag{D.4}$$

which gives us

$$\gamma_i^* = \gamma^* = \frac{d + \underline{\gamma}}{2}. \tag{D.5}$$

With $0 \leq \underline{\gamma} \leq d$, the solution γ_i^* derived under the assumption $\gamma_i^* \geq \underline{\gamma}$ is indeed consistent with the assumption.

We can compare γ^* with γ_i:

$$\gamma^* - \gamma_i = \frac{d + \underline{\gamma}}{2} - \frac{d(2a_i + a_j)}{3a_1}. \tag{D.6}$$

For $i = 1$,

$$\gamma^* - \gamma_1 = d\left(\frac{1}{2} + \frac{\underline{\gamma}}{2d} - \frac{2}{3} - \frac{a_2}{3a_1}\right), \tag{D.7}$$

so that $\gamma^* > \gamma_1$ holds if and only if $\frac{a_2}{a_1} < -\frac{1}{2} + \frac{3}{2}\frac{\underline{\gamma}}{d}$. For $i = 2$,

$$\gamma^* - \gamma_2 = d\left(\frac{1}{2} + \frac{\underline{\gamma}}{2d} - \frac{2a_2}{3a_1} - \frac{1}{3}\right), \tag{D.8}$$

so that $\gamma^* > \gamma_2$ holds if and only if $\frac{a_2}{a_1} < \frac{1}{4} + \frac{3}{4}\frac{\underline{\gamma}}{d}$. These results are depicted in Figure 2.

Appendix E Proof of Propotition 4

Using γ^* demonstrated in Proposition 3, we derive

$$z_i^* = \gamma^* a_i \left(1 - \frac{\gamma^* - \underline{\gamma}}{d}\right) + \underline{\gamma} a_j \frac{\gamma^* - \underline{\gamma}}{d}. \tag{E.1}$$

Substituting z_i^* in (E.1) into z_i in (C.2) and z_j^* into z_j similarly, we obtain the quantity of public input:

$$g_i^* = \frac{a}{6} - \frac{1}{3} + \gamma^* \frac{2a_i - a_j}{3}\left(1 - \frac{\gamma^* - \underline{\gamma}}{d}\right) + \underline{\gamma}\frac{2a_j - a_i}{3}\frac{\gamma^* - \underline{\gamma}}{d}. \tag{E.2}$$

From (C.2), we obtain

$$\begin{aligned} g_i^* - g_j^* &= z_i^* - z_j^* \\ &= \frac{a_i - a_j}{d}\left[d\gamma^* - \gamma^*(\gamma^* - \underline{\gamma}) - \underline{\gamma}(\gamma^* - \underline{\gamma})\right] \\ &= \frac{a_i - a_j}{d}\left(d\frac{d+\underline{\gamma}}{2} - \frac{d+\underline{\gamma}}{2}\frac{d-\underline{\gamma}}{2} - \underline{\gamma}\frac{d-\underline{\gamma}}{2}\right) \\ &= \frac{a_i - a_j}{4d}\left(d^2 + 3\underline{\gamma}^2\right), \end{aligned} \tag{E.3}$$

which straightforwardly derives $g_1^* > g_2^*$.

From (C.4) the quantity of private capital is

$$k_i^* = \frac{a}{3} + \frac{1}{3} - \gamma^*\frac{2a_j - a_i}{3}\left(1 - \frac{\gamma^* - \underline{\gamma}}{d}\right) - \underline{\gamma}\frac{2a_i - a_j}{3}\frac{\gamma^* - \underline{\gamma}}{d}. \tag{E.4}$$

Also, $k_i^* - k_j^* = z_i^* - z_j^*$ and (E.3) indicate $k_1^* > k_2^*$. The assertion on wage income is an application of (C.5).

Finally, we derive from (E.3) and $g_i - g_j = \frac{d\left[(a_i)^2 - (a_j)^2\right]}{3a_1}$ (see Appendix C) ,

$$\left(g_i^* - g_j^*\right) - (g_i - g_j) = (a_i - a_j)\frac{9a_1\underline{\gamma}^2 - d^2(a_1 + 4a_2)}{12a_1 d}. \tag{E.5}$$

Then, $g_1^* - g_1 < g_2^* - g_2$ (implying $(g_1^* - g_2^*) - (g_1 - g_2) < 0$) if and only if

$$9a_1\underline{\gamma}^2 - d^2(a_1 + 4a_2) < 0, \tag{E.6}$$

that is,

$$\frac{a_2}{a_1} > -\frac{1}{4} + \left(\frac{3}{2}\frac{\underline{\gamma}}{d}\right)^2. \tag{E.7}$$

The region defined by (E.7) is located to the left of the bold dotted curve in Figure 2.

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Figure 1. Potential interest income tax rates

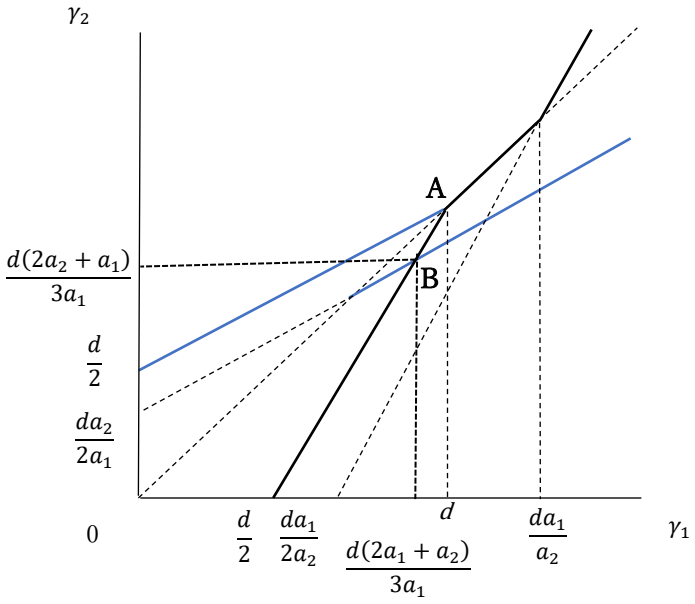
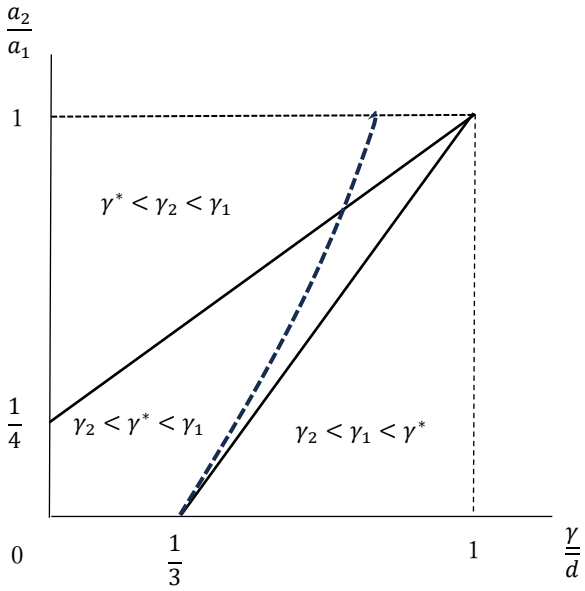
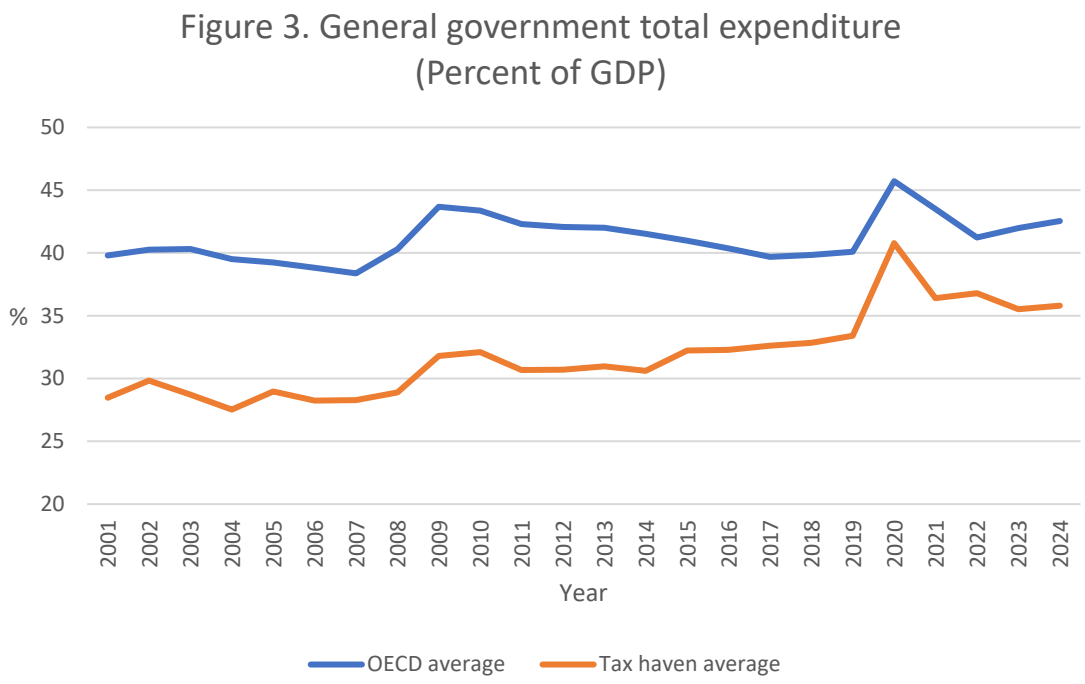


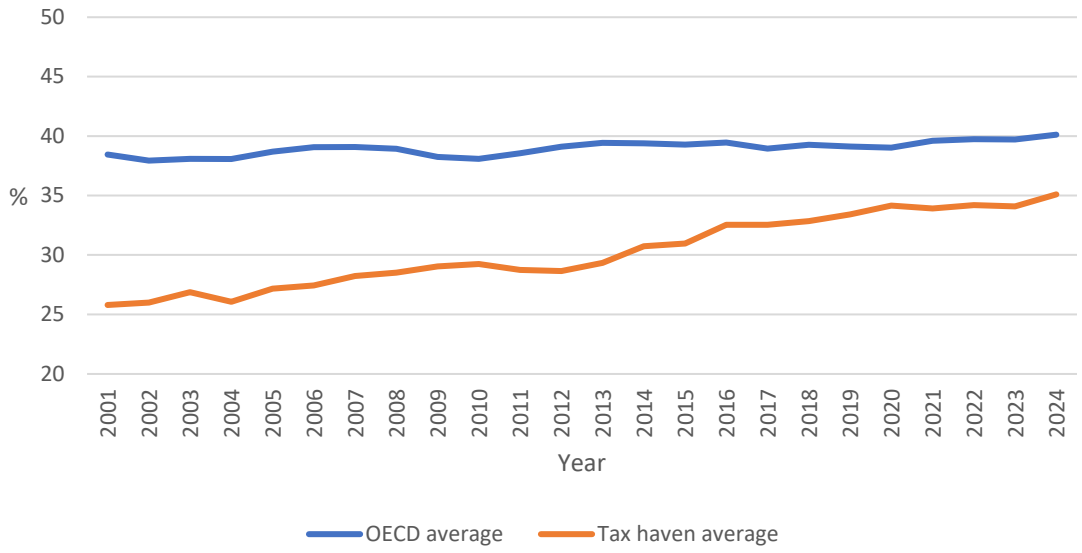
Figure 2. Relationship among γ_1, γ_2, and γ^*





Source: IMF World Economic Outlook Database, April 2025

Figure 4. General government revenue
(percent of GDP)



Source: IMF World Economic Outlook Database, April 2025